Colorado Springs Utilities

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2025

Electric

Line extension and service standards

www.csu.org

Pursuant to Colorado Springs City Code Section 12.1.110, on January 27th, 2025, Colorado Springs Utilities provided public notice of its intent to amend the Electric Line Extension and Service Standards. No substantial comments to these Standards and no request for a hearing were received. Therefore, Colorado Springs Utilities does hereby amend the Electric Line Extension and Service Standards as Colorado Springs Utilities policy to become effective on February 12th, 2025.

Somer Mese, Chief Operations Officer

2/12/25
Date Approved

Lisa Barbato, Chief System Planning & Projects Officer

2/12/25
Date Approved

COLORADO SPRINGS UTILITIES
ELECTRIC LINE EXTENSION & SERVICE STANDARDS

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2025 REVISION TABLE

(To the 2024 Electric Line Extension and Service Standards)

From, Type, Reason	CHAPTER	TITLE	REVISION DESCRIPTION
URR Tariff, Update wording based on updated to the 2025 URR Tariff language.	3.03	Overhead and Underground Electric Facilities	The costs of the extension will be collected with an *Extension Contract* or a ~~*Revenue Guarantee*~~ ***Recovery Agreement*** *Contract.* The Utilities Rules and Regulations, Electric **Line Extensions and Services Section** ~~2.A(1)~~, determine when a ***Recovery Agreement*** ~~*Revenue Guarantee*~~ *Contract* shall be applied to requests for extensions. When, in the sole judgment of Utilities, the costs to administer a ***Recovery Agreement*** ~~*Revenue Guarantee*~~ *Contract* are prohibitive, an *Extension Contract* will be administered. Total project costs will be included if a ***Recovery Agreement*** ~~*Revenue Guarantee*~~ *Contract* is administered.
Christopher Sine, Minimum conduit size for above ground vs below ground CT metering conduit.	5.04a7	Instrument Transformer (CTs & VTs) Metering	CT metering conduits, when required, shall be **a minimum** 1-1/2" **inch for above grade conduit and a minimum 2 inch for below grade conduit** size from the transformer pad or CT cabinet to the meter socket, continuous run of either GRC or schedule 40 PVC, with all exposed above ground lengths to be schedule 80 PVC or GRC terminated with grounding bushings bonded to local ground electrodes.
Christopher Sine, Line/ Load Side feed on Overhead vs Underground Services	5.04c6	Instrument Transformer (CTs & VTs) Metering/ CT Cabinets	The line side must be fed from the top of the CT cabinet, with the load side fed from the bottom **only on Overhead services, Underground services may be installed with the line side from the bottom or top.**
Christopher Sine, -Minimum conduit size for above ground vs below ground CT metering conduit. -Changed Maximum CT Conduit run length from 35' to 20'.	5.04e	Instrument Transformer (CTs & VTs) Metering/ Instrument Transformer Conduit	- In all instrument transformer metering cases, the customer will furnish and install a minimum 1-1/2 inch **for above grade** conduit **and a minimum 2 inch for below grade conduit**, between the meter socket and the instrument transformer (CT & VT) location for use by Colorado Springs Utilities. - The maximum distance (total length of conduit run **including all bends**) will be ~~35~~ **20** feet with no more than three 90-degree bends in a single pull section.
Bill Galloway and Lisa Ross, Add reference to GLESS Chapter 3 for LUSI Rules and Procedures	7.02	Residential Underground System	~~For gas service line installation requirements and procedures~~, Refer to Gas Line Extension & Service Standards book, latest edition, **Chapter 3 for the "Utility Service Installer License Rules and Procedures" and** Chapter 4 **for gas service line installation requirements and procedures,** including Appendix C - Table 7 for approved materials, Appendix C - Table ~~11~~ **10** for Inspection Checklist, and Appendix D - Figures ~~1-9~~ for installation details.

2025 REVISION TABLE

(To the 2024 Electric Line Extension and Service Standards)

Lisa Ross and Tim Benedict, Update wording for Overtime contract	8.07 & 8-10	Request for Colorado Springs Utilities to Work Overtime	8.07: Rewording of process for developer or other customer to request a Time & Material Overtime Request. 8-10: It is understood that any money paid for overtime work is not part of the base contract and is ~~nonrefundable~~ **not recoverable**.
URR Tariff, Update wording based on updated to the 2025 URR Tariff language.	10.01f1	Commercial Underground System/ Customer Installation Requirements in an Underground Area	Due to additional costs of undergrounding a distribution system, partial participation in the installation of the electrical distribution system will be required of the customer. All such work must be done by a licensed electrical contractor at the customer's expense. Appropriate ~~mainline extension~~ **recovery agreement** and aid-to-construction fees may apply.
Toby Mijares, Downtown Network customer owned secondary cable limiters.	10.06c3g	Colorado Springs Network Service Area/ Electrical System Design	Added bullet g recommending the installation of cable limiters on customer owned secondary cable and busses on the grid network. Wording is likely to change on this, will be discussed in the next downtown network meeting.
Rick Whitehair II, Customer inverter assessed for settings and optional Volt-VAR setpoints	13.04c6	Generators Continuously Paralleled /Voltage Control & Flicker	6) Normally, the generated voltage shall follow, not attempt to oppose or regulate, changes in the prevailing voltage level provided by Utilities at the PCC in accordance with IEEE 1547. ~~The customer may be required to coordinate with Utilities Engineering on a prescribed volt/VAR or power factor schedule.~~ **All solar or generation projects with an inverter will be assessed for optional advanced inverter settings during the application process. These settings including Volt-VAR setpoints and if required will be communicated to the customer, installer, and other application stakeholders.**
Bryce Reher, Installation Requirements, updates to 193-SPP-SCA Specifications	13.08c	Meter Installations at Primary Metered Generation Sites 150 kW and Above	Updates to the process of installing generation power plant SCADA panels for sites equal to or greater than 500 kW. Allow for concrete pads as well as vaults.
Tim Thomas, Appendix B updates	Appendix B	Appendix B, Utilities Addressing Plan, Utilities Design CAD File and Easements Policies and Procedures	Acronym, phone number and added additional clarification notes.
Toby Mijares, Added TESCO Metering Cabinets and Eaton Cable Limiters.	Appendix C, Table 3	Material Requirements for Use In Electric Service Line Construction	•Added TESCO metering cabinets as approved models for 8 Terminal and 13 Terminal Pre wired meter sockets with test switches. •Added Eaton cable limiters as approved for downtown network.

2025 REVISION TABLE

(To the 2024 Electric Line Extension and Service Standards)

Christopher Sine, -Minimum conduit size for above ground vs below ground CT metering conduit. -Changed Maximum CT Conduit run length from 35' to 20'.	Appendix D, (Various)	(Various)	-Appendix D, Drawings 12A, 12B, & 13: 18" RADIUS 90° ELBOW AND CONDUIT (MIN **2" PVC BELOW GRADE**) -Appendix D, Drawings 14 & 15: 1-1/2" SCH80 PVC OR GRC- **20'** MAX,OR EMT- 2' MAX -Appendix D, Drawing 19: **20'** MAX and note 7: The CT meter conduit shall be no longer than **20 feet (total length of conduit including all bends)**
Christopher Sine, Line/ Load Side feed on Overhead vs Underground Services	Appendix D, Photo 1	PHOTO 1 – THREE PHASE CT CABINET	**For Overhead Services, Line Side must be on Top. For Underground Services, Line Side may be on the Bottom or Top.**
Elizabeth Ritchey, Clarify color options for AC Disconnect Switch	Appendix D, Photo 6	PHOTO 6 – PHOTOVOLTAIC SERVICE EQUIPMENT LABELING	Customer Provided "AC Disconnect" Placard on AC Disconnect Switch. **Color may be black text on yellow background or white text on red background.**
Toby Mijares, Updated specification 102-600-077	Appendix E, Material Specification	102-600-070 & 102-600-077 Socket, Meter, Prewired Test Switch, 8 & 13 Terminal, 20 Amp	Updated Material Specification 102-600-070 & 102-600-077 Socket, Meter, Prewired Test Switch, 8 & 13 Terminal, 20 Amp
Toby Mijares, Add specification 102-700-(000-001) to Appendix E	Appendix E, Material Specification	102-700-(000-001) Switch, Color Coded Meter Test – (VARIES) Connected	Add Material Specification 102-700-(000-001) "Switch, Color Coded Meter Test – (VARIES) Connected" to Appendix E.
Bill Galloway and Adrian Pereida, Add specification 193-SPP-SCA to Appendix E	Appendix E, Material Specification	193-APP-SCA Generation Power Plant SCADA Panels	Add Material Specification 193-SPP-SCA "Generation Power Plant SCADA Panels" to Appendix E.
Updated notes in reference to conformance with City of Colorado Springs Public Works specifications.	Appendix F, 11-1	Trenching, Backfill/Compaction, Concrete Mixes, & Aggregate Base Course Materials	-Deleted notes 1 & 2 and moved note 6 to note 1 position. -Revised note 1 as follows: "**All work to be** in conformance with City of Colorado Springs Public Works specifications **(https://coloradosprings.gov/public-works/page/standard-specifications-manual)**. Refer to other authority if using state highway or county roads."
Updated notes and drawings for Fiber conduit and tracer wire. Added note about trench marking tape.	Appendix F, 11-2	Concrete Encased Duct Banks	-Updated notes and drawings for Fiber conduit and tracer wire. -Added trench marking tape note to drawing: "**INSTALL TWO RUNS OF 3" RED CAUTION TAPE, 12" ABOVE DUCT & 1' APART (#100-136-036)**"

2025 REVISION TABLE

(To the 2024 Electric Line Extension and Service Standards)

Added new section for Fiber Conduit.	Appendix F, 11-5	Tracer Wire for Empty Ducts	Added new section for Fiber Conduit.
Revised exception note about 3' clearance to Fiber, added note about horizontal clearance to fiber boxes, & updated note 2 for Joint trench with Utilities' Fiber.	Appendix F, 18-304	Clearances Of Ug Electric Conduit/Cable from Other Facilities	Reformatted wording for Exception "e" that reduces clearance Telecom/ fiber to 3' when the requirements listed are met, emphasized the past requirement that high pressure gas main requires a 10-foot horizontal clearance with no exceptions, and added text "**The horizontal clearance distance applies to fiber appurtenances, to include boxes (boxes must be the required horizontal and vertical distance away from gas and electric and shall not be placed over electric or gas pipe).**" Updated note 2: "These clearance matrix table dimensions are for separate trenches. **Joint trench between Gas and Colorado Springs Utilities Telecom./ Fiber requires a 1' radial separation. Joint trench between Electric and Colorado Springs Utilities Telecom./ Fiber requires a 3" in concrete and 6" in fill earth radial separation.**"
-Updated Phone List	Phone Numbers & Contact Information	Phone Numbers & Contact Information	Updated Phone List and FE Maps.

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CHAPTER 1
General Information

CHAPTER 1

General Information

1.01 Purpose:

These standards are issued by Colorado Springs Utilities as requirements for obtaining electric service and electric line extensions and to put forth the service available, conditions for service, and the standards for material and construction. The requirements of the chapter text and the tables, drawings, photos, material specifications and construction standards in the appendices C through F apply. The standards herein supersede all previous publications of “Electric Line Extension & Service Standards” issued by Colorado Springs Utilities prior to this date and is subject to change without notice.

These are provided to assist customers, architects, engineers, contractors, developers, wiremen, and inspectors in planning and installing electric distribution and electric service. It is not intended that any requirements may be unduly restrictive or burdensome, but that these regulations and policies serve to provide safety guidelines and expedite service connection by establishing uniform and equitable standards for electric service. No one rule or instruction covers all conditions. For conditions not specifically covered within these standards, the customer shall defer to the Colorado Springs Utilities Field Engineering’s or Quality Control Inspector’s decision on the appropriate course of action. Colorado Springs Utilities welcomes and encourages all inquires concerning unusual or special needs and to provide clarification of our requirements and standards.

1.02 Definitions:

a) The term “Customer”, when used herein, refers to any person or company applying for, receiving, using, or agreeing to take a class of electric service or other services supplied by Colorado Springs Utilities.

b) The term “National Electrical Safety Code”, or “NESC”, when used herein, refers to the current edition of the National Electrical Safety Code as adopted by Colorado Springs Utilities’ Chief Executive Officer at time of electric distribution or electric service installation.

c) The term “National Electrical Code”, or “NEC”, when used herein, refers to the current edition of the National Electrical Code as adopted by the Regional Building Department at time of construction.

d) The term "Point of Common Coupling" or "PCC" refers to the point where Colorado Springs Utilities’ equipment connects to the Customer equipment. For overhead services, this is typically the connection to the customer’s weatherhead wires, and for underground services, this is typically the connection at the residential meter socket. This is also referred to as the "Service Point" by the NEC. Ownership and responsibility for the repair and maintenance of the equipment changes at this point. The maintenance and repair beyond this point into the customer’s electrical equipment is the sole responsibility of the customer. This includes but not limited to: all secondary conduits, point of attachment, guys, junction boxes, conductors, connectors, current transformer cabinets, meter pedestals, breakers, receptacles, and meter sockets.

e) The term “T&M” refers to the cost of “Time and Materials”. It is also referred to as “3rd Party Billing”.

1.03 General Policy Information:

a) The standards herein are supplementary to, and are not intended to conflict with, the rules and regulations on file with the City Clerk of the City of Colorado Springs, applicable city ordinances, the National Electrical Safety Code, or the National Electrical Code. Colorado Springs Utilities’ policy requirements for some clearances exceed NESC minimum requirements.

b) The Customer will give the duly authorized agents and employees of Colorado Springs Utilities, when properly identified, full and free access to the premises of the Customer at all reasonable hours. This access will be for the purpose of installing, reading, inspecting, adjusting, repairing, maintaining, replacing or removing any of Colorado Springs Utilities' facilities on the premises of the Customer or for any other purpose incidental to the electric service supplied by Colorado Springs Utilities.

c) Employees of Colorado Springs Utilities may not demand nor accept any compensation from a Customer for services rendered in the line of duty. However, certain employees do collect money from Customers for settlement of accounts due Colorado Springs Utilities and of which the Customer is already aware.

d) No person shall tamper with, connect, disconnect, move, remove, or otherwise interfere with the proper operation of a Colorado Springs Utilities meter or other equipment or in any way interfere with the proper metering registration of the electric energy used. Only authorized Colorado Springs Utilities employees are permitted to connect, disconnect, move, or remove meters. Contact a Colorado Springs Utilities Customer Service representative at 448-4800 to schedule these activities.
For violation of this regulation, service will be disconnected without notice to the customer and will not be reconnected until the customer has corrected such violation in accordance with prevailing electric requirements. The customer may be billed the costs incurred by Colorado Springs Utilities to resolve the situation as well as the outstanding service charges.

e) The customer at all times will protect the property of Colorado Springs Utilities on the premises of the customer and will permit no persons other than the employees and agents of Colorado Springs Utilities and other persons authorized by law to inspect, work on, open, or otherwise handle the wires, meters or other facilities of Colorado Springs Utilities. All work on Colorado Springs Utilities equipment will be in compliance with Part 4 of the National Electrical Safety Code. In case of loss or damage to the property of Colorado Springs Utilities due to carelessness, neglect, or misuse by the customer, his family, agents, servants, or employees, the customer will, at the request of Colorado Springs Utilities, pay to Colorado Springs Utilities the cost of any necessary repairs or replacement of such facilities or the value of such facilities. See Chapter 10 for additional requirements to access Colorado Springs Utilities–owned equipment.

f) Devices or attachments will not be connected to Colorado Springs Utilities facilities in such a manner as to permit the use of unmetered energy without the prior written consent of Colorado Springs Utilities. Meter Collars or other devices are not allowed between a Colorado Springs Utilities meter and the meter socket.

g) The electric service supplied by Colorado Springs Utilities is for the exclusive use of the customer on the premises to which such service is delivered by Colorado Springs Utilities. Colorado Springs Utilities will not supply electric service to a customer for resale by the customer, except in the case allowed by City Charter for charging of electric vehicles so long as the electricity was initially purchased from Utilities and the seller has given notice to Utilities of the resale.

h) Master Metering:
For new construction, no new master meters will be connected to the Colorado Springs Utilities electric system, with certain exceptions. For the purpose of this text, a master meter is defined as one meter feeding multiple premises (occupancies) in the same building or complex of buildings. Exceptions include assisted living, student housing, Low-Income Housing Tax Credit (LIHTC) program approved affordable housing, or other similar purposes, and must be approved by Field Engineering.

At least one meter per building may be required. For certain customers – not necessarily including assisted living or student housing – master-metered customers should check meter tenants, lessees, or

other persons to whom ultimately the electricity is distributed. Individual residents should be charged by an allocation procedure, provided the master-metered commercial customer does not receive more than necessary to pay the master-metered bill. This is to ensure fair billing practices and encourage energy conservation. Each "check meter" shall meet ANSI/NEMA SM 31000 for submeters. Remodeling may require conversion to individual meters.

Utilities requirements for any new or existing master meters:

1) Provide notification to residents that their utilities are not individually metered resulting in the following:

(a) Utilities' applicable customer will be the entity and not individual residents or tenants.
(b) In the event of curtailment or outage, all residents will be impacted.
(c) Residents are not eligible for Utility's conservation programs and rebates.
(d) Green power and roof-top solar will not be available to individual residents.

2) Utility service is metered and billed on appropriate commercial rate (electric demand rate).

3) Utility service may not be resold and charges to residents may not be marked-up, in accordance with the Colorado Springs City Code.

4) The project will be required to have no more than one transformer per building.

Additional requirements for approved affordable housing master meters:

5) Billing deposit representing six-months of estimated bills and enrollment in Electronic Funds Transfer (EFT).

6) Project will provide Utilities with a letter or certificate from the City of Colorado Springs, Community Development Division, confirming that the project qualifies as "affordable housing."

i) The rates for all types of electric service supplied by Colorado Springs Utilities are on file with the City Clerk's Office, the Pricing Division, and on Colorado Springs Utilities Internet website located at www.csu.org/Pages/RatesTariffs.aspx page.

Upon request, a representative of Colorado Springs Utilities will explain rate schedules and assist in selection of the applicable rate best suited to the customer's requirements.

i) Generally, attachments of any kind to a power or street light pole will NOT be permitted (see NESC 217.A.4). Attachments of any kind to any vaults lids, padmounted equipment, or other utility owned equipment will NOT be permitted. The attachment owner may be billed the cost incurred by Colorado Springs Utilities for necessary repairs and/or replacement cost from damage to our equipment from removing an attachment. For painting of Colorado Springs Utilities vault lids or padmount equipment, see paragraph 10.01k and Appendix F, Standard 19-10.

1) In certain cases, attachments to power poles, specifically in the communication space, by other utility entities are granted. Contact South Field Engineering for eligibility requirements, which include:

(a) A "Utility Pole Attachement" excel form is to be completed by the requestor listing each individual pole along with a map(route) of proposed attachments and any material specifications needed (sag calculations). (see the following link for excel form and

instructions: https://www.csu.org/Documents/UtilityPoleAttachment.xlsx). Field Engineering will return the approved/denied forms to the requestor.

(b) Each pole attachment, shown on the map submitted, shall be reviewed and signed by a licensed professional engineer in the state of Colorado, to signify that the installation will meet all NESC clearance requirements. Any Colorado Springs Utility equipment modifications required to meet NESC clearance requirements, shall be at the expense of the requestor.

(c) Any attachments to Colorado Springs Utilities facilities by other utilities should be marked for identification according to the requirements of NESC (rule 220D and 220E). All attachments must be located outside of the climbing and working space per NESC rules 236 & 237.

2) For attachments outside of the power pole communication space, a request will be made to the appropriate North or South Field Engineering Supervisor and the Engineering Standards Managing Engineer.

3) For attachments in the supply space of poles carrying low voltage only, the requirements listed in item 1) and 2) apply.

4) In certain cases, attachments to aluminum or steel street light poles are granted. Contact North or South Field Engineering for eligibility requirements, which include:

(a) A "Request for Attachment to Streetlight Pole" form is to be completed by the requestor for each individual pole and returned to Field Engineering with a map showing streetlight pole locations (see end of chapter for form). Field Engineering will return the approved/denied forms to the requestor.

(b) A Revocable Permit is required. Contact the City of Colorado Springs Revocable Permit Coordinator at City Planning for the required revocable permit. Request for Attachment forms, which have been approved by Field Engineering, must be included with the permit request for the Revocable Permit to be granted. A copy of the permit will be given to Field Engineering before attachments are installed.

(c) Only banner brackets approved in Colorado Springs Utilities Standards are to be used (see Appendix F, Construction Standard 17-10 for bracket detail).

(d) Installation of banners and brackets (including all costs) is the responsibility of the permit holder and must follow Colorado Springs Utilities' installation guides. OSHA-qualified personnel must attach the banner brackets. Colorado Springs Utilities personnel will inspect the attachments. Banners are to be removed, by the permit holder, on or before the date specified in the revocable permit.

5) In certain cases, small wireless antennas and transmitters are allowed attachments on standard (Steel, wood and aluminum) poles. For attachments on streetlight and service lift poles. at the communication level (See 1.03i1 for attachments in the communication space and follow the existing pole attachment process). For attachments on primary poles in the supply space level, only high voltage qualified personnel may work on the equipment mounted in the supply space. If the communications company wants to attach to a pole that doesn't meet the requirements listed below, the company would be required to pay for a new pole, base and installation costs. All companies wanting these types of attachments have the right to request approval to be in the rights-of-ways (R.O.W.) without attaching to our poles, if adequate clearances can be achieved. The approval to reside in R.O.W. comes from the City of Colorado Springs Municipal Government. The minimum requirements are:

(a) All attachments must be reviewed and approved by Field Engineering.

(b) In most cases, due to the additional load, specially designed streetlight poles and bases will be provided and maintained by the communications company for Utilities

ownership, with provisions for a Utilities owned and maintained luminaire. A separate raceway in the pole and base shall be furnished for the Utilities streetlight power wiring, and shall be run straight through the pole with only one elbow at the arm. An underground J-box will be required to connect to the streetlight circuit. See the Streetlight Pole with Antenna Inspection Checklist below, for more detailed pole requirements.

(c) Colorado Springs is in a designated "Heavy Loading District" and for areas west of I-25, is in a "Special Wind Loading District". Therefore, additional strength is required for overhead structures, and shall meet AASHTO 100 mph wind rating.

(d) If an existing wooden streetlight pole or service lift pole, being used to support communications equipment, needs to have any maintenance or installation of communication equipment, it must be performed by personnel qualified to work in the supply space.

(e) Pole must be truck accessible. Non-accessible poles requiring climbing are not permitted.

(f) Wiring for attachment must be in a separate duct or raceway mounted on the surface of the wood utility pole. This prevents any interference with our supply lines during maintenance activities being performed by Communications Company or Utilities'. This also insures compliance with national codes.

(g) Streetlight must have a local (individual) photocell control. The cost for conversion of the associated streetlights to individual photocells shall be borne by the communication company.

(h) Attachment must have RF transmitter disconnect. This is to protect Utilities' employees from close proximity to RF signal transmission.

(i) Attachment cannot interfere with Utilities Automated metering 900 MHz system.

(j) All attachments must meet NESC, AASHTO and Utilities requirements. Plans shall be stamped by a registered Colorado Professional Engineer.

(k) No drilling of existing aluminum streetlight poles would be allowed as this will weaken the pole.

(l) No meters (even though these attachments would require metering) are allowed on Utilities standard poles. Meters are allowed on customer furnished poles and require a separate, sealable section or raceway for Utilities service entrance wiring. The meter shall be located so it is accessible and at least 90 degrees away from pedestrian traffic. No disconnects or other customer equipment shall be installed on the source side of the meter.

(m) Streetlight poles must be approved by the City of Colorado Springs – contact the City Senior Planning Technician/Revocable Permit Coordinator for permitting requirements.

(n) The communications company must receive public approval and proof must be submitted as part of the design for review and approval.

(o) Utilities' will not be responsible for damage to communications company equipment, or responsible for any damage that the communication company equipment causes.

(p) Attachment consisting of multiple antennas will require multiple attachment permits.

(q) A Utilities' revocable permit and agreement would have to be signed and executed before attachments would be allowed.

(r) Frangible (break-away) base or bolts may be required for certain locations. See EDCS 17-7, page 2 for details.

Streetlight Pole with Antenna; Inspection Checklist:

- ❑ **Pole Labels:**
  SPID (Service Point Identification) number on the 5G pole matches that of the original streetlight pole.
- ❑ **Luminaire Wattage:**
  The wattage of the streetlight fixture on the 5G pole is the same as that on the original streetlight pole. If the original streetlight fixture was an obsolete HPS style fixture, the new fixture should be an LED that has been approved for use in the utilites' system.
- ❑ **Luminaire Mounting Height:**
  The streetlight fixture is to be mounted on a new 6ft arm and the mounting height of the new streetlight fixture should match that of the original streetlight pole.
  100W LED Equivalent – 25ft
  250W LED Equivalent – 30ft
  400W LED Equivalent – 35ft
- ❑ **Streetlight J-Box:**
  The J-Box used for the streetlight power should be 13"x24"x18" and be manufactured by one of the approved companies listed in Appendix C, Table 3:
- ❑ **Streetlight Pole Equipment Requirements:**
  - o The wires that feed the streetlight fixture are to be installed in a continuous, 3/4", Sealtight® flexible conduit (or approved alternate) which is run from the streetlight fixture, through the arm, to the bottom of the pole, terminating behind the utilities' access door.
  - o A lockable access door for utilities' use. Designed to accommodate a padlock with a 5/16" shackle diameter, 15/16" shackle length, and ¾" width. The door must be hinged or designed to be secured with the lock only. No screws of any kind are to be used to secure the door.
  - o A disconnect switch to de-energize the system.
  - o A partition which separates CSU streetlight connections and the communications company equipment.
  - o An RF warning label
  - o An RF disconnect switch.
  - o A label with the phone number to call if the pole gets knocked down.
  - o No external conduits or cables.
  - o No external equipment.

j) Colorado Springs Utilities will use reasonable diligence to supply continuous electric service to the customer but does not guarantee the supply of electric service against irregularities or interruptions. Colorado Springs Utilities will not be considered in default of its service agreement with the customer and will not otherwise be liable for any damages incurred by any irregularity or interruption of electric service.

k) Colorado Springs Utilities will not be considered in default of its service agreement and will not otherwise be liable due to failure by Colorado Springs Utilities to perform any obligation if prevented from fulfilling such obligation by reason of delivery delays, breakdowns of or damage to facilities,

acts of God, public enemy, strikes or other labor disturbances involving Colorado Springs Utilities or the customer, action of civil, military, or governmental authority or any other cause beyond the control of Colorado Springs Utilities.

l) The customer may be required to provide a Utilities Addressing Plan (UAP), a Utilities Design CAD File (UDCF) or both in support of a service extension request. Details of the UAP and UDCF are given in Appendix B.

m) If a residential service has been disconnected for a period exceeding one year or a commercial service has been disconnected for a period exceeding six months, or evidence of any wiring changes exists, an inspection approval from the Regional Building Department shall be required before any reconnection of electric service by Colorado Springs Utilities.

n) For removal of utilities from a property for demolition or construction purposes, the customer must submit to Colorado Springs Utilities a "Request for Removal of Utilities for Demolition or Construction" (see end of chapter for form).

1.04 Locating Responsibility:

a) Colorado Springs Utilities Locating is responsible to locate:
Colorado Springs Utilities maintained electric **transmission and distribution** lines on public or private property; all residential electric service lines that originate at the transformer or junction box and end at the electric meter.

b) Colorado Springs Utilities Locating is not responsible to locate:
Any electric **distribution** system that has been identified as being private and owned by large commercial owners; any residential electric **service** line that is fed from an electric meter vault (high-can vault with meter at vault); any commercial electric **service** lines that are fed from Colorado Springs Utilities owned electric transformers.

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REQUEST FOR ATTACHMENT TO STREETLIGHT POLE

Date _____

Company Name _____ Phone Number _____

Responsible Party for Billing Purposes: Not *Applicable*

Email Address: _____

Address: _____

_____

Pole Location: _____
(Physical Street Address)

FIMS Pole Number: SL_____ _____ Elect. Grid Map Number

New Attachment: _____ Attachment Type: _____

Antenna Attachment ☐ YES ☐ NO

***Note: Map/Job Print, Revocable Permit and Pole Attachment Payment Must Accompany Each Request**

FOR COLORADO SPRINGS UTILITIES USE ONLY
FOR ANTENNA ATTACHMENTS PLEASE REFER TO L:\Field Engineering\Pole Attachments\Antenna Pole Attachments

EXISTING ATTACHMENTS

OTHER _____

STREETLIGHT POLE OWNERSHIP

☐ Utilities ☐ Century Link ☐ Other

Field Check by: _____ Date : _____ FE Work Order #: _____

Application Fee: $40.00 ☐ Approved ☐ Denied Attachment Height _____ ☐ Make Ready Work Required

Remarks: _____

_____

_____

Approved by: _____
(Field Engineering Supervisor)

Southwest District Field Engineering 1521 Hancock Expressway
P.O. Box 1103 MC:1812, Colorado Springs, CO 80947-1812
Office (719)668-5564 Fax (719)668-5956
Email: UtilityApplication@csu.org

FE-33A REVISED: 08/2020

Colorado Springs Utilities
It's how we're all connected

COLORADO SPRINGS UTILITIES
Customer Contract Administration
2880 International Cir, Suite 210 • Colorado Springs, CO 80910
Phone (719) 668-8111 cca@csu.org Fax (719) 668-8130

Date: _____

REQUEST FOR REMOVAL OF UTILITIES - DEMOLITION OR CONSTRUCTION

Property Address*: _____
**A single application may be submitted for bus shelters, traffic signals or multiple properties of one owner with a separate attachment of additional addresses*

Property Use: Residential ☐ Commercial ☐

Property Owner: _____ Phone: _____

Contractor: _____ Phone: _____

Requested Services for Removal:
- ☐ Electric
- ☐ Transformer
- ☐ Gas
- ☐ Water
- ☐ Wastewater

Notify Upon Completion of Utilities Removal: Owner ☐ Contractor ☐

Notes: _____

Meter #'s: _____

The Owner/Agent understands and agrees as follows:

Owner/Agent requests that Colorado Springs Utilities' (Utilities) electric, natural gas, water and/or wastewater services servicing the property be disconnected prior to proposed demolition or construction**.**

_____ **(the undersigned)** hereby warrants that he/she is the ☐ **Owner** or ☐ **Duly Authorized Agent** of the Owner (either is referred to herein as "Owner/Agent") of the above described property and hereby authorizes Utilities to remove all requested electric, natural gas, water, and/or wastewater services to the above described property and to execute such work as may be necessary to insure the integrity of Utilities' systems and the safety of all concerned. Owner/Agent agrees at his/her expense to meet all Utilities' requirements, including but not limited to those standards and authorized procedures for removal of said utilities. Such standards may be obtained at www.csu.org/business/development services/utility specifications.
(The utility removals are typically completed in 5-10 business days; however, emergency service requirements may affect scheduling.)

ELECTRIC

Commercial Electric Service: After Utilities has disconnected service from Utilities' side of the transformer, the Owner/Agent will have a licensed Electrician remove the Commercial Electric service wires from the secondary bushings at the transformer. This must be performed before any construction or demolition activities to protect the secondary bushings from damage.
Residential Electric Service: Utilities will remove the Residential Electric service wires from the transformer.

NATURAL GAS

Utilities will disconnect and cap the Natural Gas service line at or as close as possible to the property line or main.

WATER *(Please check one)* **Inspections 719-668-3524**

☐ **Service line to be reused within two (2) years:** Any service disconnection and reconnection must follow Utilities' Line Extension and Service Standards.

☐ **Service line not to be reused:** If the water service line is not to be reconnected or reused, then the water service line and tap shall be removed by Owner/Agent back to the water main in accordance with Utilities' Line Extension & Service Standards for Water. If Utilities is required to remove the service line and tap, Utilities will invoice the Owner for all removal costs and main line repairs on a time and materials basis; and Owner/Agent will pay any such invoice within thirty (30) days of receipt.

Inspection fees will be paid by the Owner/Agent to Utilities in accordance with Colorado Springs Utilities' Tariff

WASTEWATER *(Please check one)* **Inspections 719-668-3524**

☐ **Service line to be reused within (2) years:** If the wastewater service line will be reconnected, Owner/Agent will have a Licensed Excavator remove and cap (water tight) the wastewater service line in compliance with Utilities' Line Extension and Service Standards and may require CCTV inspection to confirm the integrity of the service line.

☐ **Service line not to be reused:** If the wastewater service line is not reconnected or reused, then the wastewater service line and tap shall be removed by Owner/Agent back to the wastewater main. If Utilities is required to remove the service line and tap, Utilities will invoice the Owner/Agent for all removal costs and wastewater main line capping on a time and materials basis; and Owner/Agent will pay any such invoice within thirty (30) days of receipt.

Inspection fees will be paid by the Owner/Agent to Utilities in accordance with Colorado Springs Utilities' Tariff

GENERAL PROVISIONS

The term "reconnection" as used in this Request for Removal of Utilities applies only when no alterations to the existing service connection points are required either by Owner/Agent or by current Utilities' Line Extension and Service Standards. If for any reason it should become necessary to reinstall or reconnect any of the utility services that have been disconnected pursuant to this Request for Removal of Utilities or if such services later appear to have been wrongfully removed or discontinued at the Owner/Agent's request, the Owner/Agent agrees to indemnify and hold harmless Colorado Springs Utilities from any and all claims arising from the removal or discontinuance of said services and to promptly reimburse Colorado Springs Utilities for any and all costs or expenses incurred to reinstall or reconnect such services and any other applicable fees. Colorado Springs Utilities shall not be liable for delays in performing its obligations to the extent the delay is caused by an unforeseeable condition beyond its reasonable control without fault or negligence including strikes, riots, wars, floods, fires, explosions, acts of nature, or labor disturbances. This Request for Removal of Utilities is subject to the applicable provisions of the City Charter, City Code, ordinances, rules and regulations of the City of Colorado Springs as amended as well as applicable provisions of Colorado Springs Utilities' Tariff, as now in effect or hereafter amended. The laws of the State of Colorado will govern this Request for Removal and any interpretation or construction thereof. Owner/agent acknowledges that Colorado Springs Utilities is afforded protections of the Colorado Governmental Immunity Act, C.R.S. §24-10-101, *et seq*.

Additional Fees: Owner/Agent understands that there may be additional fees to reconnect utility service to the above described property and will pay any fees required.

Owner/Agent Signature_____ Address _____

State of Colorado)
County of El Paso)

Subscribed and sworn before me this _____ day of _____ 20_____, By _____
(Printed name of owner/agent)

_____ My commission expires: _____
Notary Public

Application may be submitted electronically, by mail or in person.

(For Colorado Springs Utilities Completion)

Premise ID: _____

Additional Information**:** _____

_____

☐ Electric Primary: _____ Date: _____

☐ Electric Service: _____ Date: _____

☐ Natural Gas Service: _____ Date: _____

☐ Water Service: _____ Date: _____

Place of removal: □ _____ □ Water main

☐ Wastewater Service: _____ Date: _____

Place of removal: □ _____ □ Wastewater main

☐ Complete Demolition ***ONLY***:

Email sent to LBS – 'WRECK' old address: _____ Date: _____

Completed and Customer Contacted: _____ Date: _____

F01-00778 (08/2019)

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CHAPTER 2
Electrical Safety and Code Clearances

CHAPTER 2

Electrical Safety and Code Clearances

2.01 General Safety:

It is the policy of Colorado Springs Utilities to operate the electric transmission and distribution system with the highest degree of care for the safety to the public and Colorado Springs Utilities employees. To ensure the care and safety needed for an electric distribution system, the National Electric Safety Code is used for design, construction, maintenance, and operation of the electric system by Colorado Springs Utilities as well as any associated activity by the public and private industry. The applicable National Electric Safety Code in effect at the time will apply to new installations and extensions. Existing installations may be altered, replaced for maintenance, or additions made to comply with either the current edition or original requirements of the applicable National Electrical Safety Code in effect at the time of original installation as allowed in NESC Rule 013B.

a) As referenced in City Code, Section 12, Colorado Springs Utilities reserves the right to terminate service when a hazardous condition exits.

b) Illustrations of pertinent current electrical safety code clearances for low-voltage-service drop conductors are shown in Appendix F, Construction Standards 18-207, 208, 209 & 211. These standards are a guide to commonly used data and are not intended to give all the information that may be needed for specific situations. The current edition of the National Electrical Safety Code should be consulted and will take precedence. A copy can be reviewed at Colorado Springs Utilities offices and at the City Clerk's office. A Code Clearance Manual is also available to assist you.

c) Appendix F, Construction Standard 18-301 covers the placement of oil-filled equipment adjacent to buildings and the appropriate clearances for fire safety. Guidelines are also furnished for design of fire-resistant barriers when minimum clearances are necessary. Guidelines for an optional aesthetic enclosure around commercial padmount transformers are included.

d) Appendix F, Construction Standard 18-302 covers Landscaping and Working Space Clearances.

2.02 Minimum Clearance from Overhead Lines:

a) For the purpose of this Chapter, the term "clearance" means the shortest distance between any two surfaces.

b) Minimum clearance between any building or other structure and any overhead transmission line, overhead distribution facility, or electric utility pole will be maintained in accordance with the provisions of the National Electrical Safety Code.

c) Minimum clearance between signs, chimneys, radio and television antennas, storage tanks and other structures, and any overhead transmission line, overhead distribution facility, or electric utility pole will be maintained in accordance with the provisions of the National Electrical Safety Code.

d) Minimum clearance over streets, alleys, parking lots, rights-of-way, easements, etc., of overhead transmission & distribution facilities, will be maintained in accordance with provisions of the National Electrical Safety Code

e) Any person who proposes any action that would result in violation of the minimum clearances as set out in paragraph b) and c) above, will give ninety days prior notice of such proposed action to Colorado Springs Utilities by contacting the Utilities Development Services department (see Phone Section). Any person who proposes to change the use of land or change the grade of land that would result in conflict with paragraph d) above, will give ninety days prior notice of such action. Upon such a notice, Colorado Springs Utilities will determine the feasibility of relocating such line, distribution facility, and/or electric utility pole, which is in conflict with the proposed action to a suitable and safe location. Should it be determined by Colorado Springs Utilities that such relocation is feasible, Colorado Springs Utilities will perform the necessary relocation at the expense of the person whose proposed action would violate the minimum clearance requirement. This payment must be in compliance with paragraph 11.02. Relocation of such overhead transmission line, distribution facility, and/or electric utility pole may begin on a mutually agreed upon date, which may be beyond the original ninety day notification date. No action that will cause a clearance violation will take place until the necessary utility relocations are complete.

f) Should it be determined by Colorado Springs Utilities that the relocation of a transmission line, distribution facility, and/or electric utility pole is not feasible, Colorado Springs Utilities may require such other action as will prevent a violation of the minimum clearance requirement. Any action which Colorado Springs Utilities may require pursuant to this Chapter will be performed at the expense of the person whose proposed action would violate the minimum clearance requirement.

g) Minimum clearance between overheight vehicles, including house moving, and any overhead transmission line, overhead distribution facility, or electric utility pole of Colorado Springs Utilities will be maintained in accordance with the provisions of the National Electrical Safety Code (see Appendix F, Construction Standard 18-228).

2.03 Equipment Operation around Energized Facilities:

a) Overhead:

When working near or operating equipment around overhead electrical lines, Federal OSHA standards and Colorado Revised Statutes require that unqualified persons maintain the electrical distances listed in Column B of Table 2.03a between energized lines/parts and themselves, their tools, their equipment, and all conductive materials. Contacting the line can result in severe injury or death. If work must be accomplished near an overhead electrical line, call Colorado Springs Utilities Inspections (QC) (see phone section) for assistance as needed to identify line-operating voltage, to have temporary warning devices installed (see request form; 2.05), or otherwise avoid contact with these energized facilities. If distribution lines must be de-energized and grounded, or if temporary warning devices must be installed to safely conduct the work, a minimum of 10 business days advance notice is requested. Requests to de-energize transmission lines should be submitted early in the requester's planning process and will be reviewed on a case by case basis by Colorado Springs Utilities. Transmission outages require a significant level of pre-planning and could take months to coordinate (see 2.03a1&2). The Colorado Revised Statutes should be consulted and will take precedence. This law is designed to provide safer working conditions in areas around high voltage overhead lines.

As each case is subject to various and differing circumstances, the advance notification is necessary for Colorado Springs Utilities to perform a site inspection and provide an estimated schedule and costs to provide safe working conditions. This inspection will allow for a determination of electrical voltages present, the subsequent safe working distances, electrical rating of protective equipment and/or the need for possible de-energizing and grounding (or temporary relocation) of the affected utility line or lines.

In many instances, temporary cover may be installed free of charge or at a minimal cost. Larger jobs however, requiring prolonged use and exposure of Colorado Springs Utilities equipment to detrimental weather conditions, may require a contractual agreement and assessment of a flat rate time and materials charge to be coordinated by Field Engineering. These include multiple days of crew time to relocate warning devices, or prolonged use of these devices (over 6 months). Temporary line relocations will be done on a time and material basis at the contractor's expense. In the event your equipment should come in contact with an overhead line or if a broken power line falls on your rig, the best thing to do is to stay put until Colorado Springs Utilities personnel can respond and give you safe clearance to move. If you must vacate an energized rig due to a life-threatening situation such as fire, jump from it, being extremely careful not to touch the rig and the ground at the same time. If you witness such an emergency, contact the Colorado Springs Utilities Customer Service for assistance at 448-4800.

Table 2.03a: Minimum Approach Distance to Any Energized Overhead Line or Part by Unqualified Persons (General Public, General Industry, Construction Equipment) Adapted to Colorado Springs Utilities System from OSHA 1910.333 & 1926.416

A: Voltage Phase to phase (volts)	B: Electrical Distance phase to ground (feet-inches)	C: Electrical Distance With Temporary warning devices Installed phase to ground (feet-inches)
0 to 35,000 (incl. neutrals & secondary)	10'-0"	10'-0"
115,000	10'-8"	10'-8"
230,000	13'-0"	13'-0"

1) Requests for Transmission System Outages

The North American Electric Reliability Council (NERC) and the Western Electricity Coordinating Council (WECC) issue standards by which the electrical transmission system must be planned and operated. These standards address system performance during planned outages including maintenance activities. Colorado Springs Utilities complies with these standards, and requires parties requesting outages on the electric transmission system to ensure that the system complies with the NERC/WECC standards.

The Colorado Springs Utilities electric transmission system is designed to serve all load through system peak load levels according to standard TPL-002-0b. However, the system is not designed to serve all load during the loss of multiple elements at peak load levels. Accordingly, requests for planned outages may not be granted during times of peak system loading.

Standard TOP-002-2.1b, Normal Operations Planning, requirement R5 states, "Each Balancing Authority and Transmission Operator shall plan to meet scheduled system

configuration, generation dispatch, interchange scheduling and demand patterns." And requirement R6, "Each Balancing Authority and Transmission Operator shall plan to meet unscheduled changes in system configuration and generation dispatch (at a minimum N-1 Contingency planning) in accordance with NERC, Regional Reliability Organization, subregional, and local reliability requirements."

Colorado Springs Utilities on a case-by-case basis may allow individual system elements to be removed from service in order to accommodate construction or maintenance activities. Under these circumstances, the outage must be planned well in advance, and every effort must be made to minimize the duration of the outage. If at all possible, the construction or maintenance activity shall be conducted in such a manner that the facility can be returned to service immediately in the event of a loss of another system element.

Outages lasting longer than one-week may require the construction of a temporary facility to minimize the required outage time. Outages on system elements that will leave a load serving facility vulnerable under a single additional contingency will require plans to mitigate the next contingency. These plans should restore the load serving capability of the system within 48 hours. All time and material necessary to develop the contingency plan will be paid for by the requesting party. In the event the contingency plan is executed, the requesting party will pay all time and materials associated with service restoration. A bond or cash deposit in the full amount of anticipated costs to restore service in an emergency may be required prior to a planned outage. Requesting party shall pay the full amount of the time and materials associated with service restoration within 30 days of invoice.

Underground electric transmission systems present a unique challenge in that outage and restoration times will typically require several weeks. On a case-by-case basis, planned outages for the modification of underground transmission systems may be granted. However, due to the extended nature of these outages, contingency plans for the restoration of load must be in place prior to the planned outage. In some cases, an outage may not be granted, and new facilities may need to be constructed before existing facilities may be abandoned.

2) Requests for Transmission System Modifications

The integrity of the electric transmission system is fundamental to providing reliable electric service. Modifications to the electric transmission infrastructure may be granted on a case-by-case basis. Under no circumstance will modifications be allowed that either compromise the reliability of the system, or decrease the capacity. Any modifications must maintain the overall integrity of the system and minimize the introduction of higher maintenance or increased possibility of failure.

b) Underground:

Grading, excavation, ground rod, stake or post installation work will not be started until an underground facilities location has been completed. Digging into or damaging underground power lines can result in severe injury or death to the operator and others, and can cause interruption of service to wide areas. Contact the Utility Notification Center of Colorado (Colorado 811) at 811, or online at Colorado811.org at least three business days before you dig or install any material into the ground. Trained personnel will locate underground utilities at no cost. Any person doing excavation work in a public right-of-way, utility easement, or any other public place must obtain an excavation license and/or permit as required by the

jurisdiction. All excavations for electric service installation will be performed in accordance with all applicable City codes, as follows:

1) Excavation and Boring Requirements near Utility Lines

Chapter 3, Article 3 of Part 2 of the City Code governs excavations in the City and applies to any opening in the surface of a "public place" made in any manner whatsoever. "Public place" is defined to include any public right of way, utility easement, drainage structure, street way, place, alley, sidewalk, park, square, plaza, or any similar public property owned or controlled by the City or Utilities and dedicated to public use, including the location of any electric or gas service line whether on public or private property. This shall include dedicated but not improved streets in new subdivisions. Even though many references are made to the "Code for the City of Colorado Springs", by inclusion in our service standards, and to ensure the health and well-being of the general public, these excavation requirements apply to all excavations around Colorado Springs Utilities' facilities throughout our Dedicated Service Territories.

Any boring operations underneath the surface of a street are considered excavation upon a public place and are covered by City Code. The City's requirements for excavation are:

(a) The first requirement is set out in City Code section 3.3.202 EXCAVATION LICENSE REQUIRED, which provides that "No person shall make any excavation or fill any excavation in any public place without first obtaining a license and permit for the excavation except as otherwise provided in this article". Pursuant to this section of the City Code, the Deputy Licensing Officer may issue cease and desist orders or initiate license suspension or revocation proceedings against any excavator for a violation of the City Code excavation provisions or of the City's General Licensing Code.

(b) The second requirement, obtain locations of the underground utilities, is set out in the City Code at section 3.3.211, 3.3.216, 12.10.104 and by Colorado statute at CRS 9-1.5-101, et. seq. C.R.S. 9-1.5-101, et seq, governs excavation requirements throughout the State of Colorado. That statute requires notification to utility companies and the marking of underground facilities prior to excavation, and provides for civil penalties. The City Code states that no excavation shall take place until location of the facilities has been requested and obtained not more than five working days prior to the excavation. Colorado Springs Utilities must be notified prior to any construction activities around utility lines and or facilities. The proper way to notify Colorado Springs Utilities is through the statewide "One Call" notification system. The statewide "one call" notification system is the Utility Notification Center of Colorado (Colorado 811) which can be reached at 1-800-922-1987, 811 or online at colorado811.org. The Colorado Springs Underground Damage Prevention Safety Program and damage reporting requirements are detailed in City Code Chapter 12, Article 10. Colorado Springs Utilities will bill for the cost of repair to its underground facilities including the cost of gas, electric, or water lost and will assess penalties as allowed under C.R.S. 9-1.5-101, et seq.

(c) The third requirement is that one must obtain an excavation permit. City Code section 3.3.204: PERMIT REQUIRED; INSPECTIONS; FEES provides, "A. In addition to

the other requirements of this part, no person shall proceed to make or fill any excavation without first obtaining an excavation permit from the City Engineer."

(d) The fourth requirement is the requirement that excavators must use the "boring with windows" procedures as required by the City Engineering Division when excavation permits are issued. Because many of the Colorado Springs Utilities facilities are plastic lines, which can be easily damaged by underground boring operations, or are steel lines, whose cathodic protection may be jeopardized by contact with a boring machine, or high pressure water or air potholing activities, it is imperative that the exact location of those lines be determined and that reasonable precautions be taken to avoid contact with the lines. Once the lines are located, excavators are further required to expose underground facilities by hand or using soft digging techniques and visually observe the safe crossing of marked underground facilities. Additionally, in order to further protect the lines, we require the use of a reciprocating tip on your hydro-vacuum water wands and not a zero or 30 degree tip, as the zero and 30 degree tips cause excessive damage to utility facilities. The nozzle must be kept 12 inches above utility lines, to prevent damage to the coating, jacket, or material in general. Water pressure shall be limited to 1700 psi and reciprocating tip shall be used. Care shall be used while using this technique as excessive pressure has been known to puncture the power cable insulation resulting in a possible electric contact. Any damage to the line must be reported immediately to Colorado 811, and the Quality Control Supervisor to have the line re-coated or repaired and comply with the requirements of City Code Chapter 12, Article 10. Failure to report damage or numerous damages from negligent work practices will result in charges and penalties as allowed by City Code. Backfill and compaction shall meet City Engineering Public Works specifications.

(e) The National Electric Safety Code requires the protection and separation of underground electric supply lines from other structures, including other utilities. See the clearance requirements in Appendix F.

(f) Notify the Colorado Springs Utilities, Energy Construction Operation and Maintenance Department, Quality Control Supervisor at least 24 hours before digging within 20' of any 115 kV underground transmission facilities or notify Utilities Dispatch before digging within 10' of any downtown underground network facilities (See Phone Section – Inspections or Underground Utility Line Locations, Main Number) The standards herein are supplementary to, and are not intended to conflict with, the rules and regulations on file with the City Clerk of the City of Colorado Springs or applicable city ordinances. This is required to make sure a Standby Attendant will be scheduled for the excavation activities, and is especially important around underground high-voltage transmission lines.

2.04 Clearances to Hazardous (Classified) Locations:

Colorado Springs Utilities equipment and conductors are not normally suitable for installation above, below, or within areas defined by the NEC as classified locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or filings. Construction Standard 18-227 (see Appendix F), covers only some of the more common installations encountered outdoors and potentially in the vicinity of Colorado Springs Utilities lines or equipment For other situations refer to Chapter 5 of the NEC and consult local fire-prevention authorities to help determine the boundaries of classified areas.

Some of the most commonly encountered flammable materials include: gasoline, acetylene, hydrogen, acetone, ammonia, benzene, butane, ethanol, methanol, methane, natural gas, naphtha, propane, turpentine, Compressed Natural Gas (CNG), and Liquefied Natural Gas (LNG). Combustible metal dusts include aluminum, magnesium, and their commercial alloys. Atmospheres containing combustible carbonaceous dusts include carbon, black charcoal, and coal or coke dusts. Atmospheres containing combustible dusts include flour, grains, wood, plastic, and chemicals. Atmospheres containing easily ignitable fibers or filings include some parts of rayon, cotton, and other textile fibers.

2.05 Request for Hard Cover (Visual Warning Device), De-Energize (Outage), Temporary Reroute, or Permanent Reroute of Overhead Power Lines:

The following form shall be signed by the builder, contractor, or other person in charge of work performed underneath or in close proximity of overhead power lines. This request shall be made at least 10 business days before work begins.

Request for Hard Cover (Visual Warning Device), De-Energize (Outage), Temporary Reroute, or Permanent Reroute of Overhead Power Lines

Hard cover devices are not routinely electrically tested and therefore, do not qualify as insulating guards. **Hard cover devices are for visual warning only**, available only for 0 to 35kV lines, and the clearance as specified in the table listed below shall be maintained by unqualified personnel in the process of working under or in close proximity of energized overhead power lines.

The requirements in the Colorado Springs Utilities, Electric Line Extension and Service Standards, shall be followed. See Electric Line Extension and Service Standards section 2.03 "Equipment Operation around Energized Facilities" for additional information.

Minimum Approach Distance to Any Energized Overhead Line or Part by Unqualified Persons (General Public, General Industry, Construction equipment) Adapted to Colorado Springs Utilities System from OSHA 1910.333 & 1926.416

Voltage Phase to phase (volts)	Electrical Distance phase to ground (feet-inches)
0 to 35,000 (incl. neutrals & secondary)	10'-0"
115,000	10'-8"
230,000	13'-0"

Type of Request (check one):

Hard cover for Primary Line: ____ Hard cover for Secondary Line: ____

De-energize (outage): ____ Temporary Reroute: ____ Permanent Reroute: ____

Overhead Line Voltage: _____ Circuit: _____

Clearance (feet from line) Required: _____ (See table above)

From Pole #: _____ to: _____

Proposed Start Date: _____ Proposed Completion Date: _____

Company: _____

Requestor Name: _____

Service address of work performed near overhead power lines: _____

_____

By signing this I understand the above conditions and agree to follow all NEC, NESC & OSHA Safety Standards and Regulations:

Requestor Signature: _____ Phone #: _____ Date: _____

Estimated Cost: $ _____

Colorado Springs Utilities Agent Signature: _____ Phone #: _____ Date: _____

W/O#: _____

Attach map pages with work areas marked, including no. of conductors to cover and length of cover needed.

Original: QC, Copy: requestor Updated: 3-2012

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CHAPTER 3
Electric Service Limitations and Voltage Standards

CHAPTER 3

Electric Service Limitations and Voltage Standards

3.01 General:

Electric service connections are limited to electric energy supply and transmission substation and distribution facilities available at time of building construction. Available secondary service voltage classifications will depend upon a customer's location and proximity to existing facilities within an overhead or underground service area.

The standard secondary service is alternating current, 60 hertz, single phase or three-phase. Service must not be used by the customer for purposes other than those specified in the applicable Electric Tariffs. The standard voltage classification for residential service is 120/240 volt single-phase or 120/208 volt two-phase.

3.02 Overhead and Underground Service Area Secondary Voltages:

Single-phase, two-wire, 120 volts.
Single-phase, three-wire, 120/240 volts.
Two-phase, three-wire, 120/208 volts wye.
Three-phase, four-wire, 120/208 volts wye.
Three-phase, four wire 277/480 volts wye.

3.03 Overhead and Underground Electric Facilities:

The electric distribution and transmission system is composed of overhead and underground electrical facilities.

As required by City Code, electric distribution facilities will be placed underground in areas subdivided and platted after 1967 within the corporate limits of the City of Colorado Springs pursuant to the operating rules and regulations of Colorado Springs Utilities.

New electric transmission facilities will typically be constructed overhead [in accordance with the Utilities Board motion 10.18.2023]. Consideration for placement underground will be made on a case-by-case basis where overhead line congestion or other factors necessitate. Underground construction of 115kV transmission lines may also occur under a System Improvement Program agreement as described in Chapter 11, System Alteration and Conversion.

In areas containing existing overhead distribution, it is Utilities policy to extend and pay for a maximum of two spans of overhead distribution system. The customer is responsible for the costs of any additional extension. The costs of the extension will be collected with an *Extension Contract* or a *Recovery Agreement Contract.* The Utilities Rules and Regulations, Electric Line Extensions and Services Section, determine when a *Recovery Agreement Contract* shall be applied to requests for extensions. When, in the sole judgment of Utilities, the costs to administer a *Recovery Agreement Contract* are prohibitive, an *Extension Contract* will be administered. Any funds deposited with the *Extension Contract* will be identified as contributions-in-aid-to-construction and are not eligible for refund. The *Extension Contract* will not include the costs of the first two spans of the extension. Total project costs will be included if a *Recovery Agreement Contract* is administered.

3.04 Electric Line Extension Requirements:

Extension of distribution or transmission facilities to a place of delivery to the customer will be made subject to the City Code and the Electric Tariffs on file with the City Clerk's Office of the City of Colorado Springs.

3.05 Qualification for Three-Phase Service:

a) General:

Customers requesting three-phase service must have enough three-phase load to assure annual revenues that will pay for the cost of the line installation as outlined in the line extension rules. Minor three-phase loads may be provided if a three-phase primary and transformer are already in place and in use.

A customer should have a minimum of 25 horsepower connected three-phase load or a combined load greater than 40kW as diversified by Colorado Springs Utilities Field Engineering to qualify for three-phase service. Otherwise, the customer may add, at his own expense, an add-a-phase, roto-phase, or similar type device to obtain three-phase service. The 40kW diversity is calculated at the transformer secondary bushings. For minimum requirements, a distribution mainline must be readily available to the customer's lot as determined by Colorado Springs Utilities. If the customer does not qualify and still desires three-phase service, an estimated time and material cost difference for the installed cost of single phase and the installed cost of the three-phase can be paid by the customer.

b) Shell Buildings:

For the purpose of definition, a shell building is any building wherein the customer cannot identify the connected load that the Colorado Springs Utilities must serve. To qualify for three phase service:

1) Office-only buildings will be calculated at the rate of 3 watts per square foot of floor space and will have a minimum of 13,500 square feet of floor space.

2) Office/warehouse combination buildings will be calculated at the rate of 2-1/2 watts per square foot and will have a minimum of 16,000 square feet of floor space.

3) Warehouse-only buildings will be calculated at the rate of 1-1/2 watt per square foot and will have a minimum of 26,500 square feet of floor space.

3.06 Voltage Flicker:

The customer's equipment shall not create voltage flicker in excess of the "border-line of irritation" as specified in the IEEE Standard 519-1992 Figure 10.3*.

*As a protection to service and equipment, motors of ten horsepower and larger are to have such characteristics, or be equipped with a starter of such design, that the instantaneous starting current requirement will be limited to approximately 300 percent of rated full-load current.

* For residential service only, the use of any single-phase motor will be limited to 125 amps starting current at 240 volts which limits the flicker at the customer's meter to 5 percent and to 4 percent at an adjacent customer's meter.

By permission of Colorado Springs Utilities, exceptions to these rules under certain conditions may be permitted. A Motor Variance Request Form must be submitted to the Colorado Springs Utilities Field Engineering Section (see Chapter 10 for form). Include the following information:

a. Premise address
b. Contact person's name and phone number
c. Horsepower rating.
d. Nameplate voltage.
e. NEMA code letter.
f. Nameplate full-load amps.
g. Nameplate locked rotor amps & power factor.
h. Frequency of starts per time unit.
i. Expected use/purpose of the motor.
j. Proposed starting method.

3.07 Three-Phase Motor-Protection Requirements:

All three-phase motors should be provided with protection against over-and under-voltage and single and reversed phasing condition by the customer.

3.08 Power Factor:

The customer should maintain the power factor at the point of delivery as near to unity as practicable. Power factor correction equipment should be switched with the load in such a fashion as to prevent a leading power factor at all times. The customer shall be responsible to correct the leading power factor as deemed necessary by Colorado Springs Utilities. Colorado Springs Utilities will assess a monetary adjustment to any lagging power factor less than 95 percent in accordance with the applicable Electric Tariff. For information with respect to evaluation of power factor correction needs, contact the Colorado Springs Utilities Enhanced Service Engineering Section (see Phone Section).

3.09 Harmonic Injection:

Harmonic distortion contribution shall be within the IEEE Standard 519-1992 Table 11.1 specified limits. The customer shall be responsible to correct their harmonic distortion contribution or pay Colorado Springs Utilities for required equipment and upgrades to compensate for their harmonic distortion contribution as deemed necessary by Colorado Springs Utilities.

3.10 Emergency Generators, Distributed Generation, or Energy Storage Devices:

See Chapter 13 for the requirements to connect sources of energy that may back-feed power to the Utilities electric system.

3.11 System Voltage Transients:

Voltage transients can and will occur on the power system resulting from both normal operation and acts of God. These transients will characteristically be of a short-time duration, low energy, but high magnitude. Sensitive equipment such as computers may be affected by these transients. Due to the nature and origin of these types of transients, special power-conditioning equipment may be required by the customer at the customer's expense for proper equipment operation. For more information, contact the Colorado Springs Utilities Enhanced Service Engineering Section.

3.12 Voltage Levels:

The actual secondary distribution voltage at the customer's meter will vary up to and including plus or minus 5 percent of the nominal voltage, depending on circuit location and normal operating needs. This conforms to the ANSI Standard C84.1, which deals with electric power supply and utilization systems. It must be recognized that because of conditions outside Colorado Springs Utilities control, there will be infrequent and limited periods when sustained voltage outside these limits may occur. Additional voltage variation will occur between the meter and the customer's utilization equipment at normal operation.

3.13 Momentary Interruptions and Voltage Sags:

Many modern electronic appliances such as digital clocks, VCRs, microwave ovens, PCs, etc. are extremely sensitive to momentary power interruptions or voltage dips. In order to minimize the duration of outages to all customers when a temporary failure occurs (as caused by nearby or direct lightning strikes to power lines, or by wind, trees, or animals) power circuit breakers and reclosers will trip to clear the fault and automatically reclose within a few seconds to restore service. Customers are encouraged to select electronic appliances with a short-term power outage carryover automatic clock reset feature, which are readily available from most leading manufacturers.

3.14 Aurora Mitigation:

AURORA is a gap in protection that allows someone by physical or cyber means to gain access to electric substation breakers and 'bang' the breakers out of phase. This gap in protection can allow an adversary to maliciously and deliberately damage generators, transformers, and other electrical equipment connected to the electrical grid by rapidly reclosing circuit breakers out of synchronization before sync-check relays can engage.

Although Colorado Springs Utilities has taken steps with both substation protection and security to mitigate the possibility of this type of vandalism, it is required that the customer protect their own sensitive electrical equipment that can be harmed by rapid reclosing of electrical circuits. For more information, contact Substation Engineering (see Phone Section).

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Rights-of-Way, Easements and Access

CHAPTER 4

Rights-Of-Way, Easements and Access

4.01 Types of Easements:

Colorado Springs Utilities generally utilizes either easements or public rights of way to secure the property rights to install its infrastructure. The following is a brief explanation of these property rights acquisition methods, as it pertains to Colorado Springs Utilities and the typical use of that type of easement for electric lines and equipment. All easements should be recorded in the land records of the appropriate county in which the land rights are granted.

a) Public road right-of-way is generally considered the area that contains the roadway, curb, gutters, sidewalks, and open areas up to the property line. Most of the electric distribution lines and residential and light commercial transformers are installed in the roadway right-of-way. Road right of way conveyed to El Paso County or CDOT may have restrictive language with regard to who is responsible for re-location costs.

b) Platted/Dedicated is an easement type that is provided to Colorado Springs Utilities by virtue of dedication statement of every subdivision platted after 1968. A 5 foot side lot and 7 foot rear lot easement is a typical platted easement. It is sometimes necessary to install power lines along the rear or down the side lot line. Current subdivision plat dedications are subject to recorded Terms & Conditions (see FIMS document #704816).

c) A Permanent Easement Agreement is an easement that is granted to Colorado Springs Utilities by the customer. In the event Colorado Springs Utilities has to cross a property other than that of the customer requesting service to extend facilities, the requesting customer may be required to obtain or help obtain all easements needed.

d) Restrictive Easements/Utility Rights-of-Way generally contain high voltage transmission lines and substation equipment. Very strict requirements for the use of restrictive easements apply. Any use of this type of easement must be approved by Colorado Springs Utilities. All requests will be evaluated on an individual basis by contacting Utilities Development Services staff (see Phone Section).

e) Condition of Service Easements: The customer, as a condition of service, agrees to the original as-built location as a service easement for those portions of the facilities on the customer's premises that are outside of a public utility easement or right of way. Facilities for electric service include electric lines, transformers, wires, conduits, meters, poles, and other equipment of Colorado Springs Utilities necessary to render service to the customer. The customer shall not make grade changes or build permanent or portable structures, which violate the National Electric Safety Code. Any changes in the location of the facilities shall be at the sole expense of the customer.

f) Service Drop Condition of Service Easements: Receipt of electric service grants to Colorado Springs Utilities an easement on private property for electric lines, transformers, wires, conduits, meters, poles, and other equipment of Colorado Springs Utilities necessary to render service to the customer. In order to comply with the requirements of the National Electric Safety Code the customer shall not make grade changes or build permanent or portable structures (buildings, sheds, decks, swimming

pools, patios, patio covers, antennas, etc) under, over or within 5 feet measured horizontally on both sides of low voltage overhead or underground service drops (under 600 volts) without prior written approval of Colorado Springs Utilities except that in the case of a swimming pool, the horizontal clearance requirement may be larger (see Appendix F, 18-211). Any changes in the location of the facilities shall be at the sole expense of the customer.

4.02 General Restrictions of Easements/Rights-Of-Way:

a) To comply with the requirements of the National Electrical Safety Code, it is necessary that easements and rights-of-way grades not be changed by excavation or filling by more than 6 inches without prior written approval from Colorado Springs Utilities for all utility lines involved. Changes in grades and elevations may not reduce safe ground clearances of overhead wires or reduce the depth of burial of underground cables as established by Codes and/or Colorado Springs Utilities. No grading is allowed within 15' of the centerline of an underground transmission line and excavations will not reduce support strength of overhead line structures. Full cost of any alteration or relocation of utility lines will be borne by the customer requesting the change.

b) It is permissible to install fences and landscaping in easements, except where such fences will stop access to utility lines or conflict with utility equipment. Other permanent structures and buildings are not acceptable. This includes but is not limited to permanent structures such as water quality, water detention, swales or drop structures, and retaining walls. In the event a fence or landscaping must be removed, it is Colorado Springs Utilities policy to replace existing facilities to meet or exceed the original installation.

c) Colorado Springs Utilities must have access at all times for operation, maintenance, construction, and inspection purposes. Landscaping of easements is permissible; however, it is necessary for utility crews to have adequate access to vaults and padmount equipment, and structures.

1) For distribution systems, a minimum 36 inch wide path and clear opening is required in fence gates to replace equipment in residential rear-lot installations. Access clearances for Colorado Springs Utilities vaults and padmount equipment are shown in Appendix F, Construction Standard 18-302. No trees, shrubs, fences, large landscape rocks (Over 1.5 inches in size), or other obstruction will be permitted in the access area. Trees should be planted far enough away from padmounted equipment so that when they reach maturity, overhanging branches will not obstruct a crane setting or removing equipment. It is best to select trees with supple branches that can be tied back without danger of breaking their limbs. Trees may not be planted within 6 feet of electric lines. The 6 feet is measured from the base of the tree to the electric line. A temporary exception is in place for recently constructed lots (constructed mid-2019 to Spring 2020). Some of the lots constructed during that period had electric lines installed; however, trees were not planted due to insufficient space in the right-of-way to meet the separation criteria (revised layouts were being worked on). The exception for those lots allows for specific species of City approved, medium or small, single-stem trees (listed below) to be planted within 6 feet of the electric lines; however, planting must occur prior to the end of 2021. The tree list below is approved by Colorado Springs City Forestry and is consistent with the Colorado Springs Approved Street Tree List.

Buried utilities must be located prior to planting the small/medium species trees. Call Utility Notification Center of Colorado at least three business days prior to digging.

Approved Medium Trees (25-45 ft)		**Approved Small Trees (< 25 ft)**	
Amur corktree *(male only)*	*Phellodendron amurense*	Amur chokecherry	*Prunus maackii*
Golden raintree	*Koelreuteria paniculata*	Newport plum	*Prunus cerasifera*
Japanese pagoda *(protected site)*	*Styphnolobium japonicum*	Princess Kay plum	*Prunus nigra*
Japanese tree lilac *(protected site)*	*Syringa reticulata*	Tatarian maple	*Acer tataricum*
Bigtooth maple *(single stem only)*	*Acer grandidentatum*	Amur maple	*Acer ginnala*
Maple, Miyabe/ State Street	*Acer miyabei*		
Mountain ash	*Sorbus aucuparia*		
Ohio buckeye	*Aesculus glabra*		
Ussurian pear *(fruitless only)*	*Pyrus ussuriensis*		
Turkish filbert	*Corylus colurna*		

2) For transmission systems, a 50 to 75 foot radius circle shall be provided with a 2% maximum slope and a 15 foot wide access road with a 5% maximum slope. No cuts or fills will be allowed inside of the 50-75 foot radius except to meet the 2% slope. See drawings at the end of this chapter, Use of Transmission Easements and Rights-of-Way by Others, for additional information and explanation. Low level landscaping, such as rock gardens, shrubs, and other vegetation with a maximum height of 15 feet or less will be allowed within the right of way provided all other access requirements are met.

3) Responsibility for upkeep and any landscaping maintenance in an easement is borne by the property owner/customer. Colorado Springs Utilities has the option to trim and cut plantings and trees as may be necessary to maintain safety and operational clearances of its facilities. For additional information you may request a booklet "Guidelines for Landscaping around Underground Electrical Facilities" from Field Engineering.

d) Colorado Springs Utilities will retain the full rights of the entire easement even if use by other parties is allowed. Improvements by other parties shall not preclude Colorado Springs Utilities from installing any additional overhead/ underground facilities. Any modifications, changes, etc. to the other parties' facilities necessary to permit Colorado Springs Utilities to install its additional facilities shall be at the other parties' expense.

e) Commercial utilization of rights of way earth material is not allowed.

f) For improvements involving roadways and railroads, safe clearance from transmission line structures must be maintained per NESC guidelines.

g) Contact Utilities Development Services department for all easement and right-of-way information and requirements (see Phone Section).

Colorado Springs Utilities
Use of Transmission Easements and Rights-of-Way by Others

Descriptions of Use by Area

Area 1:

Area 1 is the area around a transmission structure (wood or steel) that must remain accessible by crews to maintain the structure. To guarantee the accessibility of the structure the following guidelines have been established:

- No grading inside radiuses area with the exception of smoothing to bring area to constant 2% max slope. No cut/fill around structure will be allowed which would either bury structure further or remove structural support.
- All radiuses shall be accessible by a 15 foot wide "trail/path" labeled Area 1a.

Area 1a:

Area 1a is the 15 wide trail or path that shall be used to access Area 1. The trail or path can be a road or set of tire tracks path with native vegetation that will allow access to Area 1 without requiring repair when trucks drive over it. The trail should be compacted and constructed in such a way that large vehicles can access during wet conditions and not sink. The trail should be maintained at a 5% grade with no more than a 2% cross slope.

Area 2:

Area 2 is a 50 foot wide area under the transmission conductors where grading may be allowed but must be evaluated on a case by case basis by Colorado Springs Utilities' Transmission Engineer. This area is very important since electric clearances must be maintained in this area by rules of the National Electric Safety Code and National Electric Code. Fills in this area must be examined very closely to ensure clearances are maintained.

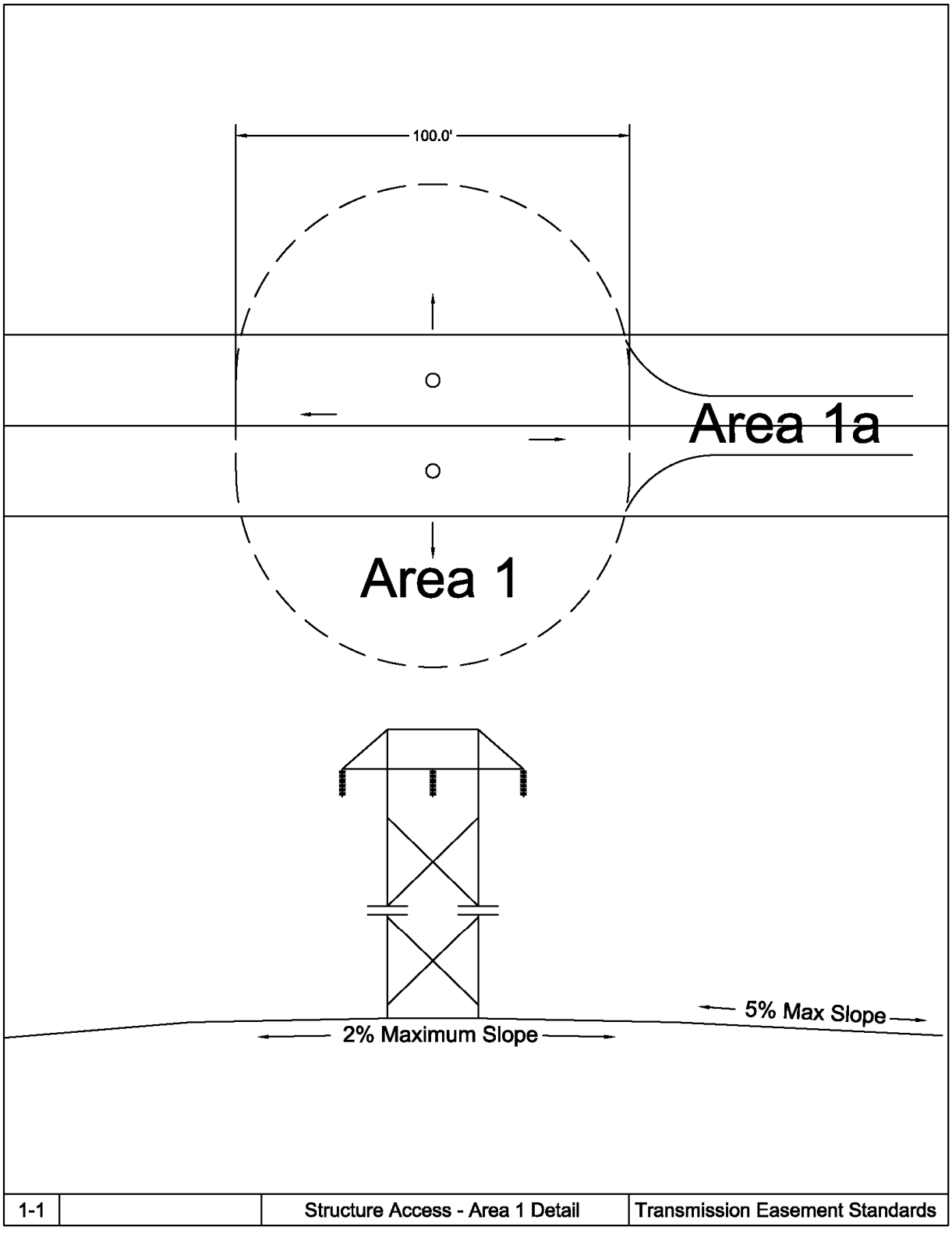
Area 3:

Area 3 is a 25-30 foot, depending on the width of the easement, where accessibility to maintain the conductors must be preserved. This area can be graded to a maximum 5% grade and 5% cross slope. Depending on the height of the conductor these areas may be stretched or narrowed and must be evaluated on a case by case basis by Colorado Springs Utilities' Transmission Engineer.

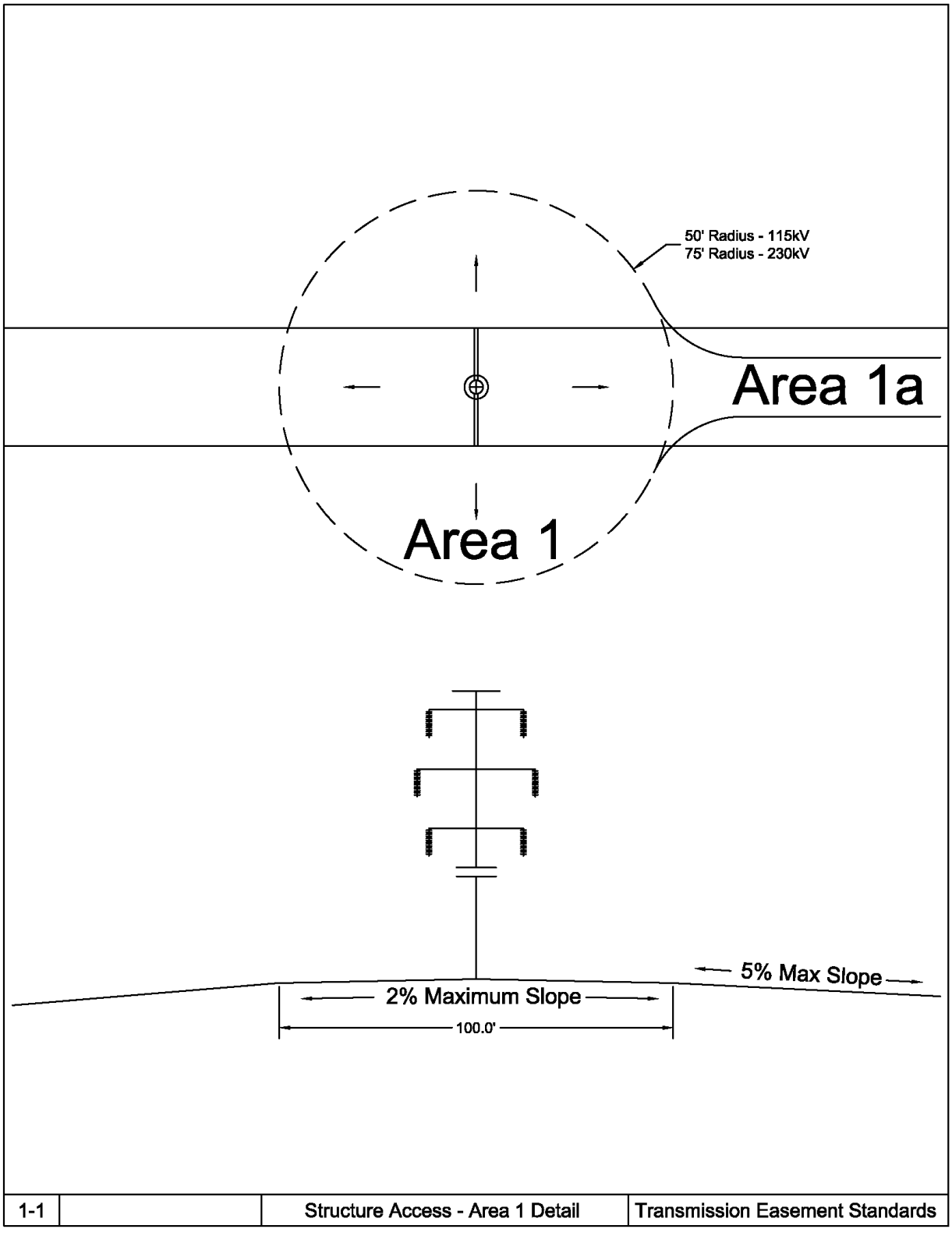
Area 4:

Area 4 is any remaining area of the transmission easement or right-of-way which Colorado Springs Utilities reserves the right to use for future utilities. This area may be graded more freely and used for items such as parking lots, driveways and streets, and landscaping. Items that are not allowed are water features such as detention ponds, water quality ponds, and swales or water moving/slowing items that may pose a problem for future use of the easement.

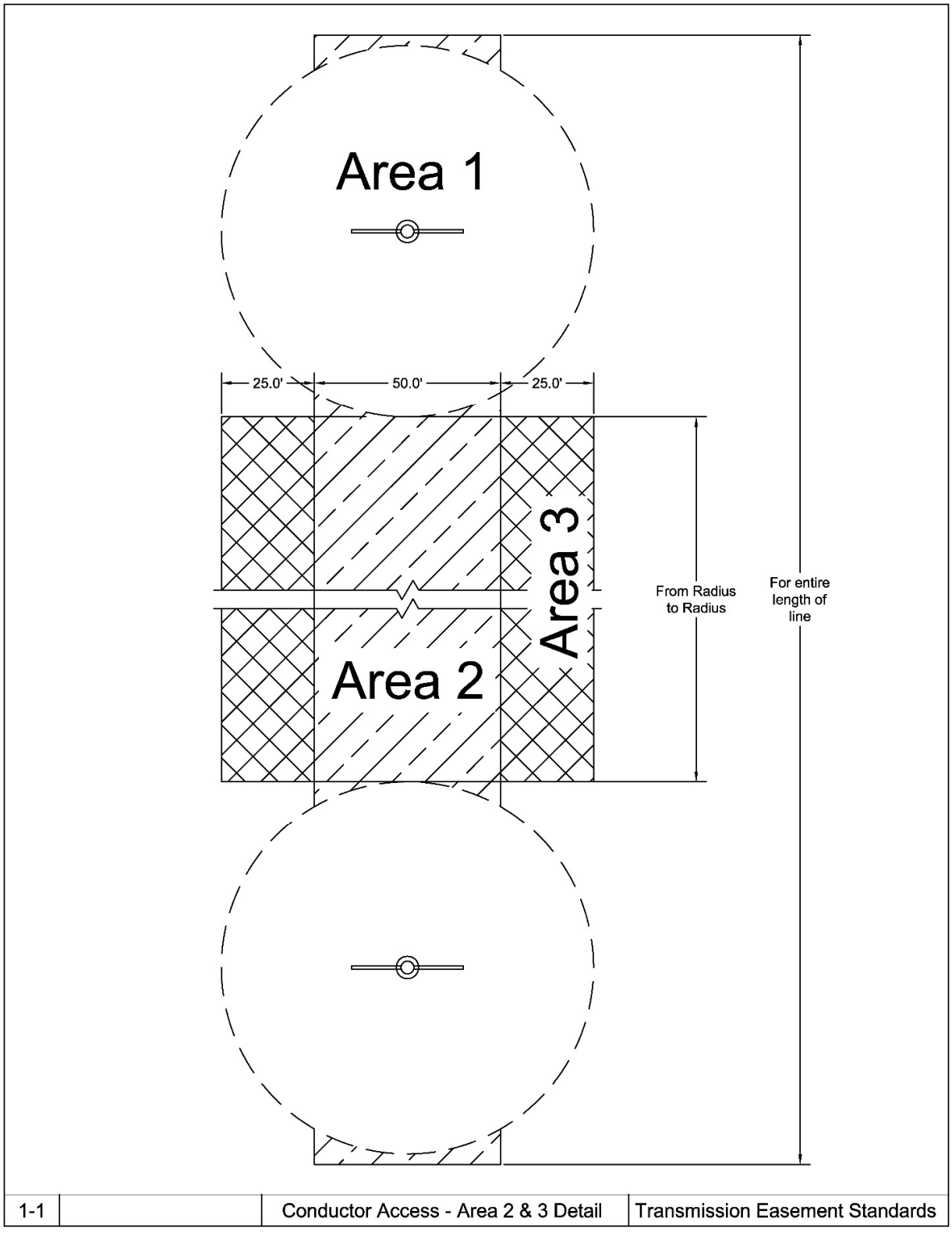
Transmission Structure Access, Area 1 (Wood)



Transmission Structure Access, Area 1 (Steel)



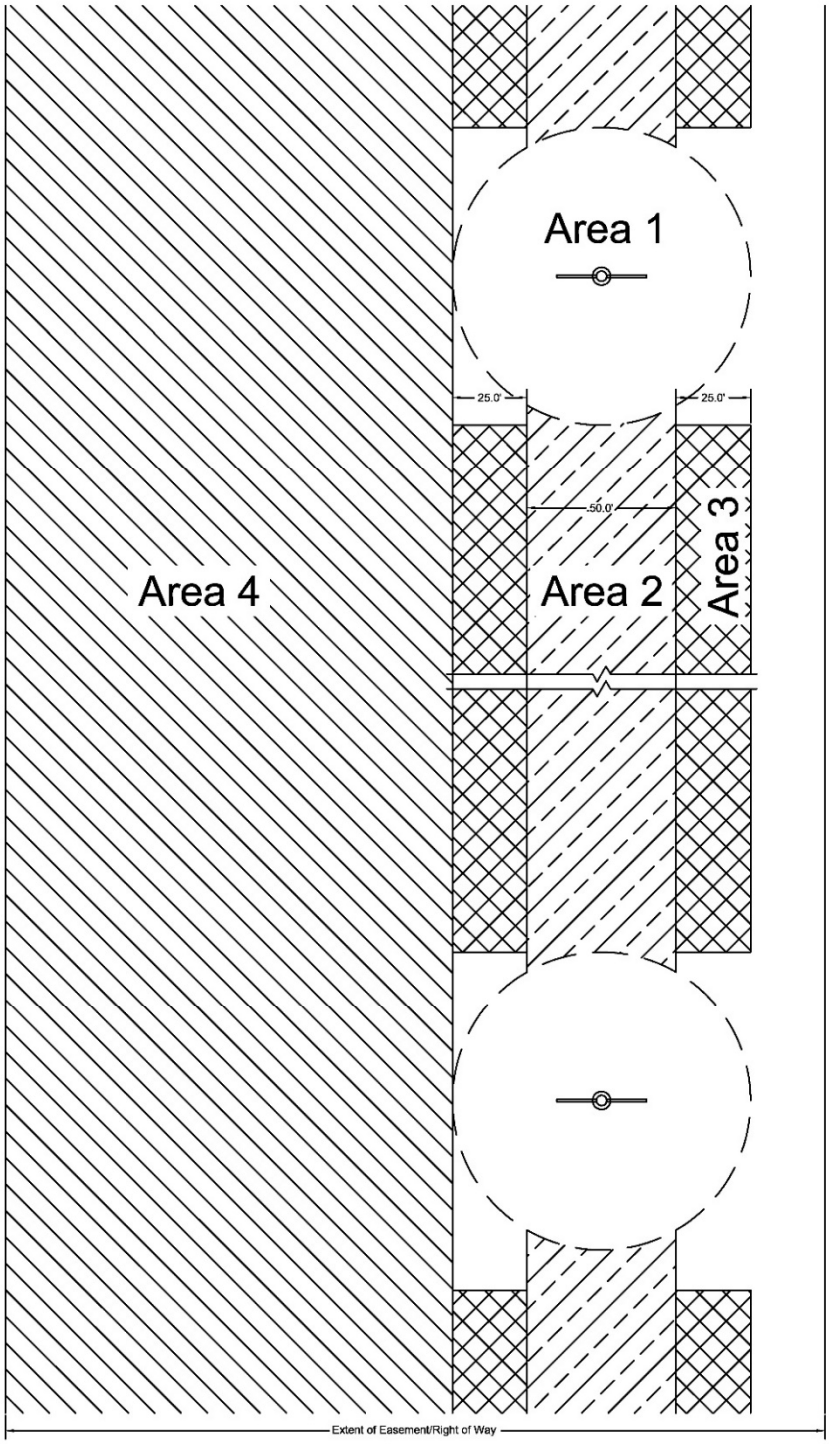
Transmission Easement Use, Areas 2 & 3



1-1		Conductor Access - Area 2 & 3 Detail	Transmission Easement Standards

Colorado Springs Utilities
Use of Transmission Easements and Rights-of-Way by Others

Transmission Easement Use, Areas 4



1-1		Easement Use - Area 4	Transmission Easement Standards

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Metering

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Metering

5.01 Electric Metering Installation and Ownership:

Only one meter for each rate and/or voltage class under which the customer receives service will be installed and maintained by Colorado Springs Utilities for each customer at each service address.

Additional meters may be used at the sole discretion of Colorado Springs Utilities when the electric requirements to the building exceed the capacity of the largest transformers, the customer has opted for any automatic transfer scheme, or other circumstance where it is required for the convenience of Colorado Springs Utilities.

The customer will provide and maintain without cost to Colorado Springs Utilities, sufficient and proper facilities for the installation of electric meters, including proper meter socket, CT cabinet, and other electrical apparatus. The equipment will be installed at an easily accessible location on or within the premises to be supplied with service and in accordance with the rules contained herein. The electric meter socket and CT cabinet are owned by the customer and all costs to maintain this equipment are the owner's responsibility.

Single phase electric services rated at 200 amps (main size) and below, require a self-contained meter socket. Single phase electric services rated greater than 200 and up to 400 amps may install either a 320 amp self-contained meter socket (120/240V only) or a CT (current transformer) rated meter socket and CT Cabinet. Single phase self-contained meter sockets for electric services rated at 400 amps and below, are acceptable with, or without an integral disconnect [main breaker(s)]. Single phase electric services rated over 400 amps will require a CT (current transformer) rated meter socket and CT Cabinet.

For single or three phase CT cabinets and CT rated meter sockets; Colorado Springs Utilities will furnish and install instrument transformers [CTs (current transformers) & VTs (voltage transformers)] and secondary wiring of instrument transformers (CTs & VTs) to meter, except on customer owned switchgear, where Utilities will deliver the CTs and the customer will install (customer shall schedule delivery of CTs with Meter Shop at 668-5525 48 hours in advance).

Meter socket stacks designed to house multiple meters in one cabinet, for installation on structures designed for multiple occupancy, must be provided by the customer. No financial reimbursement is made for meter stacks.

For all self-contained and CT rated meter socket requirements, see 5.15 "Meter Sets For Approved Meter Sockets".

All meters, service drops, and other electrical facilities installed by Colorado Springs Utilities at its expense upon the customer's premises for the purpose of delivering to and measuring electric energy used by the customer will continue to be the property of Colorado Springs Utilities. Colorado Springs Utilities reserves the right to repair or replace meter sockets at the Utilities expense in order to maintain safe accurate energy usage measurements.

For unmetered load tap service installations, refer to 10.01e(3).

5.02 Electric Meter Location And Clearances:

The location of meters and metering equipment will be designated by Colorado Springs Utilities where they will be readily accessible at all reasonable hours for reading, testing, inspecting, and other maintenance purposes. No wiring dependent upon the meter location should be started until the location has been definitely assigned. See Appendix D, Drawings 2 and 3 A&B for the following requirements:

a) General:

1) Meter sockets will be plumb and securely fastened to the building wall (at framing members).

2) All new or upgraded meter sockets will be installed where measurement at centerline of meter is 5 to 6 feet above finished grade or permanent platform. Exceptions are shown in Appendix-D drawings. If this measurement cannot be met, a variance to this rule is required on a case-by-case basis through the Utilities Quality Control Inspectors (QC) (see Phone Section).

3) Meter sockets must NOT be installed under projections lower than 6-1/2 feet to allow for reading and maintenance of equipment.

4) A minimum of three feet of clear space must be left in front of the meter for reading.

5) A minimum of two feet of clear space measured from any part of the meter socket to all conduits, pipe, walls, etc. must be maintained for servicing.

6) Electric meters, CT cabinets, panels or any source of ignition will be located at least three feet radially from gas meter regulator vents.

7) All above-ground conduit on the line side of the meter will be SCH80 PVC or GRC except as noted in the drawings; in all cases it will be as required by Regional Building Department to meet the NEC.

8) Customer owned equipment shall not be physically attached to a Colorado Springs Utilities meter. Any customer equipment found attached to a Colorado Springs Utilities meter will be removed.

b) Exterior Metering Locations:

Exterior meters will not be installed where they will interfere with traffic, sidewalks, driveways, or where they will obstruct the opening of doors or windows, or in any location which may be considered hazardous or cause damage to the metering equipment.

c) Interior Metering Locations:

An interior meter location is defined as a location with walls and a ceiling or any structure that may impede the meter's AMI radio signal. Interior meter installations are only acceptable in limited applications, by Colorado Springs Utilities Field Engineering approval only. Dedicated meter room(s) or approved area(s) shall be provided with adequate space for electric meters (as per NEC) and water modules, other Automated Metering Infrastructure (AMI) equipment, and a location on the outside wall of the building for mounting automated meter reading antennas. The meter location(s) are intended for Utilities meter and related equipment only and any other utility use must be approved by Utilities. The additional expenses for the construction of the meter location(s), antenna, cable conduit, antenna hardware, communications amplifier (if required), backboard enclosures, receptacles, AMI router(s), any other items listed

herein and power required are to be paid by the customer. Access to these areas must be available at all times to Colorado Springs Utilities for maintenance and reading of the equipment. The CT cabinet and all other equipment ahead of the meter is to be installed in the dedicated, approved location. All applicable requirements in the Electric Line Extension and Service Standards (ELESS) will apply. Please reference the Customer Interior Meter Agreement, Statement of Authority and the Interior Meter Acceptance Check List at the end of this chapter.

1) Meter Group Size/ Clearances

(a) There is no limit to the number of meters or modules per floor for each interior meter location that are stacked or connected via the meter communications cable.

(b) The minimum room dimensions, dedicated to metering equipment shall be 6'x10' or larger based on the number of electric meters, water modules, communications amplifier equipment, clearances and working space. Interior location(s) shall be sized to accommodate all Utilities AMI network equipment requirements. Minimum clearance from meter face to any obstruction in the room such as, but not limited to Main Disconnects, Switch gear and CT cabinets shall not be less than 48". All other NEC (NFPA-70 2020 edition) minimum clearance and access requirements apply.

2) Meter Location Construction Requirements

(a) Multiple floor interior meter location configurations shall be located vertically, above each other to enable the meter communications cable to interconnect these locations as shown in Appendix D, Drawing 20. Utilities must approve all multiple floor interior meter locations.

(b) The meter location may be adjacent to, but separate from any transformer vault.

(c) Water Meter Modules: Other, non-Utilities meters or equipment that may interfere with AMI signals are not allowed within the electric meter location(s). If Utilities water meters are serving individual units, then the Utilities water meter modules must be placed in the same location with the electric meters. The customer is responsible for installing 1/2" conduit and pulling AMI water module wire from each occupancy's water meter to the meter location. The conduit run may not have more than 360 degrees of bends unless a pull box will be installed, to ensure no single run exceeds 360 degrees. Each conduit run must be labeled with the occupancy unit number by permanent labeling. Water piping, appurtenances and meters shall not be located within the Interior Electric Meter Location(s) with the exception of ceiling mounted fire sprinkler heads and associated plumbing.

(d) The meter location(s) shall not be used for any type of storage and shall be free from clutter. Utilities will not be responsible for damage, removal, or loss of any items that hinder clearances or the operation of our equipment.

(e) A minimum of 3'x3'x¾" fire rated plywood backboard shall be provided for AMI communications equipment located on a wall with minimum NEC working clearances. A 120 volt receptacle, with a locking cover and a

dedicated circuit that is labeled "CSU", for AMI communications equipment shall be located on the AMI board within each metering location.

(f) Lighting requirements: Multiple lighting fixtures shall be installed to eliminate visibility problems caused by shadows. A minimum of 30 Lumens per square foot shall be required for each meter location.

(g) Meter locations are provided and maintained by the property owner per the Customer Interior Meter Agreement.

3) Meter Location Access/ Security

(a) If the ground level meter location is secured behind a locked door, customer shall provide a Kidde Keysafe Pro, Multiple key, Pushbutton, with cover, part number 001267 lock box and a meter location key to be secured within the lock box. Customer will securely attach the lock box to the outside wall of the meter location at a 5' height, adjacent and next to the meter location entry door. Utilities will reprogram the box after it is installed, accepted, and keys are verified and tested on all needed doors. The customer will be responsible for providing a new key if the door lock is ever re-keyed.

(b) All meter locations, must have matching keys for Utilities access to metering equipment.

(c) Customer access to their main breaker: Utilities will not be responsible for any electrical issues inside the building, beyond the utility owned transformer. In the event of a unit outage, an occupant shall first contact the building maintenance staff (if available), or reset their main breaker at the meter location. Utilities will only respond if the outage affects the entire building. The building owner shall provide information to the occupants including the location of their circuit breaker at the meter location.

4) Labeling

(a) Meter sockets shall be labeled for each occupancy as shown in the ELESS – 5.13

(b) Meter rooms or spaces must be labeled with unique room/ location identifier with the floor and room number, and include the following signs: "ELECTRIC METER ROOM", and "NO STORAGE"

(c) A durable and laminated, permanent map of all metering rooms/ location shall be posted in the ground level meter room/ location and must be approved by Utilities.

5) AMI Antenna/ Cable

(a) Provisions on the outside of the building shall be provided to mount the antenna as shown on the Appendix D, Drawing 20 – Interior Metering Antenna and Location Installations.

(b) The antenna shall be located between 12’ to 15’ above finished grade. The antenna cable location must be approved by Utilities.

(c) One and one quarter inch EMT Conduit shall be provided for the following Utilities installed cables: The antenna cable from the antenna on the exterior of the building to the ground floor dedicated meter location, and the AMI communications cables between each meter location. The ground floor meter location conduit to the outside must be within 6” of the ceiling. Jet-line pull string shall be provided in the conduit(s). A conduit run may not have more than 360 degrees radius bends per run unless a 12”x12”x6” pull box will be installed to ensure no single run exceeds 360 degrees. A weather-head may be required for vertical conduit runs.

(d) Utilities Responsibilities:

(1) Utilities will be responsible for meeting with the customer before installation and identifying the location for the antenna equipment and communications amplifier.

(2) Utilities vendor will install AMI communications cables, antenna cable, and all AMI communications equipment when notified by the customer to install.

d) Multiple Interior or Exterior Meters:

Where service is supplied to individual customers located in a structure designed for multiple occupancy, the individual meters will be grouped at a point nearest the service drop attachment and must be as specified in the excerpts from Article 370 of the National Electrical Code.

The mounting heights for multiple meter stacks will be no lower than 36 inches from final grade to the center of the lowest meters and will be no higher than 72 inches from grade to the center of the highest meters. Any variation from these mounting heights requires prior approval from the Quality Control Inspectors (QC) (see Phone Section). A plus or minus 7 inch tolerance may be allowed for interior locations (this variance only applies to interior metering locations).

e) Grouped Colorado Springs Utilities Residential Meters:

See Appendix F, Construction Standard 19-8, for preferred locations to group Colorado Springs Utilities gas/electric/water meters at residential installations to facilitate efficient meter reading and economic joint trench practices in the future**.**

5.03 Primary Metering:

Refer to Chapter 10, Commercial/Industrial Development.

5.04 Instrument Transformer (CTs & VTs) Metering:

a) General:

1) Current transformers (CTs) are optional if load is rated greater than 200 and up to 400 amps (single- phase 120/240V). Current transformers (CTs) are required if load is over 400 amps (single- phase 120/240V), or over 200 amps (single-phase 120/208V and three-phase). CTs, VTs (voltage transformers) and meter socket location must be approved by Colorado Springs Utilities before installation. Contact Field Engineering with any questions on suitable locations. All instrument transformers (CTs & VTs) will be furnished and installed by Colorado Springs Utilities, except on customer owned switchgear, where Utilities will deliver the CTs and the customer will install (customer shall schedule delivery of CTs with Meter Shop at 668-5525 48 hours in advance). All CTs based on customer main size of 1200 amps or less, are to be mounted in a customer supplied CT cabinet. Bar-type CTs are required when CTs are mounted in new or upgraded customer-supplied CT cabinets. CT cabinets must not be located on the inside of a structure (see 5.02c for exceptions). The use of window type (donut) CTs is not permitted in padmount transformers, customer gear, or CT cabinets unless service entrance rating is greater than 1200 amps.

2) VTs ("VT Pack") are required on all 277/480 volt instrument transformer rated services. The "VT Pack" is to be installed per Advanced Metering Technologies Group specifications. See Appendix D, Photo 3 for typical 277/480 volt instrument transformer (CT & VT) metering installations.

The mounting hardware used shall be (3) 1/4"-20 x 1" tamper-proof bolts or carriage bolts with nuts and split washers. All three mounting holes on "VT Pack" shall be used when mounting the "VT Pack". The "VT Pack" shall be mounted inside on either side of the CT cabinet with the connection point (plug) accessible for installation of the wiring harness. The "VT Pack" shall **not** be mounted on the top, bottom, back, or cabinet door of the CT cabinet. Any variation requires the approval of the Advanced Metering Technologies Group supervisor. All externally mounted "VT Packs" shall be mounted in an external NEMA 3R enclosure and require written approval from the Colorado Springs Utilities Advanced Metering Technologies Group Supervisor (see Phone Section).

3) In the case of commercial-policy underground installations, where the customer is installing secondary cables of the quantity and size to meet NEC requirements, CT cabinets with bus bar connectors shall be used. Since CT bars are designed to operate at 85°C, connectors and insulation on secondary cables connected to bar-type CTs shall be rated for 90°C operation even though conductor size and number of cables per the NEC is based on 75°C ratings.

4) Since the CTs are mounted on bus bars, in customer switchgear or CT cabinets, the customer shall provide a suitable terminal for a #12 copper wire on the neutral (and on the line side of each phase conductor in the case of window-type rather than bar-type CTs). Such terminals may consist of any appropriate lug or a #10 screw type terminal. The bolts used to connect bar-type CTs to the bus or to cable terminals shall be 1/2 inch diameter (see EUSERC standards for CT mounting base requirements). All such bolted CT connections shall include spring-type (Belleville) washers, flat washers, nut & bolts as detailed for padmount secondary connections in Appendix F, Construction Standard 7-15.

5) Wiring of all instrument transformers (CT & VT) secondaries to the meter socket will be done by Colorado Springs Utilities. On all commercial installations the line side and load

side conductors in CT cabinet must be terminated prior to utilities wiring of instrument transformers and sockets.

6) Any exception to the instrument transformers (CTs & VTs) metering practices outlined above or below will require written approval of Colorado Springs Utilities Advanced Metering Technologies Group Supervisor prior to installation (see Phone Section).

7) CT metering conduits, when required, shall be a minimum 1-1/2 inch for above grade conduit and a minimum 2 inch for below grade conduit size from the transformer pad or CT cabinet to the meter socket, continuous run of either GRC or schedule 40 PVC, with all exposed above ground lengths to be schedule 80 PVC or GRC terminated with grounding bushings bonded to local ground electrodes.

b) Instrument Transformers In Padmount Transformers:

When a three-phase padmount transformer supplies a single-metered customer with service entrance rating greater than 1200 amps, the metering CTs & VTs must be located in the secondary compartment of the padmount transformer. The customer will install a conduit from the meter socket location to the padmount transformer secondary compartment as noted in 5.04e. Metering conduit shall be installed in front of secondary conduits. A pull line will be provided, for pulling instrument transformer wire. See Appendix D, Drawings 12 & 13 for typical instrument transformer metering in padmount installations. Instrument transformers (CTs & VTs) will not be installed in single-phase padmount transformers. Instrument transformers (CTs & VTs) mounted in padmount transformers will be installed by Colorado Springs Utilities prior to, or at the time of, delivery of the transformer to the job site.

c) CT Cabinets:

Where CT cabinets are required, they will be furnished and installed on the outside of an exterior wall by the customer (see 5.02c for exceptions).

All residential single-phase CT metered installations shall be wired using two bar-type CTs. The size of the cabinet shall allow a minimum bending space in accordance with Section 312 of the National Electrical Code. If the service wires enter the cabinet, terminate directly on the CTs and exit on the opposite side, then minimum cabinet dimensions shall be 18” wide x 24” high x 10” deep. This cabinet will accommodate installations with a maximum of two 350-kcmil conductors per phase. The Colorado Springs Utilities Field Engineer will designate a point to which a customer shall install either (1) 3 inch or 4 inch conduit from the CT’s at a depth of 36 inches- typically to a j-box or transformer (SCH80 PVC or GRC above ground, PVC below ground). All commercial CT cabinets must be a minimum of 30” wide x 30” high x 10” depth regardless of voltage.

All commercial and residential CT cabinets shall meet the following requirements:

1) CT cabinets requiring three CTs shall measure a minimum of 30” wide x 30” high x 10” deep.

2) Rated and factory labeled “NEMA 3R”.

3) Rated 600 volts maximum and shall have a grounding lug.

4) Doors shall be supplied with a hasp to accept a Colorado Springs Utilities padlock (5/16 inch diameter shackle). All raceways and compartments ahead of the cabinet shall also be sealable. No breakers, fuses, or other customer accessible equipment is allowed in the cabinet.

5) Incorporate a provision (lug or terminal) for bonding together line and load side service neutrals with electrical bond to the cabinet. If the CT cabinet is on the load side of the main disconnect, where the neutral is already grounded, do not bond neutral block to the CT cabinet (see Appendix D, Drawing 17). This termination shall also include a terminal for connecting #12 AWG solid or stranded copper wire to the neutral conductor within the enclosure for purpose of providing a secondary neutral to the meter.

6) CT cabinets shall be installed immediately adjacent to the associated meter socket(s). A minimum clearance will be provided in front of the CT cabinet to fully open the door and have at least 3 feet of working space. The maximum height to the top of a CT cabinet will not exceed 7 feet above finished grade. Physical location of the CTs must be centered between 48 inches and 72 inches above finished grade. CTs must be installed with the white dot (H-1) facing the line side. The line side must be fed from the top of the CT cabinet, with the load side fed from the bottom only on Overhead services, Underground services may be installed with the line side from the bottom or top. The contractor will be required to label the line side and load side of the CT cabinet. The line and load sides shall be marked accordingly as "LINE" or "LOAD". The “VT Pack” is to be installed per Advanced Metering Technologies Group specifications (see 5.04a2), so that the connection point (plug) is accessible for installation of the wiring harness. No other meter devices or customer equipment will be allowed within the CT cabinet. Any variance requires written approval from the Colorado Springs Utilities Advanced Metering Technologies Group Supervisor (see Phone Section). See Appendix D, Drawing 14 and Photos 1, 2, 3 and 4 for a typical CT cabinet installation.

d) Instrument Transformers (CTs & VTs) In Customer Switchgear:

1) General:

Under unique circumstances, approval to install instrument transformers (CTs & VTs) in a customer’s switchgear may be granted by the Colorado Springs Utilities Advanced Metering Technologies Group Supervisor. Such approval will be provided in writing for each individual installation in the comments area on the customer reply sheet of the load data form. Approval will depend on whether or not routine work, e.g. shunting and replacing of CTs, can be accomplished in a safe manner consistent with Colorado Springs Utilities safe work practices, as well as on accessibility for routine maintenance and inspection. Such instrument transformer (CT & VT) installations will be outdoors in a location considered readily accessible during normal working hours, e.g. in a public parking garage. If a “VT Pack” is needed, it is to be installed so that the connection point (plug) is accessible for installation of the wiring harness (see 5.04a2). The minimum size for the instrument transformer (CT) compartment for a 120/208V service shall be 30” wide x 30” high x 10” deep. The minimum size for the instrument transformer (CT & VT) compartment for a 277/480V service shall be 30” wide x 30” high x 10” deep to accommodate both the CTs and the VTs (VTs are required for 277/480v services only). On 277/480 volt services, when the CT cabinet is not large enough to accommodate the VT Pack, then a sealable external VT Pack enclosure will be required with a minimum size of 18” wide x 18” high x 8” deep. Rigid conduit will be run from the instrument transformer (CT & VT) compartment or section to the meter socket location as noted below. All raceways and compartments ahead of the metering will be sealable by Colorado Springs Utilities, including the CT section. Barriers shall be provided between the CT, VT, or meter compartments and other customer accessible compartments. See Appendix D, Drawings 12 & 13 for typical instrument transformer (CT & VT) metering installations.

2) Outdoor Commercial Switchgear Metering Option:

Commercially available multi-meter switchgear meeting Colorado Springs Utilities requirements in Appendix D, Drawing 19 is approved for optional use in the Colorado Springs Utilities Electric Distribution System for commercial services. Metering switchgear is an option to be provided, installed and maintained by the customer at an outdoor location that is readily accessible by Colorado Springs Utilities. The metering switchgear shall include mounting provisions for instrument transformers (CTs & VTs) and metering equipment with phase/neutral terminals for a #12 copper potential connection. CT/VT compartments shall meet all requirements of section 5.04, however, the CT's may be mounted as low as 36" for double stacked CT compartments.

e) Instrument Transformer Conduit:

In all instrument transformer metering cases, the customer will furnish and install a minimum 1-1/2 inch for above grade conduit and a minimum 2 inch for below grade conduit, between the meter socket and the instrument transformer (CT & VT) location for use by Colorado Springs Utilities. All such conduit above ground and accessible to pedestrians will be schedule 80 PVC or galvanized rigid steel conduit (SCH80 PVC or GRC). The maximum distance (total length of conduit run including all bends) will be 20 feet with no more than three 90-degree bends in a single pull section. Colorado Springs Utilities will install and terminate conductors from the instrument transformer (CT & VT) secondary to the meter socket using the customer-furnished conduit; the customer will not install any conductors except for ground wire as shown in Appendix D, Drawing 17, in this conduit. This conduit must be contiguous from the meter socket to the switchgear CT cubicle (See Appendix-D, Drawing 19). The customer shall install a pull line for pulling instrument transformer (CT & VT) wire.

5.05 Self-Contained Meter Sockets:

a) Codes and Standards:

1) All meter sockets, meter stacks, and modular metering systems will be manufactured in accordance with the latest revision of the following:
ANSI C.12.7, ANSI/UL 50, ANSI/UL 414, and NEMA 250, as well as all other applicable code and Standards, with revisions and modification as contained in this specification.

2) All meter sockets used on the Colorado Springs Utilities electric system shall conform to the following requirements. Colorado Springs Utilities personnel have been instructed not to install a meter at a location where the meter socket does not comply with ALL of the following criteria. See also Chapter 5, 5.15 "Meter Sets for Approved Meter Sockets".

3) For questions regarding these requirements, contact the Advanced Metering Technologies Group Supervisor (see Phone Section).

b) Electrical Ratings:

1) All sockets/housings shall be rated 300V or 600V as detailed in ANSI C.12.7.

2) Minimum socket ampacity rating:

Continuous Socket Application	Continuous Ampacity Rating
Residential (single residence overhead service)	100
Residential (single residence underground service)***	200***
Residential/Commercial (Class 320 Self Contained)	320
Commercial – Single Phase*	100*
Commercial – Three Phase	200
Ganged meters/stacks (multi-unit dwelling):	

Main “house” socket - single phase**	100**
Socket feeding individual dwelling unit	100

*125 amp sockets with horn bypass are acceptable for maximum commercial single phase service ratings of 125 amps; examples of such would include telemetering installations, cablevision pedestals, sprinkler system pedestals, telephone pedestals, and site lighting at or under 125 amps. The disconnect/breaker size will be limited to 125 amps and rating based on NEC requirements.

**The main “house” socket for apartment or residential complexes shall have a minimum continuous rating of 100 amps. Loads metered off this socket are typically, but not limited to common areas, offices, recreational areas, and laundry rooms and billed to the owner under an appropriate commercial tariff. In ganged sockets, the disconnect/breaker size for the house socket shall not exceed manufacturer’s ampacity rating; for example, the disconnect/breaker shall be limited to 125 amps for a socket rated 125 amps continuous.

***The 200 amp meter socket rating is the minimum rating required on all single residence with underground service entrance so that Colorado Springs Utilities service wire #4/0 (or 350 kcmil) fits terminals and has adequate training space.

3) All ratings are at 75°C maximum continuous operating temperature.

4) All meter housings shall be UL listed and labeled. They shall be installed and used in accordance with their rating and labeling.

5) For commercial single phase self-contained meter socket enclosures, the customer has the option of installing either a meter socket enclosure with or without an integral disconnects [main breaker(s)]. A commercial service load data form reply letter from Utilities Field Engineering will provide the fault current at the secondary within the transformer for the customer to determine the fault current at the service entrance equipment.

For residential single phase self-contained meter socket enclosures (400 amp services and below), the customer has the option of installing either a meter socket enclosure with or without an integral disconnect [main breaker(s)].

c) General Construction:

1) For all self-contained meter socket requirements, see 5.15 “Meter Sets For Approved Meter Sockets”.

2) Every line side compartment shall accommodate a Colorado Springs Utilities seal whether or not the compartment is designed to house a meter.

3) A temporary meter cover plate is required. It shall be as a minimum, waxed cardboard. No metallic material is acceptable.

4) All meter sockets shall be outdoor weather resistant type.

d) Covers:

1) Each socket in a multi-socket stack shall have an individual cover and sealing provision.

2) Only one-piece ringless covers are acceptable.

3) Covers shall be designed for sealing with a padlock type seal and removable without removing any screws, bolts or nuts.

4) Covers shall be designed to prevent removal of any portion without first removing the seal.

e) Jaws & Terminal Block:

Jaws shall be constructed of tin plated copper.

1) Any tension springs shall be permanently captive.

2) Lugs/terminals shall be suitable for use with copper or aluminum conductors.

3) Lug size shall not exceed the wire range as a specified in the manufacturer's label.

4) Lugs shall be hex head type with captive bolts.

5) The terminal block shall have a fifth 'stinger' terminal in the nine o'clock position if single-phase 3 wire (network) service is supplied from a 208 wye/120 volt 3-phase secondary system.

f) Bonding Provisions:

Service equipment and enclosures would be called on to carry heavy fault currents in the event of a ground-fault. For this reason, it is imperative that meter sockets and metallic conduits be adequately bonded to neutral and to the ground. Bonding is to be done by threaded couplings and threaded bosses in a rigid metal conduit system where the joints will be made up wrench tight. Locknuts and bushings do not fulfill the requirement of bonding at service equipment. Grounding bushing (with bonding jumpers), bonding locknuts, threaded conduit hubs, or other means approved by the Regional Building Department are required. See Appendix D, Drawings 16 & 17 for typical grounding and bonding details.

1) A combination neutral/bonding terminal shall be provided in the center of the terminal block.

2) This terminal shall be mechanically and electrically bonded to the enclosure.

3) There shall be two separate lugs on the combination terminal for landing neutral conductors to one and ground bonding wires, when needed, to the other.

4) The neutral lug shall be capable of accepting conductors as large as the phase conductors.

5) The ground lug shall be capable of accepting up to a #4 solid copper wire for 100 amp sockets, up to a #2 copper wire for 200 amp sockets, and up to #1/0 for 320 amp meter sockets.

g) Bypass Requirements:

Socket Application	**Maximum Ampacity Rating Continuous**		
	125 Amp	**200 Amp**	**320 Amp**
Residential (Single Residence)	H or L	H or L	L
Single-Phase Meter Pedestals (Mobile Home & Permanent Commercial)	H or L	H or L	L
Commercial – Three Phase	L	L	N/A
Commercial – Single Phase (Excludes Permanent Meter Pedestals, See Single-Phase Meter Pedestals above)	L*	L	L
Ganged (Multi-Unit Dwelling):			
Main "house" socket	H	L	L
Socket Feeding individual dwelling	H	H	L
	L= Lever Bypass/ H= "Horn" Bypass		

Note: Lever operated; jaw release bypass mechanisms shall be equivalent to the Duncan HQ-5 or HQ-7.

*125 amp sockets with horn bypass are acceptable for maximum commercial single phase service ratings of 125 amps; examples of such would include telemetering installations, cablevision pedestals, sprinkler system pedestals, telephone pedestals, and site lighting at or under 125 amps. The disconnect/breaker size will be limited to 125 amps and rating based on NEC requirements.

h) Meter Socket Wiring & Maintenance:

1) Customers will wire all self-contained meter sockets (up to 400 amp rating) in accordance with the appropriate wiring diagram in Appendix F, Construction Standard 14-11.

2) The owner of the facility being served is responsible for the repair and maintenance of ganged meter sockets.

i) Residential Meter Sockets:

1) All meter sockets will be purchased and installed by the electrical contractor from suppliers (see Appendix C, Table 3 for material requirements).

2) For all self-contained meter socket requirements and limitations, see 5.15 "Meter Sets For Approved Meter Sockets".

3) The customer shall follow the Pikes Peak Regional Building Department's requirements regarding the installation of a residential outdoor emergency disconnect and labeling.

4) Residential Meter Sockets with Integral Disconnect (All-in-One Unit or Meter with Main Breaker and separate Sub-Panel):

(a) The service equipment enclosure shall be a combination unit consisting of a ringless type meter socket and the customers main disconnect [main circuit breaker(s)] with or without branch circuit breakers. The branch circuit breakers may be contained in a separate sub-panel.

(b) The enclosure shall have two separate compartments with a barrier between Utilities' meter section and the customer's circuit breaker section. The separate compartments shall be factory bussed from the load side meter section to the line side circuit breaker section. Each compartment shall have a one-piece cover and equipped with a suitable device for closing and sealing. The Utility's compartment shall be locked with a Colorado Springs Utilities padlock type seal and the customer's compartment shall have the ability to be locked.

(c) The meter section of an integral disconnect socket shall contain a 4 terminal meter mounting block, with either horn or lever bypass on the 125 & 200 amp sockets, lever bypass only on the 320 amp sockets, and supplied with a grounding provision (neutral) and auxiliary ("triplex") ground electrically bonded to the socket. The meter section terminal block shall have a fifth 'stinger' terminal in the nine o'clock position in the case where single-phase 3 wire (network) service is supplied from a 208 wye/120 volt 3-phase secondary system.

(d) The Main breaker section of an integral disconnect socket shall have provisions for a maximum of 6 main, "plug-in" style circuit breakers and shall be "Dead Front".

(e) Knockouts of load carrying cable shall be concentric type ranging from 1 inch to 2-1/2 inches. If the top of the enclosure has a hub opening, a closing plate shall be supplied if used for underground service. Cable lugs shall be suitable for use with either copper or aluminum conductors and will accept #6 through

2/0 AWG for 100 amp service, #6 through 350 kcmil for 200 amp service, #4 through 600 kcmil for 320 amp services.

j) Commercial Meter Sockets:

1) Commercial meter sockets will be purchased and installed by the electrical contractor from suppliers (see Appendix C, Table 3 for material requirements and approved socket materials).

2) For all self-contained meter socket requirements, see 5.15 "Meter Sets For Approved Meter Sockets".

3) Meter socket stacks designed to house multiple meters in one cabinet, for installation on structures designed for multiple occupancy, must be provided by the customer. No financial reimbursement is made for meter stacks.

5.06 Optional Aesthetic Meter Enclosures:

New installations of meter enclosures are not permitted with the use of AMI meter devices, as they significantly impede the transmission signal. Existing structures will be evaluated on a case-by-case basis as to whether they will continue to be allowed. The following guidelines refer to existing meter socket enclosures only. These guidelines are in addition to and in no way preclude or lessen any other requirements stated in the meter section, i.e., tagging, general construction requirements, locks, accessibility, etc.

a) Ganged Meter Sockets:

1) When enclosed, the enclosure will be hinged on the outside of the enclosure allowing for easy removal, not permanently mounted. The bottom will be left open.

2) When enclosed, there will be a minimum clearance of 12 inches in front, and 24 inches on the sides, the top, and the bottom of the meter socket or meter stack from the enclosure. In addition, there will be a minimum of 36 inches of clear working space in front of meters when the doors of the enclosure are open. There will not be any locks on these enclosures.

3) Locking of the meter enclosure cabinet will be permitted only if the following guidelines are met:

(a) The customer may place an enclosure key in a "lock box" with a Colorado Springs Utilities lock on the box. The box must be clearly marked "meter key" and be in a readily accessible area as close to the enclosure lock as practical.

(b) A dual locking method may be used if both the customer and the Colorado Springs Utilities lock can be independently operated to gain access to the enclosure.

b) Single Meter Sockets:

1) The enclosure will have an access hole either round or square, which is a minimum of five inches in diameter, centered over the meter. The bottom will be left open.

2) The cover will be hung, using hooks, allowing for easy removal, not permanently mounted.

3) There will be a minimum clearance of 5 inches from the socket to the inside front of the cover. If a special meter is required, more clearance may be needed.

4) Colorado Springs Utilities will not be held liable for damage to the cover incurred while performing work to the meter.

5.07 Converting Existing Apartment Houses With Master Meters to Individual Meters for Each Apartment Unit:

NOTE: This does not apply to new apartment units to be constructed. Colorado Springs Utilities will consider requests from apartment owners to place electric meters inside an apartment building when converting from master metering to individual apartment metering. These requests will be evaluated on an individual basis. It is not always an economical advantage to the apartment owner to place meters inside. Caution should be used in selecting a conversion method. A request to place meters inside must be made in writing to Field Engineering Section (see Phone Section). If permission is granted to place meters inside, it will be done in accordance with the following stipulations:

a) The meter location must meet all requirements of the applicable City Code, National Electrical Safety Code, and the National Electrical Code.

b) All doors leading to the meter locations will have all locking devices removed and will remain open at all times for access by Colorado Springs Utilities personnel.

c) All conduit and cable work from the secondary terminals on the transformer or weatherhead will be done in accordance with Regional Building Department code requirements. The Regional Building Department will be responsible for inspection and acceptance.

d) On padmount transformer installations, the customer will provide and install all secondary cable and cable connectors and make connections to the secondary terminals of the transformer as specified by Colorado Springs Utilities.

e) On transformer vault installations, the customer will provide and install all secondary conduit and cable but Colorado Springs Utilities will make the connections to the transformers. The customer is to leave enough slack cable to make the connections.

f) The customer may elect to use Colorado Springs Utilities approved, individual meter sockets or ganged meter panel. In some cases when electric load is of a certain magnitude, current transformer metering may be required.

g) It will be the responsibility of the owner to correct any errors in tagging. Installations of this type will be subject to inspection by Colorado Springs Utilities service personnel to ensure proper tagging. See marking of multiple meter sockets for details (see paragraphs 5.13 and 5.14).

h) The apartment owner and/or manager will notify each tenant that the metering is being changed to individual metering and that they, the tenants, must make arrangements with Colorado Springs Utilities Customer Service, either by telephone, or in person, to have a meter contract initiated in their name (see Phone Section). Until all contracts have been negotiated and meters set, the billing will continue on the master meter.

i) During construction, flatted or jumpering of the meter sockets will not be allowed.

5.08 Self-Supporting Meter Mounting:

a) Self-supporting meter sockets will only be allowed to be mounted on approved utility structures (see Appendix D, Drawings 5 & 10). Approved utility structures include:

1) Utility grade pole

2) 6"x 6" pressure-treated post

3) 3"x 3"x 3/16" angle iron

4) 2 " minimum diameter GRC post

b) When post type mounting is necessary, the minimum requirements are as follows:

1) Posts are to be 2 inch diameter GRC or 3”x 3”x 3/16” angle iron set in 18 inches of concrete. Wood is not to be used for permanent support posts but temporary installations may use 4”x 4” pressure treated wood posts without concrete.

2) Cross bars are to be 2”x 3/16” strap iron or material of equal rigidity (2 inch wide unistrut type channels will be acceptable).

3) When served from an overhead source, post type meter must be no closer than 15 feet from the pole.

5.09 Moving or Removing Meters and Metering Equipment:

No person shall tamper, connect, disconnect, move, remove or otherwise interfere with the proper operation of Colorado Springs Utilities meter or other equipment, or in any way interfere with the proper meter registration of the electric energy used. Only authorized Colorado Springs Utilities employees are permitted to connect, disconnect, move, or remove meters. Contact a Colorado Springs Utilities Customer Service representative (see Phone Section) to schedule these activities. The customer must get PPRBD (Pikes Peak Regional Building Department) to inspect their facility, within three business days after the reconnection of a meter that was removed for electrical work.

5.10 Pulse-Initiating Device to Monitor Electrical Demand:

Upon the customer’s request, Colorado Springs Utilities will install a pulse-initiating device on a customer’s existing meter socket with an additional installation charge and a monthly charge. To initiate a request for a pulse-initiating device, the customer shall contact a Colorado Springs Utilities Advanced Metering Technologies (AMT) Supervisor (see Phone Section). The customer should submit, in writing, all technical information concerning the customer’s load-monitoring equipment to the Colorado Springs Utilities Advanced Metering Technologies (AMT) Supervisor (see Phone Section). Colorado Springs Utilities will determine what type of pulse and the amount of pulses available in a given time interval.

To get the pulse-initiating device installed, the customer will install a weatherproof junction box within 1 foot of the meter socket, a 3 to 5 position terminal block inside of the junction box. The customer will furnish, install and maintain the wiring from the 3 to 5 position terminal block to the customer’s monitoring equipment. The customer is responsible for supplied and maintained wiring to fuse block. The customer should supply wetting voltage no less than 5 VDC and no greater than 24 VDC. This wiring will be in accordance with the requirements of the electrical code governing such installation with Colorado Springs Utilities stipulation that one-amp current-limiting fuses be installed on the load side of the terminal block (see Appendix D, Drawing 18).

Colorado Springs Utilities will then install pulse-initiating device and wiring from the meter socket to the terminal block. Note: Colorado Springs Utilities responsibility and liability ends at the line side of the terminal block.

5.11 End of Interval Indicator:

Colorado Springs Utilities will not supply or install an end of interval indicator on meters of any type.

5.12 Equipment Ahead of the Meter:

If there is equipment ahead of the meter(s), it is to be designed in such a manner that it can be sealed in an acceptable manner, with padlock or wire seals, depending on the situation. No disconnects shall be installed on the source side of residential meters. Disconnects are allowed on the source side of commercial meters and shall include sealing provisions as stated above and include locking provisions for lock out tag out. Gutters on the source side of meters shall be installed on the outside of buildings. Customer installed underground junction boxes or underground connections boxes are not allowed on the source side of commercial meters.

5.13 Marking of Multiple Meter Sockets / Breakers:

The electrical contractor who installs the wiring will plainly mark each meter and corresponding breaker of a multiple meter socket stack and all individual meter pedestals with a permanent brass tag showing which apartment, office, or room is metered by each meter. The electrical contractor will provide the brass tags, the following requirements will apply:

a) The tag will be round and 1-1/4 inch in diameter.
b) The tag will have a 3/16 inch diameter hole near the edge.
c) Letters or numbers must be a stamped impression in the tag and must be at least 3/16 inch in height.

5.14 Tagging Meters / Switchgear/ CT Cabinets:

The property owner and electrical contractor shall be responsible for assuring that all sockets and corresponding CT compartments are tagged correctly with 1-1/4" diameter brass tags. CT Cabinets shall be tagged with address numbers and suite numbers as applicable. Meters will not be installed until all sockets are tagged correctly. When internal numbering and/or lettering schemes are changed or incorrect tagging creates inaccurate information in Colorado Springs Utilities records, the owner of such premises will be responsible for actual time and material charges incurred by the Colorado Springs Utilities to correct the situation.

5.15 Meter Sets For Approved Meter Sockets:

For all self-contained meter socket requirements, see 5.05 "Self-Contained Meter Sockets", Appendix C - Table 3 for Material Requirements, Appendix E - Material Specifications 102-1 & 102-600-130, and Appendix F – Standard 14-11 "Meter Socket Wiring Schematics".

For all CT rated meter socket requirements, see 5.04 "Instrument Transformers (CTs & VTs) Metering", Appendix C – Table 3 for Material Requirements, Appendix E - Material Specifications

102-600-070 & 102-600-077, and Appendix F – Standard 14-11 “Meter Socket Wiring Schematics”.

Please contact the Advanced Metering Technologies Group Supervisor if you have any questions regarding Colorado Springs Utilities- material requirements or approved sockets (see Phone Section). Any variances to the requirements below must be approved by Utilities’ Inspections (QC) (see Phone Section). Meters will not be set on sockets that don’t meet these requirements. The meter sockets must meet the following guidelines:

a) Material requirements herein or an approved socket type.

b) Proper tagging.

c) Legitimate addresses.

d) Proper covers.

e) Proper heights.

f) No unsafe conditions such as holes cut in the electrical equipment and not covered properly.

5.16 Adding Surge Suppression to Meter Sockets:

a) Colorado Springs Utilities does not allow home and business owners to install or contract the installation of surge suppression devices on self-contained electric meter sockets.

5.17 Electric Meter Testing

a) Acceptance testing for new electric meters:

1) All new electric meters received by Colorado Springs Utilities are certified and tested by the manufacture for accuracy.

2) Colorado Springs Utilities performs a sample test of 5% of all new residential electric meters, Forms 1S & 2S, to verify accuracy. Colorado Springs Utilities performs a sample test of 25 percent of all new residential and commercial meters, Forms 12S & 16S, to verify accuracy. Residential electric meters must be plus or minus .5 percent accurate to pass the acceptance testing.

3) Colorado Springs Utilities performs a sample test of 100 percent of all new transformer rated commercial and industrial electric meters to verify accuracy. Commercial and industrial electric meters must be plus or minus .5 percent accurate to pass the acceptance testing.

4) All rebuilt or repaired electric meters will follow the same accuracy limits as denoted in 5.17(a) & (b) before being placed in service.

b) Electric Meter Periodic Test Schedule:

1) Electric meters not tested since original acceptance test will be periodically tested. Electric meters must be plus or minus 2 percent accurate to pass the periodic test.

2) Electric meters are periodically tested according to the following test schedule:

(a) Self-contained single phase and three-wire network meters:

(1) A 10 percent sample test on meters not tested since original acceptance test every 4, 12, and 20 years.

(2) A 100 percent test of meters that have not been tested for 25 years.

(b) Self-Contained Polyphase Meters:

(1) A 10 percent sample test on meters not tested since original acceptance test every 4 and 8 years.
(2) A 100 percent test of meters that have not been tested for 12 years.

(c) Instrument transformer rated, single-phase meters:

(1) A 10 percent sample test at the following intervals on meters not tested since original acceptance test every 4 and 8 years.
(2) A 100 percent test of meters that have not been tested for 12 years.

(d) Instrument transformer rated, polyphase meters:

(1) A 10 percent sample test on meters not tested since original acceptance test every 2 and 4 years.
(2) A 100 percent test of meters that have not been tested for 6 years.
(3) A 100 percent test of meters that have not been tested for 2 years for meters with loads of 500 kW, or greater, for 2 out of 12 consecutive billing periods.

(e) Special service contracts: test as determined by contract if specified or used appropriate meter test schedule.

(f) Integrated (block interval) demand meters including demand registers and associated control devices: test schedule is the same as for the associated watt-hour meters, but not to exceed 12 years.

Interior Meter Acceptance Check List

Pass ☐ Fail ☐

1. Meter location size and lighting.

Comments: _____

_____

SU Inspector: _____ Customer_____ Date _____

Pass ☐ Fail ☐

2. Locks installed & operational.

Comments: _____

_____

SU Inspector: _____ Customer_____ Date _____

Pass ☐ Fail ☐

3. Water module wiring and labeling.

Comments: _____

_____

SU Inspector: _____ Customer_____ Date _____

Pass ☐ Fail ☐

4. Meter location door labeling.

Comments: _____

_____

SU Inspector: _____ Customer_____ Date _____

Pass ☐ Fail ☐

5. Meter location map.

Comments: _____

_____

SU Inspector: _____ Customer_____ Date _____

Pass ☐ Fail ☐

6. All required lock boxes installed.

Comments: _____

_____

SU Inspector: _____ Customer_____ Date _____

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CUSTOMER INTERIOR METER AGREEMENT

A. This Customer Interior Meter Agreement ("Agreement") shall be signed, notarized, and returned to Utilities by the Owner of the premises addressed herein or the Owner's authorized representative (collectively "Customer"). This Agreement will be effective ("Effective Date") upon execution by Customer following confirmation from Utilities that Customer has complied with all applicable requirements and has agreed to the additional payment for interior metering network. Through this Agreement, Customer is requesting Utilities approval for an interior meter location. The interior meter location and Customer information is as follows:

Billing Contact Name: _____
Billing Address: _____
_____

Customer Name: _____
Property Owner: _____
Property Address: _____
_____

Price Estimate for AMI Network Installation: _____

B. Through execution of this Agreement, Customer agrees:

a. To comply with all requirements of the Specification for Interior Electric Meter Location and all applicable Utilities' rules, regulations, standards, and Tariffs (as defined below) and to build the interior electric meter location(s) to the required specifications.

b. Customer is authorized to execute this Agreement and has provided Utilities with evidence of such authorization.

c. That this Agreement incorporates and is controlled by Colorado Springs Utilities' Utilities Rules and Regulations and Tariffs (collectively the "Tariffs") as amended from time to time, specifically including, but not limited to Utilities' Right of Access to Customer's premises.

d. Customer shall be solely responsible for the consequences of failing to comply with any obligations of this Agreement.

e. The meter locations shall not be used for any type of storage and shall be free from any and all clutter. Utilities will not be responsible for damage or removal of any items that hinder clearances or the operation of our equipment.

f. Meter locations are provided and maintained by Customer.

g. Utilities will not be responsible for any electrical issues inside the building, beyond the utility owned transformer. In the event of a unit outage, an occupant shall first contact the building maintenance staff (if available), or reset their main breaker at the meter location. Utilities will only respond if the outage affects the entire building. The building owner shall provide information to the occupants including the location of their circuit breaker at the meter location.

h. Customer is responsible to pay for all installation and materials including AMI network equipment (except meters). If equipment is damaged, the customer is responsible to pay for its replacement and installation.

i. CT meter location is approved by Utilities.

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C. In the event that Customer transfers ownership of the Premises, Customer will notify the new owner of this Agreement and shall require the new owner to execute a then current Agreement as part of the property transfer. Customer shall post and keep posted at all times within the meter locations a notice to the existence of this Agreement and the requirement that any new ownership will require a new Agreement. The customer is responsible to provide a new key to Utilities if the door to the meter location is re-keyed, and will pay the cost to Utilities to gain access if no key has been provided.

D. Customer will provide and keep current, primary and secondary contact phone numbers to allow Utilities to contact Customer at any time to restore access to meter locations. Customer will notify Utilities of any changes to these numbers within 24 hours of the change:

Primary Contact Name: _____
Primary Contact Phone number: _____
Secondary Contact Phone number: _____

E. Upon execution by Customer, this document will be delivered to Utilities at:

Colorado Springs Utilities Representative
Field Engineering (cc Quality Control Inspector)
Colorado Springs Utilities
1521 Hancock Expressway
Colorado Springs, CO 80947-1821

F. Prior to Customer's execution of this Agreement, Customer will provide Utilities with the necessary information and/or access to review compliance of the interior meter locations with the necessary specifications. Through this review, Utilities shall evaluate the interior meter locations and record the conclusions through the attached and incorporated Acceptance Check List.

Utilities Acceptance Check List Approval: _____

Customer Agrees to the Terms of this Agreement:

Customer (Print Name): _____
Customer (Signature): _____
Date: _____
Statement of Authority: Must complete and provide the attached Statement of Authority

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CUSTOMER INTERIOR METER AGREEMENT STATEMENT OF AUTHORITY

1. This Statement of Authority relates to an entity named: _____
2. The type of entity is a

- ☐ Corporation
- ☐ Nonprofit Corporation
- ☐ Limited Liability Company
- ☐ General partnership
- ☐ Limited partnership
- ☐ Registered limited liability partnership
- ☐ Business trust
- ☐ Trust
- ☐ Other _____
- ☐ Registered limited liability limited partnership
- ☐ Limited partnership association
- ☐ Unincorporated nonprofit association
- ☐ Government or governmental subdivision or agency

3. The entity is formed under the laws of _____

4. The mailing address for the entity is _____

5. The name and position of each person authorized to execute instruments conveying, encumbering, or otherwise affecting title to real property on behalf of the entity is

_____

6. (*Optional*) The authority of the foregoing person(s) to bind the entity is

☐ not limited ☐ limited as follows: _____

7. (*Optional*) Other matters concerning the manner in which the entity deals with interest in real property: _____

8. This Statement of Authority is executed on behalf of the entity pursuant to the provisions of Section 38-30-172, C.R.S.

Executed this _____ day of _____, 20__.

By: _____

STATE OF COLORADO)
) ss.
County of El Paso)

The foregoing instrument was acknowledged before me this ____ day of _____, 20__ by _____as_____ of _____.

Witness my hand and official seal

My Commission Expires: _____

Notary Public _____

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CHAPTER 6
Temporary Electrical Service

CHAPTER 6

Temporary Electrical Service

6.01 General:

a) Temporary construction service may be provided prior to the installation of permanent service and meter (not to exceed 18 months). Non-construction temporary service may be provided when temporary service is required for a short period of time (4 to 45 days) or for "Special Events" (1 to 3 days).

City Ordinance prohibits Peddlers of Food wares from connecting to any utility service. All religious, nonprofit, and charitable organizations are exempt from peddler licensing requirements. "Special Events" require a revocable permit (issued by the City of Colorado Springs) and do not fall under this City ordinance.

b) All temporary service panels will be equipped with ground-fault circuit interrupters (GFCIs) in accordance with National Electrical Code (NEC) requirements and OSHA regulations. All customer installations will conform to the rules and regulations of OSHA, the current edition of the NEC and the National Electrical Safety Code in all aspects including ground-fault protection.

1) The standard temporary electric service voltage will be either 120/240 volt or 120/208 volt single-phase, three-wire service.

2) Any other voltage, including three-phase, may be provided by special arrangement with Colorado Springs Utilities Field Engineering on a Time-and-Material basis (see paragraph 6.03).

c) Any temporary service request (except for "Special Events") must be initiated by contacting Colorado Springs Utilities Development Services (see Phone Section). The requesting party must complete a temporary service application and inform Utilities of the intended use for the temporary power. Providing incorrect or inadequate information can result in immediate revocation of the temporary power contract. The application will remain on file with Utilities Development Services. Prior to orders being issued to install temporary service, the requesting customer must pay an installation/removal charge for each request. See 6.06 for "Special Events" process.

d) Grading, excavation, ground rod, stake or post installation work will not be started until an underground facilities location has been completed. Call 811 for utility locates. See 2.03b for Underground locate requirements.

6.02 Temporary Construction Service (Not to exceed 18 months):

a) Construction Needs:

Temporary service may be provided for construction needs, which include but are not limited to: Non-metered service for construction power for a residential development. Metered service for sales trailers and temporary construction offices (considered commercial). Please reference Appendix D, Drawings 6A & 6B for temporary overhead service installation and Drawings 7, 8, 9, 10A & 10B for temporary underground post type or pedestal service installation.

b) Types of Temporary Construction Electrical Services:

1) Non-Metered Temporary Services - Colorado Springs Utilities installs and removes the non-metered temporary pedestal:

a) New Underground Residential Development (50 amps or less) - Colorado Springs Utilities pre-installs non-metered temporary pedestals for new underground residential single-family developments. The customer will be billed a flat monthly consumption until the temporary service is removed.

2) Metered Temporary Services - Customer installs and removes the metered service. The customer coordinates in advance with the Field Engineering Section. Regional Building Department inspections will be required on temporary services with mains larger than 50 amps. Load data forms will be required on temporary services with mains greater than 200 amps.

a) Existing Underground Residential (50 amps or less) – Only if there is no non-metered temporary pedestal installed.
b) New or Existing Underground Residential (over 50 amps)
c) Overhead Residential (Any size service)
d) Commercial – (Any size service)

c) Underground Temporary Construction Power (50 amps or less):

When existing primary and secondary facilities are available, standard temporary service in an underground service area may be provided as follows:

1) For a new underground residential development, Colorado Springs Utilities will pre-install a non-metered temporary electric pedestal at each lot during the development phase.

All Utility provided temporary pedestals provide two 20 amp, 120-volt duplex outlets with ground fault protection and one 50 amp breaker with a 240-volt range outlet with GFCI. The care of Colorado Springs Utilities-owned pedestal is the responsibility of the party requesting the service. Colorado Springs Utilities will inspect the pedestal at the time of removal and will note the condition. If repairs are necessary, Colorado Springs Utilities will provide material and labor, which will be billed to the party requesting the service. Should the pedestal be damaged beyond repair, a time and material charge will be assessed for the full replacement of the pedestal.

2) If Colorado Springs Utilities has not pre-installed a non-metered pedestal, the customer will provide and install a metered temporary electric pedestal or post type meter, as long as and the pedestal/post meter conforms to the requirements detailed in Appendix D, Drawings 7 or 8. Each transformer and/or secondary junction box will be limited to two temporary installations.

d) Overhead Temporary Construction Power (50 amps or less):

The customer must construct, and supply service loop supports in accordance with Appendix D, Drawings 6A or 6B. These supports should be located not less than 15 feet and not more than 100 feet from the nearest overhead distribution pole. The attachment point height will be determined by Utilities after evaluation of field conditions and must meet NESC conductor clearance requirements.

e) Underground or Overhead Temporary Construction Power (over 50 amps):

Any temporary service needs larger than 50 amps will be metered, installed by the customer

6.03 Temporary Service "Flat Rate" and "Time and Material" Installation:

In the event the request for temporary service requires extension of primary or secondary facilities, poles, transformers, or other modification, the facilities may be installed on either a "Flat Rate" contract and/or a "Time-and-Material" contract and must be requested in writing to the Field Engineering office (see Phone Section). See modification to the system in Chapter 11 for estimate, installation, and billing requirements. This process will require more lead-time than the normal temporary service request, typically three weeks or less.

a) The installation and removal of a 1-phase transformer may be installed on a "Flat Rate" contract if the transformer is located next to an existing power source. The transformer installation and removal will be performed by Colorado Springs Utilities.

b) The installation and removal of a 3-phase transformer will be on a "Time and Material" contract and the customer must follow the commercial policy outlined in Chapter 10 (example: The customer must install the primary and secondary conduit, trench, backfill, compaction of trench and transformer pad location, etc.)

6.04 Scheduling of Temporary Electrical Service:

Most normal temporary service requests are processed within 10 business days if a distribution transformer or secondary junction box is readily available. In areas where the pedestals are pre-installed with the distribution system in the development phase, temporary service requests will be processed in two business days or less. In the instance a distribution transformer or secondary junction box is not available, or a secondary voltage other than the standard voltages is needed, this policy will not apply (see Paragraph 6.03).

6.05 Short-Term Temporary Service (4 to 45 Days):

a) The purpose of this policy is to provide prompt temporary electric service to meet short-term non-construction type energy needs for consumers such as circuses, fairs, fireworks stands, Christmas tree sales, seasonal business and other similar activities, which need service for only 4 to 45 days. Single-phase 120/240 or 120/208 volt service will be delivered through a customer provided and installed temporary electric pedestal or post type meter. The pedestal/post meter must conform to the requirements detailed in Appendix D, Drawings 7 or 8. Overhead or underground secondary voltage facilities must be closely adjacent to the service point.

b) A Temporary service connection fee in addition to the charge for the energy consumed will be billed to the customer. A deposit may be required on this type of service. Customers in need of this service can make an appointment with a representative of the Field Engineering Section or can be referred to Field Engineering by the Utilities Development Services. The representative will ask to meet at the service location in order to gather site data and establish the dates of installation and removal. Receipt of a written request or purchase order at this meeting is necessary to insure prompt service.

6.06 “Special Events” Temporary Service (1 to 3 days):

The purpose of this policy is to provide prompt temporary electric service to meet short-term energy needs for “Special Events” such as organizations that conduct bazaars, summer concerts, festivals, parades, and other similar activities and need service for 1 to 3 days. Single-phase 120/240 volt service will be delivered through Colorado Springs Utilities furnished equipment consisting of either a pedestal with two-20 amp, 120 volt breakers with duplex outlets with GFCI, and one-50 amp, 240-volt breaker with range outlet and GFCI or will be fed from a streetlight with one-20 amp, 120 volt breakers with duplex outlets with GFCI from a streetlight.

Organizations or event producers requiring temporary power must submit an on-line sponsorship application to request their power needs for the event. Submit the application at least four weeks prior to your event. The application is available on Colorado Springs Utilities web site at https://www.csu.org/Pages/EventSupport.aspx.

Customers in need of this service must also make an appointment with a representative of the Field Engineering Section. The representative will ask to meet at the service location in order to gather site data and establish the dates of installation and removal.

At Utilities discretion, the consumed energy may be provided as an in-kind donation/sponsorship by Colorado Springs Utilities, which will be recognized at the appropriate sponsorship level. If the in-kind sponsorship is not approved, the costs of energy will be paid by the customer. A time and materials charge will be billed to set up the facilities and accommodate the power needs. Colorado Springs Utilities will bill the customer immediately following the removal of the service.

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CHAPTER 7
Permanent Residential Services

Chapter 7

Permanent Residential Services

7.01 Residential Overhead Systems:

The standard method of connection between the Colorado Springs Utilities Overhead Distribution System and the Customer's Service entrance location is by means of overhead wires.

The customer or customer's licensed electrician must install and maintain the overhead meter socket, conduit, entrance conductors, weatherhead, and point of attachment, including guys.

For services rated greater than 200 amps, the customer's licensed electrician is responsible for providing and installing the conduit and entrance conductors. A Load Data Form must be submitted to Colorado Springs Utilities Field Engineering for required service design details which are necessary to assure that sufficient transformer capacity, appropriate conductor size, and metering requirements are provided by Colorado Springs Utilities. The process for services greater than 200 amps parallels the commercial process noted in Chapter 10. See Chapter 10 for additional details.

Colorado Springs Utilities will install, maintain and connect the overhead wires, install and maintain the service drop lift poles and service meter.

Permanent meter requests are to be initiated by contacting the Colorado Springs Utilities Customer Service. Colorado Springs Utilities must be notified reasonably in advance of required installation.

Grading, excavation, ground rod, stake or post installation work will not be started until an underground facilities location has been completed. Call 811 for utility locates. See 2.03b for Underground locate requirements.

a) Number of Services to Building:

Single-family through four-family residences will be served by one service only.

b) Point of Attachment:

1) The customer will bring the service entrance conductors to a point outside the building, which may be satisfactorily reached from Colorado Springs Utilities nearest pole without service trespass on other property, and must meet National Electrical Safety Code height clearances. Colorado Springs Utilities requires that the service entrance be located to avoid having conductors cross over, or within 10 feet horizontally from the edge of swimming pools, over buildings or trees or other obstructions.

2) Information relative to existing poles and wires of the electric distribution system will be obtained from, and the details approved by Colorado Springs Utilities before locating the service entrance to a building. Contact Colorado Springs Utilities Field Engineering. Note that when remodeling or adding patio covers, care must be taken with respect to the service attachment location. Additional clearances may be required (see Appendix D, Drawing 1, Note 2).

c) Method of Attachment:

1) The customer will install a service bracket or other dead-end insulating device of adequate strength to support the Colorado Springs Utilities service drop on the building and withstand a minimum of 400 pounds horizontal tension. The point of attachment of all service drops will meet the requirements of Article 230 of the National Electrical Code

and all Regional Building Code requirements. Clearance of the drip loop wires will meet both NESC and NEC (see Appendix F, 18-208 and 18-209).

2) For a house with under eave service installation, the customer will not place the service knobs in the roof. A minimum of 2 inches of thread length into a solid framing member (stud) is required for use of a service knob. Service knobs with a 4 inch thread length are recommended. On buildings of a masonry or fireproof construction, dead-end devices are to be mounted by means of through-bolts set in the structure. (see Appendix D, Drawing 2)

3) For a house with less than 12 feet of ground clearance to the eaves, the customer will be required to install a mast-type riser through the roof. The conduit must be a minimum of 2 inch galvanized rigid steel and extend above the roof to obtain an 18 inch clearance between roof and the lowest point of the service drop. (see Appendix D, Drawing 1)

4) Service drop anchor or riser attachments shall not be located on chimneys, firewalls, or parapet walls.

d) Length of Service Drop:

Allowable length of service drops will be governed by clearances required by the National Electrical Safety Code. In general, service drops should not exceed 100 feet in length and large service drops should be proportionately shorter. If minimum attachment height of 12 feet at the service mast is provided, service drops over 60 feet in length may require Colorado Springs Utilities to install a service drop lift pole on the customer's property in order to meet NESC clearances. This may be avoided by the customer increasing the service attachment height. See Appendix C, Table 1 or Table 2 for typical conductor sizing and span length limits for various attachment heights. For complex clearance situations, one option offered by Colorado Springs Utilities is an underground service line (see Section 7.04).

e) Service Drop Lift Poles:

Where length of the service drop is excessive, or proper clearances cannot be maintained, or the size of the conductor would cause undue mechanical strain upon either the customer's structure or Colorado Springs Utilities pole line, Colorado Springs Utilities may be required to install a service drop lift pole on the customer's or adjacent property owner's premises. A suitable right-of-way must be obtained from the customer and/or property owner when a service supplies more than one customer.

f) Service Entrance Conductors:

1) The customer's service entrance conductors and conduit may be defined as the service conductors between the terminals of the service equipment and a point normally outside the building clear of building walls where joined by tap or splice to the service drop wires, at the point of common coupling. Service entrance conductors and conduit that are not outside of the building must be approved by Colorado Springs Utilities QC Inspector or Advanced Metering Technologies Group Supervisor (see Phone Section).

2) Service entrance conductors will have a current-carrying capacity at least as great as that provided in Article 220 and meet requirements of Article 230 of the National Electrical Code.

3) At least 18 inches of conductor will extend from the service head for connection to Colorado Springs Utilities service drop wires. The neutral conductor will be marked distinctly so that it can be readily identified.

4) Only electric service line conductors will be installed in the service conduit.

5) Colorado Springs Utilities will require that the customer's service entrance conductors, meter loop, and service entrance switch be installed in accordance with the National

Electrical Code and Regional Building Department requirements at the customer's expense.

7.02 Residential Underground System:

In locations where Colorado Springs Utilities has installed an underground distribution system, Colorado Springs Utilities has three types of residential underground services with various areas of responsibility. The three main types are: Residential developments that are joint trench with gas (subdivision installations), Residential developments or Individual applications for service that are not joint trench with gas and Residential services rated greater than 200 amps. Refer to Chapter 8 for additional requirements for an underground residential development.

- On residential developments that utilize a joint trench for Colorado Springs Utilities' electric service lines and gas services: The customer shall hire a Licensed Utility Service Installer that is responsible for providing and installing the trenching, padding & backfilling, underground conduit (if required), electric service conductor and gas service lines to the building foundation. The customer's licensed electrician will install the service conductor from the building foundation to the meter socket, per Colorado Springs Utilities standards. Refer to Gas Line Extension & Service Standards book, latest edition, Chapter 3 for the "Utility Service Installer License Rules and Procedures" and Chapter 4 for gas service line installation requirements and procedures, including Appendix C - Table 7 for approved materials, Appendix C - Table 10 for Inspection Checklist, and Appendix D - Figures for installation details.
- On residential developments or individual applications for service, that will not utilize a joint trench for Colorado Springs Utilities' electric service lines and gas services: The customer or the customer's licensed electrician is responsible for providing and installing the trenching, padding & backfilling and conduit. The customer's licensed electrician will furnish and install the service conductor per Colorado Springs Utilities standards.
- For services rated greater than 200 amps, the customer's licensed electrician is responsible for providing and installing the trench, padding & backfill, conduit and service conductor. A Load Data Form must be submitted to Colorado Springs Utilities Field Engineering for required service design details which are necessary to assure that sufficient transformer capacity, appropriate conductor size, and metering requirements are provided by Colorado Springs Utilities. The process for services greater than 200 amps parallels the commercial process noted in Chapter 10 with the exception that the service conductor must meet Colorado Springs Utilities conductor standards. See 7.02 a3 and Chapter 10 for additional details.

Colorado Springs Utilities will own, and maintain all residential underground services up to the meter except as designated in this Chapter.

Permanent meter requests are to be initiated by contacting the Colorado Springs Utilities Customer Service. Colorado Springs Utilities must be notified reasonably in advance of required installation. Electric service fees will be paid prior to issuance of a building permit.

Grading, excavation, ground rod, stake or post installation work will not be started until an underground facilities location has been completed. Call 811 for utility locates. See 2.03b for Underground locate requirements.

a) Underground Electric Service Requirements:

1) For all services the customer will be responsible for:
(a) Bring the lot to final grade.
(b) Remove all obstacles, such as piles of lumber, brick, etc.

(c) Meter Equipment – Furnish, install and maintain a meter socket and other service equipment. For services rated greater than 200 amps, a 320A meter socket or meter socket and CT cabinet. See Appendix D, Drawing 3A & 3B for installation and clearances. For metering locations and specification, see Metering Chapter 5.

2) For services rated 200 amps or less, the customer or customer's licensed electrician or customer's Licensed Utility Service Installer (joint trench with gas) will furnish and install:

(a) Trench – Furnish all necessary trenches, excavations, and backfill from the meter point back to the JBox or transformer or property line, to meet standards set forth by Colorado Springs Utilities and in the drawings within these Standards. For services not joint trench with gas, please reference construction standard 18-304 page 3 for the clearances between electric, gas, water or sewer lines. Colorado Springs Utilities will evaluate and select the backfill to cover the service conductors. If the excavated material contains rock, it will not be satisfactory for backfilling and the customer will be required to supply proper fill material.

(b) Conduit – Furnish and install above-ground riser conduit on line side of meter (SCH80 PVC or GRC required). Riser conduit is to be mounted to solid framing members (stud-cross members) on the exterior of the house in accordance with the Regional Building Codes. All GRC conduits below grade will be coated with an asphaltic material or suitable corrosion protection. Additionally, in the event the electric service conductor must be installed under a driveway, patio, deck or similar structure, a 2 inch (SCH40 or SCH80 PVC) electrical rated conduit must be extended 24 inches beyond both sides of the obstruction, with a utility-provided locator biscuit installed on each side of conduit for future locating purposes. See Appendix-C, Table 3 for Approved Electrical Materials, Appendix-D, Drawing 3A & 3B for installation and clearances, and Appendix- E for specification 194-2 regarding "Polyethylene Conduit for Underground Installation".

(c) Conductor – For services joint trench with gas, the customer's Licensed Utility Service Installer will furnish and install the service conductor to the building foundation and the customer's licensed electrician will install and terminate the service conductor from the building foundation to the meter socket. For services not joint trench with gas, the customer's licensed electrician will furnish and install the service conductor from the JBox or transformer, to the meter socket. The conductor must be a continuous length with no intermediate splices allowed. Service conductor is to be installed free of damage to the cable insulation, i.e., shovel nicks, gouges, abrasions, knife cuts, kinks, etc. Note that all conductors on the customer's side of any meter shall be completed by others, not Colorado Springs Utilities, and in accordance with the requirements of electrical codes governing such installation. See Appendix-C, Table 3 for Approved Electrical Materials.

(d) Inspections - Contact Quality Control inspector for inspection of trench, backfill material, conduit, and service conductor (see Phone Section). See 7.07 in this chapter for Residential Service Inspection Responsibilities.

3) For services rated greater than 200 amps, the customer's licensed electrician shall perform the following:

(a) Trench - Furnish all necessary trenches, excavations, and backfill from the service equipment back to the JBox or transformer or property line, to meet standards set forth by Colorado Springs Utilities and in the drawings within these Standards. Please reference construction standard 18-304 page 3 for the clearances between electric, gas,

water or sewer lines. Colorado Springs Utilities will evaluate and select the backfill to cover the service conductors. If the excavated material contains rock, it will not be satisfactory for backfilling and the customer will be required to supply proper fill material.

(b) Conduit - Furnish and install either a 3 inch (DB120/ SCH40/ SCH80 PVC) or 4 inch (DB120/ SCH40/ SCH80 PVC or SCH40/ DR13.5 HDPE) conduit from the transformer or JBox to the 320A meter socket or CT cabinet riser location. Install SCH80 PVC or GRC conduit for above ground riser. Note: 320A meter socket utilizes a 3 inch maximum conduit size. If a 4 inch conduit is installed, provide a 4 inch to 3 inch reducer at the socket. See Appendix-C, Table 3 for Approved Electrical Materials, Appendix-D, Drawing 3A & 3B for installation and clearances, and Appendix- E for specification 194-2 regarding "Polyethylene Conduit for Underground Installation".

(c) Conductor - Furnish, install and terminate the service conductor from the transformer or JBox to the meter socket or CT cabinet location. Conductor must meet Colorado Springs Utilities approved conductor standards, and sized as specified per Utility Load Data Form. See Appendix-C, Table 3 for Approved Electrical Materials.

(d) Inspections - Contact Quality Control inspector for inspection of trench, backfill material, conduit, and service conductor (see Phone Section). See 7.07 in this chapter for Residential Service Inspection Responsibilities. See 10.01j for access to tie into Colorado Springs Utilities equipment.

4) Colorado Springs Utilities will be responsible for::

(a) Trench/Bore – If the power source is located beyond the property, furnish the trench or bore from the power source to the property line.
(b) Conductor Connection – On services rated 200 amps or less, connect the service conductor to the power source.
(c) Meter Install – Install meter. See 7.08 for requirements.

b) Additional Meters to a Developed Lot:

1) To add additional meters to a developed lot, see 7.02a "Underground Electric Service Requirements" for installation details. The customer will be responsible for:

(a) Meter Equipment – Furnish, install and maintain a new meter socket(s) and other service equipment.
(b) Trench – Furnishing all necessary trenches, excavations, and backfill from the service equipment back to the JBox or transformer or property line. Restoring the landscaping on their property.
(c) Conduit - Furnish and install above-ground conduit and if required, below-ground conduit.
(d) Conductor - Provide and install the service conductor from the service equipment back to the JBox or transformer or property line.
(e) Inspections - Contact Quality Control inspector for inspection of trench, backfill material, conduit, and service conductor (see Phone Section). See 7.07 in this chapter for Residential Service Inspection Responsibilities.

2) Colorado Springs Utilities will be responsible for:
(a) Trench/Bore – If the power source is located beyond the property, furnish the trench or bore from the power source to the property line.
(b) Conductor Connection – On services rated 200 amps or less, Connect the service conductor to the power source.
(c) Meter Install – Install meter. See 7.08 requirements.

7.03 Residential Underground Service Upgrades for Meters Located at the Vault:

Residential underground electrical systems installed prior to 1965 were constructed with high metal vault covers. The residential meters were mounted on the cover with the customer-owned service run on the load side of the meter.

When the meter is located on the vault, the customer owns the meter socket and the service from the vault to the residence and is responsible for their maintenance and repair.

a) Relocate meter from vault to residence:

1) In the event the customer elects to have Colorado Springs Utilities own and maintain the service from the vault to the entrance at the residence, see 7.02a "Underground Electric Service Requirements" for installation details. The customer will be responsible for:

(a) Meter Equipment – Furnish, install and maintain a new meter socket(s) and other service equipment.
(b) Trench – Furnishing all necessary trenches, excavations, and backfill from the service equipment back to the point where the service enters the property. Restoring the landscaping on their property.
(c) Conduit - Furnish and install above-ground conduit and if required, below-ground conduit.
(d) Inspections - Contact Quality Control inspector for inspection of trench, backfill material, conduit, and service conductor (see Phone Section). See 7.07 in this chapter for Residential Service Inspection Responsibilities.

2) Colorado Springs Utilities will be responsible for:

(a) Trench/Bore – If the power source is located beyond the property, furnish the trench or bore from the power source to the property line.
(b) Conductor – Provide, install and connect the service conductor from the service equipment back to the JBox or transformer at no cost to the customer regardless of the service main size.
(c) Meter Install – Install meter. See 7.08 requirements.

b) Upgrade of service with meter at the vault:

1) Any upgrade that exceeds the 100A capability of the vault mounted metering equipment will require a new meter socket and main at the house location. The requirements for meter, trench, conduit, inspections and conductor are detailed in 7.03a, Relocate meter from vault to residence.

7.04 Residential Underground Service from Existing Overhead Facilities:

The standard service from existing overhead lines is an overhead service; however, in new installations or in the modification of an existing overhead service, the customer may request an

overhead-to-underground service. See 7.02a “Underground Electric Service Requirements” for installation details.

a) Burying of an existing overhead service:

1) To bury an existing overhead service the customer will be responsible for:

(a) Meter Equipment – Furnish, install and maintain a new meter socket(s) and other service equipment.

(b) Trench – Furnishing all necessary trenches, excavations, and backfill from the service equipment back to the pole riser or property line. Restoring the landscaping on their property.

(c) Conduit - Furnish and install above-ground conduit and if required, below-ground conduit.

(d) Inspections - Contact Quality Control inspector for inspection of trench, backfill material, conduit, and service conductor (see Phone Section). See 7.07 in this chapter for Residential Service Inspection Responsibilities.

2) Colorado Springs Utilities will be responsible for:

(a) Trench/Bore – If the power source is located beyond the property, furnish the trench or bore from the power source to the property line.

(b) Conductor – Provide, install and connect the service conductor from the service equipment back to the pole at no cost to the customer regardless of the service main size and install a U-Guard on the pole riser.

(c) Meter Install – Install meter. See 7.08 requirements.

b) New Installations:

1) To bury a new overhead service the customer will be responsible for:

(a) Meter Equipment - Furnish, install and maintain a new meter socket(s) and other service equipment.

(b) Trench – Furnishing all necessary trenches, excavations, and backfill from the service equipment back to the pole riser or property line. Restoring the landscaping on their property.

(c) Conduit - Furnish and install above-ground conduit and if required, below-ground conduit.

(d) Conductor – Provide and install the service conductor from the service equipment back to the pole or property line.

(e) Inspections - Contact Quality Control inspector for inspection of trench, backfill material, conduit, and service conductor (see Phone Section). See 7.07 in this chapter for Residential Service Inspection Responsibilities.

2) Colorado Springs Utilities will be responsible for:

(a) Trench/Bore – If the power source is located beyond the property, furnish the trench or bore from the power source to the property line.

(b) Conductor Connection – Connect the service conductor to the power source on the pole and install a U-Guard on the pole riser.

(c) Meter Install – Install meter. See 7.08 requirements.

7.05 Residential Reroute of Permanent Services on Developed Lot:

a) Overhead Service Reroute:

1) Before construction begins, the customer shall contact Colorado Springs Utilities Field Engineering for pre-job construction planning. At that time the Field Engineer will advise the customer on the best location for the service wires and if required, lift poles. See 7.01

"Residential Overhead Systems" for installation details. The customer will be responsible for:

(a) Meter Equipment - Furnish, install and maintain a new meter socket(s) and other service equipment, if applicable.
(b) Conduit - Furnish and install riser conduit and other service conduit, if applicable. See 7.01a&b for Point and Method of Attachment.
(c) Conductor - Provide and install the service conductor from the service equipment to the riser conduit weatherhead point of attachment.
(d) Service Drop Lift Pole – The customer may be responsible for paying to relocate an existing or install a new service drop lift pole(s) depending on service drop length, clearance or mechanical strain.
(e) Inspections - Contact Quality Control inspector for inspection of the point of attachment, weatherhead, service riser conduit and conductor (see Phone Section). See 7.07 in this chapter for Residential Service Inspection Responsibilities.

2) Colorado Springs Utilities will be responsible for:

(a) Service Drop Wires – Provide, install and connect the overhead service drop wires.
(b) Service Drop Lift Pole – Provide, install and maintain the service drop lift poles, if required.
(c) Meter Install – Install meter, if required. See 7.08 requirements.

b) Underground Service Reroute:

1) Before construction begins, the customer shall contact Colorado Springs Utilities Quality Control for pre-job construction planning. At that time the utility inspector will advise the customer on the best location for the new trench. See 7.02a "Underground Electric Service Requirements" for installation details. The customer will be responsible for:

(a) Meter Equipment - Furnish, install and maintain a new meter socket(s) and other service equipment, if applicable.
(b) Trench – Furnishing all necessary trenches, excavations, and backfill from the service equipment back to the power source or property line. Restoring the landscaping on their property. When relocating an individual electric service not in a joint trench, the new trench route is to have a minimum of 3 feet of separation from gas, water or sewer service lines when parallel. There shall be a minimum 3 foot by 3 foot splice pit at each splice location. If relocating both electric and natural gas services, a joint service trench may be utilized (see 7.02 and Appendix F, Construction Standard 19-8).
(c) Conduit - Furnish and install above-ground conduit and if required, below-ground conduit.
(d) Conductor - Provide and install the service conductor from the service equipment back to the power source or property line.
(e) Inspections - Contact Quality Control inspector for inspection of trench, backfill material, conduit, and service conductor (see Phone Section). See 7.07 in this chapter for Residential Service Inspection Responsibilities.

2) Colorado Springs Utilities will be responsible for:

(a) Trench/Bore – If the power source is located beyond the property, furnish the trench or bore from the power source to the property line.
(b) Conductor Connection – On services rated 200 amps or less, connect the service conductor to the power source.
(c) Meter Install – Install meter, if required. See 7.08 requirements.

7.06 Upgrade or Update of Existing Residential Services:

Any voluntary change/upgrade/repair to service equipment on the line side of the meter will require the meter socket to meet all current requirements (**existing round meter sockets are not acceptable**). Involuntary repairs, due to acts of nature or equipment failure, are not required to be upgraded to the current requirements.

a) Overhead Service Upgrade with larger service wire:

1) Before construction begins, the customer shall contact Colorado Springs Utilities Field Engineering for pre-job construction planning. At that time the Field Engineer will advise the customer on the service wire clearances and if required, lift poles. See 7.01 "Residential Overhead Systems" for installation details. The customer will be responsible for:
   (a) Meter Equipment - Furnish, install and maintain a new meter socket(s) and other service equipment, if applicable.
   (b) Conduit - Furnish and install riser conduit and other service conduit, if applicable. See 7.01a&b for Point and Method of Attachment.
   (c) Conductor - Provide and install the service conductor from the service equipment to the riser conduit weatherhead point of attachment.
   (d) Inspections - Contact Quality Control inspector for inspection of the point of attachment, weatherhead, service riser conduit and conductor (see Phone Section). See 7.07 in this chapter for Residential Service Inspection Responsibilities.

2) Colorado Springs Utilities will be responsible for:
   (a) Service Drop Wires – Provide, install and connect the overhead service drop wires.
   (b) Service Drop Lift Pole – Provide, install and maintain the service drop lift poles.
   (c) Meter Install – Install meter. See 7.08 requirements.

b) Underground Service Upgrade with larger service conductor:

1) For an Underground Service Upgrade, See 7.02a "Underground Electric Service Requirements" for installation details. The customer will be responsible for:
   (a) Meter Equipment - Furnish, install and maintain a new meter socket(s) and other service equipment, if applicable.
   (b) Trench – Furnishing all necessary trenches, excavations, and backfill from the service equipment back to the power source or property line. Restoring the landscaping on their property.
   (c) Conduit - Furnish and install above-ground conduit and if required, below-ground conduit.
   (d) Conductor - For Services over 200 amp, the customer shall provide the service conductor, see 7.02a3c.
   (e) Inspections - Contact Quality Control inspector for inspection of trench, backfill material, conduit, and service conductor (see Phone Section). See 7.07 in this chapter for Residential Service Inspection Responsibilities.

2) Colorado Springs Utilities will be responsible for:
   (a) Trench/Bore – If the power source is located beyond the property, furnish the trench or bore from the power source to the property line.
   (b) Conductor – For services 200 amp or less, provide, install and connect the service conductor from the service equipment back to the JBox or transformer at no cost to the customer.

(c) Meter Install – Install meter. See 7.08 requirements.

c) Update services due to power quality issues:

When the customer is not actively upgrading their main panel or service equipment and the existing service conductor is undersized and voltage problems are evident, Colorado Springs Utilities will:

1) On an Overhead Service:
(a) Provide, install and connect the service drop wires from the transformer to the point of attachment. Note the customer owns and maintains the service conductor from the service equipment to the riser conduit weatherhead point of attachment.

2) On an Underground Service:
(a) Trench and backfill from the service equipment to the power source and provide and install the appropriately sized service conductor at no cost to the customer regardless of the service main size.

7.07 Residential Service Inspection Responsibilities:

a) Colorado Springs Utilities will inspect the underground service conduit including the riser conduit to the service equipment. Colorado Springs Utilities responsibility to inspect will cease at the entrance to the first unit of service equipment, i.e., meter socket, main disconnect, CT cabinet, gutter, secondary junction box, or other similar equipment. However, the Colorado Springs Utilities may inspect meter sockets and CT cabinets beyond the first unit of service equipment. The Pikes Peak Regional Building Department will also inspect the riser conduit attached to any building.

b) The Regional Building Department will:

1) Make the inspection of all service equipment (meter socket, disconnects, CT cabinet, gutter, secondary junction box, or similar), riser conduit, and conductor at the building/structure served.

2) Make the inspection of all secondary conduits and conductor on the load side of service equipment and any CT metering conduit.

c) Colorado Springs Utilities will:

1) Make the inspection of any furnished trench and backfill materials. See 8.06 for underground residential development additional trenching and bored-in conduit requirements.

2) Make the inspection of any underground conduits, (e.g. those under driveways sidewalk, patios, decks, or similar structures) and conductor between the service equipment (meter socket) riser conduit and the power source of utility supply (pole or transformer or JBox).

3) Make the inspection of the riser conduit to the service equipment. SCH80 PVC or GRC will be required for all risers; SCH40 PVC is not acceptable above grade because it becomes brittle at cold ambient temperatures and is subject to impact damage.

4) Connect overhead secondary within 10 business days after all required inspections are completed

7.08 Residential Meter Installation:

a) Upon completion of the required Colorado Springs Utilities inspections and installation, the meter will be set and the final service will be energized within 10 business days, after receipt of the following:

1) Service Contract - Is initiated at Utilities Development Services when a customer signs a service contract.

2) Development Fees – Paid at Utilities Development Services when signing a service contract.

(a) Electric Extension Design Fee & Contract – For new underground residential developments (subdivisions).

(b) Residential Service Fees (Underground Only) - Inspection/Connection fees. Overhead services do not have this fee.

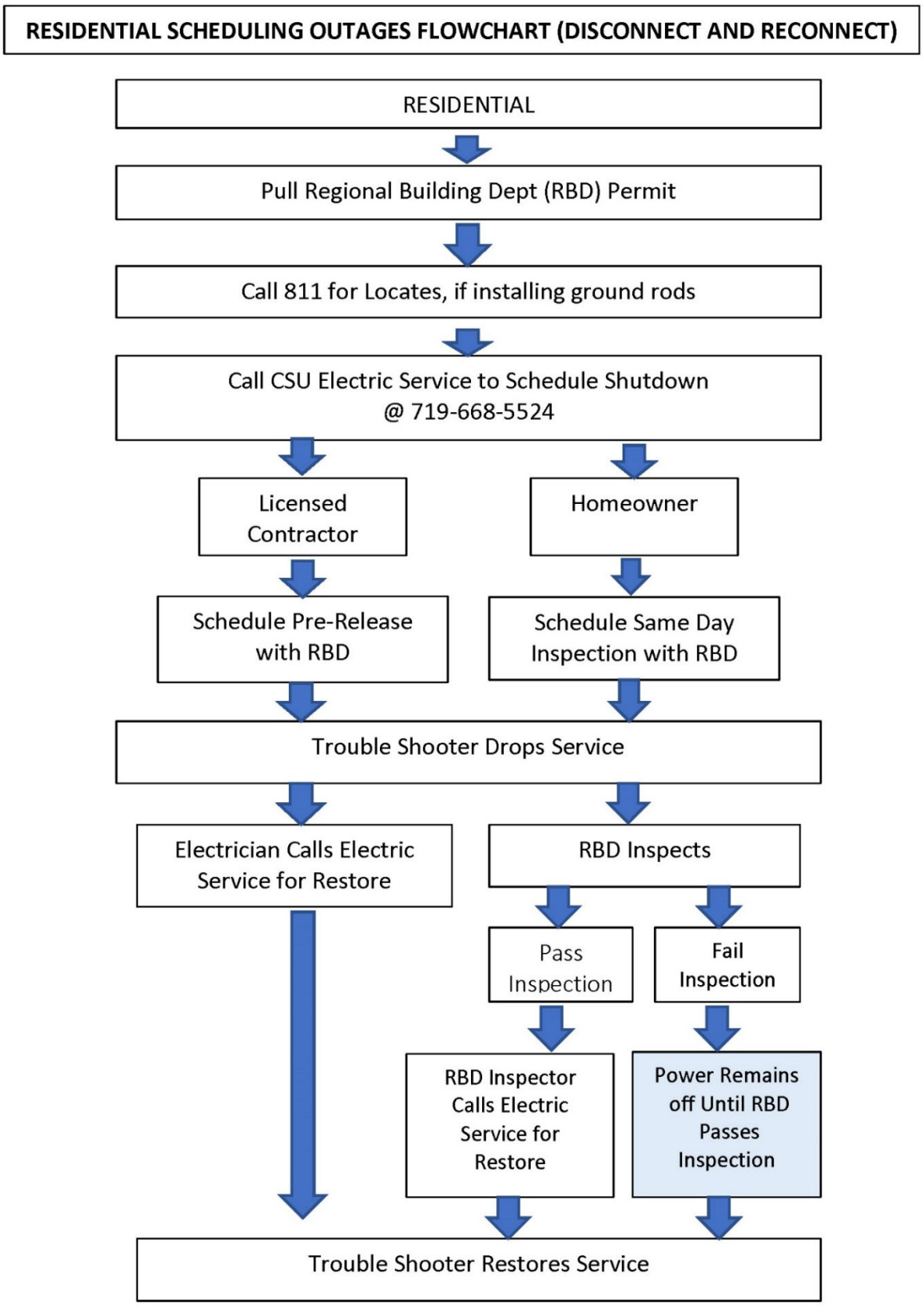
(c) Electric Contribution-In-Aid-To-Construction Fees – When Utilities must extend primary electric to reach a lot or subdivision.

3) RBD Inspection - An inspection approval from the Regional Building Department for the wiring (Code compliance clearance.)

4) Easement Documents – Easement documents needed to bring service to the property, if required.

5) Load Data Form – This form is required for services rated greater than 200 amps.

b) For Scheduling service outages (disconnect and reconnect), see "Residential Scheduling Outages Flowchart (Disconnect and Reconnect)" at the back of the chapter.



Note: The customer must get PPRBD (Pikes Peak Regional Building Department) to inspect their facility, within three business days after the reconnection of a meter that was removed for electrical work.

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Underground Residential Development

CHAPTER 8

UNDERGROUND RESIDENTIAL DEVELOPMENT

8.01 General:

a) The following service and requirements will apply to developments and subdivided property in which only one building (consisting of a single-family residence up to a four-family residence) is constructed on a single, legally described building lot with a single service. This includes townhouses and condominiums that are constructed and sold with an individual service to each residence. See Chapter 10 for five-plexes and above with multiple meter stacks.

b) Residential underground electric distribution is an electrical system complete with conduit, primary voltage conductor, transformer vaults or padmounted transformers to reduce the primary system voltage to the standard usable residential voltage of 120/240 volts three-wire single-phase and secondary service conductor stubbed to each individual lot.

c) If a subdivision is to be heated with gas, a 3 to 7 kW distribution system will be designed. A 12kW distribution system will be needed for an all-electrically-heated subdivision. Conversions from gas to electric heat can be made on a limited basis. All requests will be evaluated on an individual basis by Colorado Springs Utilities Field Engineering (see paragraph 8.03).

8.02 Estimates:

a) Residential underground distribution requires the application of aid-to-construction fees as set forth in the Electric Tariffs. The type of service requested will determine the appropriate fee application. Copies of the electrical fees will be given upon request by Colorado Springs Utilities Field Engineering.

b) Estimates for residential underground distribution will be prepared for the customer to include primary footage fees and engineering design fees. Secondary fees will be deferred to the time of building construction. Secondary service fees will be assessed and collected from the homebuilder before issuance of a building permit.

c) Preliminary estimates will be furnished to the customer for planning purposes only, based on average electric underground costs developed from previously completed projects, using preliminary plats. No money will be collected on preliminary estimates.

8.03 Customer Requirements for Estimates:

a) The customer will be given a firm price for electric underground distribution after providing the following information to Colorado Springs Utilities Field Engineering:

1) A final approved plat map with zoning, type of occupancy (i.e., single–family dwelling, duplex, four-family, etc.), all lot/block numbers, including addresses, and all existing easements shown.

2) When a customer elects to submit for preliminary platting requesting PUD zoning, instead of R-1 through R-6 zoning, it will be required that the customer provide Colorado Springs Utilities with a master facility plan and written documentation that the electric meter and electric service locations have been approved by Colorado Springs Utilities Field

Engineering and that the customer is in agreement with the approved locations. This requirement places electric meters on the front or on the sides immediately adjacent to the front, of all residential structures. The service must be located so as to be free of surface covering by concrete, asphalt, etc., and have no obstructions between the meter and the street, otherwise conduit shall be installed from the meter socket to the junction box or transformer, according to 10.01 (d) and 7.02a2 (b). This requirement will be met prior to Colorado Springs Utilities Field Engineering approval of the preliminary platting process.

3) Water, wastewater, storm drain, gas plans, final grading plans, and street profile plans. These will be used to design the electric distribution system with minimum conflict with other utilities and structures.

b) Plans may be submitted to Colorado Springs Utilities Field Engineering as AutoCad drawing files on a compact disk (CD). Please contact the appropriate district (see map) for criteria on submitting these plans.

c) Please note that if a current recorded plat of subdivision and current approved addressing is not provided for the project, the customer will need to submit a Utilities Addressing Plan (UAP) to Colorado Springs Utilities. A Utilities Design CAD File will need to be submitted to Colorado Springs Utilities. Any questions regarding either the UAP or Utilities Design CAD File should be directed to Colorado Springs Utilities (see Appendix B).

d) Development Plan Requirements for Private Utility Cross Sections or City Cross Sections with Structure Setbacks that are less than 15 feet from back of Curb:

1) The information and preliminary meeting in item 2 (below) shall be provided for Development Plans that include any of the following criteria:
(a) Structure setbacks that are less than 15’ from the back of curb.
(b) Less than 22 feet roadway (edge to edge of pavement) width.
(c) Lots that follow the utilities private cross section drawing.
(d) Lots that have 42 feet or less between the front of the buildings (Private Cross Sections).

2) A Preliminary Utility Plan, meeting the most recent edition of Colorado Springs Utilities Electric, Natural Gas, Water, and Wastewater Line Extension and Service Standards, showing the location of the following shall be submitted prior to the Development Plan and application. A preliminary meeting with Colorado Springs Utilities is to be arranged. Some of the information below may be unknown, however, will need to be accounted for during the preliminary meeting:
(a) Building footprints, including any covered patios or overhead structures, elevations, basement or crawl space details, and the locations of all doors, windows, and window wells.
(b) Driveway dimensions and locations.
(c) Trees within the public rights-of-way.
(d) Attached or detached sidewalk(s).
(e) Retaining wall(s).
(f) Swales with service line depth noted to ensure proper cover and clearances.
(g) Location and size of any drainage pipes installed in swales.
(h) Street cross-section.
(i) Product type detail (elevation view).
(j) Proposed Electric, Gas, Water, and Wastewater main lines within the street sections.

(k) Electric, Gas, Water, and Wastewater Service line(s) detail and location for each product type.
(l) Water curb stop(s) and Wastewater clean-outs. These may be shown on the typical detail for each product type.
(m) Gas, electric, & water meter(s). These may be shown on the typical detail for each product type.
(n) Adequate space for potential Electric transformers, J-boxes, vaults, switches, and streetlights (required at public intersections) to be determined prior to DP at preliminary meeting.
(o) Air conditioner (pad-mounted condenser) units.
(p) Preliminary fire hydrant locations.
(q) Preliminary layout of any stormwater facilities.

8.04 Electric System Design and Payment:

a) The developer submits an "Application for Gas & Electric Line Extension", which includes the developer's construction installation date (see form at the end of this chapter). The field engineer assigned to the project will provide an electrical facilities design and residential aid-to-construction contract to the developer then complete the construction drawing and specifications. When the developer accepts the contract and electrical facilities design, arrangements need to be made between the developer and Colorado Springs Utilities Development Services personnel for payment. Full payment is required prior to Colorado Springs Utilities establishing a firm construction schedule date for the installation of electric facilities.

b) Padmounted transformers are normally utilized for underground electric service. Below grade, vault mounted transformers and fusing may be requested, with the difference in cost to be paid by the builder/developer. Field Engineering will determine the additional cost.

c) Prior to the scheduled construction start date, the project will be inspected by Colorado Springs Utilities to verify that the conditions listed in paragraph 8.05 have been met. In the event the site requirements have NOT been satisfied, the project will be removed from the schedule and given the next available schedule opening.

8.05 Scheduling of Job:

The Scheduling Coordinator will provide construction scheduling time frames. If Utilities crews are delayed due to the construction site not being ready to install facilities after mobilizing to the site, the developer will be charged for the cost of de-mobilizing and re-mobilizing to the site with a Time and Material contract. Prior to the scheduling and installation of the electrical facilities, Colorado Springs Utilities must receive full payment and the customer must meet the following conditions:

a) Final grade will be provided within 6 inches in general and 3 inches on padmount transformer, vault, and junction box locations.

b) Installation of curb & gutter, excluding curb returns. As an option, Colorado Springs Utilities will consider working from curb stakes with final grade and/or finished grade clearly marked. The entire project will have curb & gutter or staking for curb & gutter. However, no combination of curb & gutter and staking will be approved. The developer and a Colorado

Springs Utilities representative will be required to sign a "Utility Staking (Verification Form)" before the project is energized. This form will be provided by the construction crew or the quality control inspector. Signatures on this form verify that the electrical facilities have been correctly installed relative to the curb stakes and the grade stake references (see Utility Staking forms at end of chapter).

c) All property pins will be provided. Should these pins be inadvertently removed during construction, it is the responsibility of the customer to replace them.

d) Installation of all water and wastewater mains and service stubs, storm drains, and catch basins with trenches associated with these facilities backfilled and properly closed.

e) All trash, construction material, debris, and fences cleared from the proposed electrical construction site or path.

f) Certified soil density tests when requested.

g) The installation of the following facilities is preferred after underground electric:

1) Phone lines

2) Cable TV

3) Sidewalks

4) Driveways and curb returns

NOTE: Other utilities WILL NOT be allowed in Colorado Springs Utilities trenches without prior approval by Colorado Springs Utilities.

8.06 Construction of Facilities:

a) The installation of the primary conduit and conductors, transformer pads, vaults, and service conductor will be installed by Colorado Springs Utilities. At the discretion of Colorado Springs Utilities, the customer may be required to furnish all necessary trenches, excavations and backfill to meet standards set forth by Colorado Springs Utilities. A credit will be given based on average trenching costs to Colorado Springs Utilities in average soils. Colorado Springs Utilities will, in these cases, select the backfill to cover all conductors. If the excavated material contains rock, it will not be satisfactory for backfill and the customer will be required to supply proper fill material and compaction. Any alterations or relocation of the underground electrical lines as installed in said subdivision will be done at the customer's expense.

b) The onsite geotechnical company, developer, or the developer's representative shall be responsible for promptly and consistently providing a copy of all completed soil compaction test results that are taken on any and all new construction projects where the gas and/or electric utilities are or have been installed by Colorado Springs Utilities or its designated contractor. These soil compaction test results shall be furnished to the Colorado Springs Utilities onsite representative immediately upon the completion of said soil compaction tests and prior to the installation crew leaving and/or moving off the development, subdivision, or jobsite. This is to ensure that any soil compaction test failures or issues that may exist can be remedied prior to the crew moving off or leaving the jobsite.

c) Trenching and Boring of Conduit:

1) If required depth of trench or bored-in conduit cannot be met, new proposed depth must be approved in advance by Utilities inspector.

2) Potholing may be required, at the discretion of Utilities inspector, to prove the need for any excessive depth proposed, prior to approval.

3) Conduit will be required for any installation that exceeds Utilities maximum depth as shown in Electric Distribution Construction Standard 11-1 (see Appendix-F).

8.07 Request for Colorado Springs Utilities to Work Overtime:

Developers or other customers may request for a Gas or Electric Extension Crew (Colorado Springs Utilities/Contractor) to work overtime (OT) on their projects. Colorado Springs Utilities reserves the right to select the crew based on operational and contractual obligations.

The Developer or other customer must complete and submit to Colorado Springs Utilities a T&M Overtime Request Letter with relevant information filled in (see form at end of this chapter). The request letter is available from Colorado Springs Utilities Quality Control Inspectors, Colorado Springs Utilities Crew Supervisors or Colorado Springs Utilities Field Engineering representatives. The OT requests are typically discussed and completed at pre-construction meetings. If an overtime request is approved (contingent upon crew availability), Colorado Springs Utilities will create an Overtime T&M work order for the actual OT cost. Field Engineering will reconcile the OT costs upon completion of the project.

The money received by Colorado Springs Utilities Field Engineering will be deposited as Aid to Construction at the respective Field Engineering office. Contact Colorado Springs Utilities Field Engineering with questions (see Contact Section).

Colorado Springs Utilities
It's how we're all connected

Gas Work Order # _____
Electric Work Order# _____
(Internal Use)

APPLICATION FOR GAS AND ELECTRIC LINE EXTENSION

(Residential Electric - Residential and Commercial Gas)

To be submitted to: **UtilityApplication@csu.org or**

North Work Center Field Engineering
7710 Durant Drive, P.O. Box 1103, Mail Code 2150
Colorado Springs, CO 80947-2150

or

South Work Center Field Engineering
1521 Hancock Expressway, P.O. Box 1103, Mail Code 1812
Colorado Springs, CO 80947-1812

Project: _____ **Date:** _____
(Subdivision, address, or description of project)

Applicant: _____
(Entity that will enter into contract) Individual (☐) Partnership (☐) Corporation ☐) Limited Liability Company ☐) Other (☐)

This application is intended for: ☐ **Gas** ☐ **Electric** ☐ **Both** **Avg. Building Sq. Footage?** _____

Will there be any "Parade / Model" homes built within this project? ☐ **Yes** ☐ **No**
Will the first lift of asphalt be installed prior to the construction of utilities? ☐ **Yes** ☐ **No**
Will this project use soil cementing in the roadways? ☐ **Yes** ☐ **No**

Projected date that site will be ready for gas and/or electric installation _____

If an applicant advances funds for construction of Gas Mainline Facilities, they may receive refunds for that facility. The Applicant must notify Colorado Springs Utilities prior to the start of construction if the Applicant desires to enter into a Refund Contract. Please check box to request applicable Gas Mainline Refund Facilities Co☐ct [ ]
Note: a meter will not be installed until the person financially responsible for the billing has set up an account with Utilities Development Services (719-668-8111).

PLAN REQUIREMENTS (2 sets if submitting for both gas and electric)

___ Water System Plan	___ Wastewater System Plan & Profile	___ Utilities Addressing Plan (UAP)*
___ Street Plan & Profiles	___ Storm Drain Plan & Profile	___ Utilities Design CAD File (UDCF)*
___ Utility Service Plan	___ Recorded Plat or Utility Easement	___ Gas loads per building (if commercial)

* See requirements in Appendix B of the Colorado Springs Utilities Line Extension and Service Standards

Applicant agrees to provide Colorado Springs Utilities with a recorded plat or acceptable easements prior to construction. The Applicant agrees to notify Colorado Springs Utilities of any changes following submittal of application that may affect the design, scheduling, and construction of the gas and electric distribution system.

_____ **Applicant's Signature** (Contract holder)	_____ **Agent's Name** (Project Contact)
_____ **Applicant's Name** (Please type or print)	_____ **Address**
_____ **Address**	_____ **City, State, and Zip Code**
_____ **City, State, and Zip Code**	_____ **Telephone and FAX Numbers**
_____ **Telephone and FAX Numbers**	_____ **Cellular/Field Numbers** (If Applicable)
_____ **Email Address**	_____ **Email Address**

Please indicate who the Designs, and Contracts should be sent to: **Applicant** ☐ **Agent** ☐

_____ **Applicant's Signature** Authorizing the **Agent** to sign contracts and bind Applicant to such contracts regarding gas and electric.

07/25/23

Colorado Springs Utilities

Utility Staking Standards (New Residential and Commercial)

Before Starting Job

When Colorado Springs Utilities' facilities (Electric, Gas, Both – Joint Trench) are to be installed prior to the installation of curb and gutter, in private streets or right-of-way, that are designated as existing public utilities easements, the Developer or Developer's Representative shall adhere to the following staking requirements:

- □ All wet utilities shall be installed prior to gas and electric installation – this includes storm water.
- □ Grade at Transformers, J-Boxes and Vaults to within +/- 3" of sub/final grade. On Streets, Easements and Right-Of-Ways to within +/- 6" of sub/final grade.
- □ Grade staking shall be provided at 25-foot spacing and located in the Right-Of-Way with offsets.
- □ Re-staking and/or additional staking, as needed, shall be provided within 48 hours of notice.
- □ Final grade staking shall have Station Numbers and Cut Sheets provided to a Colorado Springs Utilities Representative.
- □ Grade staking in Cul-De-Sac or Short Radius Turns, shall include Radius Points, Points of Curvature, Tangent Points, and be provided at a maximum of 15-foot spacing.
- □ Grade staking for Vaults, Transformer Pads, J-Boxes and Streetlights, shall have a minimum of two grade stakes, with no more than 5-foot offsets.
- □ Stakes shall be denoted in the format as follows: Station Number, Top Back Curb, Offset, Cut or Fill.
- □ The entire project shall have final staking before construction will commence, or as may otherwise be agreed upon with a Colorado Springs Utilities Quality Control Inspector or appropriate Colorado Springs Representative.
- □ Once construction has commenced, the Developer or Developer's Representative shall work with the Colorado Springs Utilities Representative "on-site", to provide adequate and appropriate staking, to eliminate any delays. Developer shall be responsible for delay costs due to inadequate staking.
- □ Verification survey shots shall be taken for Vaults, Transformer Pads and J-Boxes prior to the Construction Crew leaving the project, and Colorado Springs Utilities verification form shall be signed by the Developer or Developer's Representative, indicating Colorado Springs Utilities' release from the installed facilities.
- □ The Developer will incur all costs for improper installation or repositioning of facilities, due to staking errors or changes in grade. Once this verification form has been signed, the Developer will be responsible for corrections to utility facilities.
- □ The Developer understands that the staking provided may be destroyed upon installation of utilities.

WO#: _____

Job Address: _____

Project Name: _____

Developer / Representative: _____

Colorado Springs Utilities Representative: _____

Signature _____ Date ____/____/____

Original - PA/QC Copy – Developer

Colorado Springs Utilities

Utility Staking Standards (Verification Form)

Date ____/____/____

WO#: _____

Job Address / Project Name: _____

Developer /
Representative: _____

Colorado Springs Utilities Representative: _____

I, _____, as Developer or Developer's Representative do hereby verify that
(print name)
the installation of the utilities on _____ are now completed
(project name)
As of the _____ day of _____, year _____ and are positioned per the staking that I have provided.
(date) (month) (year)

Signature _____ Date ____/____/____

Comments:

_____
_____
_____
_____
_____
_____
_____
_____
_____

Original - PA/QC Copy - Developer

Request Form for
Colorado Springs Utilities to Work Overtime

Date_____

Re: **T&M Overtime Request**

Colorado Springs Utilities

Field Engineering- North Work Center
7710 Durant Drive
Colorado Springs, CO 80920

Field Engineering- South Work Center
1521 Hancock Expressway
Colorado Springs, CO 80903
Email: UtilityApplication@csu.org

Dear Colorado Springs Utilities:

This is a request for the Gas & Electric Extension Crews (Colorado Springs Utilities or Contractor) to work overtime on _____ Subdivision (project name and filing number). Overtime will only be worked as resources are available. The overtime worked will help expedite the process of the installation of the gas and electric extension, which is needed at this time. It is understood that any money paid for overtime work is not part of the base contract and is not recoverable.

Thank you for your assistance in this matter. If you have any questions, please contact me at _____.

Sincerely,

_____(print name)

_____(title)

_____(company name)

_____(billing address)

_____

_____(requested number of overtime hours)

_____(date(s) for requested overtime

Frost Approval Form (New Residential and Commercial)

Before Starting the Job

When Colorado Springs Utilities' facilities (Gas and Joint Trench) are to be installed during frost conditions, the following processes will be applied.

Gas Only Project:

If frost conditions are encountered during installation, Colorado Springs Utilities will dig the first top 6" of frost at no additional cost. Any additional 6" increments of frost will require additional monies to complete the project. Monies paid per the Tariff to dig in frost will not be refunded as part of any single parcel or mainline contract. Utilities crews must complete the "Payment Itemization" sheet and Utilities' contractors should use the appropriate frost bid units for digging in frost. Field Engineering will reconcile the costs after the project construction is completed.

If the Contractor is already on site, a T&M work order will be created to charge any down time to while Developer's representative excavates the ditches. If the developer chooses not to pay for Colorado Springs Utilities/Contractor excavating in frost and the Contractor must return later, the Developer will incur a remobilization fee.

Gas & Electric Joint Trench Project:

Electric - Installation of the primary conduit and conductors, transformer pads, vaults, and service conductor will be installed by Colorado Springs Utilities. At the discretion of Colorado Springs Utilities, the customer may be required to furnish all necessary trenches, excavations to meet standards set forth by Colorado Springs Utilities. A credit will be given based on average trenching costs to Colorado Springs Utilities in average soils. Colorado Springs Utilities will, in these cases, select the backfill to cover all conductors. If the excavated material contains rock, it will not be satisfactory for backfill and the customer will be required to supply proper fill material and compaction. Any alterations or relocation of the underground electrical lines as installed in said subdivision will be done at the customer's expense. While anyone else digging the ditches is strongly discouraged, and excavations shall meet Colorado Springs Utilities/Contractor standards and all safety requirements.

Gas – If the customer requests Colorado Springs Utilities to excavate the joint trench ditch in frost, customer will be responsible for 50% of the additional monies to complete the project. The remaining additional cost will be charged to electric and absorbed by Colorado Springs Utilities per the Tariff.

By signing this document, the Developer/Representative approves COLORADO SPRINGS UTILITIES and/or their designated contractor to install infrastructure if frost is encountered within the project and agrees to pay the additional cost upon reconciliation.

WO#: _____

Job Address: _____

Project Name: _____

Developer/Representative: _____

Colorado Springs Utilities Representative: _____ **Date:** _____

Developer/Representative: _____ **Date:** _____

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CHAPTER 9
Mobile Home Parks

CHAPTER 9

MOBILE HOME PARKS

9.01 Scope:

This chapter only applies to new and existing mobile home parks built under the Underground Residential Development policy. For new and existing mobile home parks built as a Commercial Development, see chapter 10.

9.02 Underground Facilities:

a) In new mobile home developments, the primary per-foot charge will be assessed according to Colorado Springs Utilities current aid-to-construction charge, as outlined in Chapter 8 "Electric Underground Distribution for Residential Development". A secondary service lot fee will be assessed for each service. The mobile home owner will furnish, install, and maintain the facilities to connect a mobile home, i.e., meter pedestal, breakers, and/or receptacles, as approved by Colorado Springs Utilities. A customer-granted easement for all electrical facilities will be necessary at the time of design/installation. All underground services to be installed per 7.02.

b) Please note that if a current recorded plat of subdivision and current approved addressing is not provided for the project, the customer will need to submit a Utility Addressing Plan (UAP) and a Utility Design CAD File will need to be submitted to Colorado Springs Utilities. Any questions regarding either the UAP or Utility Design CAD File should be directed to Colorado Springs Utilities (see Appendix B).

9.03 Underground Pedestal Maintenance, Repair, Upgrade or Relocation:

a) The owner of the mobile home park, or his assignee, will initiate a request to Colorado Springs Utilities Field Engineering for the upgrading of a mobile home space for service to an electrically-heated mobile home.

b) The customer is responsible for the upgrading and/or maintenance and repair of the meter pedestal, the breakers, and the receptacles. The meter pedestal must conform to Colorado Springs Utilities standards (see Appendix E, Material Specification 194-113-406).

c) The customer will be responsible for the costs of relocating any existing meter pedestal. The customer will provide all trenching and backfilling from the existing cable location to the new pedestal. Colorado Springs Utilities will provide the necessary secondary cable, splices and connections at no charge to the customer.

d) In instances where pedestal upgrades require a larger service cable, Utilities will provide, install and connect the appropriate service cable. The Customer will provide all trenching and backfilling from the new pedestal to the Utility transformer or junction box as determined by the Utility Field Engineer.

e) Colorado Springs Utilities will maintain and repair “daisy chain” (feed through) service terminals and connectors in customer pedestals.

9.04 Overhead Facilities or Master Meter Conversion:

In the event the customer qualifies for overhead service in an overhead area or requests converting from a master meter to individual meter locations, the following would apply:

a) An overhead system would be installed by Colorado Springs Utilities complete with primary poles, wire, transformers, and secondary service wire. The customer will be required to install utility-grade service meter poles, with clevis attachment, and meter loop.

b) Colorado Springs Utilities will have final approval on the meter pole locations.

c) The customer may elect to request underground electrical facilities complete with pedestal, see paragraph 9.02 for requirements. The customer may be required to provide trenching and backfilling.

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CHAPTER 10

COMMERCIAL/INDUSTRIAL DEVELOPMENT

10.01 Commercial Underground Systems:

a) General:

1) The following service and requirements will apply to development of commercial businesses, industrial businesses, schools, apartment complexes (five-family and up), townhouses, and condominiums (consisting of a cluster of buildings constructed on one common lot or prescribe plot of ground). This includes all other service requests not covered under Chapter 7 "Permanent Residential Services". Contact the South Area Field Engineering Section (see Phone Section) and see section 10.06 for requirements in the downtown network system. Commercial underground electric distribution is an electrical system complete with conduit, primary voltage conductor, vaults, and padmounted transformers to reduce the primary system voltage to a standard usable voltage (listed in paragraph 3.02) and/or secondary service conductor installed to a designated termination as outlined below. Refer to paragraph 5.02d, for Multiple Outdoor Meters. The type of service and voltage specified by Colorado Springs Utilities is dependent on the location and load requirement of the customer.

2) Regional Building Department permits are required for all installations whether metered or non-metered. See paragraph 10.01 e) 3) for details regarding non-metered services.

3) Grading, excavation, ground rod, stake or post installation work will not be started until an underground facilities location has been completed. Call 811 for utility locates. See 2.03b for Underground locate requirements.

b) Request for Service:

1) To initiate a request to serve a given development, complex, or building, the customer must submit the following to Colorado Springs Utilities Field Engineering:

(a) A completed Load Data Form (see form at the end of this chapter). Blank forms are also supplied by Colorado Springs Utilities Field Engineering. The design of the Colorado Springs Utilities' electrical service is based on information furnished by the Customer at the time of initial service design; therefore, no additions or changes shall be made to the Customer's installation without providing a new load data form and receiving subsequent approval from Colorado Springs Utilities.

(b) A complete set of plans consisting of a plot plan with vicinity map, street profile plans, electrical and mechanical plans, grading plans, and a plan showing the location of all other utilities.

2) Please note that if a current recorded plat of subdivision and current approved addressing is not provided for the project, the customer will need to submit a Utilities Addressing Plan (UAP) to Colorado Springs Utilities. A Utilities Design CAD File will need to be submitted to Colorado Springs Utilities. Any questions regarding the UAP or Utility Design CAD File should be directed to Colorado Springs Utilities (see Appendix B).

c) Electrical System Design:

1) Field Engineering will evaluate the load data form and design a system to meet the needs of the customer and the requirements of Colorado Springs Utilities. In the event the requested services and voltage needs cannot be met by Colorado Springs Utilities due to system constraints, the Field Engineer will notify the customer and work out an agreeable alternative to meet the needs of the customer. A design, diversified demands, fault current figures and metering requirements will be provided to the customer by Colorado Springs Utilities.

2) It is the policy of Colorado Springs Utilities to accommodate the aesthetic needs of the customer as much as possible on placement of padmount equipment. However, these needs cannot always be satisfied because of system operational constraints and financial consideration. In the event Colorado Springs Utilities cannot meet the customer's needs, the Field Engineer will notify the customer and work out an agreeable solution.

3) Padmounted transformers are normally utilized for underground electric service. Below grade, vault mounted transformers may be requested, with the difference in cost to be paid by the builder/developer. Field Engineering will determine the additional cost. Commercial three phase below grade vault mounted transformers may be considered as an option on properties previously developed and where there is no space for padmounted equipment to be installed or have been designated as "Historic Structures". These are non-preferred installations due to operational issues and will be evaluated on a case by case basis by Utilities personnel.

4) Only one transformer for each voltage class per parcel shall be installed and maintained by Colorado Springs Utilities, unless Colorado Springs Utilities determines a second transformer is necessary due to physical or loading constraints.

d) Minimum Conduit Size:

All main disconnects in excess of 50 amp rating will have a minimum conduit size of 2 inch. Wire size must conform to Article 220 of the National Electrical Code.

e) Conduit and Wire Size for Minor Loads in an Underground Installation:

1) For the purpose of this Chapter, the term "minor load" will mean any metered or non-metered loop having a main disconnect of 50 amps or less. Multiple disconnects with a maximum 50 amp rating each and within compliance with Article 230-71 of the NEC (6-handle Rule) will be considered minor loads.

2) This policy will only apply to the installation between the meter or point of common coupling (PCC) connections and Colorado Springs Utilities secondary source.

(a) The minimum acceptable conduit size is to be one inch:

(1) SCH80 PVC or GRC must be used where entering or exiting the ground and at any point that constitutes a shear point. All meter socket (and PCC) risers will be SCH80 PVC or GRC. All GRC will be coated with an asphaltic coating or suitable corrosion protection material where installed underground.

(2) PVC or HDPE conduit may be used in underground applications when 30 inches of ground cover is present. See Appendix-C, Table 3 for Approved

Electrical Materials, and Appendix-E for specification 194-2 regarding "Polyethylene Conduit for Underground Installation".

(b) The minimum acceptable wire size for minor load, metered or non-metered loops is:

(1) #6 copper or aluminum.

(2) This will apply to both neutral and phase conductors.

(3) Any insulation type approved for designated use by the National Electrical Code is acceptable.

(c) By-pass jaws are not required on meter sockets for minor loads.

3) Non-metered Single-Phase Services:

(a) Non-metered services are available through our Non-Metered Tariff with an average daily usage that on a per device basis cannot exceed 1,000 kWh within a single monthly billing period and the equipment is located within the public right-of-way. Alternatively, a non-metered service is available only after a customer has met and agreed to the requirements for a commercial non-metered electric load and has signed a Nominal Load Contract/Agreement with Colorado Springs Utilities. The rate is based on the amount of energy used, which may not exceed 33kWh per day for the Non-Metered Tariff or 66kWh per day for a Nominal Load Contract/Agreement. The Non-Metered Tariff is subject to City Council approval (estimated to be completed by December 31, 2021).

(b) For unmetered 120V load tap services, the contractor is required to install either a 10A circuit breaker for 900 Watt services, or a streetlight fuse kit, sized for the load requirements. See Appendix F EDCS 8-7 for construction details, and Appendix C Table 3 for approved materials.

f) Customer Installation Requirements in an Underground Area:

1) Due to additional costs of undergrounding a distribution system, partial participation in the installation of the electrical distribution system will be required of the customer. All such work must be done by a licensed electrical contractor at the customer's expense. Appropriate recovery agreement and aid-to-construction fees may apply. A design fee will be collected by Utilities Development Services at time of building permit. The current Electric Tariffs, as adopted by City Council, should be consulted.

2) The customer will be responsible to install the electrical distribution facilities within the private property adhering to Colorado Springs Utilities design policies and all applicable codes. Installations by the customer creating noncompliance with Colorado Springs Utilities policies and/or applicable electrical codes will be relocated as necessary at the sole expense of the customer. Transformers and switches will be located to be accessible from the street, driveway, or parking area without obstruction. Primary distribution or secondary services will not pass under any form of structure. When a transformer is remote from the street, the customer will provide a driving surface no less than 10 feet wide to within 12 feet of a transformer location. Acceptable materials for a driving surface include concrete, asphalt, architectural pavers and aggregate base course. For aggregate base course, the top six (6) inches of topsoil shall be stripped with a width approximately 5' wider than driving surface road width. Fill 6" and taper approximately 2.5' on both sides. Aggregate base

course material will conform to Colorado State Aggregate Base Course Class 5 or Class 6. See Appendix F, Construction Standard 11-1 for Class 5 or 6 aggregate base course material gradation specs and compaction requirements. All driving surfaces will be subject to approval by Colorado Springs Utilities. The customer will be responsible to identify any possible conflicts with the electrical distribution system within the private commercial projects.

3) Commercial/industrial customers will own and maintain all secondary (service entrance) conductors and secondary duct regardless of instrument transformer [CT (current transformer) & VT (voltage transformer)] or meter location; the utility will own and maintain all primary conductors and transformers (except as allowed in paragraph 10.04 for primary meter service). All secondary conductors and secondary conduits will be sized according to the National Electrical Code as required by the Regional Building Department.

4) Secondary ducts from the pad or vault to the building must have a minimum 30 inches of cover and be a minimum SCH40/SCH80 PVC or SCH40/ DR13.5 HDPE) electrical rated conduit, and/or meet alternative wiring methods as required by the Regional Building Department. It is the customer's responsibility to seal the customer's secondary ducts from water entering the customer's equipment or building that originate from a Colorado Springs Utilities' transformer or vault. See Appendix-C, Table 3 for Approved Electrical Materials, and Appendix-E for specification 194-2 regarding "Polyethylene Conduit for Underground Installation".

5) The customer is required to perform or provide the following:

(a) Padmount transformer installation:

(1) Trenching, backfilling, compaction of primary and secondary trenches. Restore all concrete or asphalt surfaces, and landscaping, if any, from feed source to pad.

(2) Install primary conduit from the primary feed source. Primary conduit shall have a minimum cover of 42" of compacted backfill over the top of the ducts and a minimum of 3" from side of ducts to trench walls (4" shall be DB-120/SCH-40 or 6" shall be DB-60/SCH-40 rated for 90º C). See Appendix F, Construction Standard 11-3 for "Duct Requirements for Primary Cable (Under Commercial Policy)". Install secondary conduits up to the pad. Schedule 80 PVC duct is no longer acceptable for primary cable ducts. All horizontal 90º bends in primary cable duct runs shall be long radius (48 inch) GRC with suitable corrosion protection tape or fiberglass (See Appendix C – Table 3 for fiberglass elbow material requirements) All horizontal 90º bends in primary cable duct runs shall have no more than three 90º bends in a single pull section. All vertical primary conduit runs shall have a minimum 36" radius. For primary 4" (3-phase) conduit runs with three (maximum allowed) 90° bends and/or a length of 300' and longer, the vertical conduit bend into the transformer pad shall be Fiberglass or GRC material. Otherwise, 4" (3-phase) conduit runs with two or less 90° bends and a length of less than 300', the vertical conduit bend into the transformer pad may be PVC material. All primary 4" (1-phase) vertical conduit bends into the transformer pad may be PVC material (GRC conduit is not allowed for 1-phase installations).

(3) Installing and connecting all secondary cable including approved secondary cable connectors. Colorado Springs Utilities personnel will make connections in single-phase padmount transformers- 100 amps or less. In the event multiple services are installed from one pad location, each service must be tagged with laminated tape to the address it is serving (see Appendix F, Construction Standard 7-15). Tags on commercial services fed from residential transformers will include the customer's name, i.e., CATV.

(4) Compaction test on all pad locations. The first test for each location will be paid by Colorado Springs Utilities; any additional tests will be paid by the customer.

(5) Bottom of transformer pad must be installed at final grade or 1 inch below final grade.

(6) Installation of meter sockets(s), conduit, and cabinet, see Chapter 5.

(7) Furnish and install an 8 foot long ground rod in pad window. The ground rod shall have a maximum OD of 5/8 inch to fit Colorado Springs Utilities stock clamp, and shall be copper-clad (stainless steel or stainless steel-clad) with a minimum 1/2 inch OD driven at least 7-1/2 feet into earth per NESC requirements.

(8) Provide and install tracer wire on any primary ducts to remain empty as shown in Appendix F, Construction Standard 11-5, e.g. stubs for future phases of development. Install Colorado Springs Utilities-furnished electronic markers and handhole per Appendix F, Construction Standard 11-5.

(9) Furnish and install bumper posts when Colorado Springs Utilities equipment is installed on private property where subject to vehicular traffic (see Appendix F, Construction Standard 15-2).

(10) Excavation for any vaults required with the padmount transformer designed to include a level floor, backfill, compaction, and final preparation of vault holes.

(b) Conduit System Installation with Vaults:

(1) Trenching, backfilling and compacting of primary and secondary trenches.

(2) Installation of primary conduit from the primary feed source and secondary conduits up to the vault.

(3) Excavating, backfilling, and compacting vault holes (Colorado Springs Utilities will furnish and install their standard vaults).

(4) Installation of all secondary cable. Provide and install secondary connectors on any conductor over 350 kcmil.

(5) Making all secondary cable connections at the meter. Colorado Springs Utilities will connect these cables to the transformers in the vaults, all secondary junction boxes, and single-phase padmount transformers- 100 amps or less. Sufficient excess cable must be left in the vaults to make connections to the transformers. Contact Colorado Springs Utilities Field Engineering for recommended cable length. Cables must be marked for phasing if three phase and marked with service address location.

(6) Installation of meter socket(s), conduit, and cabinet.

(7) Provide and install tracer wire on any primary ducts to remain empty as shown in Appendix F, Construction Standard 11-5, e.g., stubs for future phases of development. Install Colorado Springs Utilities-furnished electronic markers and handhold in accordance with Appendix F, Construction Standard 11-5.

NOTE: The customer is required to provide protection for the padmount/vault from damage by vehicles, falling debris, etc. during construction.

6) Colorado Springs Utilities will provide the following:

(a) Padmount transformer installation:

(1) All primary cable and primary cable terminations.

(2) Primary voltage switching and protection equipment.

(3) Transformers(s).

(4) Transformer pad(s). For pads up to 2500 kVA, a precast pad will be set at the time of construction. In the event the customer elects to pour the pad because of schedule constraints and/or design needs, Colorado Springs Utilities will reimburse the customer up to the limits of Colorado Springs Utilities cost, with prior approval. A bill must be provided to Colorado Springs Utilities by the customer. A construction drawing of the pad will be approved by Colorado Springs Utilities (see Appendix F, Construction Standard 19-9).

(5) Metering equipment to include meters, voltage and current transformers, and current transformer cable.

(6) Electronic markers and handhole for tracer wire termination on any empty primary duct stubs, as shown in Appendix F, Construction Standard 11-5, e.g., for any future phases of development.

(7) Furnish and install bumper posts if equipment is placed in road right-of-way and subject to vehicular traffic.

(8) Upon completion of vault hole inspection, furnish and install any vaults required.

(b) Vault System Installation:

(1) Primary cable and terminations.

(2) Primary voltage switching and protection equipment.

(3) Transformer(s).

(4) Vault(s).

(5) Metering equipment to include meters, voltage and current transformers, and current transformer cable.

(6) Electronic markers and handhole for tracer wire termination on any empty primary duct stubs, as shown in Appendix F, Construction Standard 11-5, e.g., for any future phases of development.

g) Transformer Secondary Connection Limitations:

The use of bussway or wireway-type entrance conductors may be required on padmounted services. This type of secondary must comply with the requirements relating to moisture as set

forth in the National Electrical Safety Code. The secondary connections will comply with Appendix F, Construction Standard 7-15. The cantilever force on the transformer secondary bushing will not exceed 600-inch pounds; an alternate method to support the secondary conductor through the use of cable supports approved by Colorado Springs Utilities is required when adding secondary cable to older padmount without cantilever supports on bushings.

h) Inspections:

1) Colorado Springs Utilities requires certain inspections prior to the installation of primary conductor, equipment, pad and transformer by Colorado Springs Utilities. The customer will be required to call and schedule inspections.

(a) To schedule the initial inspection, contact a Q.C. Supervisor or Q.C. Inspector when the site is ready for inspection.

(b) Subsequent inspections (ie: pad compaction, secondary conductor, equipment access, ect…) will be scheduled with the assigned Q.C. inspector.

(c) If job site is not ready for inspection upon arrival of Quality Control Inspector, a service charge may occur.

2) The Colorado Springs Utilities inspector will inspect the following:

(a) Primary conduit prior to backfilling compaction of the trench. Secondary conduit prior to backfilling from the pad or vault location to the building entrance. Secondary conduit size and quantity will be inspected according to information provided on the project's final load data form, which must meet the requirements of the Regional Building Department.

(b) Compaction at each pad location. Asphalt covered surfaces will not meet this requirement. All asphalt directly under the pad location must be removed. Bottom of transformer pad must be installed at final grade or 1 inch below final grade.

(c) All secondary and meter installations and equipment as follows: Colorado Springs Utilities will inspect the underground service conduit including the riser to the service equipment. SCH80 PVC or GRC will be required for all risers above grade where exposed to public access and for 8 feet above any readily accessible level; SCH40 PVC is not acceptable above grade because it becomes brittle at cold ambient temperatures and is subject to impact damage. Colorado Springs Utilities responsibility to inspect will cease after the entrance to the first unit of service equipment, i.e., meter socket, main disconnect, CT cabinet, gutter, secondary junction box, or other similar equipment. When the customer's service equipment is inside the building wall, Colorado Springs Utilities inspection responsibility ceases at the building wall except for meter sockets and CT cabinets located inside the building. The conduit must be SCH80 PVC or GRC where it passes through the masonry or concrete building wall.

(1) The Pikes Peak Regional Building Department or a third-party inspector for R.O.W. inspections will:

(a) Make the inspection of all service equipment including the risers and wiring at the building/structure served.

(b) Make inspections of all secondary conduits on the load side of service equipment and any instrument transformer (CT & VT) metering conduit.

(c) Make inspections of all secondary conduits and wiring/equipment on the load side of the service point on all unmetered services.

(d) For inspections in the Right-Of-Way (R.O.W.), a third-party inspection from an independent licensed journeyman electrician will be necessary, see the "Electric Inspection in the Right-of-Way Certificate" form in the back of this chapter. Contact the Q.C. Supervisor or Q.C. Inspector for details of inspection process in the R.O.W.

(2) Colorado Springs Utilities will:

(a) Make the inspection of secondary conduits between the service equipment riser at the building/structure served and the source of utility supply (transformer, pole, or j-box).

(b) Make the inspection of all customer–installed secondary conductor connections at the source of utility supply including meter sockets and CT cabinets.

(c) Make inspections of all secondary conduits and wiring/equipment on the source side of the service point on all unmetered services.

(d) Make the inspections of customer-installed equipment on the primary side of the transformer, including the preparation of the transformer site.

(d) Equipment locations may not vary from the locations selected by Colorado Springs Utilities. Express written consent from Colorado Springs Utilities will be required before location changes will be accepted.

(e) Trenching and Boring of Conduit**:**

(1) If required depth of trench or bored-in conduit cannot be met, new proposed depth must be approved in advance by Utilities inspector.

(2) Potholing may be required, at the discretion of Utilities inspector, to prove the need for any excessive depth proposed, prior to approval.

(3) Conduit will be required for any installation that exceeds Utilities maximum depth as shown in Electric Distribution Construction Standard 11-1(see Appendix-F).

i) Scheduling:

1) Upon completion of the required inspections, Colorado Springs Utilities work will be scheduled. If Utilities crews are delayed due to the construction site not being ready to install facilities after mobilizing to the site, the developer will be charged for the cost of de-mobilizing and re-mobilizing to the site with a Time and Material contract. Transformers will generally be installed two (2) weeks after an approved pad compaction test is received.

(a) Call the Colorado Springs Utilities Scheduling Coordinator for scheduling time frames (see Phone Section).

2) Within ten (10) business days of the Q.C. inspector receiving an order and a Load Data Form from Electric Service and, upon receiving the design fee and other fees, easement documents, the service order from Colorado Springs Utilities Customer Service, the Regional Building Department inspection approval documentation, and completion of

Colorado Springs Utilities installation, the meter will be set and the final service will be energized.

3) For Scheduling service outages (disconnect and reconnect), see "Commercial Scheduling Outages Flowchart (Disconnect and Reconnect)" at the back of the chapter.

j) Access to Tie Into Colorado Springs Utilities Equipment:

1) Only licensed electricians working for a licensed contractor will be authorized to access and work in Colorado Springs Utilities padmount equipment when hired by customers for commercial/industrial installations (Customers/contractors are not allowed inside Colorado Springs Utilities vaults). Safe work practices shall be followed as required by applicable OSHA regulations. All such work shall meet the requirements of current editions of NEC and NESC, as well as Colorado Springs Utilities Standards. Electricians shall not move or operate any Springs Utilities primary cables, primary elbows or transformer accessories.

2) If a contractor is approved by Colorado Springs Utilities for unattended access, the contractor must receive a Work Permit for Unattended Access.

3) It will be the contractor's responsibility to provide appropriate lockout/tagout devices on the padmount cabinet as required by OSHA for worker safety and to also protect the public and the padmount while working on or around the padmount. Electricians shall not move or operate any Colorado Springs Utilities primary cables, primary elbows or transformer accessories. It is the contractor's responsibility to verify the equipment denergized. Colorado Springs Utilities requires that each contractor have a lock and appropriate warning tag installed on the cabinet door of Colorado Springs Utilities equipment that shall include the name of the worker and a telephone number (pager, cellular, or office) at which the worker can be reached. Once the contractor has completed his work, he will secure the equipment and padlock the padmount. The contractor will then contact a Colorado Springs Utilities representative and notify them that all work is complete, that workers are in the clear, that grounds and lockout/tagout devices have been removed and the equipment is ready to be energized. There shall be no delay releasing the equipment for service. The Colorado Springs Utilities representative will return to the job site, check to see if the contractor's work is complete, padlock the equipment with a Colorado Springs Utilities lock, and coordinate with the Distribution Control Center to re-energize.

4) If the electrician fails to secure and padlock a padmount or fails to follow safe work practices, the Colorado Springs Utilities representative will inform the electrician of the violation and maintain records of each violation. Infractions may also be reported to the State Licensing Board and OSHA. If Colorado Springs Utilities decides that the electrician can not work unsupervised because of past violations on padmounted equipment, the electrician will not be authorized future access for such work.

(a) Access to Padmount Transformers: The contractor will contact Colorado Springs Utilities Inspections to requests access to the padmount. A Colorado Springs Utilities representative will be assigned the responsibility to coordinate with the electrician in a manner that will assure operating safety. The electrician and the Colorado Springs Utilities representative will make an appointment and meet at the job site. A Work Permit for Unattended Access will be signed and issued to the licensed electrician for such access, authorizing work on the secondary only.

(1) If the transformer is energized and can be de-energized without affecting other customers, Colorado Springs Utilities will de-energize the padmount.

(2) If the transformer cannot be de-energized without affecting other customers, and the electrician decides the work can be done safely while the transformer is energized, the padmount will remain energized.

(3) If the transformer cannot be de-energized without affecting other customers, and either the primary is live-front or the electrician decides that safe work practice requires the transformer de-energized, it will be the Colorado Springs Utilities representative's responsibility to contact the Distribution Control Center and initiate the process to schedule an outage on the transformer. Note: All scheduled outages will conform to Distribution Operations present procedure for schedule outages. Such an outage will require at least two business days advance notice and scheduling coordinated with affected customers to the extent practicable. Once the outage has been scheduled, the transformer will be de-energized.

(b) Access to Tie into Department Vaults: The contractor will contact Colorado Springs Utilities Inspections and request access to tie into the vault. The customer and the Colorado Springs Utilities representative will make an appointment and meet at the jobsite. Note a Work Permit for Unattended Access will not be issued. The Colorado Springs Utilities representative will stand by while the customer performs his work.

(c) Access to Primary Metering Equipment: The contractor will contact Colorado Springs Utilities Inspections to requests access to the equipment. A Colorado Springs Utilities representative will be assigned the responsibility to coordinate with the electrician in a manner that will assure operating safety. The electrician and the Colorado Springs Utilities representative will make an appointment and meet at the job site. A Work Permit for Unattended Access will be signed and issued to the licensed electrician for such access, authorizing work in this equipment.

k) Painting of Colorado Springs Utilities Equipment:

Vault lids or padmount equipment may be painted by the customer to match the surrounding color scheme. All identification numbers and warning signs must remain intact and clearly visible. Once the customer paints the equipment he assumes permanent responsibility for the upkeep of the paint. For acceptable paint type see Appendix F, Construction Standard 19-10.

l) Overhead to Underground Primary Feed Source:

When the primary feed source is from an overhead line, the customer is to install conduit to the pole, 90 degree bend, and PVC stub up the pole as described in Appendix D, Drawing 4B.

m) Removable Aesthetic Pavers Over Manhole Covers:

Removable aesthetic pavers are permissible over manhole covers with approval by Colorado Spring Utilities (example: WunderCovers Pavers). The customer must provide lifting device(s) and lifting device kits to remove the pavers (upon approval by Utilities). The lifting device must use a levered device where the user will push down to lift the pavers up (example: WunderCover

Easy Lift). The surface must meet ADA requirements for slip resistance. Pavers must be engraved with the Utilities Vault Code to identify the vault location. The sidewalk around the vault and manhole paver covers must meet HS20 loading for truck access.

10.02 Overhead Commercial Service:

a) General:

1) The standard method of connection between Colorado Springs Utilities overhead distribution system and the customer's service entrance location is by means of overhead wires, which are provided by Colorado Springs Utilities. The customer must install and maintain the overhead meter socket, entrance conduit, entrance wire, weatherhead, and point of attachment, and CT cabinets if applicable.

2) The maximum size single-phase transformer that will be installed by Colorado Springs Utilities on a pole is 75 kVA; similarly, the maximum three-phase bank will be 225 kVA. New services with an estimated diversified load greater than can be supplied by those transformer sizes will be served by a padmount transformer and underground systems (see paragraph 10.01).

3) Regional Building Department permits are required for all installations whether metered or non-metered. See paragraph 10.01 e) 3) for details regarding non-metered services.

4) Grading, excavation, ground rod, stake or post installation work will not be started until an underground facilities location has been completed. Call 811 for utility locates. See 2.03b for Underground locate requirements

b) Request for Service:

1) To initiate a request to serve a given development, complex, or building, the customer must submit the following to Colorado Springs Utilities Field Engineering.

(a) A completed load data form (blank forms supplied by the Colorado Springs Utilities Field Engineering). The design of the Colorado Springs Utilities' electrical service is based on information furnished by the Customer at the time of initial service design; therefore, no additions or changes shall be made to the Customer's installation without providing a new load data form and receiving subsequent approval from Colorado Springs Utilities.

(b) A complete set of plans consisting of a plot plan with vicinity map, street profile plans, electrical and mechanical plans, grading plans, and a plan showing the location of all other utilities.

2) Please note that if a current recorded plat of subdivision and current approved addressing is not provided for the project, the customer will need to submit a Utilities Addressing Plan (UAP) to Colorado Springs Utilities. A Utility Design CAD File (UDCF) will need to be submitted to Colorado Springs Utilities. Any questions regarding either the UAP or Utility Design CAD File should be directed to Colorado Springs Utilities (see Appendix B).

c) Electric System Design:

Colorado Springs Utilities Field Engineering will evaluate the load data form and design a system that will meet the needs of the customer and the requirements of Colorado Springs

Utilities. In the event the requested services and voltage needs cannot be met by Colorado Springs Utilities due to system constraints, the Field Engineer will notify the customer and work out an agreeable alternative to meet the needs of the customer. A design, minimum service attachment height, diversified demands, fault current figures and metering requirements will be provided to the customer by Colorado Springs Utilities.

d) Number of Services to Buildings:

Multiple services will be installed only with prior written approval by the Chief Electrical Inspector of the Regional Building Department. Colorado Springs Utilities may add an additional charge for providing multiple services.

e) Point of Attachment:

1) The service entrance wiring will be brought to a point outside the building which may be satisfactorily reached from the Colorado Springs Utilities poles and lines without service trespass on other property and must meet National Electrical Safety Code height clearances.

2) Information relative to existing poles and wires of the electrical distribution system will be obtained from and the details approved by Colorado Springs Utilities before locating the service entrance to a building.

f) Method of Attachment:

1) On all new or remodeled buildings, the customer will install a service bracket or other dead-end insulating device of adequate strength to support the Colorado Springs Utilities service drop on the building and withstand a minimum of 400 pounds horizontal tension per cable. On buildings of masonry or fireproof construction, dead-end devices are to be mounted by means of through-bolts set in the structure. A four-spool rack may be necessary in some instances. Refer to the load data reply letter for specific requirements in each installation.

2) The point of attachment of all service drops will meet the requirements of Article 230 of the National Electrical Code. Service knobs will not be placed in the roof. For a building with less than 12 feet of ground clearance to the eaves, a mast-type riser through the roof will be required. Conductor clearance will be as set forth in the National Electrical Safety Code or Section 230 of the National Electrical Code, whichever is greater.

3) The mast conduit must be a minimum of 2 inch GRC and extend above the roof to obtain an 18 inch clearance between the roof and the lowest point of the service drop. Also, see Article 230 of the National Electrical Code and the Regional Building Department code requirements (see Appendix D, Drawing 1).

g) Length of Service Drop:

Allowable length of service drops will be governed by Article 230 of the National Electrical Code. In general, service drops should not exceed 100 feet in length and large conductor size service drops should be proportionately shorter. The service mast or service pole will withstand a minimum of 400 pounds tension per cable attachment. Multiplex cable requires one such attachment; open wire services require three or four such attachments, each to hold 400 pounds tension. Guys or braces may be needed for this strength depending on the height of unsupported mast.

h) Service Drop Poles:

Where length of the service drop is excessive, or proper clearances cannot be maintained, or the size of the conductor would cause undue mechanical strain upon either the customer's structure or the Colorado Springs Utilities pole line, a service pole may be required on the customer's property or adjacent property-owner's premises. A suitable right-of–way must be obtained from the customer and/or property owner when a service supplies more than one customer.

i) Service Entrance Conductors:

1) The service entrance conductors and conduit may be defined as the service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop.

2) Service entrance conductors will have a current-carrying capacity at least as great as that provided in Article 220 and meet requirements of Article 230 of the National Electrical Code.

j) Scheduling:

1) Upon completion of the inspection process and receipt of the required design fee, Colorado Springs Utilities work will be scheduled and installed. If Utilities crews are delayed due to the construction site not being ready to install facilities after mobilizing to the site, the developer will be charged for the cost of de-mobilizing and re-mobilizing to the site with a Time and Material contract. Call the Colorado Springs Utilities Scheduling Coordinator for a scheduling time frame (see Phone Section).

2) Upon receiving all other fees, if any, easement documents as required, the service order from Colorado Springs Utilities Customer Service, the Regional Building Department inspection approval documentation, and completion of Colorado Springs Utilities installation, the final service will be energized within 10 business days.

3) For Scheduling service outages (disconnect and reconnect), see "Commercial Scheduling Outages Flowchart (Disconnect and Reconnect)" at the back of the chapter.

10.03 Commercial Overhead To Underground Secondary:

a) General:

In some instances it may be to the customer's advantage to install the secondary service line underground, even if they are located in an overhead distribution area. All such work must be done by a licensed electrical contractor at the customer's expense. See 10.01 for Commercial Underground System requirements. The customer is required to (see Appendix D, Drawings 3A & B and Drawing 4A):

1) Provide trenching, backfilling, compaction of secondary trenches and restoration of all concrete or asphalt surfaces and landscaping, if any, from pole riser to meter socket. See paragraphs 10.01f and 7.07 for required inspections.

2) Install secondary conduit from the base of pole riser to meter socket as shown in Appendix D, Drawings 3A and 4A, sized in accordance with Colorado Springs Utilities and National Electrical Code standards (refer to paragraph 10.01d and 10.01e). See Appendix-C, Table 3 for Approved Electrical Materials, and Appendix-E for specification 194-2 regarding "Polyethylene Conduit for Underground Installation".

3) Install secondary conductor, from the meter socket to the base of the riser pole, sized in accordance with the National Electrical Code Standards. Adequate additional length must be left on conductors at the base of the riser pole for the Utility to install up the pole and connect to Colorado Springs Utilities secondary lines with a 12 inch drip loop. The Colorado Springs Utilities Field Engineer will specify on the load data form the additional length of cables needed to make connections up the pole. As noted in paragraph 2.03a, only utility workers qualified to safely work near high voltage overhead lines are authorized to approach such lines closer than 10 feet.

4) Clearly mark phasing on three-phase services. Distinctly mark the neutral wire so it can be readily identified.

5) Point of Common Coupling is at the point where Colorado Springs Utilities wire connects to the Customers' wires at the top of the pole. This is also referred to as the "Service Point" by the NEC. The maintenance and repair from this point into the customers electrical equipment is the sole responsibility of the customer. This includes but not limited to all secondary conduits, junction boxes, conductors, connectors, current transformer cabinets, and meter sockets.

6) When served from an overhead source, meter pedestal or post type meter installation must be no closer than 15 feet from the pole

b) Scheduling:

1) Upon completion of the inspection process, Colorado Springs Utilities work will be scheduled and installed. If Utilities crews are delayed due to the construction site not being ready to install facilities after mobilizing to the site, the developer will be charged for the cost of de-mobilizing and re-mobilizing to the site with a Time and Material contract. Call the Colorado Springs Utilities Scheduling Coordinator for scheduling time frame (see Phone Section).

2) Upon receiving all fees, if any, easement documents, the service order from Colorado Springs Utilities Customer Service, the Regional Building Department's inspection approval documentation, and completion of Colorado Springs Utilities installation, the final service will be energized within 10 business days.

3) For Scheduling service outages (disconnect and reconnect), see "Commercial Scheduling Outages Flowchart (Disconnect and Reconnect)" at the back of the chapter.

c) Conduit and Wire Size for Various Loads in an Overhead to Underground Installation:

Refer to paragraphs 10.01d and 10.01e.

10.04 Primary Metered Service (Not For Residential Use):

At the request of the customer, primary service is available for those service points whose Maximum Billing Demands are expected to exceed 4,000kW. Utilities may provide primary service for service points with a Maximum Billing Demand of less than 4,000kW if such points were taking primary service prior to July 1, 1998, or in cases where customers require secondary service at non-standard voltage levels. This does not preclude Colorado Springs Utilities from providing primary or secondary service to a customer at Colorado Springs Utilities convenience, provided the service is metered and billed under the appropriate Electric Tariff. For the purpose of

this Chapter, the term "Customer's Distribution System" will mean the total system service beyond the Point of Common Coupling as designated by Colorado Springs Utilities. In order to qualify, the following conditions must be met:

a) The customer's electric distribution system must be designed and constructed under the supervision of a professional engineer licensed by the state of Colorado.

b) The primary supply voltage will be as determined by Colorado Springs Utilities.

c) Metering equipment will be owned, specified, designed, and installed at Colorado Springs Utilities expense at a location designated by Colorado Springs Utilities. In some existing locations, if this equipment is on the load side of the Point of Common Coupling, the customer is responsible to install or remove the Colorado Springs Utilities metering equipment for maintenance or repair.

d) Terminal equipment at the Point of Common Coupling will be owned and installed by Colorado Springs Utilities. Type of terminal equipment will be determined by Colorado Springs Utilities. Customer equipment at the Point of Common Coupling must be compatible with the terminals of the primary equipment for customer connections.

1) Final connection of customer's completed terminations to Colorado Springs Utilities terminal equipment at the point of delivery will be made by the customer.

2) Damage to Colorado Springs Utilities equipment resulting from failure of customer equipment will be repaired by Colorado Springs Utilities at the expense of the customer. Repair of customer equipment will be the responsibility of the customer.

4) Customers will not be allowed to test their electrical system with the use of Colorado Springs Utilities transformers.

e) Service voltage to the customer will be nominal plus or minus 10 percent, at the primary meter, as rendered under a power contract. If for any reason, modifications or additions are necessary to correct voltage problems to within the limits mentioned above, such modifications or additions will be designed, installed, maintained, and owned by the customer at his expense and under the supervision of a professional engineer licensed by the state of Colorado.

f) If at any time, damage or failure occurs on any part of the customer's distribution system, Colorado Springs Utilities will not make any repairs.

g) Information provided by Colorado Springs Utilities to aid in the customer's design of his own electric distribution system will be limited to:

1) Primary service voltage with maximum and minimum limits plus or minus 10 percent variation from nominal is acceptable.

2) Maximum possible fault currents available at the point of supply.

3) Coordinating information relating to proposed protective equipment to be located on that portion of the supply system owned by Colorado Springs Utilities so that the customer may specify the proper protective equipment for his distribution system.

4) Location of metering equipment and Point of Common Coupling.

5) Specifications of Colorado Springs Utilities terminal equipment necessary for coordination with the customer's terminal equipment.

h) In accordance with the Electric Tariffs, all wiring, pole lines, conductors, transformers, and other electrical substation and distribution equipment beyond the Point of Common Coupling,

except Colorado Springs Utilities metering equipment, will be provided, owned, installed and maintained by the customer at his expense.

i) The customer will protect Colorado Springs Utilities facilities and equipment located on his premises. Access will be limited to Colorado Springs Utilities personnel only. If a customer has need to access the area where the equipment is secured, Colorado Springs Utilities, on request, will provide a qualified employee to open the area and stand by until the customer's need is met.

j) The customer should consult the current Electric Tariffs for additional information/ responsibilities concerning primary-metered installations.

k) Primary-metered customers will provide Colorado Springs Utilities Enhanced Service Engineering with equipment location and specifications of the first Lock Out/Tag Out location on the load side of the Point of Common Coupling.

10.05 Enhanced Power Service:

a) General:

1) Enhanced Power Service is available by contract in Colorado Springs Utilities' electric service territory for customers who receive service under an Industrial Service Rate Schedule and require a higher level of availability than standard commercial service. Enhanced Power Service typically includes a second feed to the facility, often referred to as "dual feed" or "redundant service."

2) Enhanced Power Service equipment, with the ability to transfer customer load from a preferred source to an alternate source, is available. Colorado Springs Utilities will install, at the customer's expense, either a primary meter station on each feed into the customer's site, or one Automatic Throw Over (ATO) switch.

3) In accordance with the Utilities Rules and Regulations, ownership and responsibility for any repair and maintenance of the Enhanced Power Service equipment changes at the Point of Common Coupling ("PCC") or Service Point. Colorado Springs Utilities assumes no responsibility in the operations and maintenance of any equipment located on the load side of the PCC.

4) Colorado Springs Utilities does not guarantee that Enhanced Power Service will provide uninterrupted service or eliminate voltage disturbances. Even normal operations of Enhanced Power Service facilities may cause momentary interruptions during load transfer. Colorado Springs Utilities will not be liable for any losses sustained by the customer or third parties due to any interruption of service or any malfunction of the Enhanced Power Service facilities.

b) Request for Service:

1) To initiate a request for Enhanced Power Service, the customer must submit the following to Colorado Springs Utilities:

(a) A completed Enhanced Power Service request form (blank forms supplied by Colorado Springs Utilities Enhanced Service Engineering).

2) Requests for Enhanced Power Service will be reviewed on a case by case basis. As each case is subject to various and differing circumstances, Colorado Springs Utilities will review each request to ensure that the Enhanced Power Service does not have the potential to jeopardize the integrity, reliability or operability of the electric distribution system.

3) Due to annual budget constraints, Colorado Springs Utilities will have the right to limit the number of Enhanced Power Service customers and/or the amount of Enhanced Power Service equipment supplied.

4) In the event the Enhanced Power Service request cannot be met by Colorado Springs Utilities due to budget or system constraints, Colorado Springs Utilities will notify the customer and work out an agreeable alternative to meet the needs of the customer.

c) Capital Costs:

1) The customer will pay the entire cost to construct the Enhanced Power Service facilities. The customer will be responsible for the actual cost of the work and will be either billed for any additional costs incurred over and above the estimate, or will be reimbursed the difference between the estimate and the actual cost, whichever may be applicable.

2) All work performed for Enhanced Power Service will have the full amount of the estimate deposited with Colorado Springs Utilities prior to scheduling the work. Other payment options may also be available.

d) Operations & Maintenance Costs:

1) The customer will pay a monthly operations and maintenance (O&M) charge as set out in the Electric Tariffs and in accordance with the following calculation:

O&M Charge = ((Customer Load / Circuit Capacity) * (Replacement Cost * Depreciation Percentage) + (Customer Load / Circuit Capacity) * (O&M Cost per Mile * Miles)) / 12

2) The components of the O&M Charge calculation are defined as follows:

Customer Load – Projected peak demand (MW) at final build-out as provided by the customer on the Enhanced Power Service request form or in other writing accepted by Colorado Springs Utilities.

Circuit Capacity – Total load that can be provided by the circuit.

Replacement Cost – Cost of replacing all electric equipment between the customer site and the substation such as conductors, cables, elbows, transformers, primary meter stations, switches, modules, splices, "T" bodies, etc. The replacement cost does not include the cost of replacing structural equipment such as conduit, vaults, trenching, concrete encasement, etc.

Depreciation Percentage – Currently 3.33% based on a typical 30 year useful life.

O&M Cost per Mile – Calculated by Colorado Springs Utilities on an annual basis and includes distribution, sub-transmission and transmission system costs.

Miles – Represents the number of miles from the PCC to the substation.

e) Electric Tariffs:

1) Per the Electric Tariffs, the customer will pay the applicable Industrial Service Rate as well as a reserved capacity charge as set forth in the *Electric Rate Schedules, Enhanced Power Service*.

10.06 Colorado Springs Network Service Area

a) General:

1) Colorado Springs Network System service area consists of approximately 16 blocks (see Figure 1, pg. 22) in downtown Colorado Springs. The general area is South of Platte Ave., West of Wahsatch Ave., North of Vermijo Ave. and East of Sawatch St. Network Service is not available in areas outside these existing boundaries. Depending on load/capacity requirements, only network service is available inside the boundary. The boundaries of the Network System are not expanding; conversely, customers adjacent to the boundaries may be converted to the radial distribution system at the discretion of Colorado Springs Utilities for technical and operational reasons. The preference is for Network Service to serve multi-story office buildings in the Downtown Area and is given capacity priority over smaller 208Y/120 volt services.

2) A Customer, served by the Network System, experiences a very high degree of reliability as compared to the radial distribution system, and is considered enhanced power. The cost to provide a service to the Network System ranges from three to ten times higher than the cost of Colorado Springs Utilities' radial distribution system. This reliability is due to a Customer being supplied simultaneously by multiple sources of power and infrastructure or equipment. In the event one source of power is unable to serve the Customer; another source is already in service.

3) Colorado Springs Utilities does not guarantee that Network Service will provide uninterrupted service or eliminate voltage disturbances. Colorado Springs Utilities will not be liable for any losses sustained by a Customer or third party due to any interruption of service or any malfunction of the Network System.

4) The Commercial Policy of the Line Extension and Service Standards applies to the Network System except in the items identified as special to the Network System.

5) Colorado Springs Utilities does not allow distributed generation in the Network System due to technical and safety reasons. As an alternative, there may be an option to convert the customer from a Network System to the radial distribution system, in which distributed generation is allowed or for the customer to participate in renewable tariff options offered by Utilities (see www.csu.org). While radial conversion may be the most expensive option to the customer, cost sharing may be available on a case by case basis.

6) Colorado Springs Utilities will provide either "grid" – 208Y/120 volt or "spot" – 480Y/277 volt service. The type of service provided will depend upon the Customer's electrical load characteristics.

b) Request for Service:

1) To initiate a request to serve a building or complex, the Customer shall submit the following to Colorado Springs Utilities Field Engineering Section:

(a) All documents listed in 10.01b of the Commercial Underground Systems of the "Electric Line Extension & Service Standards".

(b) In addition to the documents above, a scaled site plan with building footprint and desired location of the service entrance shall be submitted.

(c) The Customer shall contact Colorado Springs Utilities before planning either a new

service or changing an existing service within the Network System boundaries. Long lead times for network equipment may affect the Customer's service date. Alterations and additions to this System generally require a great deal of time and coordination between Colorado Springs Utilities and the Customer.

c) Electrical System Design:

1) After the load data form has been received, Colorado Springs Utilities will reply with a letter stating the fault current on the Network System. The fault currents are higher in the Network System because there are multiple sources paralleled together serving the secondary wires that serve the Customer. Diversified demands and metering requirements will be provided to the Customer.

2) Colorado Springs Utilities limits the capacity to any "spot" Customer on the Network System to 2000 kVA diversified load and limits the capacity to any "grid" building on the Network System to 300 kVA diversified load. If the "grid" building has multiple services, the load of the building is still limited to 300kVA diversified. In the event the requested service is higher than these limits, Colorado Springs Utilities will work with the Customer on a case by case basis to meet their needs. This may require alternatives to Network service.

3) Grid (208Y/120):

(a) A "grid" Network System has its (208Y/120 volt) secondaries paralleled together and serves small loads located within the boundaries of the network.

(b) Maximum allowable load to any new or existing Customer will be up to 300 kVA diversified load. Colorado Springs Utilities is no longer expanding the areas served by the "grid". Each request will need to be evaluated due to the age and design of the Network System. Please contact the South Area Field Engineering Section (see Phone Section) for information.

(c) The point of common coupling is determined by Colorado Springs Utilities. The point of common coupling for the Network System will differ from typical commercial installations. The Customer is responsible for the service from the service entrance up to the point of common coupling. The point of common coupling may be from a vault or possibly back to the transformer.

(d) The Customer shall be responsible for purchase, installation, and maintenance of the service lateral conduits in accordance with Colorado Springs Utilities' specifications from the point of common coupling to the Customer's service entrance. Colorado Springs Utilities' personnel shall directly supervise all work involving Customer penetration into Colorado Springs Utilities' equipment (handhole, manhole, or vault).

(e) Secondary cable permitted in the Network System is 600 volt class, rated for wet locations, a temperature of 90 degree C. Secondary cable shall be approved by Colorado Springs Utilities. The required size of the secondary cable is 250 kcmil Cu.

(f) Service equipment shall be capable of interrupting the available fault current.

(g) For the purpose of protecting customer owned equipment, it is recommended that cable limiters be installed on all customer owned secondary cable and bus equipment. Failure to do so could result in damage to customer owned equipment

and reduced reliability. See Appendix C Table 3 for approved manufacturers and models of cable limiters.

4) Spot (480Y/277):

(a) A "spot" Network System (480Y/277 volt) consists of two or more transformers in one above ground vault, or other suitable facility, serving an individual Customer with large loads within the boundaries of the network. Typical design is for a multistory office building.

(b) The maximum diversified load of a spot vault is 2000 kVA. This will consist of a maximum of 3-1000 kVA transformers.

(c) Colorado Springs Utilities will supply the medium voltage supply cable, modules, transformers and network protectors. A "Spot Network Customer Vault Agreement" form shall be signed. After the form is signed, Colorado Springs Utilities will order the equipment.

(d) The Customer shall provide the property necessary for an above ground vault or other suitable facility to house network equipment. The Customer is responsible for the purchase and installation of the vault, or other suitable facility, which shall be approved by Colorado Springs Utilities. All above ground level Spot Network Vaults shall conform to Colorado Springs Utilities' Specification 16-1. This shall be understood to be a minimum requirement. Any deviation from this specification shall be approved in writing by Colorado Springs Utilities.

(e) After the Spot Network Vault is completed and accepted by Colorado Springs Utilities, the Spot Network Vault shall be designated as Colorado Springs Utilities' equipment, and Colorado Springs Utilities' personnel shall approve and directly supervise all work involving Customer penetration into the Colorado Springs Utilities' equipment (e.g. vault, building). This includes, but is not limited to, all future customer services and vault modifications.

(f) The Customer is responsible for the purchase and installation of a secondary network bus and switchgear in a location approved by Colorado Springs Utilities. It shall adhere to Colorado Springs Utilities' material specification 194-8 (Low Voltage Busway for 277/480V Spot Networks). Maintenance of the secondary network bus shall be the responsibility of the Property Owner and/or Customer. The Property Owner and/or Customer shall be qualified to work around energized, electrical equipment, will perform maintenance as specified by the manufacturer of the Customer's bus and Colorado Springs Utility material specification 194-8 (Low Voltage Busway for 277/480V Spot Networks) and will document the maintenance for Colorado Springs Utilities' review. For each transformer/network protector unit inside a downtown spot network vault, three-phase AC disconnect switches shall be installed between the network protector and the 480-Volt bus. These AC disconnect switches shall be rated for 1875 A or higher and shall be mounted just inside the vault wall. The 480-Volt bus shall be mounted outside of the spot network vault.

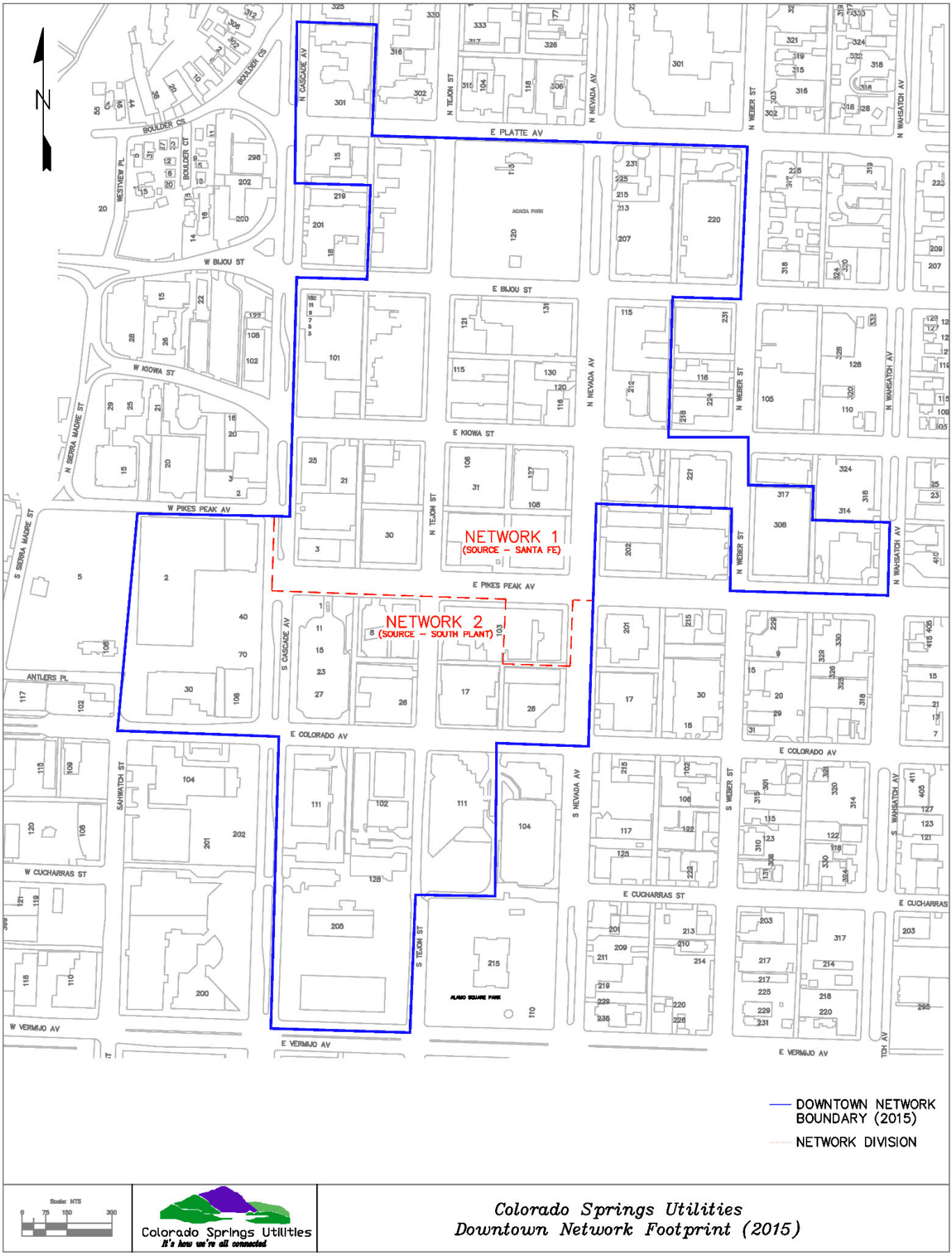
(g) The Property Owner and/or Customer is responsible for the maintenance of the vault including, but not limited to, structural integrity, exterior condition and unobstructed entry to the vault, including doors and ventilation ducts. The Property

Owner and/or Customer are also responsible for sealing the vault against water or debris from entering the vault.

(h) Service equipment shall be capable of interrupting the available fault current as listed in Colorado Springs Utilities' material specification 194-8 (Low Voltage Busway for 277/480V Spot Networks).

(i) The Spot Network Vault shall be built in accordance with Article 450-41 through 450-48 (2011 ed.) and Article 230-1 (2011 ed.) of the most current edition of the National Electric Code (NEC). This shall be construed as being the minimum requirements. Where conflicts occur between this document and the NEC the more stringent requirement shall apply.

(j) The design of the Colorado Springs Utilities' electrical service is based on information furnished by the Customer at the time of initial service design; therefore, no significant additions or changes shall be made to the Customer's installation without providing a new load data form and receiving subsequent approval from Colorado Springs Utilities' Electric Planning. Additions or changes to the Customer's installation may require facilities to be redesigned by both Colorado Springs Utilities and the Customer, which may include the construction of an additional Spot Network Vault. No relocation or replacement will be made unless access, suitable easements and/or property rights are provided without cost to Colorado Springs Utilities.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S WEBER ST
S WAHSATCH AV
BOULDER CS
BOULDER CT
WESTVIEW PL
ANTLERS PL
ACACIA PARK
ALAMO SQUARE PARK
NETWORK 1
(SOURCE – SANTA FE)
NETWORK 2
(SOURCE – SOUTH PLANT)
DOWNTOWN NETWORK BOUNDARY (2015)
NETWORK DIVISION
Colorado Springs Utilities
It's how we're all connected
Colorado Springs Utilities
Downtown Network Footprint (2015)

Figure 1

Spot Network Vault Customer Agreement Form

This agreement acknowledges the Property Owner and/or Customer shall provide the property necessary for an above ground vault or other suitable facility to house secondary network equipment. The Customer is responsible for the purchase and installation of the above ground vault, or other suitable facility, which shall be approved by Colorado Springs Utilities and in accordance to Colorado Springs Utilities Electric Distribution Construction Standards 16-1. Any deviation from this specification shall be approved in writing by Colorado Springs Utilities. The Spot Network Vault shall be designated as Colorado Springs Utilities' equipment, and Utilities personnel shall directly supervise all work involving Customer penetration into the Utilities equipment. The Property Owner and/or Customer is responsible for the maintenance of the vault including, but not limited to, structural integrity, exterior condition and unobstructed entry to the vault, including doors and ventilation ducts. The Property Owner and/or Customer are also responsible for sealing the vault against water or debris from entering the vault.

The Property Owner and/or Customer are required to provide a Network Secondary Bus in accordance with Colorado Springs Utility specification 194-8. The Property Owner and/or Customer will perform maintenance as specified by the manufacturer of the Customer's bus and Colorado Springs Utility specification 194-8 and document the maintenance for Colorado Springs Utilities' review.

The Customer Spot Network Vault will contain Colorado Springs Utilities medium voltage insulated cable, modules, transformers and network protectors. The design of the Colorado Springs electrical service is based on information furnished by the Customer at the time of initial service design; therefore, no significant additions or changes shall be made to the Customer's installation without providing a new load data form and receiving subsequent approval from Colorado Springs Utilities Electric Planning. Additions or changes to the Customer's installation may require facilities to be redesigned by both Colorado Springs Utilities and the Customer, which may include the construction of an additional Spot Network Vault. No relocation or replacement will be made unless access, suitable easements and/or property rights are provided without cost to Colorado Springs Utilities.

This agreement shall be signed by the Property Owner and Customer and then returned to Colorado Springs Utilities before Colorado Springs Utilities orders equipment for the vault. If for some reason the Customer fails to follow through with the installation and Colorado Springs Utilities has already purchased transformers or other network equipment, then the Customer will be responsible to Colorado Springs Utilities for reimbursement of time and material already expended. This will include design time and the cost of equipment ordered. Please be aware of the long lead times when ordering both network transformers and network protectors. A copy of this agreement shall be sent to the Pikes Peak Regional Building Department Electrical Inspector. The only authorized signers of this form are the Property Owner and Customer receiving service at the time of this request.

Return the signed statement to:

Colorado Springs Utilities
South Field Engineering Section
Downtown Network Representative
P.O. Box 1103, Mail Code 1812
Colorado Springs, CO 80947-1812

The undersigned hereby authorizes the use of the transformer vault located in:

Customer Name (please print): _____

Address: _____

City, State & Zip Code: _____

Signature/Date: _____

Title (please print): _____

Property Owner (please print): _____

Address: _____

City, State & Zip Code: _____

Signature/Date: _____

Title (please print): _____

CC: Pikes Peak Regional Building Department, Chief Electrical Inspector

Definitions:

a. **Customer** – A Colorado Springs Utilities Secondary Network customer that takes service under any electric rate schedule at the time of this request.
b. **Property Owner** – A person or entity that legally owns the property where the Spot Network Vault will reside. The Customer and Property Owner may be the same.
c. **Spot Network Vault Customer Agreement** – An Agreement between Customer and Colorado Springs Utilities.

ELECTRONIC VERSION AVAILABLE ONLINE:
https://www.csu.org/Documents/ElectricLoadData.pdf

Colorado Springs Utilities
It's how we're all connected

For office use only
FORM FE-40 REVISED 01/12/2023

Field Engineering

ELECTRIC LOAD DATA FORM

FOR OFFICE USE ONLY INPUT BY: | F.E. W.O. NUMBER: | FIELD ENG:

PROJECT (ELECTRICAL WORK SITE)

ADDRESS: Block | Street Name
CITY: | STATE: | ZIP:
BUSINESS NAME:
BUSINESS TYPE: SELECT TYPE | DAYS/WK: | HRS/DAY:
BUSINESS SQ.FOOTAGE: | # UNITS:
PROJECTED DATE THAT SITE WILL BE READY FOR ELECTRIC INSTALLATION:

ELECTRICIAN (PERSON OR COMPANY SUBMITTING LOAD DATA FORM)

COMPANY: | CONTACT PERSON:
ADDRESS:
CITY: | STATE: | ZIP:
PHONE: | CELL: | EMAIL:

SERVICE REQUESTED

Load information relating to this request is for typical load items associated with this class/size of metered main breaker panel. This request can include/involve multiple addresses. Typical load item combinations that are different will require a separate Load Data Form for each metered combination.

NEW GUTTER/BUSS SIZE: | NEW METERED MAIN: | STATUS: ◯ NEW ◯ EXISTING | TYPE: ◯ PERMANENT ◯ TEMPORARY ◯ INFO. ONLY
EX. GUTTER/BUSS SIZE: | EX. METERED MAIN:
METER LOCATION:

# METERS:		METER SOCKETS BY CUSTOMER:	
1PH		1PH	
3PH		3PH	

SERVICE DESIRED: ◯ OH ◯ UG ◯ OH to UG

VOLTAGE: SELECT VOLTAGE

INSTALLING SWITCHGEAR: ◯ YES ◯ NO
IF YES, WILL METERING BE INTEGRAL OR REMOTE TO SWITCHGEAR: SELECT

	SIZE	QUANTITY
ENTRANCE CONDUCTORS: (SIZE & TYPE)	# PER PHASE:	CONDUIT:

PROJECT DETAILS: If applying for more than one meter, include a list of the addresses/unit numbers for each meter requested.

(OVER)

LOAD DATA

MAJOR LOAD ITEMS:		1 PHASE TOTAL EXIST	1 PHASE TOTAL NEW	3 PHASE TOTAL EXIST	3 PHASE TOTAL NEW
SPACE HEAT	Select Type	KW	KW	KW	KW
BACKUP HEAT	Select Type	KW	KW	KW	KW
RANGE	Select Type	KW	KW	KW	KW
WATER HEATER	Select Type	KW	KW	KW	KW
INSIDE LIGHTING		KW	KW	KW	KW
OUTSIDE LIGHTING		KW	KW	KW	KW
ELECTRIC KITCHEN EQUIPMENT		KW	KW	KW	KW
DATA PROCESSING		KW	KW	KW	KW
RECEPTACLES		KW	KW	KW	KW
OTHER:		KW	KW	KW	KW
OTHER:		KW	KW	KW	KW
OTHER:		KW	KW	KW	KW
OTHER:		KW	KW	KW	KW
AIR CONDITIONING	# of units	KW	KW	KW	KW
EV CHARGERS	Select Level # of units	KW	KW	KW	KW
TOTAL MOTOR LOAD	# of motors	HP	HP	HP	HP
LARGEST MOTOR(S)		HP	HP	HP	HP

10HP AND LARGER EQUIPPED WITH REDUCED VOLTAGE STARTERS: ◯ Yes ◯ No

(If "No" is selected a Motor Variance Request Form must be submitted- contact Field Engineering for form)

BATTERIES	KVA	KW	KW	KW	KW
PARALLEL GENERATION	type	KW	KW	KW	KW
BACK UP GENERATION	type	KW	KW	KW	KW

WILL THIS PROJECT BE ALL ELECTRIC (100% ELECTRIC APPLIANCES, NO GAS TO SITE): ◯ Yes ◯ No

CUSTOMER SIGNATURE AND ADDITIONAL INFORMATION

LOAD DATA FORMS MUST BE AS COMPLETE AS POSSIBLE. LOAD DATA FORMS WITH INADEQUATE INFORMATION OR WITHOUT PLANS MAY BE DELAYED AND/OR NOT PROCESSED. COST OF CHANGES DUE TO INADEQUATE/ INACCURATE INFORMATION WILL BE BORNE BY THE PROPERTY OWNER OR ELECTRICIAN.

SITE, GRADING, UTILITY AND LANDSCAPING PLANS ARE REQUIRED WHEN PRIMARY ELECTRICAL EXTENSIONS ARE NECESSARY.

NOTE: A METER WILL NOT BE INSTALLED UNTIL THE PERSON FINANCIALLY RESPONSIBLE FOR BILLING HAS SET UP AN ACCOUNT WITH UTILITIES DEVELOPMENT SERVICES (668-8111).

FORM WILL NOT BE PROCESSED WITHOUT SIGNATURE.

SIGNATURE: _____ DATE: _____

DIGITAL FORMS ONLY. Email this filled form to: LoadData@csu.org (DO NOT SUBMIT SCANNED COPY)

NORTH DISTRICT FIELD ENGINEERING Ph. (719) 668-5928

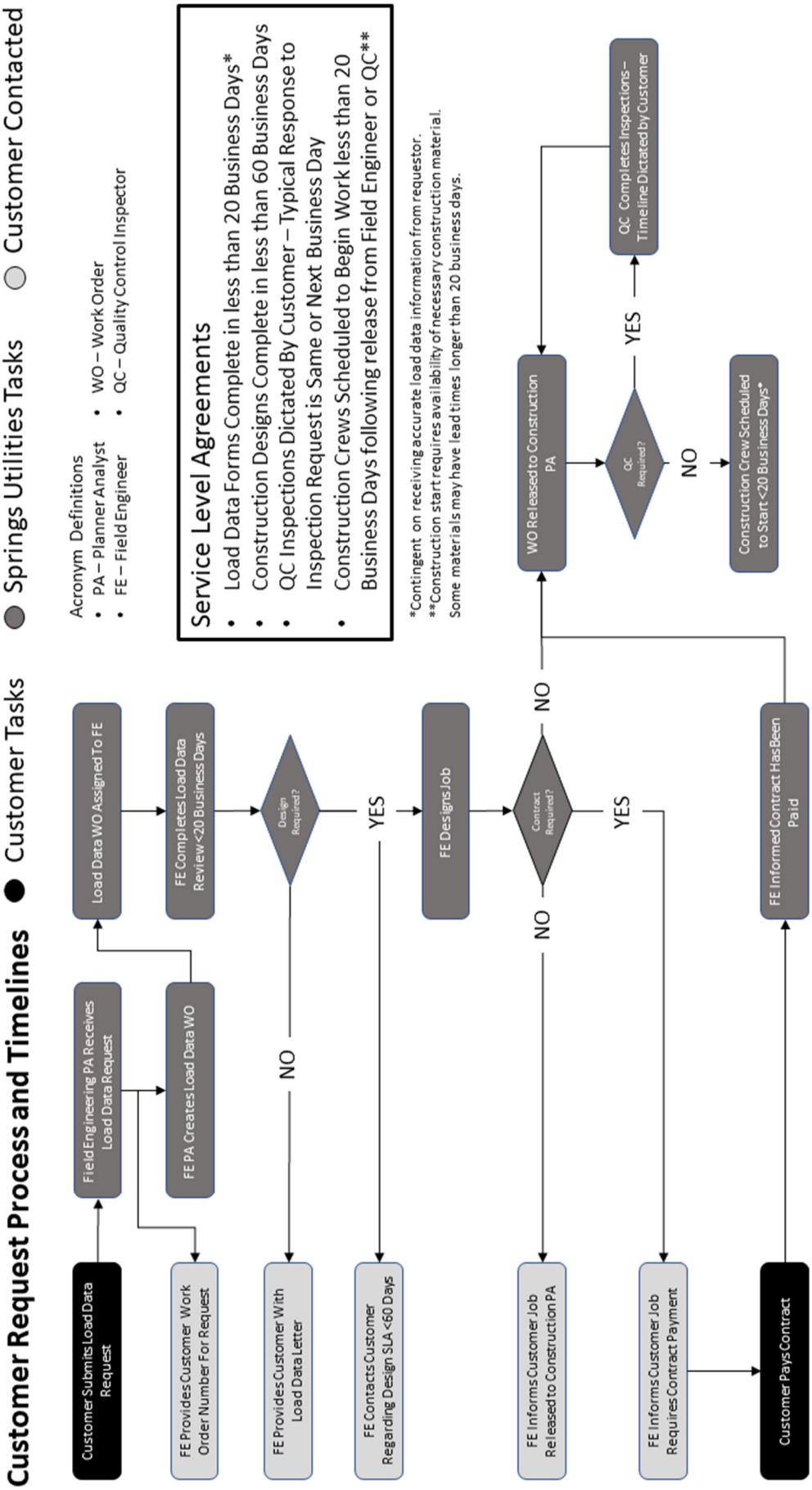
SOUTH DISTRICT FIELD ENGINEERING Ph. (719) 668-5564

FOR ADDITIONAL INFORMATION OR QUESTIONS, REFER TO THE LATEST SERVICE STANDARDS BOOK OR CONTACT THE APPROPRIATE FIELD ENGINEERING OFFICE.

F01-01536 (01/2023)

Load Data Customer Request Process and Timelines

To view the Work Order Status for your project, navigate to the following web address:
https://www.csu.org/Pages/WorkOrderStatus.aspx



Colorado Springs Utilities
It's how we're all connected

MOTOR VARIANCE REQUEST FORM

Date: _____

Premise Address: _____

Contact Person's Name: _____

Contact Person's Phone Number: _____

Contact Person's Address: _____

Horsepower Rating of Largest Motor : _____

Nameplate Voltage : _____

Nema Motor Code Letter : _____

Nameplate Locked Rotor Amps : _____

Locked Rotor Power Factor : _____

Full Load Power Factor : _____

Expected Use/Purpose of the Motor : _____

Do multiple motors start simultaneously? _____

Expected Number of Motor Starts per Unit of Time (Choose Appropriate):

Daily : _____

Hourly : _____

Per Minute : _____

Proposed Starting Method (Circle One):

Across the Line (Full Voltage)

Autotransformer

Line Resistors

Solid State

Other

Please provide details of motor-start methodology if other than "across the line":

_____

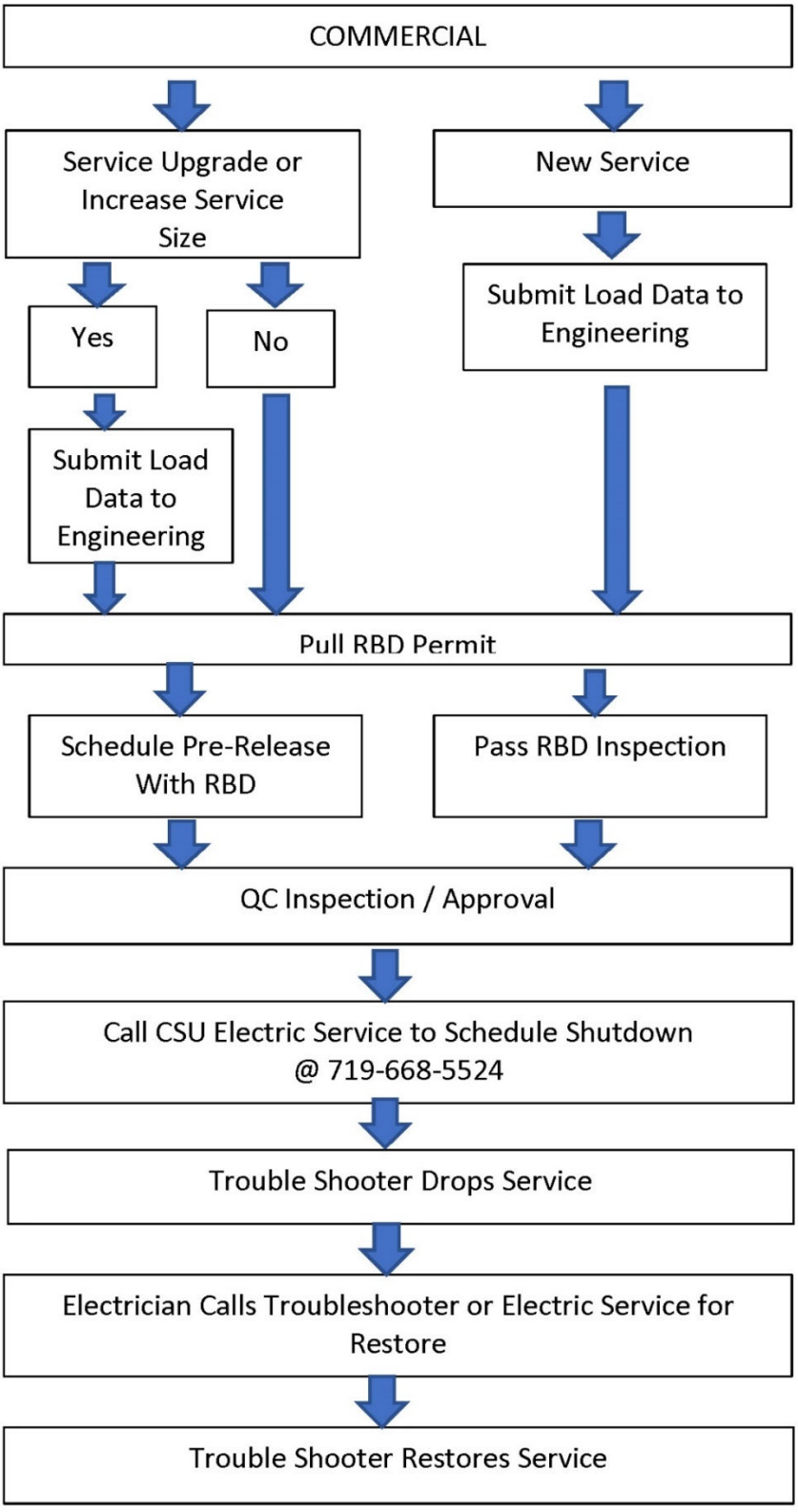
_____

To be completed by Utilities Field Engineer:

Transformer Size: _____ Nearest Existing Vault Code: _____

MOTOR VARIANCE REQUEST FORM 9/12

COMMERCIAL SCHEDULING OUTAGES FLOWCHART (DISCONNECT AND RECONNECT)



Note: The customer must get PPRBD (Pikes Peak Regional Building Department) to inspect their facility, within three business days after the reconnection of a meter that was removed for electrical work.

Electric Inspection in the Right-of-Way Certificate

Colorado Springs Utilities
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Date:_____Owner/ Customer:_____

Service address:_____

City:_____State:_____Zip:_____

Phone number:_____Cell phone:_____

Owner's/ Customer's Electric contractor:_____

Phone number:_____Cell phone:_____

Check appropriate boxes:

☐ Overhead Service ☐ Underground Service ☐ Rewire/upgrade

Number of phases:_____Voltage:_____Entrance size (amps):_____

Remarks:_____

The undersigned, being an independent licensed journeyman electrician in the State of Colorado, hereby affirms that he/she has a currently valid license and hereby certifies that an inspection has been performed at the above-described service address, that the installation was done in compliance with the Colorado State Electrical Board-adopted version of the National Electric Code (https://dpo.colorado.gov/Electrical) and all other applicable codes and safety standards, and that the installation is now ready for connection. The undersigned further acknowledges that Colorado Springs Utilities is not responsiblefor customer-owned equipment past the meter or point of common coupling (PCC) and will not inspect customer's wiring for adequacy, safety, or compliance with applicable electrical codes on the customer's side; such responsibility remains with the customer and authorities having jurisdiction.

Print name of licensed journeyman electrician:_____

Colorado License number:_____Phone:_____

Signature of licensed journeyman electrician:_____Date: _____

Before electricity can be furnished this form must be completely filled out, signed and hand-delivered to theassigned Colorado Springs Utilities Electric Quality Control Inspector.

(Colorado Springs Utilities Electric Inspections phone number: 719-668-5524).

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CHAPTER 11
System Alteration and Conversion

CHAPTER 11

SYSTEM ALTERATION AND CONVERSION

11.01 Conversion of Existing System:

All relocations and/or alterations of existing overhead and underground lines and equipment will be accomplished at the expense of the customer initiating the request on a Time-and-Material billing basis. The customer will be required to provide all necessary easements and right-of-way without cost to Colorado Springs Utilities. The request must be submitted allowing ample time for Colorado Springs Utilities Field Engineering to investigate, engineer, schedule, and construct the relocations.

11.02 Requirements for Work Performed on Time-and-Material Basis:

All work performed on a Time-and-Material contract will have the full amount of the estimate deposited with Utilities, prior to scheduling the work to be performed. The customer requesting the conversion will be responsible for the actual cost of the work and will be either billed for any additional costs incurred over and above the estimate, or will be reimbursed the difference between the estimate and the actual cost, whichever may be applicable.

11.03 Conversion of Single Residential Overhead Service to Underground:

a) In the event the property owner requests conversion of the service conductor from overhead to underground, the customer must convert his meter loop from overhead to underground.

b) The property owner must provide the 2 inch SCH80 PVC or GRC riser at the meter location as well as supply the necessary conduit to pass under patios, driveways and sidewalks, and trenching and backfilling between the meter and pole riser (see 7.04). All installations must conform to Utilities specifications and must be inspected and approved by Utilities personnel. Utilities will install the pole riser and connect the new underground service wire and will remove the overhead service wire at no expense to the property owner. The property owner will be responsible for the removal of the overhead mast. The property owner will assume all costs incurred in replacing fences, sod, trees, shrubs, and other landscaping items, and the repair of damages to, or the remodeling of building structures.

11.04 System Improvement Program (SIP):

a) The System Improvement Program (SIP) provides an avenue for Utilities and its customers to share the cost of burying primary voltage power lines (7kV to 115kV only) and has been affirmed by the Utilities Board on October 18th, 2023. Costs are not shared for converting secondary service to a building or converting individual services from overhead to underground. Distribution burial requirements as outlined in Appendix F, Construction Standard 11-1 will apply. The ***Application to Request System Improvement Funds (SIP Request)*** form must be submitted by the customer to Utilities. The customer will be required to provide all necessary easements and right-of-way without cost to Utilities. The SIP Request must be submitted allowing ample time for the following:

1) Utilities Field Engineering investigation and estimate, which is used to determine deposit percentage, see Table 1 Summary in Section 11.04

2) Contract and deposit submittal deadlines, see Table 1 Summary in Section 11.04

b) Once Utilities confirms that the proposed project is a viable candidate, a SIP contract will be developed. In order to be included in Utilities SIP budgeting process for the following calendar year and to have funds matched on a 50/50 basis, applicants for distribution and/or transmission conversion projects must submit the signed SIP contract before any deadline summarized in Table 1. The SIP Contract will be required with a deposit of five percent (5%) of the total estimated cost of conversion on or before March 1st. If the SIP Contract is approved and budgeted by Utilities, and funds are available, Utilities will cover fifty percent (50%) of the total cost of conversion and the applicant will be responsible for fifty percent (50%).

c) For distribution conversion project contracted with Utilities and budgeted by Utilities, the remaining forty five percent (45%) of the total estimated cost of conversion must be deposited by Jan 31 of the year following City Council approval of the budget and as per paragraph 11.02. If the Utilities budget is not approved, funds are not available, and/or the project is removed from the budget prior to final budget approval, the five percent (5%) deposit will be refunded. If the applicant does not deposit the remaining forty-five percent (45%) as per paragraph 11.02, the project will be cancelled and the five percent (5%) deposit will not be refunded.

d) Underground transmission projects require unique materials that must be ordered 18 to 24 months in advance of construction. For this reason, the design, material ordering, and construction phases of the project may span two years. The signed contract and 5% deposit as described in paragraph 11.04 b) are due on March 1st of the year before the design and material ordering are expected to happen. The remaining 45% requester contribution will be paid to Utilities after the City Council approves the budget and prior to any materials being ordered for the project. Due to material lead times, projects submitted on March 1st for construction in the following year will be scheduled for the third quarter or later in the construction year if funding allows. If the Utilities budget is not approved, funds are not available, and/or the project is removed from the budget prior to final budget approval, the five percent (5%) deposit will be refunded. If the applicant does not provide the remaining (45%) contribution upon request, the project will be cancelled and the five percent (5%) deposit will not be refunded.

e) In the event that a SIP Contract is submitted between March 2nd and May 1st, Utilities will consider the request to match funds on a 60/40 basis if SIP funds are available. If a late SIP Contract is approved and funds are available, Utilities will cover forty percent (40%) of the total conversion cost and the applicant will be responsible for sixty (60%) of the total conversion cost in accordance with paragraph 11.02. Refund policies remain as indicated in preceding paragraphs.

For distribution conversion project SIP Contracts, the remaining fifty-five percent (55%) of the total estimated cost of conversion will need to be deposited by Jan 31st of the year following City Council approval of the budget and as per paragraph 11.02. If, upon evaluation, it is determined that funds are not available, the five percent (5%) deposit will be refunded. If the applicant does not deposit the remaining fifty-five percent (55%) of the total estimated cost of conversion as per paragraph 11.02, the project will be cancelled and the five percent (5%) deposit will not be refunded.

f) In the event that a SIP Contract is submitted after May 1st, Utilities will consider the request to match funds on a 70/30 basis if SIP funds are available. If a late SIP Contract is approved and funds are available, Utilities will cover thirty percent (30%) of the total conversion cost and the applicant will be responsible for seventy percent (70%) of the total conversion cost in accordance with paragraph 11.02. Refund policies remain as indicated in preceding paragraphs.

For distribution conversion project SIP Contracts, the remaining sixty-five percent (65%) of the total estimated cost of conversion will need to be deposited by Jan 31st of the year following City Council approval of the budget and as per paragraph 11.02. If, upon evaluation, it is determined that funds are not available, the five percent (5%) deposit will be refunded. If the applicant does not deposit the remaining sixty-five percent (65%) of the total estimated cost of conversion as per paragraph 11.02, the project will be cancelled and the five percent (5%) deposit will not be refunded.

In the event a customer would like to have 50/50 matching funds, the customer could submit a SIP Request Form for the following year to request funds for the subsequent year on a 50/50 basis.

Table 1 Summary of SIP program Dates and Requirements

<table>
<tr><th>Submit Signed Contract plus 5% Deposit by:</th><th>Developer / Utilities Contribution</th><th>Remaining Deposit Due:</th><th>Comments</th></tr>
<tr><td>On or before March 1st of year prior to execution</td><td>50/50</td><td rowspan="3">After City Council Approval and…
- Distribution: by Jan 31 of execution year
- Transmission: prior to material ordering</td><td rowspan="2">For transmission projects, expect a two year cycle: Design and material ordering in first year; construction in second. Contract and 5% deposit must be received March 1st of the year before the design year. Transmission projects submitted for construction in the following year will be scheduled for construction in the third quarter or later of that following year as funding allows.</td></tr>
<tr><td>March 1 to May 1</td><td>60/40</td></tr>
<tr><td>After May 1</td><td>70/30</td><td>Projects submitted after June 1 are not likely to make the budget for the following year.</td></tr>
</table>

11.05 Conversion of Residential and/or Commercial Overhead to Underground (SIP):

Utilities will consider requests from property owners in residential and commercial areas to place existing distribution and transmission facilities underground. The following conditions will apply:

a) The area to be converted must be deemed by Utilities to meet size, operational, and reliability requirements. Distribution conversion projects will be considered to qualify for the SIP if they are a full block in length or longer. Transmission conversion projects considered to qualify for the SIP must meet minimum lengths as specified in Utilities standards. Distribution conversion projects for areas smaller than one city block will be converted on a Time-and-Material contract and do not qualify for SIP funds. For information on Time-and-Material process, see section 11.02. Transmission projects that do not meet minimum lengths required per Utilities standards will not be considered for conversion and do not qualify for SIP funds.

b) Property owners in the area of consideration should choose one individual with the power of attorney to act as spokesperson and should submit a written request to Utilities. This request should contain a list of addresses with signatures of property owners in the area considered for conversion. Every property owner must agree to the conversion; otherwise, the project will not be considered by Utilities. If the applicant is seeking SIP funding for conversion, see section 11.04 for additional requirements.

c) Utilities Field Engineering and/or Substation and Transmission Engineering will prepare the necessary plans, easement requests if required, Time-and-Material cost estimate, and a SIP contract. This will be presented to the spokesperson for the property owners. The property owners will have 90 days to either accept or reject the conversion proposal. Once Utilities receives the accepted, executed SIP contract, the deposits, and the easements, construction coordination will be handled through the group spokesperson.

d) Each property owner will be responsible for converting their meter loop from overhead to underground and obtaining an inspection from Regional Building Department.

1) In residential areas the property owner must supply and install the necessary conduit to pass under patios, driveways and sidewalks, and trenching and backfilling between the meter and the property line. Utilities will install new underground service wire from the transformer to the new meter socket locations. Requirements as outlined in paragraph 11.03 will apply, excluding all pole riser requirements.

2) In commercial areas, the property owner must supply and install all secondary conduit and conductor as outlined in Chapter 10. The property owner will then be responsible for removing the overhead service mast.

e) The poles and overhead primary distribution and/or transmission will be removed by Utilities when all property owners are converted to the underground system.

f) The cost estimate and actual cost will be in compliance with paragraph 11.02, Requirements for Work Performed on Time-and-Material basis.

Note: Utilities does not guarantee that other utility facilities, such as telephone equipment or CATV lines, which might be attached to Utilities poles, will be placed underground. For further information, these utilities should be contacted individually.

11.06 Improvement Districts:

a) Relocation of existing electrical lines and equipment in areas declared by City Council to be in an Improvement District will be accomplished according to the most recent Utility Relocation Agreement in effect with the City of Colorado Springs at the time of request. Utilities will be notified in advance of the projects by those city departments scheduling and undertaking such projects. This notice will be such as to allow the proper scheduling, engineering, and budgeting of the relocations. Projects not budgeted by Utilities due to improper notification will not be completed or undertaken unless approved by City Council.

b) Please note that if a current recorded plat of subdivision and current approved addressing is not provided for the project, the customer will need to submit a Utilities Addressing Plan (UAP) to Utilities. A Utilities Design CAD File will need to be submitted to Utilities. Any questions regarding either the UAP or Design CAD File should be directed to Utilities (see Appendix B).

Colorado Springs Utilities
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Electric Work Order # _____

APPLICATION TO REQUEST SYSTEM IMPROVEMENT FUNDS

To be submitted to:

North Work Center Field Engineering
7710 Durant Drive, P.O. Box 1103, Mail Code 2150
Colorado Springs, CO 80947-2150

or

South Work Center Field Engineering
1521 Hancock Expressway, P.O. Box 1103, Mail Code 1812
Colorado Springs, CO 80947-1812

Project: _____ **Date:** _____
(Subdivision, address, or description of project)

Applicant: _____
(Entity that will enter into contract) Individual ( ) Partnership ( ) Corporation ( ) Limited Liability Company ( ) Other ( )

Description of work requested: _____

_____

_____

*** (Please submit a proposed Development Plan with this request)**

What year would the funds be required: _____

Projected date that site will be ready for construction: _____

_____
Applicant's Signature (Contract holder)

_____
Applicant's Name (Please type or print)

_____
Address

_____
City, State, and Zip Code

_____
Telephone and FAX Numbers

_____
Email Address

_____
Agent's Name (Project Contact)

_____
Address

_____
City, State, and Zip Code

_____
Telephone and FAX Numbers

_____
Cellular/Field Numbers (If Applicable)

_____
Email Address

Please indicate who the Designs, and Contracts should be sent to: **Applicant** _____ **Agent** _____

Applicant's Signature Authorizing the **Agent** to sign contracts and bind Applicant to such contracts regarding electric. All requests must be received in advance of deadlines (per Section 11 of the Electric Line Extension & Service Standards) for application so that design, contracts and other requirements can be met.

_____
Applicant's Signature

4/15/2016

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CHAPTER 12
Roadway and Security Lighting

CHAPTER 12

ROADWAY AND SECURITY LIGHTING

12.01 Roadway Lighting

12.01.01 Colorado Springs Utilities Enterprise-related Street Lighting

a) Pursuant to Article 9 of Chapter 12 (Utilities) of the Code of the City of Colorado Springs, Colorado Springs Utilities provides street lighting for all public street lights along the public street system within the municipal limits of the City of Colorado Springs. Colorado Springs Utilities Street Lighting Enterprise (Enterprise) comprises the planning, installation, maintenance, administration, and operation of this public roadway street light system within the municipal limits of the City of Colorado Springs.

Colorado Springs Utilities approves all new Enterprise-related roadway street lighting and determines all Enterprise-related lighting illumination and uniformity levels. All Enterprise-related arterial street lighting designs shall conform to ANSI/IES RP-8, and the Colorado Springs Utilities Distribution Construction Standards.

b) The Colorado legislature per State Statute C.R.S. 43-2-135 has placed responsibility on municipalities for lighting state highways within their jurisdiction, including interstate highways. For the City of Colorado Springs this responsibility includes I-25 and all state highways within the city limits of the City of Colorado Springs.

CDOT generally bears the expense of construction improvements to the interstate system and on state highways. All such improvements are to be constructed per the then current Colorado Springs Utilities construction and installation standards.

Responsibility for energy and maintenance of street lights on the interstate system and on State highways within municipalities has been placed on municipalities (City of Colorado Springs) by CDOT per C.R.S. 43-2-135.

c) See 12.01.04 for street light information for all non Enterprise-related public and private roadways.

12.01.02 Enterprise-related Arterial Roadway Street Lighting; New Development and Backlog

a) Enterprise-related arterial roadway street lights are installed on all non-residential streets and on other types of streets meeting the criteria set forth in the City of Colorado Springs Subdivision Policy Manual and Public Works Manual. Arterial roadway lighting for new developments will be completed as follows:

1) Colorado Springs Utilities shall design and construct the first phase of the project including all bases, breakaway (crash) bases, conduit, cable, intersection street lights and any required street lights to protect the integrity of the infrastructure during development.

2) The roadway developer shall pay the estimated costs (including labor, material, equipment and applicable overheads) of the trenching, conduit, junction boxes, wire and terminations prior to construction of the roadway and the installation of any street lights during this first phase of street light installations.

3) As a second phase when development so requires, Colorado Springs Utilities shall install the remaining street lights (Backlog) according to Colorado Springs Utilities policies and tariffs. The timing of the installation of the remaining street lights shall be at the sole discretion of Colorado Springs Utilities per the Service Level Agreement (SLA) with the City of Colorado Springs.

12.01.03 Enterprise-related Residential Roadway Lighting; New Development and Backlog

a) Enterprise-related residential roadway lighting for new developments will be completed as follows:

1) Colorado Springs Utilities shall design the electric distribution infrastructure to include all required intersection street lighting. Mid-block street lighting will be installed upon request of the developer. Colorado Springs Utilities shall install the residential street lights during construction of the underground electric distribution system for the new development.

2) The developer will fund the construction of all new residential subdivision street lights by paying a per-street light fee as set forth in the line extension (aid-to-construction) contract. The street light fees shall recover all reasonable costs, as determined by Colorado Springs Utilities, including labor, materials, equipment and applicable overheads necessary to complete the installations.

b) The installation of Enterprise-related residential roadway intersection street lighting in previously developed areas (Backlog) shall be at the discretion of Colorado Springs Utilities per the Service Level Agreement (SLA) with the City of Colorado Springs.

c) The installation of Enterprise-related residential roadway mid-block street lighting in previously developed areas (Backlog) shall be at the discretion of Colorado Springs Utilities per the SLA and will be administered through a petition process as follows:

1) The petition process will be administered by Colorado Springs Utilities Field Engineering.

2) When a request for a street light is received, Colorado Springs Utilities will determine if a street light is necessary, the specific location, the impact on neighboring properties and the type of street light to be installed. If it is determined that a street light or street lights are appropriate, a petition form will be sent to the requesting party. It is the responsibility of the requesting party to obtain signatures from the affected property owners. A majority of the affected property owners must sign the petition before any street lights are installed. An easement may be required by Colorado Springs Utilities for the installation of power for a street light. If an easement is required, then it must be granted prior to the

installation of the street light. If the requested easement is not granted, then the street light cannot be installed.

d) Streetlights on traffic signal poles:

1) All new and any retrofitted streetlight on traffic signal poles will be owned by City Traffic Engineering and the secondary load side equipment necessary such as; meter pedestal, J-boxes, conduit, wire, etc. will be furnished, installed, owned and maintained by the City. The wattage and type of light fixture will be chosen by City Traffic Engineering. City Traffic Engineering owned streetlights on traffic signal poles will be metered and the Point of Common Coupling (P.C.C.) will be at the meter pedestal as with any other commercial customer. City Traffic Engineering owned streetlights on traffic signal poles will be identified by the lack of a Utilities pole number identification sticker (LID) on the pole and lack of a lamp wattage sticker on the luminaries.

(a) Requests for new streetlights on traffic signal poles will be submitted by Traffic Engineering by contacting North Field Engineering and submitting a Load Data Form for the new metered service.

(b) Requests for retrofitted streetlights on traffic signal poles will be submitted by Traffic Engineering by contacting North Field Engineering and submitting the "Street Light on Traffic Signal Poles" packet. This packet includes a Load Data Form (for the new metered service) and a Site Plan with Light Request worksheet with the number and location of the existing Utilities owned streetlights on traffic signal poles that are to be removed (so that these streetlights will be removed from the list of non-metered streetlights for billing purposes).

2) Existing Utilities owned streetlights on traffic signal poles have been installed without an electric meter and are maintained by Utilities. The wattage and type of light will be limited to the available fixtures offered in Colorado Springs Utilities Distribution Construction Standards. Utilities owned streetlights on traffic signal poles will be identified by the presence of a Utilities pole number identification sticker (LID) on the pole and the presence of a lamp wattage sticker on the luminaries. All existing Utilities owned streetlights on traffic signal poles and any secondary load side equipment necessary such as; J-boxes, conduit, and wire are owned and maintained by Utilities. Wiring feeds are to be independent of the wiring feeds for the traffic signal pole. See "Streetlight and Traffic Signal Installation for Utility Owned Streetlight" standard 17-13 in Appendix-F.

12.01.04 Contract Service – Street Lighting Rate Schedule Street Lights

a) Non Enterprise-related street lighting within the authorized service territory of Colorado Springs Utilities is provided under Colorado Springs Utilities Electric Rate Schedules, Contract Service- Street Lighting. The Non Enterprise lighting process is used for:

1) All private roads within the Colorado Springs city limits,

2) All public and private roads outside of Colorado Springs city limits within the Electric certificated area.

Some entities, such as the City of Manitou Springs, the Cherokee Metropolitan District, and the Fountain Valley Ranch Homeowners Association, have special authority to request

roadway street lighting within the authorized service territory of Utilities. A list of the current entities is in the Contact & Phone section of this publication.
Where no such authorized entity exists, individuals or land developers may request roadway street lighting within the authorized service territory of Colorado Springs Utilities.

Contract Service- Street Lighting for public roadways or private streets will be provided under the terms and conditions set forth in Colorado Springs Utilities tariffs.

b) Requests for Contract Service- Street Lighting roadway lights should be submitted to Colorado Springs Utilities Field Engineering. Each request will be handled on an individual basis. Customers requesting such roadway lighting service will be responsible for the following:

1) The total installed capital costs, which will be paid on a Time-and-Material Contract prior to construction start.

2) Execution of an outdoor lighting contract, as developed by Colorado Springs Utilities, for roadway lighting service for a minimum of five years under the terms and rates contained in Colorado Springs Utilities Contract Service- Street Lighting rate schedule. Contact Colorado Springs Utilities Field Engineering to discuss options, which may allow multiple customers to be billed monthly for the O&M costs.

3) Initiation of a roadway light billing account with Colorado Springs Utilities Customer Care Division.

c) The wattage and type of light will be determined by mutual agreement between the Customer and Colorado Springs Utilities, but will be limited to the available fixtures offered in Colorado Springs Utilities Distribution Construction Standards.

d) The Customer will be responsible for reporting any malfunctions of the light. Colorado Springs Utilities will be responsible for repairing and maintaining the light.

e) The term of this Agreement shall be a minimum of five (5) years. After which the customer may discontinue outdoor lighting service without paying removal costs. If the light is removed prior to the end of the 5 year term, the costs of removal will be charged on a (T&M) Time-and-Material basis.

f) If the monthly charges for the roadway light are not paid, Colorado Springs Utilities Customer Care Division will notify the Customer of nonpayment. If the account remains unpaid or is not transferred to a new Customer within 30 days, then Colorado Springs Utilities will remove the light and bill the Customer in accordance with Section 12.01.04.a.4.

12.01.05 Enterprise-related Street Lighting Exemption Policy

Colorado Springs Utilities will consider requests to limit the placement of street lights on residential and minor collector streets within the City of Colorado Springs, such street lights being a part of the Colorado Springs Utilities Street Lighting Enterprise. There are two categories of exemption available to previously developed areas, but any such exemption will only apply

where there are no identifiable public safety issues, either existing or in the future, that requires street lighting.

12.01.05.A Category 1 Exemption

The Category 1 Exemption process allows an area to be exempt from roadway intersection[1] street lights, but individual residents may request additional street lights in the future. The process for a Category 1 Exemption is as follows:

a) A homeowners association (HOA) must submit a letter to Colorado Springs Utilities Field Engineering requesting a Category 1 Exemption specifying that street lighting service is not desired within the boundaries of the HOA.

b) Upon receipt of the letter, Colorado Springs Utilities will consult with the City of Colorado Springs Traffic Engineering, Police and Fire departments to identify any public safety issues that require street lights. Colorado Springs Utilities reserves the right to condition any street light exemption request. Such conditions may be for reasons of public safety, which may necessitate leaving existing street lights in place or which may require installing new street lights at anytime in the future at Colorado Springs Utilities expense if a public safety need is identified at that future date. If public safety issues are discovered, then Colorado Springs Utilities shall communicate these to the HOA. Upon completion of the review, Colorado Springs Utilities will send a letter to the HOA confirming that the area does or does not qualify for a Category 1 Exemption and any conditions that Colorado Springs Utilities determines must be placed on the exemption.

c) If residents within an area that has qualified for a Category 1 Exemption want intersection or mid-block street lights installed in the future, then the requestor shall contact Colorado Springs Utilities Field Engineering to initiate a small area petition process. Colorado Springs Utilities Field Engineering will review the location of the proposed light and will prepare the petition, designate the affected property owners and send a letter to the requestor(s) with the list of affected property owners and the petition. The requestor(s) are responsible for obtaining the necessary signatures. A minimum of 67 percent (two out of three) of the property owners within a 100 foot radius of the location of the proposed light must approve the petition. If a property is under joint ownership, then all property owners for a parcel must sign the petition. Each parcel counts as one vote on the petition. All signatures must be obtained within a 60 day period starting from the date of the Colorado Springs Utilities letter to the requestor(s). Upon receipt of an approved petition, Colorado Springs Utilities Field Engineering will proceed with the installation of the street light. The cost of the installation will be paid by Colorado Springs Utilities.

d) If residents request the removal of a street light, then a small area petition is required and the requestors shall pay for the costs of removal. The cost of any reinstallation of a street light shall be borne by the requestors.

[1] Intersections are the area in which two or more legally designated streets or rights of way converge. The Code of the City of Colorado Springs §10.1.202 defines intersections as: "[t]he area embraced within the prolongation of lateral curb lines or, if none, then the lateral boundary lines of two or more streets or highways that join one another at an angle, whether or not one street or highway crosses another." Intersection may be further defined by an amended version of the City Code.

12.01.05.B Category 2 Exemption

The Category 2 Exemption process allows an area to be excluded from roadway intersection and mid-block lighting and additionally eliminates the ability of individual residents to request additional street lights in the future, absent a bona fide public safety issue. The process to request a Category 2 Exemption is as follows:

a) An HOA must submit a letter to Colorado Springs Utilities Field Engineering requesting a Category 2 Exemption specifying that street lighting service is not desired within the boundaries of the HOA.

b) Once a request letter is received, Colorado Springs Utilities shall provide a large area petition to be used for the collection of signatures. The petition must be in the form provided by Colorado Springs Utilities. The requestor(s) are responsible for obtaining the necessary signatures. A minimum of 67 percent (two out of three) of the property owners within the petition boundary must sign the petition. If a property is under joint ownership, then all property owners for a parcel must sign the petition. Each parcel counts as one vote on the petition. All signatures must be obtained within a 120 day period starting from the date of Colorado Springs Utilities letter to the requestor(s). The costs to remove any existing streetlights are the responsibility of the residents.

c) The completed petition shall be submitted for review by Colorado Springs Utilities. Colorado Springs Utilities may take appropriate actions to verify the signatures. The petition may be rejected if the appropriate number of signatures cannot be verified or if the petition contains irregularities.

d) If the petition is accepted, then Colorado Springs Utilities will consult with the City of Colorado Springs Traffic Engineering, Police and Fire departments to identify any public safety issues that require street lights. Colorado Springs Utilities reserves the right to condition any street light exemption request for reasons of public safety which may necessitate leaving any existing street lights in place or installing new street lights at anytime in the future at Colorado Springs Utilities expense if any public safety need is identified. If public safety issues are discovered, then Colorado Springs Utilities shall communicate these to the HOA.

e) If residents want to be removed from the Category 2 Exemption, then a large area petition as specified within 12.01.05.B is required.

12.01.05.C Areas Where Homeowners Associations Do Not Exist

There are areas within the City of Colorado Springs where HOAs do not exist. If residents within these areas want to pursue an exemption from street lights, then there are two options:

a) The residents may elect to form an HOA or a similar association and then pursue an exemption as specified in 12.01.05.A or B.

b) The residents may elect to create a large area boundary or an exemption area of complete blocks or tracts, defined by subdivision boundaries, streets and/or alleys. Individual lots or small enclaves within these areas must be included within the defined area and may not

decline the exemption. The large area petition process as specified in 12.01.05.B must be used. Once a valid petition is accepted by Colorado Springs Utilities, a Category 1 or 2 Exemption may be elected.

12.01.05.D Exemptions for New Development

If a developer elects to limit the placement of street lights on residential and minor collector streets for new development, then the areas shall be designated accordingly during the land planning process. Depending upon the zoning, the exemption shall be defined as a condition of the development plan or the preliminary plat. Only a Category 2 Exemption is available for new development areas and the area shall be correspondingly defined. All of the conditions for the Category 2 Exemption shall apply. Colorado Springs Utilities reserves the right to condition the exemption for reasons of public safety. The conditions may include requiring street lights to be installed at designated areas at the time of development or installing new street lights in the future, if any public safety need is identified.

If the developer or residents want to change the exemption and add streetlights in the future after a Category 2 Exemption is applied, then the large area petition process as specified in 12.01.05.B must be used. Once a valid petition is accepted by Colorado Springs Utilities, the exemption shall be changed and the development plan or preliminary plat shall also be changed according to the current rules and procedures of the City of Colorado Springs Planning Department. The developer or residents shall be responsible for the installation costs of any future street lights within the previously defined exemption area.

12.02 Security Lighting; Contract Service- Street Lighting Rate Schedule

a) Colorado Springs Utilities will, under certain conditions, install and maintain lighting fixtures for the purpose of residential and small commercial Customer security lighting within the authorized service territory of Colorado Springs Utilities. Such lighting is not intended for large area or parking lot lighting and will not be designed with the intent to comply with Illuminating Engineering Society standards and guidelines for parking lot lighting, or El Paso County Land Development Code pertaining to illuminating parking areas and driveways. Security lights will be installed on private property, but cannot interfere with Enterprise-related roadway lighting or Contract Service – Street Lighting rate schedule roadway lighting as described in paragraph 12.01. A security light must be installed on an existing wood pole with secondary attached, and cannot create a safety hazard, i.e., clearances from overhead lines or vehicles. These lights will be installed in accordance with National Electrical Safety Code and Colorado Springs Utilities Distribution Construction Standards.

b) Requests for security lighting should be submitted to Colorado Springs Utilities Field Engineering. Each request will be handled on an individual basis. Customers requesting security lighting service will be responsible for the following:

1) The installed capital costs, which will be paid prior to construction start on a flat rate (T&M) Time-and-Material contract.

2) Execution of a security lighting contract, as developed by Colorado Springs Utilities, under the terms and rates contained in Colorado Springs Utilities Contract Service- Street Lighting rate schedule (SL2 rate).

3) Initiation of a security lighting billing account with Colorado Springs Utilities Customer Care Division.

4) If deemed necessary by Colorado Springs Utilities, written assurances must be obtained from the surrounding property owners that the installation of the security light will not adversely impact those property owners.

c) The wattage and type of light will be determined by mutual agreement between the Customer and Colorado Springs Utilities, but will be limited to the available fixtures offered in Colorado Springs Utilities Distribution Construction Standards.

d) The Customer will be responsible for reporting any malfunctions of the light. Colorado Springs Utilities will be responsible for repairing and maintaining the light.

e) If a Customer requests removal of the light, Colorado Springs Utilities will remove the light in a reasonable time. If customer wanted the lights re-installed, the process would start over as shown in paragraph b) above.

f) If the monthly charges for the security light are not paid, Utilities Customer Care Division will notify the Customer of nonpayment. If the account remains unpaid or is not transferred to a new Customer within 30 days, then Colorado Springs Utilities will remove the light.

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CHAPTER 13

Interconnection Requirements: Customer-Owned Generation or Energy Storage

13.01 Purpose:

a) The purpose of this chapter is to define Colorado Springs Utilities' technical requirements for generator interconnection to the Utilities distribution system. Utilities distributes power at 12.47 kV and 34.5 kV system voltages. The technical requirements are to ensure the safety of Utilities employees and the public, to protect Utilities equipment from damage, and to ensure the reliability of service to Utilities customers.

b) For purposes of this chapter, the term "generation" includes rotating and inverter-derived sources of generation, including emergency generators. These requirements will vary by mode of generator operation as explained below. In addition to the technical requirements identified in this chapter, other Utilities regulations, rules, and standards may also apply.

c) The interconnection of generation or energy storage that may back-feed into the Utilities downtown network system is not allowed.

d) The customer is strongly encouraged to engage with Utilities Engineering as early as possible to determine any known limitations on the amount of generation that can be installed at the customer's proposed location.

13.02 Generators Standards (Generators and Photovoltaic, PV):

a) Disconnecting Device Requirements:

1) Utilities requires that a disconnecting device with a visibly open means be provided, installed, and paid for by the customer to safely isolate the generator from the Utilities system.

2) The disconnecting device must be clearly labeled, readily accessible, and lockable by Utilities personnel.

3) The disconnecting device must be rated for the proper operating voltage, expected load current, and maximum available fault current.

4) For inverter-based applications, the disconnecting device must be on the AC (utility) side of the inverter.

b) Acceptance Testing:

1) Test results or equipment pre-certification shall be supplied by the customer that verify compliance with IEEE 1547.1.

2) The customer shall provide Utilities the opportunity to perform an inspection prior to interconnection to verify correct protective settings and wiring connections.

3) Acceptance testing of the protective schemes must be completed on all new or modified installations. The customer shall submit commissioning test procedures to Utilities Engineering at least seven (7) calendar days prior to energization. Utilities may require their representative be present to witness the generator's commissioning test procedures.

4) The customer shall provide Utilities Engineering the results of their commissioning test no later than thirty (30) calendar days from energization.

c) Telemetry Requirements:

1) This section only applies to customer-owned generation whose aggregate AC rating is 500 kW or greater. The customer shall install equipment for Utilities to monitor generation production. All time and materials associated with this work will be at the customer's expense.

a) A remote terminal unit (RTU), cabinet, and communication equipment.
b) Status Points: RTU status, generator breaker status.
c) Analog Points: generator output voltage, line currents.
d) Control Points: Generator kW and kVAR output, and other parameters/ setpoints may be required for control by Colorado Springs Utilities.

d) Metering Requirements:

1) Electric billing (net) meters with customer-owned generation shall be bi-directional.

2) Production meters are required for all sources of customer-owned generation intended for continuous parallel operation, except the following:

a) Non-renewable generation subject to the Telemetry Requirements in section 13.02 c)

b) AC-coupled combined battery/ inverter systems listed under UL 1741 with a continuous output capacity less than 10 kW per battery/inverter module.

3) Production meters shall be installed between the generator and the generator breaker.

4) In the case of an existing customer that is adding generation to their facility, a review of the wiring and current transformers may need to be performed to verify the ampacity ratings are sufficient for the size of the generator.

e) Meter Requirements:

1) Meters are required to meet standards for location and clearances consistent with Chapter 5, and Appendix D.

a) A minimum of three feet of clear space must be left in front of the meters.
b) Electric meters, CT cabinets, panels or any source of ignition will be located at least three feet radially from gas meter regulator vents.

2) Meters sockets must have a bypass per 5.05 g). Horn or lever bypass for residential systems below 320 Amp and lever bypass for commercial and systems rated 320 Amp.

3) The Billing meter and Production meter sockets must provide proper space for decals or placards and meet the requirement of CSU specifications 102- 4.

a) 200 Amp socket, Length:14-1/2", Width:11", Depth:4-1/8"
b) For a >100 amp and less than 200 Amp socket, use the dimensions for a 200 Amp socket. See section 3.5 on drawing 102-1.

4) Meter socket enclosure construction must comply with Chapter 5 requirements.

5) Meter locations require 2' minimum working clearance on each side of the meter socket and 6' 6" headroom clearance.

a) See Appendix D, Drawing 3A & 3B for additional details and requirements.

6) The Billing meter and Production meter socket enclosures shall be installed 5-6 feet above grade measured to the center of the meter face.

7) Remove the neutral grounding jumper on the Production meter socket (NEC 250).

8) The meter cover shall be of the one-piece ringless type.

9) Customer owned equipment shall not be physically attached to a meter socket enclosure.

10) Production meters must be wired with the line side (top) coming from the solar inverter or combiner and the generation side (bottom) toward utility.

11) Billing meters outside current standards require upgrading.
a) Move low can or pedestal meters to the building, provide location and trenching plans for Quality Control review.
b) Height of the meter moved within standards height, 60-72 inches from grade.
c) Billing meters that do not meet the size requirements listed above require updated to a new socket that meet the current standards.
d) Billing meters that are obstructed and do not have the required working clearances require the obstructions removed or relocated to within standards.

13.03 Generators:

a) Generators using Open-Transition Transfer:
Generators using Open-Transition Transfer (OTT) are defined as those that utilize a break-before-make switch or other effective means, which prevents parallel operation with, or back-feeding into, Utilities' system. The generator installation must meet all local, state, and national code requirements. No further coordination is required with Utilities on these applications.

b) Generators using Closed-Transition Transfer:
Generators using Closed-Transition Transfer (CTT), or make-before-break, must comply with Sections 13.02(a) through 13.02(e). CTT applications that parallel with the Utilities distribution system for a period of 100 milliseconds (6 cycles) or more must also comply with Section 13.04. All customers using a CTT scheme shall have a signed Operating Agreement with Utilities prior to energization.

1) Technical Review:
Utilities Engineering shall have the opportunity to evaluate impacts to normal operating voltage levels, circuit loading, responses to abnormal events, etc. All operating and protective relay settings shall be provided not less than sixty (60) calendar days prior to the scheduled date for first parallel operation.

2) Technical Requirements:
a) The customer is solely responsible for protecting their equipment in such a manner that faults, imbalances or other disturbances on Utilities' distribution system do not cause damage to the customer-owned generation.

b) The generator must not be a source of switching surges, voltage flicker, or other power quality anomalies to other Utilities customers during load paralleling or transferring. The voltage control and flicker requirements listed in Section 13.04 c) of this chapter must be satisfied.

c) The protection scheme shall be designed to prevent the generator from being connected to a de-energized Utilities circuit.

d) Backup protection schemes are required for those CTT applications less than 100 milliseconds. The protection and control scheme must be designed to trip an alternate customer breaker within 200 milliseconds of the intent to transfer if the transfer

scheme fails to separate the generator from the Utilities system. Utilities also reserves the right to require tripping of the customer's main circuit breaker if the customer's generator remains in parallel for a duration exceeding 500 milliseconds. The implementation of this system shall be reviewed and discussed with the customer on an individual basis due to the complexity and variances between customer systems.

e) The customer's transfer switch must be rated for the proper operating voltage, expected ampacity, and maximum available fault current.

3) Maintenance Requirements:

a) The customer shall maintain all equipment associated with the generator system per good electrical practices and per equipment manufacturer's recommendations.

b) The customer shall keep a written log and test records showing the periodic testing of such equipment. These records shall be available to Utilities thirty (30) calendar days upon request.

13.04 Generators Continuously Paralleled:

This section specifies the technical requirements for customer-owned generators intended to continuously operate in parallel with the Utilities system and those CTT applications of 100 milliseconds or more. These generators must also comply with Sections 13.03 b).

There may be locations on the Utilities distribution system where the introduction or addition of even small amounts of generation cannot be accomplished without substantial system upgrades.

a) Applicability:

1) These requirements apply to customer-owned generation used to offset energy usage and distributed generation exporting energy on a retail or wholesale basis.

a) Customer-owned generators and associated equipment must comply with all applicable national, state, and local construction codes and all operation and maintenance-related safety codes, such as the National Electrical Code (NEC), the National Electrical Safety Code (NESC), and the Occupational Safety and Health Administration (OSHA) regulations.

b) Generator interconnections are subject to applicable Federal or State Interconnection Rules and Regulations.

c) Other than where prohibited by regulation (e.g. Bidirectional Meter), the cost of any Utilities system upgrades necessary to accommodate the installation of the customer-owned generator shall be paid for by the customer.

2) These requirements apply to new generator interconnections as well as existing facilities being upgraded or expanded.

b) Relaying and Protection:

1) The customer is responsible for providing adequate protection to their facility under any distribution system operating condition. Conditions may include, but are not limited to:

a) Loss of a single phase of supply
b) Distribution system faults
c) Equipment failures
d) Abnormal voltage or frequency
e) Lightning and switching surges
f) Excessive harmonic current injection

g) Excessive negative sequence voltages
h) Separation from supply
i) Synchronizing generator to the distribution system
j) Re-synchronizing generator after electric restoration of the supply

2) Where relays are required to meet the generator protection requirements of this chapter and IEEE 1547, the relay(s) must trip the generator's primary interrupting device directly without relying on the operation of other equipment to affect the interruption.

3) The design of the isolation and fault protection shall be based upon a single failure philosophy, i.e., the failure of any single component (primarily relays or breaker failure protection) shall not render the protection inoperative. Utilities Engineering shall advise if the proposed protection scheme is adequate.

4) Utility grade relays, meeting the requirements of Section 13.04 b)5), shall be utilized to meet the requirements of Section 13.04 b)1) and IEEE 1547 for any of the following:
a) Any rotating machines rated 100 kW or larger.
b) Where multiple generators rated 250 kW or larger in aggregate are protected by a single interrupting device.

5) Utility grade relays must comply with the most current version of the following standards or its ANSI/IEC equivalent:
a) IEEE C37.90, "IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus"
b) IEEE C37.90.1, "IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus"
c) IEEE C37.90.2, "IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers"
d) IEEE C37.98, "IEEE Standard for Seismic Testing of Relays"
e) IEEE C37.2, "IEEE Standard for Electrical Power System Device Function Numbers, Acronyms, and Contact Designations"

6) The generator protection and controls must be designed to coordinate with the reclosing practices of Utilities line protective devices. The generator must cease to energize the Utilities circuit to which it is connected prior to automatic reclose of any of Utilities' automatic reclosing devices.

7) The generator shall cease to energize the Utilities distribution system for faults on the circuit to which it is connected. The generator shall not reconnect to the Utilities system until the Utilities system has been re-energized for a period of five minutes or more.

8) The generator protection and controls shall be designed to prevent the generator from being connected to a de-energized Utilities circuit. The generator must connect to the Utilities system through an interrupting device, which has adequate fault interruption, withstand capability, and adequate continuous current and voltage ratings in accordance with the latest IEEE C37 standards. Three-phase generators shall use an interrupting device that interrupts all three phases simultaneously. The tripping control of the circuit-interrupting device shall be powered independently of the utility AC source to permit operation upon loss of the Utilities supply.
a) Field-adjustable set points shall be protected against unauthorized adjustment.
b) Comply with IEEE 1547 recommended clearing times for under and overvoltage tripping thresholds as well as under and over frequency tripping thresholds for

abnormal system conditions. Clearing time is the time between the start of the abnormal condition and the generator ceasing to energize the utility system.

c) The generator protection and controls must be able to detect an island condition on one or more phases and disconnect all phases of the generator from the Utilities system within two seconds of the formation of an island on any phase.

c) Voltage Control & Flicker:

1) The customer-owned generator shall not cause an objectionable voltage flicker at the point of common coupling (PCC). Flicker is considered objectionable when it either causes a modulation of the light level of lamps sufficient to be irritating to humans, or causes equipment misoperation. The type of generation will be considered when determining the frequency of starts and stops.

2) The customer-owned generator must have adequate protection and controls to ensure the requirements for frequency, voltage, and phase angle, as described in IEEE 1547, are met prior to paralleling with the Utilities system.

3) The generator shall not be a source of excessive harmonic voltage or current distortion. Limits for harmonic distortion (including inductive telephone influence factors) are available in IEEE 519.

4) Utilities may require the installation of a power quality monitoring system to permit ongoing assessment of compliance with the aforementioned criteria. The monitoring system shall be installed at the customer's expense.

5) If high voltage, low voltage, or objectionable voltage flicker arises due to the operation, frequent tripping, and/or frequent starting and stopping of the generator, the customer shall be required to disconnect its generation equipment from the Utilities system until the problem has been resolved.

6) Normally, the generated voltage shall follow, not attempt to oppose or regulate, changes in the prevailing voltage level provided by Utilities at the PCC in accordance with IEEE 1547. All solar or generation projects with an inverter will be assessed for optional advanced inverter settings during the application process. These settings including Volt-VAR setpoints and if required will be communicated to the customer, installer, and other application stakeholders.

13.05 Generation with Inverter (PV) Applicable Standards:

a) Customer-owned generation shall comply with all applicable requirements from the most recent version of:

1) IEEE 1547, "Standard for Interconnecting Distributed Resources with Electric Power Systems"

2) IEEE 1547.1, "Standard Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems"

3) IEEE 1547.2, "Application Guide for IEEE Std. 1547, IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems"

4) IEEE 1547.3, "Guide for Monitoring, Information Exchange, and Control of Distributed Resources Interconnected with Electric Power Systems"

5) IEEE 519, "Recommended Practice and Requirements for Harmonic Control in Electric Power Systems"

b) Inverter based systems must demonstrate compliance with all requirements of the latest version of the UL1741/UL1741SA, "Standard for Inverters, Converters, Controllers and

Interconnection System Equipment for Use with Distributed Energy Resources". Photovoltaic modules must demonstrate compliance with all requirements of the latest version of UL 61730 North American and International Safety Standards for PV Modules. Energy Storage Systems and equipment must maintain compliance with Safety Standard UL 9540, which includes energy storage systems that includes any of the following:

1) Standalone to provide energy for local loads.

2) In parallel with an electric power system, electric utility grid, or able to perform multiple operational modes.

3) For use in utility-interactive applications in compliance with IEEE 1547 and IEEE 1547.1

4) Other applications intended to provide grid support functionality. Inverter based resources starting January 1, 2023 must comply with IEEE 1547-2018 default parameters listed below 1 through 5. Any deviation from these settings must be approved by Utilities.

a) Category II Voltage Shall Trip Default Settings (IEEE 1547-2018 Table 12)
   (1) Over voltage trip settings:
      (a) When applicable voltage exceeds an overvoltage threshold of 1.2 p.u. of nominal voltage, the DER must cease to energize the electric power system and trip within a clearing time of 0.16 seconds.
      (b) When applicable voltage exceeds overvoltage threshold of 1.1 p.u. of nominal voltage, the DER must cease to energize the electric power system and trip within a clearing time of 2.0 seconds.
   (2) Under voltage trip settings:
      (a) When applicable voltage drops under a threshold of 0.70 p.u. of nominal voltage, the DER must cease to energize the electric power system and trip within a clearing time of 10.0 seconds.
      (b) When applicable voltage drops under a threshold of 0.45 p.u. of nominal voltage, the DER must cease to energize the electric power system and trip within a clearing time of 0.16 seconds.

b) Frequency Shall Trip Default Settings (IEEE 1547-2018 Table 18), Settings are the same for Cat I/II/III
   (1) Over frequency trip settings:
      (a) When system frequency exceeds 62 Hz, the DER must cease to energize the electric power system and trip within 0.16 seconds
      (b) When system frequency exceeds 61.2 Hz, the DER must cease to energize the electric power system and trip within 300 seconds
   (2) Under frequency trip settings:
      (a) When system frequency drops below 58.5 Hz, the DER must cease to energize the electric power system and trip within 300 seconds
      (b) When system frequency drops below 56.5 Hz, the DER must cease to energize the electric power system and trip within 0.16 seconds

c) Category II Voltage Ride Through Settings (IEEE 1547-2018 Table 15)
   (1) Required performance during voltage disturbances:
      (a) When applicable voltage exceeds 1.2 p.u. of nominal voltage, The DER must cease to energize the electric power system and trip within a clearing time of 0.16 seconds. (per IEEE 1547-2018 Table 15 and Table 12)
      (b) When the voltage range is between 1.175 p.u. and 1.2 p.u., the DER should have continued operation for a minimum of 0.2 seconds
      (c) When the voltage range is between 1.15 p.u. and 1.175 p.u., the DER should have continued operation for a minimum of 0.5 seconds

(d) When the voltage range is between 1.10 p.u. and 1.15 p.u., the DER should have continued operation for a minimum of 1.0 seconds
(e) When the voltage range is between .88 p.u. and 1.10 p.u., the DER must operate continuously
(f) When the voltage range is between 0.65 and 0.88, the DER must have a ride through time equal to 3 seconds plus 8.7s times the value of per unit voltage minus 0.65 (see equation in IEEE 1547-2018 Table 15).
(g) When the voltage range is between .45 p.u. and 0.65 p.u., the DER should have continued operation for a minimum of 0.32 seconds
(h) When the voltage range is between 0.30 p.u. and 0.45 p.u., the DER should have continued operation for a minimum of 0.16 seconds
(i) When the voltage drops under 0.30 p.u., The DER must cease to energize the electric power system and trip within a clearing time of 0.16 seconds.

d) Frequency Ride Through Settings (IEEE 1547-2018 Table 19), Settings are the same for Cat I/II/III
(1) Required performance during frequency disturbances:
(a) When frequency exceeds 62 Hz there are no ride-through allowances – the DER must cease to energize the electric power system and trip within a clearing time of 0.16 seconds. (per IEEE 1547-2018 Table 18)
(b) When the frequency range is between 61.2 Hz and 61.8 Hz, the DER must have continued operation for minimum of 299 seconds
(c) When the frequency range is between 58.8 Hz and 61.2 Hz, the DER must operate continuously
(d) When the frequency range is between 57.0 Hz and 58.8 Hz, the DER must have continued operation for minimum of 299 seconds
(e) When the frequency is below 57.0 Hz, there are no ride-through requirements.

e) Category II Rate of Change Frequency Ride Through "ROCOF" (IEEE 1547-2018 Table 21)
(1) The DER must not trip for frequency changes occurring at a rate equal to or less than 2.0 Hz/second

5) May include balance of plant and other ancillary equipment of the system.

c) Equipment Requirements:

1) Qualifying inverters, PV modules, energy storage systems and batteries must be included in the California Energy Commission's Solar Equipment Lists found at: https://www.energy.ca.gov/programs-and-topics/topics/renewable-energy/solar-equipment-lists and are updated three times a month, usually (1st, 11th, and 21st).

d) Sizing Requirements:

1) Residential PV systems must meet the sizing specifications set out within the current tariff rate structure.

e) Customer Loads:

1) All Customer loads must be located on the utility side of the production meter.

f) Overhead services:

1) For overhead electric services, do not place any part of a roof mounted photovoltaic array within 3 feet minimum horizontal distance from the mast for utilities maintenance clearance (see Appendix D, Drawing 1 & Appendix F, Construction Standard 18-209 for typical overhead service drop clearances).

g) Tap Requirements:

1) Line side taps

a) A line side tap is defined as connection made to the conductors placed after the billing meter and before the main disconnecting means.

b) An overcurrent protection device, typically a fused disconnect, is required on a line side tap. (NEC 230) This fused disconnect is in addition to the AC disconnect for the photovoltaic system and must meet the requirements in section 13.05j. This disconnect is to protect the production meter and downstream equipment.

c) The fused disconnect must be placed before the production meter.

d) The fused disconnect needs to have a visible external lockable handle.

e) The line side tap may not be located within the meter enclosure. This space is restricted to utilities access and remains locked and tagged.

f) The tap must be installed per NEC Article 230 requirements.

2) Load side taps

a) A load side tap is defined as a connection made after the customer's main disconnecting means. Typically at the main service panel.

b) A load side tap shall be fed from a breaker in an electrical panel.

h) Labeling:

1) Installer to provide a small "Warning – Distributed Generation Backfeed Possible" warning label on the outside of the billing meter socket enclosure. Warning label shall follow NFPA 70-2020 and ANSI Z535.1,3,4-1998 or latest revisions.

i) Clearance:

1) Electric meter and photovoltaic equipment have clearance requirements from doors and windows such that the door or window can be operated without obstruction.

2) A minimum of 3 feet clear space must be left in front of all photovoltaic system equipment.

3) Meters, cabinets, panels or any source of ignition will be located at least 3 feet radially from gas meter regulator vents.

4) See section 5.02 Appendix F, Construction Standard 19-8 for additional installation clearances.

j) AC Disconnect requirements:

1) An AC disconnect is required between the production meter and the inverter or combiner.

2) An AC disconnect that is accessible and can be readily operated to isolate any potential back-feed to Utilities electric service.

3) The AC disconnect must be installed in a visible location on the building exterior within 10' and within line of sight to the production and billing meter except when approved by Quality Control variance. Equipment split around a corner does not meet this requirement.

4) All disconnects shall be installed 5'-6' above grade.

5) The AC disconnect must have a visible external lockable handle.

6) The AC disconnect must meet the requirements of Chapter 13.02a.

7) Detached solar arrays installed on an external building remote from the main panel or free standing require a disconnect at the main panel and an additional disconnect at the array location.

13.06 Energy Storage:

a) Battery systems or other energy storage devices that may back-feed power into the Utilities electric system shall meet the applicable requirements as shown for generators in section 13.02, 13.03, 13.04 or 13.05, for the type of connection that applies.

13.07 Photovoltaic (PV) Systems With Battery Storage:

a) All requirements for a Typical photovoltaic installation in section 13.01, 13.02, 13.05, and 13.06 apply unless noted in this section.

b) Utilities allows battery installations meeting these requirements.

1) The system will be open transition in the event of a loss of utility power, as defined in 13.03.

2) The system may be able to isolate and form a single customer "microgrid" forming with the photovoltaic panels, batteries, and customer loads.

3) This system will not be able to backfeed the utility grid with the loss of utility power.

4) The customer loads can be a whole house backup or a protected loads panel, provided it complies with one of the approved configurations in the drawings that follow.

c) Batteries:

1) Batteries must have a visible disconnect. The disconnect can be integral to the ESS (energy storage system) if it meets NEC 706.15 requirements, as well as those listed in 13.05.

2) Batteries on the customer generation side of the production meter may charge only from the photovoltaic system. This ensures accurate metering of production.

d) Protected Loads:

1) All customer loads (including protected loads) must be normally connected on the utility side of the production meter.

13.08 Meter Installations at Primary Metered Generation Sites 150 kW and Above:

a) General:

1) Any generation site that is equal to 150 kW and greater, but less than 500kW in size requires MV90 data for settlements and an Aclara KV2c meter is required. Any generation site equal to or greater than 500 kW in size requires both MV90 data and real-time data interface to the utility, i.e. SCADA, via an SEL-735 meter.

b) Equipment Requirements for sites equal or greater than 500 kW:

1) The required meter shall be the SEL-735, which provides MV90 and SCADA data. (See Appendix E – Material Specification 193-SPP-SCA for list of required data points)

2) The meter will be installed in a SCADA enclosure with a swing out panel kit. (See Appendix E - Material Specification 193-SPP-SCA)

3) If the site includes solar or wind generation, a weather station and/or equivalent sensors are required (preferably located at the geographic mid-point of the renewable generation site) to provide Utilities with relevant weather conditions that impact performance/generation at the site. The customer must provide conduits and wiring from the meteorological station to the customer's RTU and from the customer's RTU to Utilities' SCADA enclosure. (See Appendix E - Material Specification 193-SPP-SCA for list of required weather data points)

4) If the generation site is 500kW or larger, “Breaker Status” and “Load Switch Status” points are to be brought back via the customer’s plant RTU. The customer is to install 52a contacts in their breaker and hardwire into the customer owned RTU. Customer is to send soft points to Utility’s SCADA system. The customer is to install 89a contacts in their load switch and hardwire into the customer owned RTU. Customer is to send soft points to Colorado Springs Utilities’ SCADA system.
5) If Colorado Springs Utility fiber network is not installed at the site, a SEL-3061 Cellular Router is required for communications and must be powered from the DC power supply. Note – if using the SEL-3061 router, site must meet Utilities’ cellular network strength requirements

c) Installation Requirements for sites eqaul to or greather than 500 kW (See Appendix E – Material Specification 193-SPP-SCA for full parts list and design drawings)

This section details the responsibilities of Coloraod Springs Utilities and the Customer; first describing the ownership of the installation steps, followed by the financial responsibility of each party in regards to installation.

1) Installation
   a) Colorado Springs Utilities Meter Shop shall install CTs and PTs in the specified enclosure, with a 13-terminal meter socket mounted on the side, and perform wiring in the shop.
   b) If the system is 600 amps the customer shall prepare the site where the 6’x12’ vault will be installed for the CT/PT enclosure. If the system is 200 amps, customer shall prepare the site where concrete pad will be installed for the PT/CT enclosure.
   c) Customer shall install primary conduit and primary wire with all appropriate connections to the vault site or concrete pad, dig a pit for the vault (if applicable), request and pass inspections, and call Colorado Springs Utilities to schedule the delivery of the 6’x12’ vault or concrete pad.
   d) Colorado Springs Utilites shall install the 6’x12’ vault or concrete pad.
   e) Colorado Springs Utilities shall install the CT/PT padmount enclosure on the 6’x12’ vault or concrete pad after the CTs, PTs, 13-terminal meter socket, and wiring is complete in the shop and after the vault or concrete pad is installed.
   f) Customer shall install the Unistrut structure, per Utilities’ standards, in the field close to the CT/PT enclosure.
   g) Customer shall install weather station and/or other devices to provide the required meteorological data points if applicable (see 13.08b3). This is to tie into the customer’s RTU.
   h) Colorado Springs Utilities or their contractor shall pre-build the SCADA enclosure by installing a power supply, radio, SEL-735 meter and test switch prior to installing enclosure in field.
   i) Customer shall coordinate with Colorado Springs Utilites to pick up SCADA cabinet and install the SCADA cabinet on customer installed Unistrut structure in the field.
   j) Customer shall install a 2” riser with a 2” LB conduit body and a weather head for the radio antenna. (See Appendix E – Material Specification 193-SPP-SCA)
   k) Colorado Springs Utilities will install a radio antenna, cellular antena and all associated wiring in the enclosure.
   l) Customer shall install conduit from the 13 terminal meter socket, mounted on the CT/PT enclosure, to the SCADA enclosure, and from the single phase 120/240 V transformer to the SCADA enclosure. All conduit must be rigid 1.5 inch (minimum) with a maximum of three 90 degree bends (a total of 270 degrees)..

m) Customer to pull secondary 10 gauge wire from single phase 120/240 V transformer to SCADA enclosure to provide 120V to the power distribution DIN rail. Customer to terminate the 10 gauge wire inside single phase 120/240V transformer. Colorado Springs Utilities to terminate inside SCADA enclosure.
n) Colorado Springs Utilities shall pull control wire from the 13-terminal meter socket test switch to the test switch inside the SCADA enclosure and terminate at both ends.
o) Customer shall install conduit and multimode fiber from the customer's electric controls to Utilities' SCADA enclosure.
p) Colorado Springs Utilities shall tie in multimode fiber from customer's electric controls to Utilities' media convertor in the SCADA enclosure. Utilities shall perform all other wiring for telemetry.
q) Customer shall prep concrete pad site, install pad and 120/240V single-phase padmount transformer to supply 120V to the SCADA cabinet and meter.Transformer is to be fed from the same primary circuit that the SCADA cabinet and meter are being fed from.

2) The customer is responsible for paying and providing:
a) Unistrut structure and 2" riser for radio antenna.
b) Weather station and/or other devices for meteorological data points (as required)
c) 52a and 89a contacts to provide breaker and load switch status points
d) Conduit and multimode fiber from the customer's controls to Utilities' SCADA enclosure
e) Conduit and wiring from single-phase 120/240 V transformer to the SCADA enclosure
f) Pit for 6'x12' vault or preparing the site for concrete pad, installing primary conduit and primary wire with all appropriate connections, scheduling and passing inspections, and scheduling the vault or concrete pad installation with Colorado Springs Utilities
g) Conduit from 13-terminal meter socket, mounted on CT/PT enclosure, to SCADA enclosure
h) A 120/240V single-phase tranformer pad meeting Utilities' and regional building department's requirements, including proper compaction and correct final grade.
i) A 120/240 V single-phase padmount transformer and all primary work involved.

3) The following items will be provided by the Utility, and paid for by the Customer:
a) All items required for the SCADA and metering enclosure (See Appendix E – Material Specification 193-SPP-SCA for full list and part specifications) including
b) Labor costs incurred by Utilities due to the Utilities owned tasks listed above, including enclosure assembly and wiring, inspections, vault or concrete pad and enclosure installations, and other wiring

d) Electric Design Information to be provided to Colorado Springs Utilities (to be provided one time and subsequently if there is a change)

1) Contact information - 24x7 contact information
a) Generation Owner
b) Generation operator

2) Geographical Data
a) Coordinates of the corners of the generation site including, but not limited to, the northwestern, northeastern, southwestern, and southeastern locations, in order to properly identify the exact footprint and area of the site

b) One set of latitude and longitude coordinates for generation site mid-point
   (1) Latitude – Latitude of the resource location, including the mid-point and four corners of the generation site, submitted as degrees in decimal form rounded to four digits
   (2) Longitude – Longitude of the resource location, including the mid-point and four corners of the generation site, submitted as degrees in decimal form rounded to four digits
c) One set of latitude and longitude coordinates for meteorological collection device station (if required per generation type)
   (1) Latitude – Latitude of the meteorological station submitted as degrees in decimal form rounded to four digits
   (2) Longitude – Longitude of the meteorological station submitted as degrees in decimal form rounded to four digits

3) General Generation Resource Data (for all generation types)
a) Manufacturer - Manufacturer of the generation technology.
b) Model - Model of the generation devices. Provide any prefixes and suffixes if available

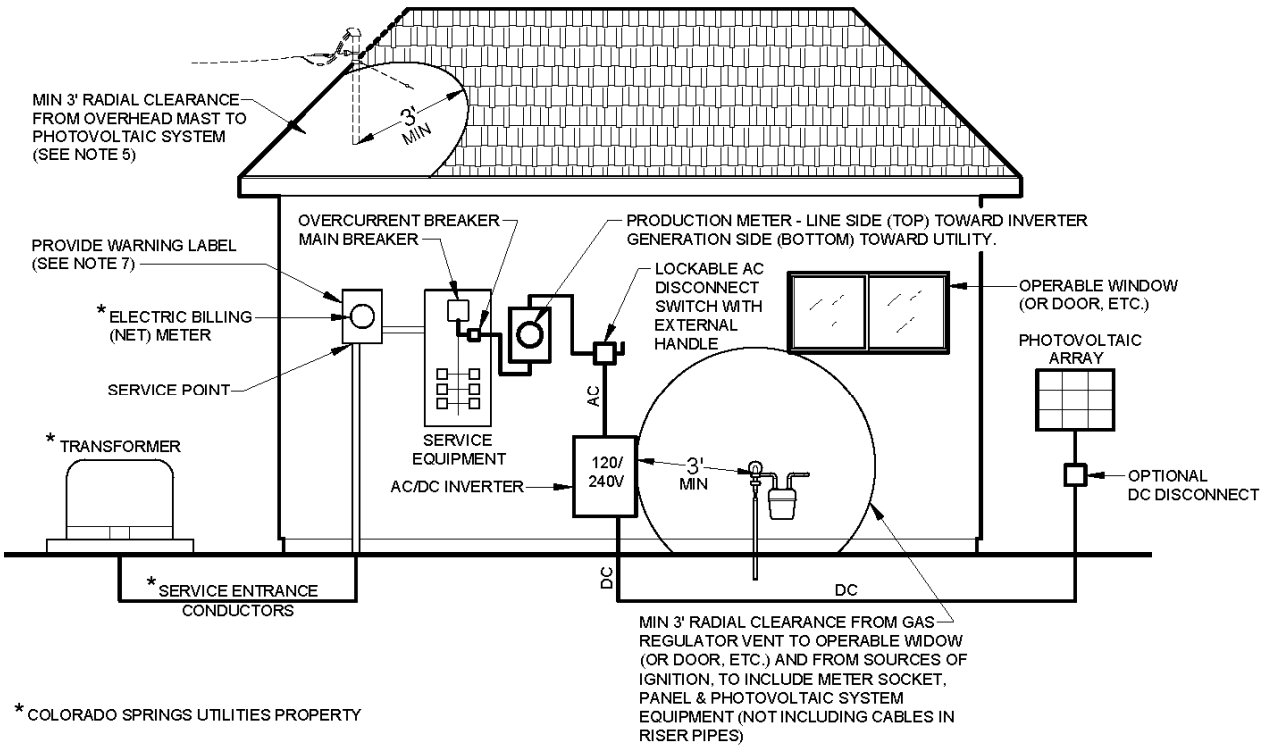
4) Solar Powered Generation Resource Data (for solar generation sites only)
a) Generation Devices – The number of panels, mirrors, or thermal cells at the site
b) Capacity – The nameplate capacity of each unit; both AC and DC capacity
c) Degradation Factor – Yearly degradation factor percentage
d) Temperature Coefficient – Percent over degrees Celsius
e) Tilt – Altitude angle or angle range for units
f) Azimuth Angle – Azimuth angle or angle range for units (alignment due south)
g) Height – Elevation of panels above surface level
h) Inverter Technology – Centralized inverters, string inverters, micro inverters and/or maximum power point trackers.
i) Tracking data (only if a tracking system is equipped).
   (1) Type – Single or dual-axis tracking
   (2) Manufacturer – Manufacturer of the tracker
   (3) Model – Model of the tracker

5) Battery Generation Resource Data (for battery generation sites only)
a) Devices – the number of battery cells
b) Capacity – The nameplate capacity of each unit; both AC and DC capacity
c) Degradation Factor – Yearly degradation factor percentage
d) Temperature Coefficient – Percent over degrees Celsius
e) Power Conversion System (PCS) information

The following section provides drawings for site-specific installation requirements.

a) Drawing 13.1 - Typical Single-Phase Photovoltaic Installation
b) Typical Connection Diagram Drawings.
c) Drawing 13.2 - Typical Three-Phase Customer-Owned Generation Installation

DRAWING 13.1 - TYPICAL SINGLE-PHASE PHOTOVOLTAIC INSTALLATION



GENERAL NOTES:

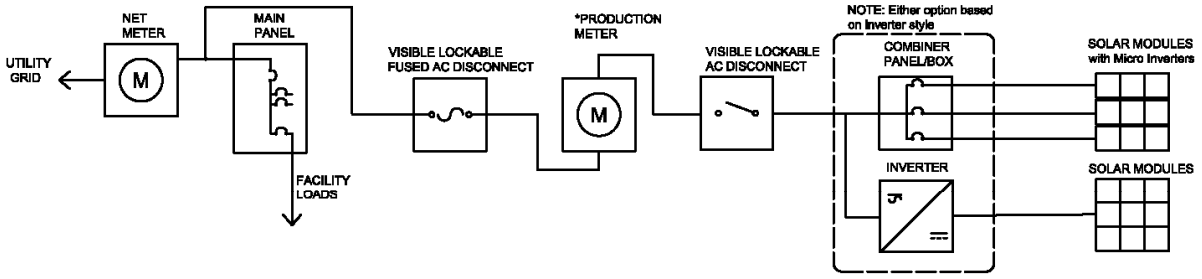
1. The AC disconnect switch shall be mounted in a visible location on the building exterior, within 10' and line of sight of the production and billing meter, except when approved by a Utilities variance. The AC disconnect switch shall have an external lockable disconnect handle. The AC disconnect shall be installed on the Utility side of any potential backfeed, such as batteries, solar systems, gas or water powered generators, etc. The AC disconnect shall meet the requirements of Chapter 13.03c.
2. Residential PV systems must meet the sizing specifications set out within the current tariff rate structures.
3. Batteries on the customer generation side of the production meter may charge only from the photovoltaic system.
4. All customer loads must be located on the utility side of the production meter.
5. For overhead electric services, do not place any part of a roof-mounted photovoltaic array within 3' minimum horizontal distance from the mast for utility maintenance clearance (see Appendix D, Drawing 1 & Appendix F, Construction Standard 18-209 for typical overhead service drop clearances).
6. Billing meter, Production meter, and disconnect switch shall be installed 5'-6' above grade. Remove the neutral grounding jumper on the Production meter socket (NEC 250).
7. Installer to provide a small "Warning - Distributed Generation Backfeed Possible" warning label on the outside of the meter socket. Warning label shall follow NFPA 70-2020 and ANSI Z535.1,3,4-1998 or latest revisions.
8. Electric meter & photovoltaic equipment have no clearance requirements from doors or windows.
9. See Appendix F, Construction Standard 19-8 for additional installation clearances.

INSPECTION NOTES:

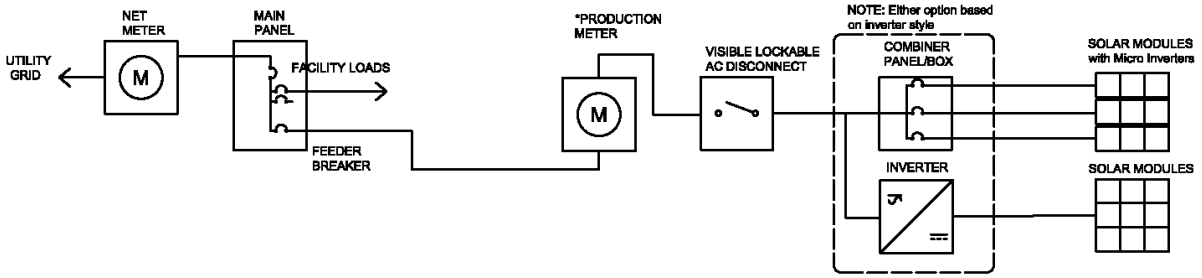
1. Customer to ensure proper wiring configuration for either breaker or line-side methods of interconnection. Line-side tap requires a fused disconnect between the breaker panel and the production meter.
2. Customer to supply proper approved equipment:
   a. From 100A up to 200A production meter socket horn bypass or lever bypass with proper space for decals and placards.
   b. Approved fused disconnect for line-side tap.
   c. Approved disconnect switch in all cases.
3. Customer will commission, program and leave the system energized prior to the meter installation to verify system production at time of meter installation and to verify back-feed protection in a timely manner. AC Shutoff should be in the disconnected, OFF, position.
4. Depending on the system design and location of Customer-owned equipment, Customer may be required to provide access for safe and proper testing.

Note: Each diagram provides a guidance to a configuration in principle and intent and is not considered a design service.

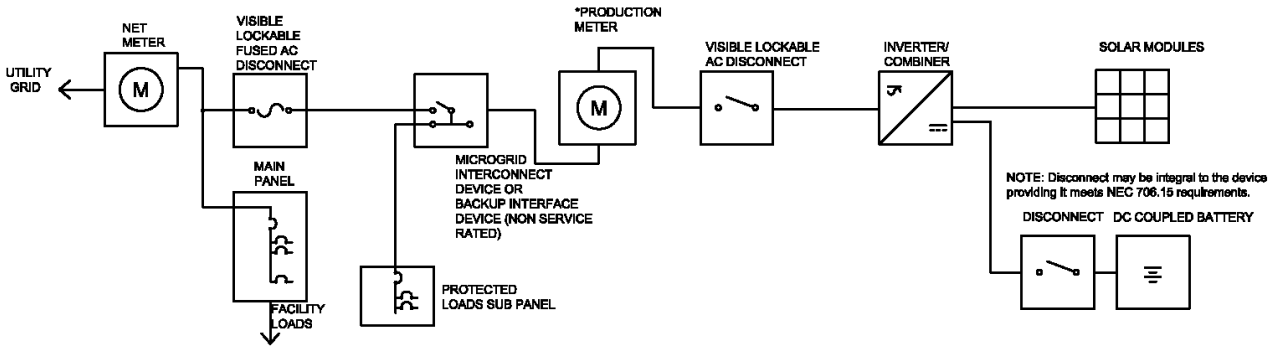
1) LINE SIDE TAP - TYPICAL PV



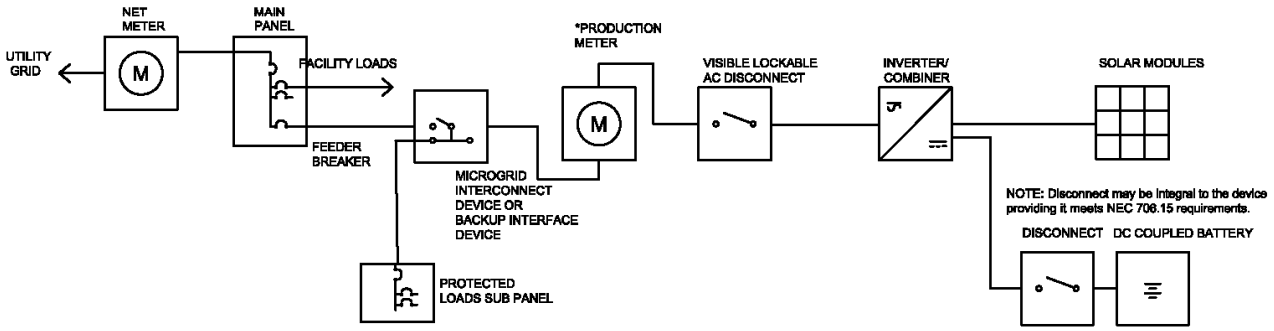
2) LOAD SIDE TAP - TYPICAL PV



3) LINE SIDE TAP - PV + BATTERY (MICROGRID)

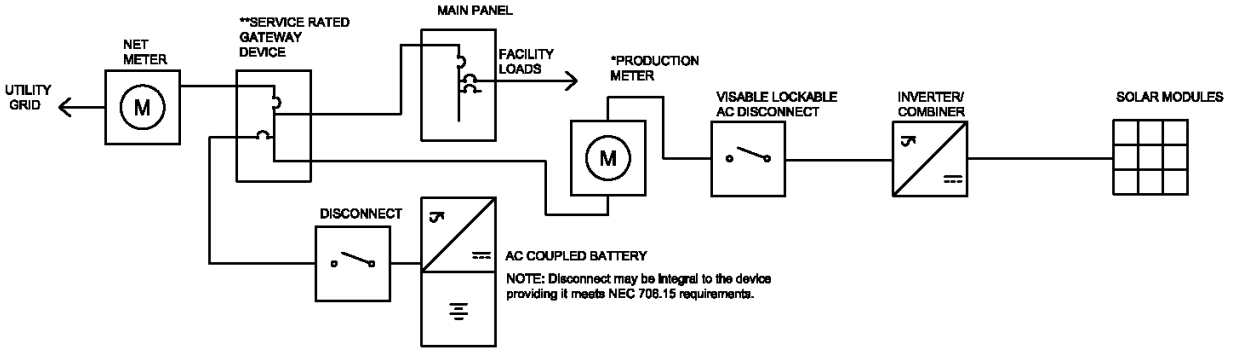


4) LOAD SIDE TAP - PV + BATTERY (MICROGRID)

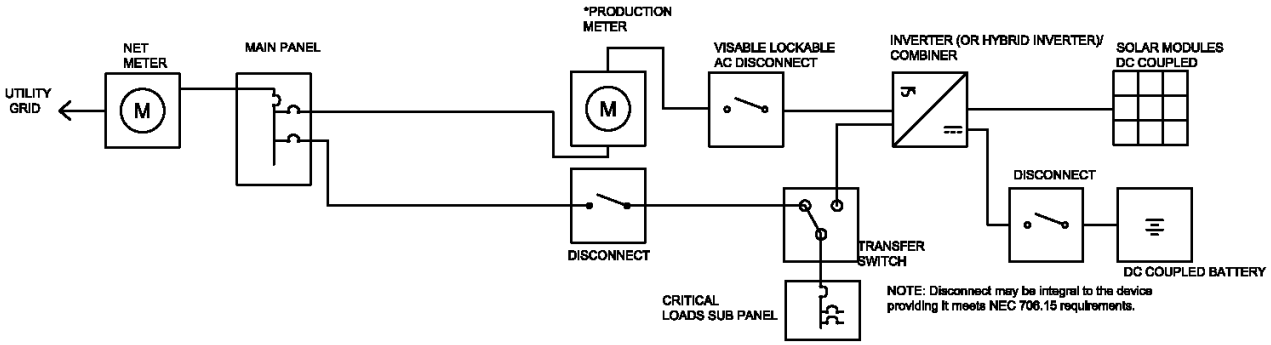


* The solar production meter socket will be wired with the line side / production of the panels into the top of the meter. The utility grid side will be wired to the bottom of the meter.

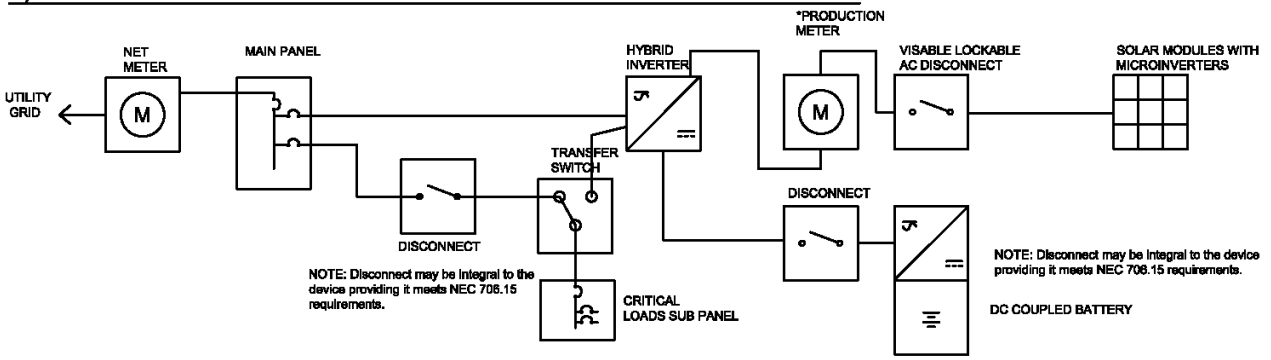
5) LINE SIDE TAP - GATEWAY TYPE PV + BATTERY



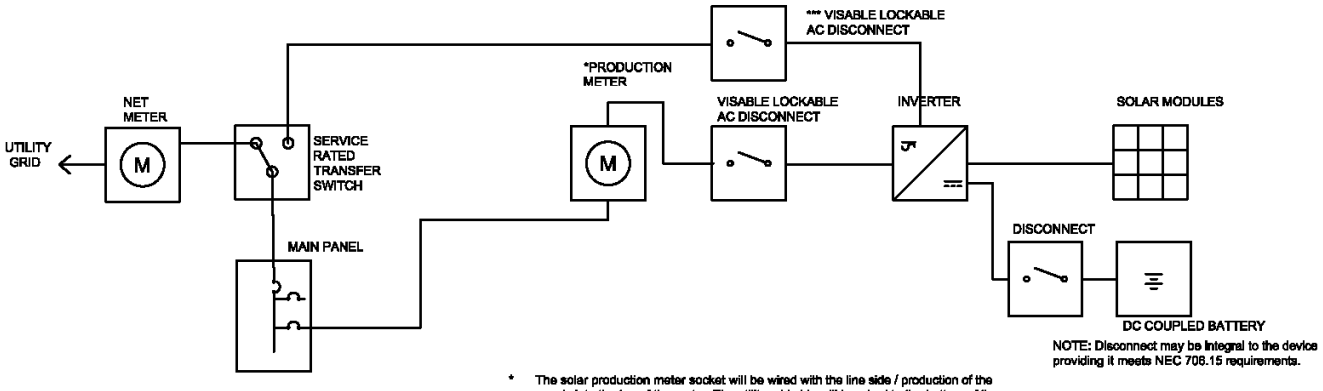
6) LOAD SIDE TAP - TRANSFER SWITCH - DC COUPLED PV + BATTERY



7) LOAD SIDE TAP - TRANSFER SWITCH - AC COUPLED PV + BATTERY



8) LOAD SIDE TAP - TRANSFER SWITCH - PV + BATTERY

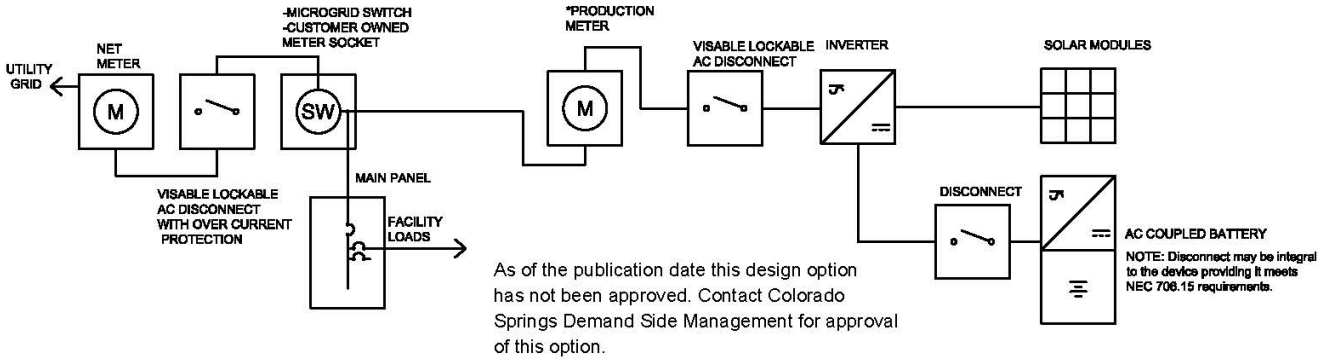


* The solar production meter socket will be wired with the line side / production of the panels into the top of the meter. The utility grid side will be wired to the bottom of the meter.

** Where multiple batteries and disconnects are required, a single fused disconnect may instead be placed in between the Net Meter and the Gateway Device. Where the gateway is not service rated a fused disconnect is required.

*** This will cause a reduction in the RECs recorded at the production meter during utility outages.

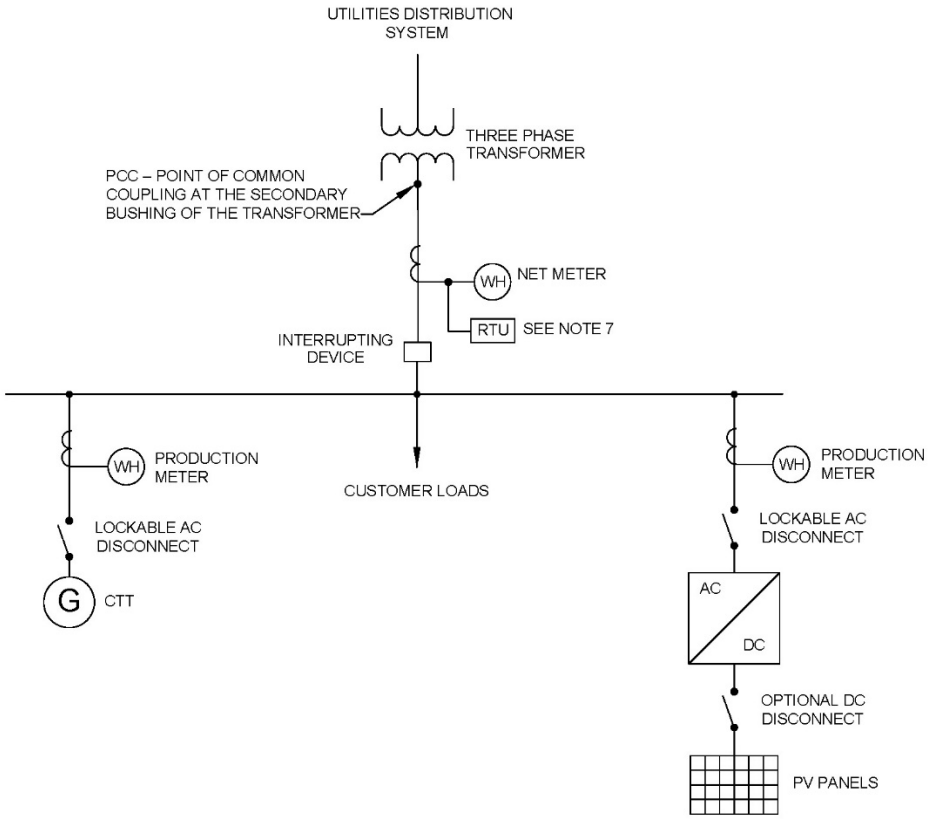
9) LINE SIDE TAP - MICROGRID FORMING SWITCH ON CUSTOMER OWNED METER SOCKET + PV + BATTERY



As of the publication date this design option has not been approved. Contact Colorado Springs Demand Side Management for approval of this option.

* The solar production meter socket will be wired with the line side / production of the solar panels into the top of the meter. The utility grid side will be wired to the bottom of the meter.

DRAWING 13.2 - TYPICAL THREE-PHASE CUSTOMER-OWNED GENERATION INSTALLATION



NOTES:

1. All CT metering to be designed and installed per Colorado Springs Utilities Electric Line Extension and Service Standards, current edition.

2. The lockable AC disconnect switch shall be mounted in a visible location on the building exterior, adjacent to the billing meter. The lockable AC disconnect switch shall have an External Disconnect Handle.

3. For overhead electric services, do not place any part of a roof-mounted photovoltaic array within 3' minimum horizontal distance from the mast for utility maintenance clearance (see Appendix D, Drawing 1 & Appendix F, Construction Standard 18-209 for typical overhead service drop clearances).

4. Meter and disconnect switch shall be installed 5'-6' above grade.

5. Install large "Distributed Generation Backfeed Possible" warning label (Item #100-130-505) on the outside of the transformer tank. Install small version of this warning label (Item #100-130-506) on the outside of the meter socket. Install cable wrap version of this warning label (Item #100-130-507) adjacent to the address label at secondary connectors to clearly identify each service entrance conductor involved with the photovoltaic system.

6. Customer or authorized representative must be present at time of inspection to operate the photovoltaic system.

7. Customer-owned generation whose aggregate AC rating is 500 kW or greater will require telemetry monitoring.

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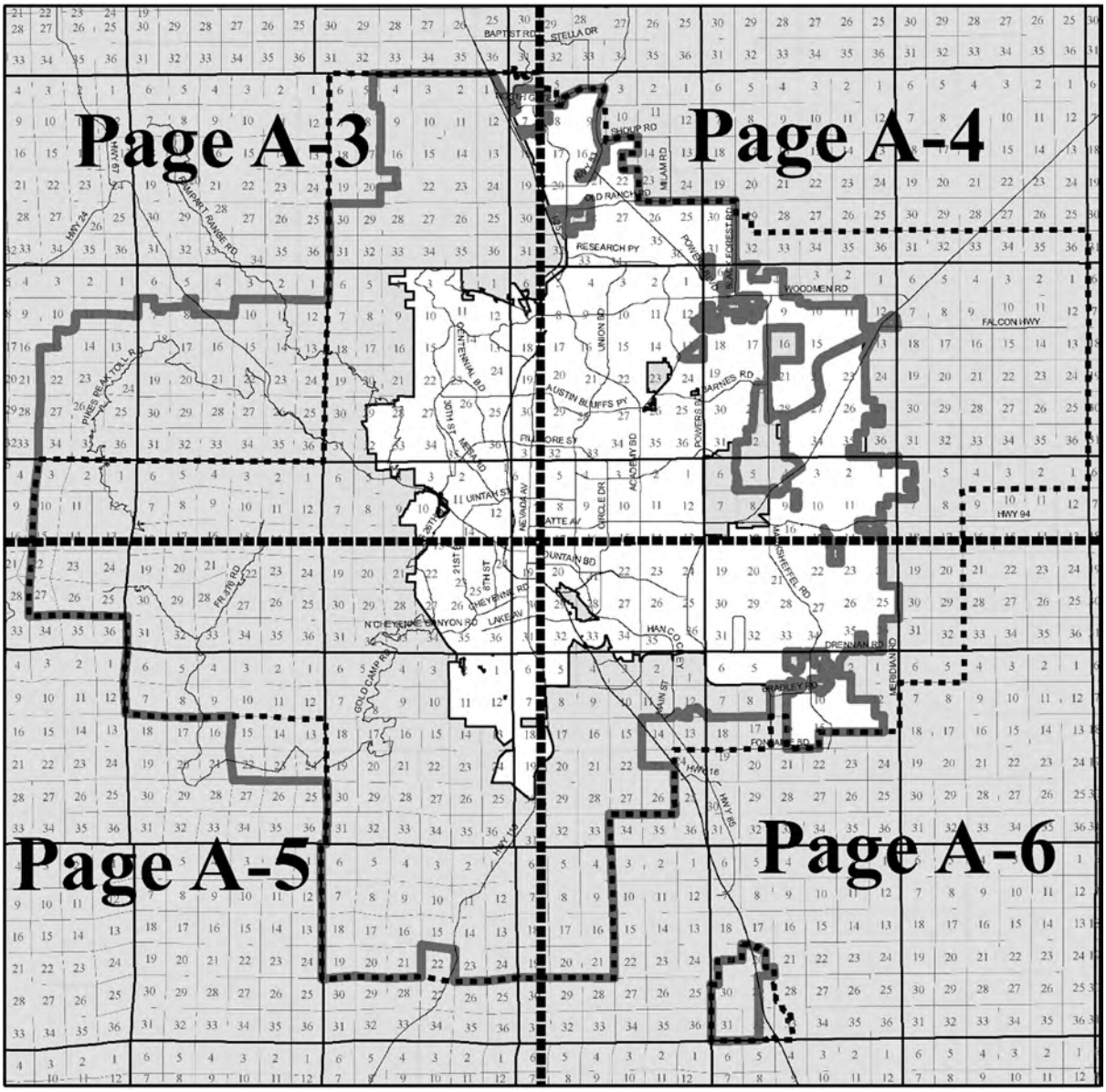
Appendix A
Colorado Springs Utilities Service Area Maps

Appendix A
Colorado Springs Utilities Service Area Boundaries

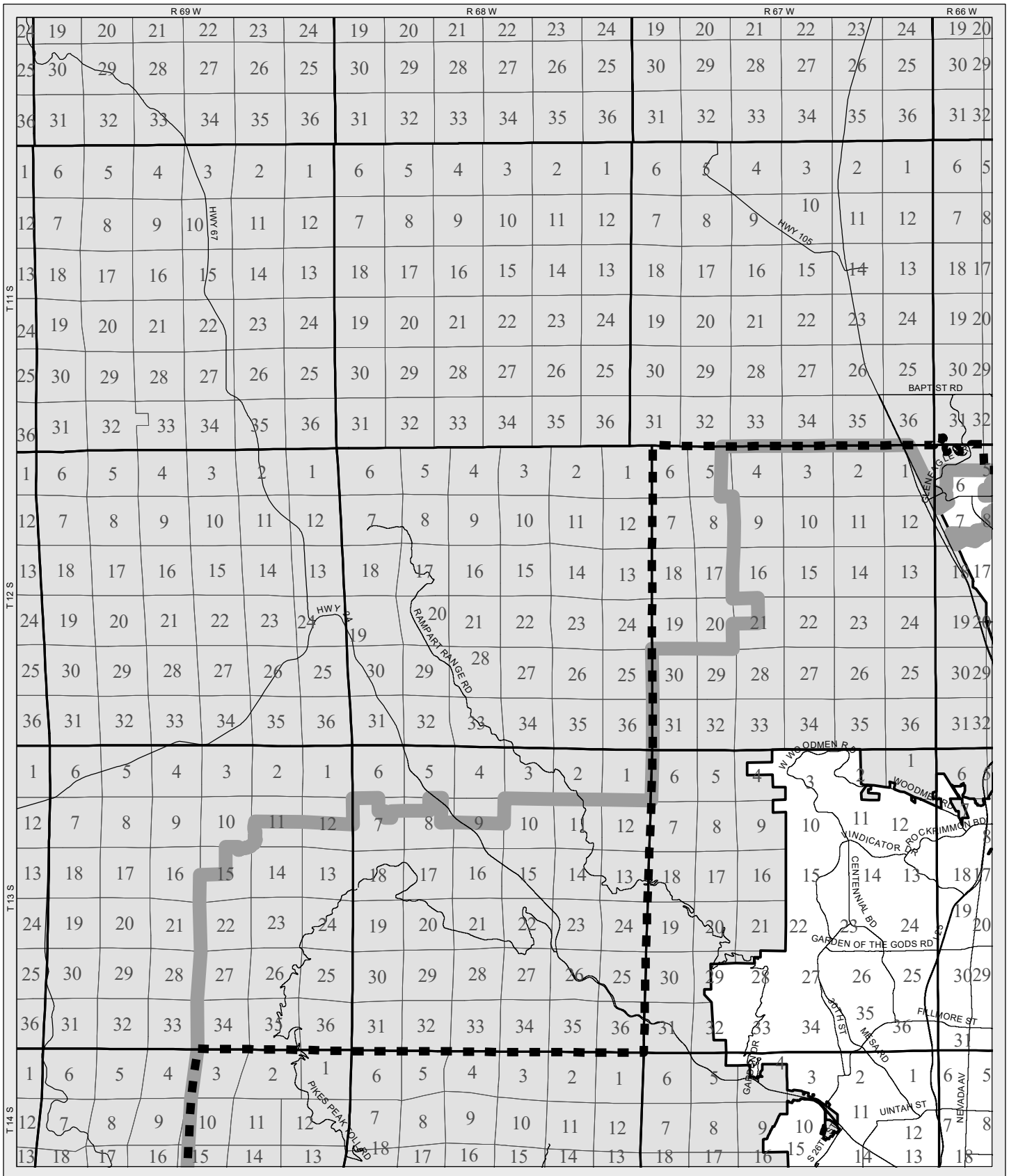
A.1.0 INTRODUCTION

The maps on the following pages depict the Colorado Springs Electric and Gas Service area boundaries as filed with the Colorado Public Utilities Commission and are up to date as of the date of the publication of this manual. The City of Colorado Springs limits are shown from the best information available as of the date of publication. Colorado Springs Utilities water and wastewater service area is generally limited to those areas within the current city limits (see Index Map below). Specific questions regarding utility service should be directed to Colorado Springs Utilities Development Services office.

A more detailed, larger scale version of the service area map can be obtained from the Colorado Springs Utilities web site at www.csu.org.



Index Map



Colorado Springs Utilities
It's how we're all connected

Scale 1" = 14000'

Legend

- Electric Service Area
- Gas Service Area
- Colorado Springs Boundary
- Section Lines
- Township/Range Lines

Colorado Springs Utilities
Service Area Boundaries

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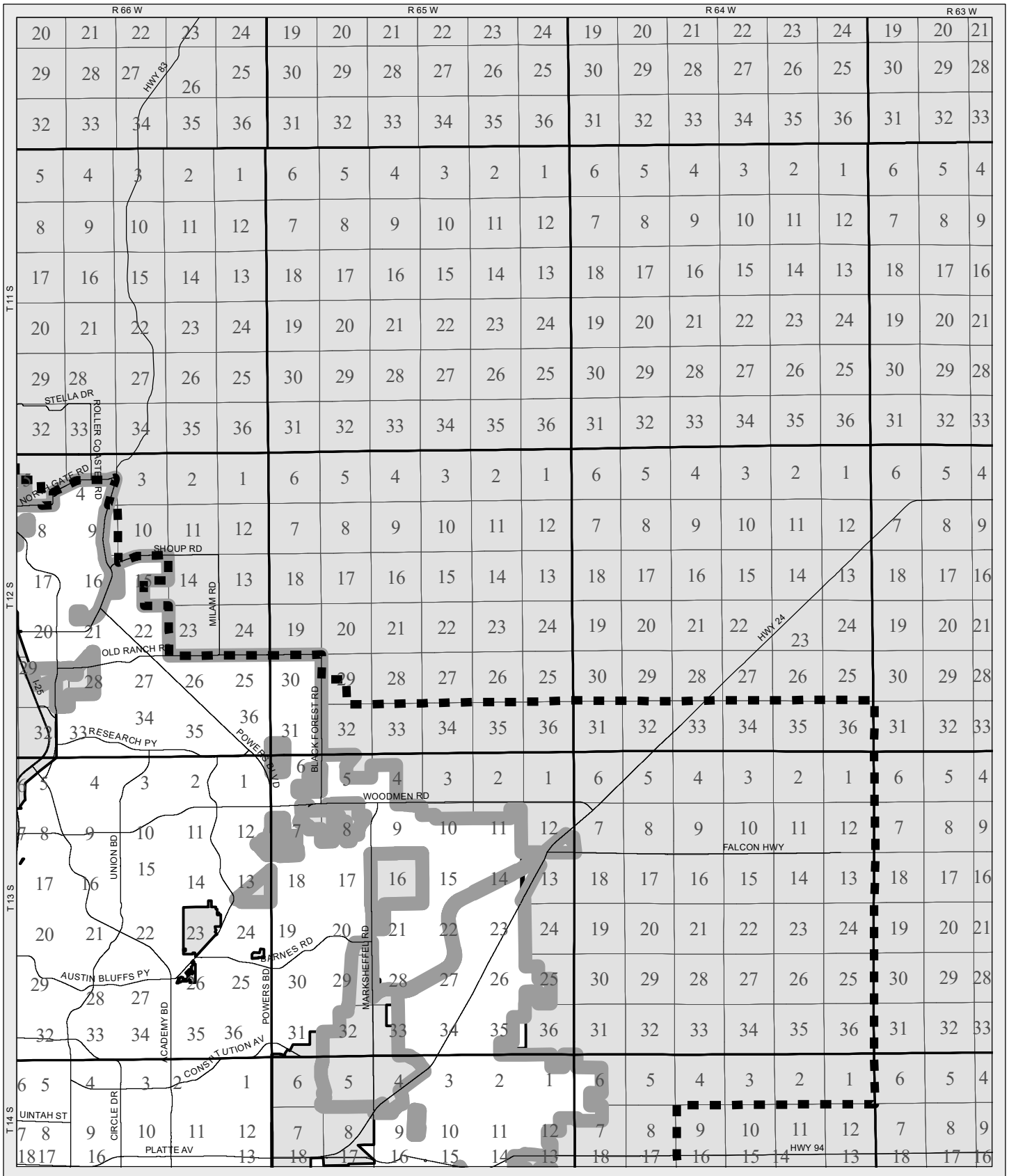

Colorado Springs Utilities
It's how we're all connected

Scale 1" = 14000'

Legend

- Electric Service Area
- Gas Service Area
- Colorado Springs Boundary
- Section Lines
- Township/Range Lines

Colorado Springs Utilities
Service Area Boundaries

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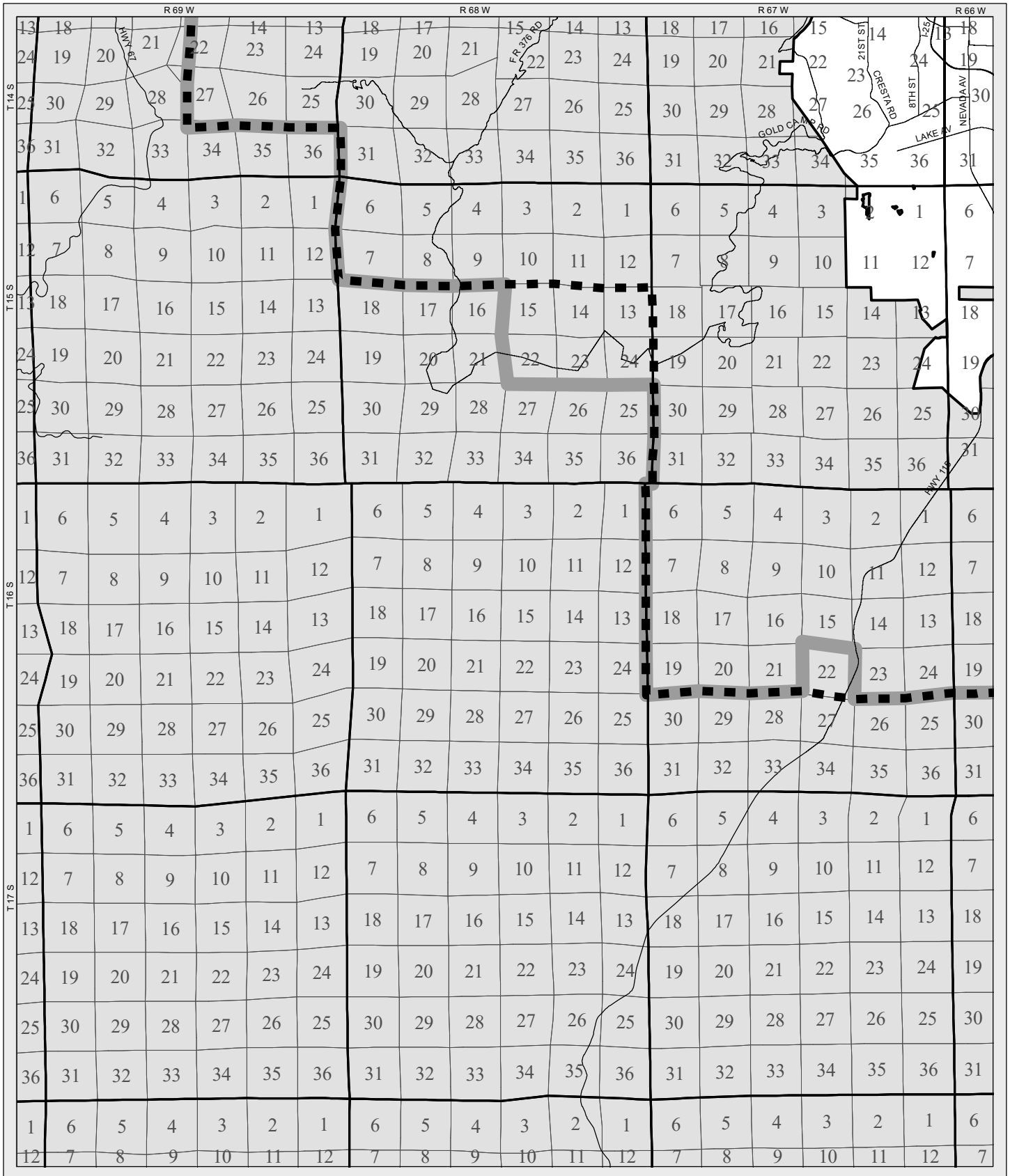

Colorado Springs Utilities
It's how we're all connected

Scale 1" = 14000'

Legend

- Electric Service Area
- Gas Service Area
- Colorado Springs Boundary
- Section Lines
- Township/Range Lines

Colorado Springs Utilities
Service Area Boundaries

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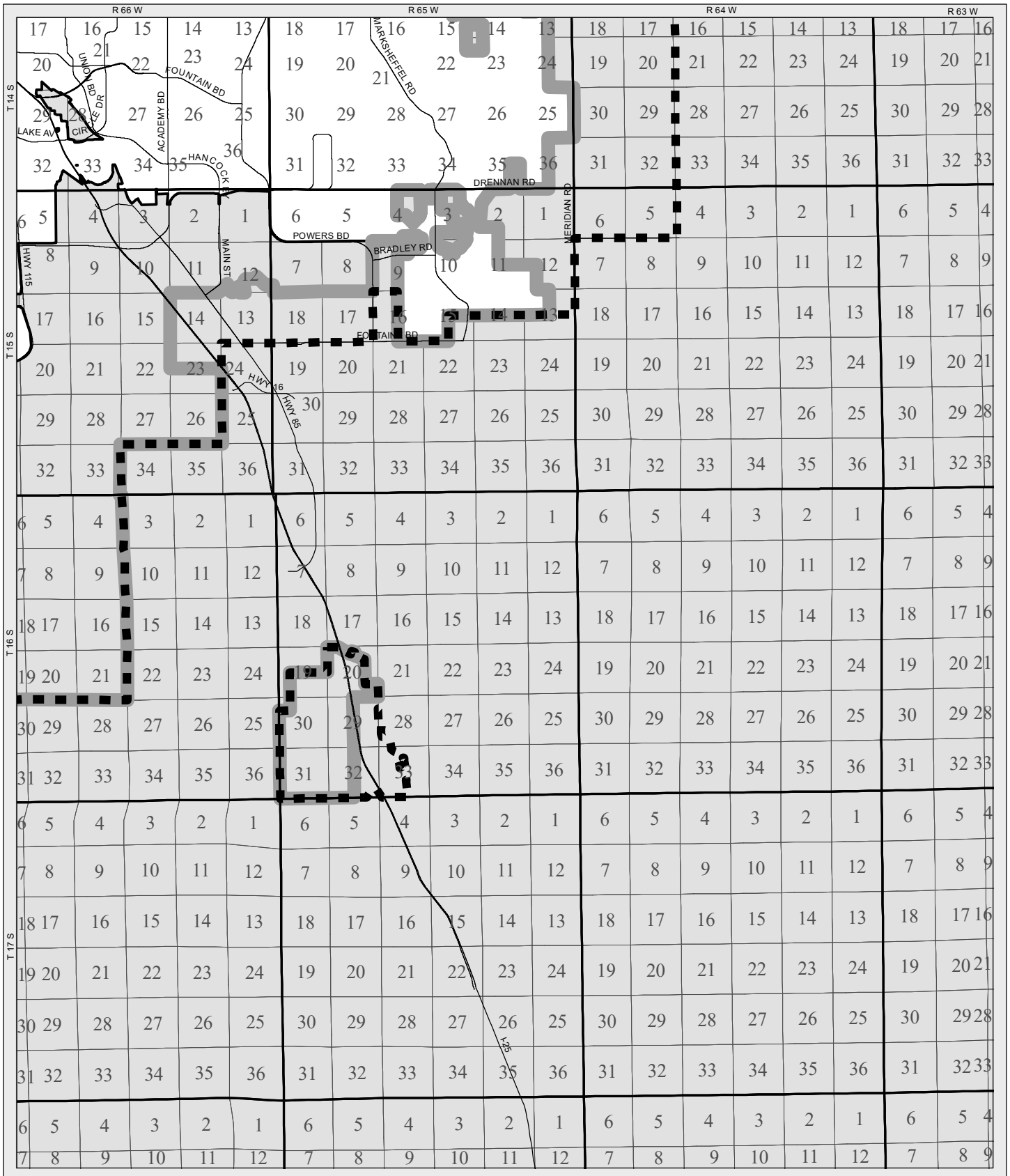

Colorado Springs Utilities
It's how we're all connected

Scale 1" = 14000'

Legend

- Electric Service Area
- Gas Service Area
- Colorado Springs Boundary
- Section Lines
- Township/Range Lines

Colorado Springs Utilities
Service Area Boundaries

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Appendix B
Utilities Addressing Plan, Utilities Design CAD File and Easements Policies and Procedures

UTILITIES ADDRESSING PLAN, UTILITIES DESIGN CAD FILE AND EASEMENTS

Policies and Procedures Guide

B.1.0 INTRODUCTION

Interaction with Colorado Springs Utilities (UTILITIES) on any land development project requires supporting documentation. This information is unique to a given type of service (i.e. electric, gas, water or wastewater). There are two types of support data that are universal to all service extensions: the Utilities Addressing Plan (UAP) and the Utilities Design CAD File (UDCF). Depending upon the nature and timing of your project you may need to submit a UAP and/or a UDCF as part of the flow of information to UTILITIES in support of the design or review of your proposed utility infrastructure. It is best to be aware of these two items as well as potential easement requirements in advance of your first contact with UTILITIES regarding a given project. The following Sections describe each item in detail.

B.2.0 UTILITIES ADDRESSING PLAN

The UAP is a submittal that must be made, under certain circumstances, to UTILITIES prior to initiating a request for utility design review or service extension from SU. The content of the UAP is similar to that of a subdivision plat (see FORM 1 for the UAP checklist). In fact, a copy of the subdivision plat prepared per the City of Colorado Springs Code pertaining to Subdivision Platting will suffice as a UAP submittal. Advanced Geomatics (ADG) uses the UAP to obtain addressing from the Regional Building Department's (RBD) enumerator's office for the lots in the project. ADG converts lot geometry for the proposed project to the cadastral layers of the ADG database and create address pointers for the lots. The ADG cadastre, address data and SU's Customer Billing (C2M) system are synchronized using this information.

B.2.1 CONDITIONS CALLING FOR A UTILITIES ADDRESSING PLAN

A Utilities Addressing Plan is required to be submitted to UTILITIES anytime an application for the design of extensions of electric, gas, water or wastewater mains and/or service lines is made and any of the following conditions apply:

- The request for service applies to a parcel of land that does not have a recorded final subdivision plat and assigned addressing in place as of the date of the request.
- The request for service applies to a parcel of land which may have an existing recorded plat in place, but the existing parcel geometry will be modified as part of a land development process and the replat is not yet of record.
- The request for service applies to a parcel of land for which an approved UAP exists, but changes have been made (or are proposed) to the geometry of the development which substantially affects the lot or street configuration of the development.
- The proposed development activity will in any way change approved addressing on the site.

B.2.2 PURPOSE OF THE UTILITIES ADDRESSING PLAN

The UAP serves two critical purposes in the land development process. Information provided on the UAP allows ADG to create preliminary lot and street geometry in the UTILITIES Geographic Information Systems database. Approved addressing is then entered into the addressing database which in turn is tied to the UTILITIES C2M system. With this in mind, consider the UAP as a "Preliminary" version of the final plat. The data elements to be shown are nearly identical to a final plat and in fact, an unrecorded copy of the final plat of the project is an acceptable UAP.

B.2.3 UTILITIES ADDRESSING PLAN SUBMITTAL

The UAP can be submitted in either hardcopy format or electronically. The UAP must be submitted at least ***five (5) working days prior*** to the need for SU's action on a request for service. Requests for service may be submitted concurrently with the UAP but will not be acted upon until after the UAP has been processed.

A revised UAP must be submitted whenever boundary, right-of-way, lot or easement lines or dimensions are revised, or if addresses or street names are changed.

Digital submittal

Digital UAP submittals are the preferred method. Digital submittals may be performed online using the Digital Data Services web link (https://www.csu.org/Pages/GISMapping.aspx). When a submittal is made online, a receipt is emailed to the user. This receipt must accompany the request for utility service, as evidence that the UAP has been processed if the UAP is required (see above section for conditions requirement). A digital submission shall consist of an AutoCAD drawing (.dwg) file with a layout for each sheet (where there are multiple sheets to the plan) of the proposed project including all necessary model and paper space elements to enable ADG staff to print hard copies. For information or assistance in performing online UAP submittal, contact ADG staff at C_ADGSupport@csu.org or (719) 668-7920 or 668-8779.

B.2.4 UAP FREQUENTLY ASKED QUESTIONS

Do I need to have accurate and correct dimensioning for lots and streets centerlines on the UAP?
Although a preliminary version of the plat is acceptable for the UAP, fictitious, incomplete or erroneous plat geometry is not. UTILITIES require sufficient information on the UAP to be able to run coordinate geometry on the boundaries, the rights of way, tracts and each individual lot. Missing or erroneous data will only delay the UAP processing because ADG staff will refer the errors back to the submitter for correction before completing the UAP.

B.3.0 UTILITIES DESIGN CAD FILE

The Utilities Design CAD File (UDCF) is an AutoCAD (.dwg format) drawing file which contains specific point, line and text features related to the design and analysis of new utility lines in proposed land developments and public works projects. Defining the content and structure of the CAD data to be received allows ADG to position the UDCF file when necessary, enabling UTILITIES system designers to provide a more efficient design process for each land development customer. The primary use of the UDCF is to meet the requirements of the water, gas and electric system designers. It will contain electronic feature data (see TABLE A for a list of recommended features) needed to do CAD based

system design and analysis on new service system extensions. For residential projects, the UDCF contains most of the features on the water service plan. For commercial, multifamily and industrial projects, the UDCF will include the features from the site plan or site/utility plan. A secondary use of the feature data contained in the UDCF will be to update the planimetric base and utility mapping used by UTILITIES.

All dimensional data shall use AutoCAD drawing units of:

- Length: Decimal (Precision 0.000)
- Angle: Surveyor's units (Precision N 0d 00' 00" E)
- Insertion Scale: Unitless.

B.3.1 CONDITIONS CALLING FOR A UTILITIES DESIGN CAD FILE

A Utilities Design CAD File is to be submitted:

- For all projects that require utility system extensions or relocations.
- For all single-family residential projects that create new lots or rights of way through the subdivision platting process.
- For all mobile home parks, multifamily residential developments, commercial and industrial projects.

B.3.2 PURPOSE OF THE UTILITIES DESIGN CAD FILE

The Utilities Design CAD File will be used by the water system planners to model pressure zones, by the gas and electric system designers as a background environment to support their system extension design, and possibly by UTILITIES's Asset Management department to update planimetric base or utility mapping. The customer is responsible for ensuring that the project data supplied to UTILITIES is current through all project design phases. If UTILITIES does not have the most up to date version of project data, its construction schedule could be negatively impacted. The customer consents to UTILITIES use of the electronic data being used to update UTILITIES/ADG base mapping.

B.3.3 UTILITIES DESIGN CAD FILE SUBMITTAL

A Utilities Design CAD File (UDCF) is to be submitted to the Colorado Springs Utilities (UTILITIES) prior to or at the same time any application for water or wastewater plan review or service extension design is initiated. It may be submitted at the time of a UAP submittal or any time thereafter. A final submission of the UDCF is required and time of Development Services plan approval. The final UDCF must accurately match the approved plans. The file is to be submitted to UTILITIES's via an Internet application (https://www.csu.org/Pages/GISMapping.aspx). It is requested that the customer provide the UDCF file in the FIMS horizontal coordinate system. UTILITIES/ADG will process the file by registering it to the FIMS horizontal coordinate system when necessary and making it available to all UTILITIES departments.

The CAD file to be submitted shall be a .dwg format file containing all *applicable* feature elements listed in Table A in model space. The Utilities Design CAD File shall be complete. One and only one file is to be submitted. Any XREFs need to be bound to the parent file. Features shall be placed on separate layers. Processing can be expedited if the layer organization delineated in Table A is followed. Residential subdivision projects shall include pertinent elements checked under the **Residential** column

of **Table A**. All other development types (commercial, multifamily residential, industrial and mobile home parks, Municipal and State projects) shall require that the CAD file include pertinent feature types checked under the column titled **All Others**. Generally speaking, on residential projects, the UDCF will contain the same feature data as the water service plan and on commercial and multifamily projects the UDCF will contain the same feature data as the site plan or the site/utility plan.

B.3.4 UDCF FREQUENTLY ASKED QUESTIONS

What is the UDCF used for?
The UDCF is needed for efficient system modeling and design of new utility infrastructure. The UDCF is processed by ADG to position the model space features contained in the file onto the FIMS horizontal datum. The file structure is checked to ensure the file will be readable by all CAD desktops within UTILITIES and is then made available on a server that is accessible to all UTILITIES system designers.

The UDCF data may be used to maintain the FIMS planimetric database. Certain features will be verified and converted to keep the planimetric base mapping up to date. It is hoped that UTILITIES will realize long term cost savings for our ratepayers by reducing the number and frequency of aerial mapping projects needed to map areas of development activity.

I have several .dwg files that are not XREF'd for my project, how can I submit them?
Although we accept zipped files for large .dwg files we cannot accept multiple files zipped together, they must be merged into one .dwg file (using the X-REF/BIND command in AutoCAD). Do not use the re-submit option as a method to upload multiple files.

Does the UDCF have to conform to a certain layering standard?
No. Although Appendix A indicates the recommended layer structure, this is not a requirement. Processing the file can be made more efficient if the file conforms to the recommended layering structure, but it is not a requirement of the process.

Who will be responsible for assuring that the UDCF is accurate, complete and up to date?
Ultimately, the customer is responsible for the content of the file. ADG will perform a quick check ensure the file appears to be complete. If obvious inadequacies exist, UDS will contact the customer to remedy the situation. Missing or inaccurate data may affect the timing of design or construction schedules. The customer will be responsible for submitting an amended file should any of the projects feature details change after the time of the initial submittal but prior to completion of the use of the data by water, gas, and electric designers. The online application was designed to make iterative resubmission of data more convenient for the UTILITIES's customers. UTILITIES representatives will make every effort to remind the customer at each application stage to keep the file up to date.

What about projects that are not done using CAD?
It is recognized that there are still some small projects that may not be designed using CAD tools and there are still some design firms that do not employ CAD to accomplish project design. This submittal is not required if CAD data is not available. It should be recognized that plan review and new system design can be greatly expedited if a Utilities Design CAD File is supplied; otherwise UTILITIES system designers will have to spend time manually creating key planimetric features to complete their work. The whole point in acquiring the file is to make the design process for each department more efficient.

B.4.0 EASEMENTS

Development activity often requires an extension of UTILITIES's infrastructure, which in turn may lead to the need for an easement or executive agreement. Across City property (not a Public Right – Of – Way), an Executive Agreement is required. On private property, Easements are required when infrastructure is placed outside of a public right-of-way. Easements are typically granted either by a Subdivision Plat or by a Permanent Easement Agreement. Easements granted by Subdivision Plat are governed by the City of Colorado Springs Code pertaining to Subdivisions, as modified by the Terms & Conditions recorded at Reception Number 212112548. Easements obtained through a Permanent Easement Agreement are controlled by the Utilities' Standard Procedures for Easement Acquisition and Reference (SPEAR) process. The Spear Easements process now goes through the Construction & Development Hub. At this location users can select the "Development Process" link to see Utilities' Development process and all the phases within. Under the Construction Phase, the user can select Easement Submittal link that will provide access to the Utilities Easement Procedures along with Easement Preparation Checklists. The user will also find a series of Permanent Easement Templates for different types of easements. This information will guide the user through the easement Submittal process where the required checklist can be submitted to Development Services for review.

***** Please note, the Land Management team (Jessica Davis) should be used to help acquire any new easements or for changes to existing easements. Please call 688-7581 for help. *****

B.4.1 CONDITIONS CALLING FOR AN EASEMENT

If utilities are installed outside of a public right-of-way or existing UTILITIES utility easement, then a UTILITIES utility easement must be granted. The need for an easement may be triggered by a neighboring development or even a UTILITIES initiated project that requires the installation of utilities across the property and not falling within a dedicated right-of-way or existing easement. These circumstances would require the recording of a Permanent Easement Agreement

B.4.2 REQUIRED EASEMENT ELEMENTS

SU's Permanent Easement Agreement has a standard set of Terms & Conditions, and three (3) exhibits. Exhibit A is a description of the parcel burdened by the easement. This description could consist of a reference to a platted lot, a metes and bounds description or an existing reception number / book and page. Exhibit B is a description of the easement area. Exhibit C is a graphical representation of the easement area described in Exhibit B. UTILITIES require that Exhibit B be prepared, signed and sealed by a Colorado Professional Land Surveyor.

UTILITIES staff reviews the easement document for conformance to the design specification, and generally accepted surveying standard of care. During the review process comments may be referred back the Land Developer for review or revision. Upon acceptance by UTILITIES the easement is recorded at the Clerk & Recorders Office, and a recorded copy provided to the Land Developer.

B.4.3 EASEMENT SUBMITTAL PROCESS

Most easements dedicated to UTILITIES are initiated by the developer of the property in order to receive utility service. The need for a utility easement is identified during the Development Plan review process. The submittal process is explained on the UTILITIES website at the link given in 4.0 above.

Some of the key aspects are:

1. Always download the latest easement agreement forms from the UTILITIES website.
2. A licensed professional land surveyor must sign and certify that the exhibits prepared under their direct supervision, are accurate and correct to the best of their knowledge. Please see Advanced Geomatics if any questions arise about this item.
3. All owners and any Deed of Trust holders must sign the easement and ensure that their signatures are notarized.

B.4.4 EASEMENT FREQUENTLY ASKED QUESTIONS

How wide of an easement do I need to grant?

In general, a water or wastewater main requires a 30' easement width and a multi-utility easement is required to be 50' wide. Sometimes a wider easement is required based on characteristics of the line such as size, pressure, slope or depth of installation. Contact Development Services or refer to the appropriate standards to understand what the easement width might be for your utility installation project.

Can the utility be installed within an existing access easement?

Not typically. Not all existing easements have full rights for utility infrastructure. The Terms and Conditions of the actual easement agreement would need to be reviewed for language permitting the installation, maintenance and access to the infrastructure.

I need to dedicate an easement across multiple lots. What is the best way to do this?

If the multiple lots are owned by the same legal entity, the easement could be granted on a single easement. If the easement would include multiple owners, it is required that the easement be split into multiple sections so that each easement is granted by a single legal entity. The exception to this is for property held jointly for which a standard easement agreement was prepared.

What rights do I, as the owner, retain within the easement area?

Springs Utilities Permanent Easement Agreement is very specific on what rights are granted to the City of Colorado Springs and what rights are retained by the property owner. Please refer to the easement agreement, contact Development Services or seek legal counsel for answers to more specific questions.

FORM 1

UTILITIES Addressing Plan Check List

1 Name of the Utilities Addressing Plan

2 Name and address of the legal owner and/or manager of the project.

3 Name and address of the preparer of the Utilities Addressing Plan

4 Date of preparation

5 North arrow

6 Vicinity Map

7 Graphic scale

8 Delineate all lands to be conveyed or reserved for public use or reserved for the common use of all property owners in the proposed subdivision/project.

9 The dimensions of the exterior boundary of the proposed project, which must be the result of a boundary survey. All lines are to be annotated with a bearing and distance. All curved lines should be annotated with a minimum of three curve elements. Non-tangent curves should have a bearing reference (i.e., bearing to radius point or chord bearing).

10 The dimensions of all interior streets and lots. All lines are to be annotated with a bearing and distance. All curved lines should be annotated with a minimum of three curve elements. Non-tangent curve should have a bearing reference (i.e., bearing to radius point or chord bearing).

11 Lot and block numbers

12 Dimensions sufficient to clearly locate and define the extents of all easements to allow for the final design of the associated utilities. Side and rear lot easements may be described as text rather than graphical if a blanket statement is possible.

13 Names of the public or private streets or other public or private ways. Any private street name shall be clearly labeled "Private".

14 Area in square feet of each lot within the Utilities Addressing Plan.

15 Addressing is complete and legible (If Addressing is obtained from the Enumerator prior to UAP submittal. Note: This will not speed up the processing as UTILITIES will need to get verification from Enumerator that addressing is correct). If addressing has not been obtained prior to the UAP submittal, please indicate the location of addresses requested with “( )” .

NOTES:

1) Although not a requirement for the acceptance or approval of a UAP, in the instances of multi-family, commercial, or industrial developments where the plans for the development have progressed to the point of having final building locations and configurations, this plan may (at the discretion of the submitter) accompany the UAP submittal to assist the enumerator in assigning addresses to the project.
2) A final plat document prepared in accordance with City of Colorado Springs specifications will be acceptable as a UAP document.

Table A – UDCF Feature List

***** Following this Feature List Guide, helps to get CAD files approved and ingested as quickly as possible. CSU staff thanks you for using and following this information! *****

Recommended Feature Data	Residential	All Others	Recommended CAD Layer Name
Lot Lines	X	X	xx-lots-ln
Project Exterior Boundary Lines	X	X	xx-sub-bdy
Street Lines	X	X	xx-row-street
Easements	X	X	**see list below**
			xx-esmt-access
			xx-esmt-avig
			xx-esmt-drain
			xx-esmt-pub
			xx-esmt-scenic
			xx-esmt-trail
			xx-esmt-util
			xx-easmt-util-gas
			xx-easmt-util-elec
			xx-easmt-util-water
			xx-easmt-util-ww
			xx-esmt-util_drain
			xx-esmt-util_pub
			xx-esmt-util-misc
Building Footprints		X	xx-building-ftprnt
Water Lines	X	X	xx-water-line
Water Services	X	X	xx-water-serv
Water Valves		X	xx-water-valve
Fire Hydrants	X	X	xx-water-fh
Gas main lines (proposed)	X	X	pp-gas-line
Gas service lines (proposed)	X	X	pp-gas-stub
Electric lines (proposed)	X	X	pp-elec-line-ug (underground)
			pp-elec-line-ug (overhead)
Transformer Location		X	pp-elec-tr_pad
Elec sevice attachment points (proposed)		X	pp-elec-serv_att_pt
Secondary Electric		X	xx-electric-line-ug (overhead)
			xx-electric-line-ug (underground)
Sanitary Sewer Lines	X	X	xx-ww-line
Sanitary Sewer Manholes	X	X	xx-ww-mh
Sanitary Sewer Services	X	X	xx-ww-serv
Underdrains	X	X	xx-drain-udline
Storm Sewer Lines	X	X	xx-drain-line
Storm Sewer Inlets (Catch Basins)	X	X	xx-drain-catch
Curb Lines	X	X	xx-curb-back
			xx-curb-fl
			xx-curb-lip
Hard Surfaces (Paved Areas)		X	**see list below**
			xx-alley-pvd
			xx-drain-chan-lnd
			xx-drain-cross
			xx-drive-pvd

Recommended Feature Data	Residential	All Others	Recommended CAD Layer Name
			xx-parking-pvd
			xx-sidewalk-ln
			xx-street-pvd
			xx-trail-rec
Private Lighting		**X**	xx-landscape-light
Private Signs		**X**	xx-sign-post
Grading / Contours		**X**	xx-cont-index
			xx-cont-int
Project Phase Lines		**X**	xx-devel-phase
Existing Adjacent Utilities (non Colorado Springs Utilities)		**X**	**see list below**
			xx-phone-serv
			xx-phone-line-oh (overhead)
			xx-phone-line-ug (underground)
			xx-phone-mh
			xx-phone-pole
			xx-phone-riser
			xx-phone-vault
			xx-pipeline-oh (overhead)
			xx-pipeline-ug (underground)
			xx-tower-loc
			xx-catv-line-oh (overhead)
			xx-catv-line-ug (underground)
			xx-catv-riser
			xx-fibop-line
			xx-fibop-box
Annotation			
Lot Dimensions	**X**	**X**	xx-lot-anno
Lot/ Block Numbers	**X**	**X**	xx-lots-anno
Addresses	**X**	**X**	xx-building-add

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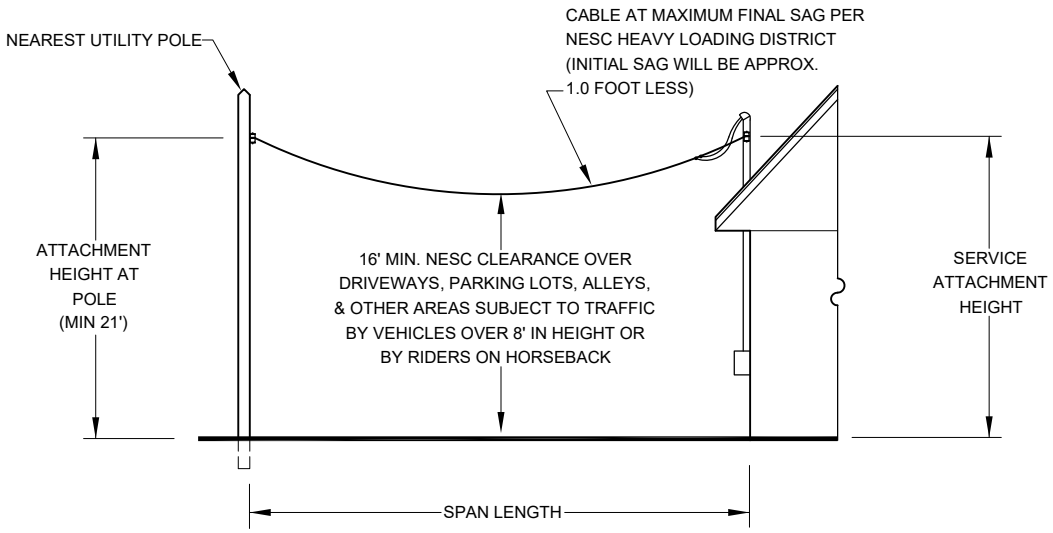
APPENDIX C
Tables

TABLE 1: OVERHEAD RESIDENTIAL SERVICE DROP SIZING & MAXIMUM SPANS

(Crossing driveways, parking lots, alleys, open spaces, & other areas accessible to traffic by vehicles over 8' in height or by riders on horseback)



MAXIMUM RESIDENTIAL SERVICE DROP SPAN LENGTHS TO MAINTAIN 16' MIN. NESC CLEARANCES OVER AREAS SUBJECT TO TRUCK TRAFFIC OR EQUESTRIANS								
SERVICE ENTRANCE RATING OR MAIN DISCONNECT RATING PER NEC/REGIONAL BLDG.	COLORADO SPRINGS UTILITIES ELECTRIC SERVICE DROP SIZE/TYPE	RATING	MAXIMUM SPAN LENGTH (FEET) @ SERVICE ATTACHMENT HEIGHT					
(AMPS)	(ALUMINUM)	(AMPS)*	16'	17'	18'	19'	20'	21'
50-150	#4 triplex	90	50'	72'	81'	88'	94'	100'
151-200	#2 triplex	120	46'	66'	75'	81'	87'	91'
201-250	#1/0 triplex	160	40'	57'	65'	71'	75'	79'
251-380	#4/0 triplex	245	32'	49'	57'	63'	67'	71'

* Ampacity at 90°C steady state conductor temperature.

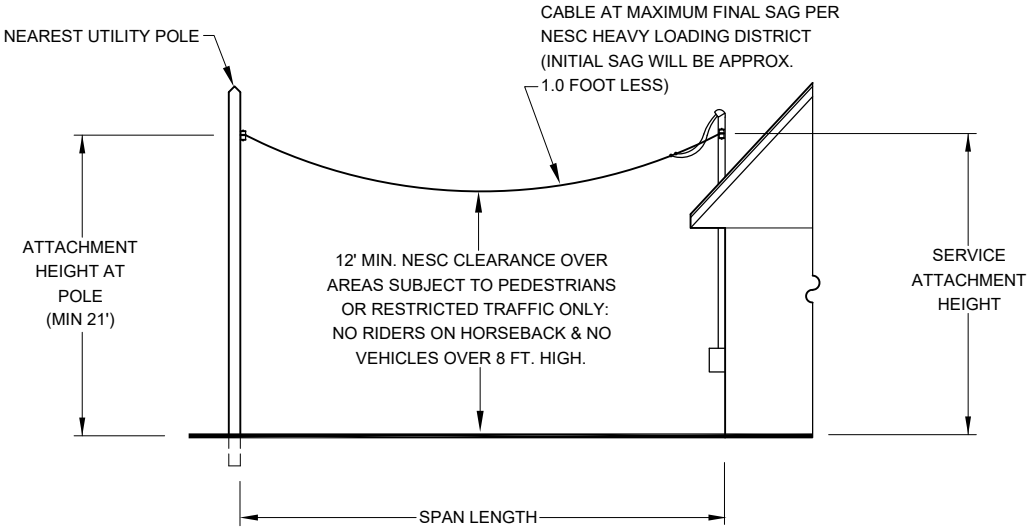
NOTES:

1. Usually, for short service drops under 80 feet, the conductor size tabulated will be installed by Colorado Springs Utilities. However, in order to limit voltage drop on long services to acceptable values, a larger service drop conductor may be required.
2. For distances longer than these maximum spans, either a service lift pole will be required on the customer's property or a higher service attachment will be necessary. Above lengths are based on a minimum 21' attachment height at the utility pole takeoff and level terrain without the cable crossing over any buildings or other structures, swimming pools, water areas (lakes, pools, streams, etc.), areas accessible to riders on horseback, or to vehicles and other mobile units over 8' in height, elevated terrain, or other conflicting structures that require increased NESC clearances. Contact Field Engineering to schedule installation of a lift pole or for assistance to avoid an undesired additional pole.

CAUTION: For your own safety, keep all measuring instruments at least 10 feet away from any power system conductors in order to prevent electric shock. If you would like help to plan attachment height and service entrance location based on actual conditions at your site, call Field Engineering; people trained and equipped to safely measure the height of conductors and discuss design options will assist you.

TABLE 2: OVERHEAD RESIDENTIAL SERVICE DROP SIZING & MAXIMUM SPANS

(Crossing areas subject to pedestrians or restricted traffic only)



MAXIMUM RESIDENTIAL SERVICE DROP SPAN LENGTHS TO MAINTAIN 12' MIN. NESC CLEARANCES OVER AREAS SUBJECT TO PEDESTRIANS OR RESTRICTED TRAFFIC ONLY									
SERVICE ENTRANCE RATING OR MAIN DISCONNECT RATING PER NEC/REGIONAL BLDG.	COLORADO SPRINGS UTILITIES ELECTRIC SERVICE DROP SIZE/TYPE	RATING	MAXIMUM SPAN LENGTH (FEET) @ SERVICE ATTACHMENT HEIGHT						
(AMPS)	(ALUMINUM)	(AMPS)*	12'	13'	14'	15'	16'	17'	18'
50-150	#4 triplex	90	67'	89'	98'	105'	111'	117'	121'
151-200	#2 triplex	120	61'	82'	90'	97'	102'	107'	111'
201-250	#1/0 triplex	160	53'	71'	78'	84'	89'	93'	97'
251-380	#4/0 triplex	245	45'	63'	70'	75'	80'	85'	90'

* Ampacity at 90°C steady state conductor temperature.

NOTES:

1. Usually, for short service drops under 80 feet, the conductor size tabulated will be installed by Colorado Springs Utilities. However, in order to limit voltage drop on long services to acceptable values, a larger service drop conductor may be required.
2. For distances longer than these maximum spans, either a service lift pole will be required on the customer's property or a higher service attachment will be necessary. Above lengths are based on a minimum 21' attachment height at the utility pole takeoff and level terrain without the cable crossing over any buildings or other structures, swimming pools, water areas (lakes, pools, streams, etc.), areas accessible to riders on horseback, or to vehicles and other mobile units over 8' in height, elevated terrain, or other conflicting structures that require increased NESC clearances. Contact Field Engineering to schedule installation of a lift pole or for assistance to avoid an undesired additional pole.

   CAUTION: for your own safety, keep all measuring instruments at least 10 feet away from any power system conductors in order to prevent electric shock. If you would like help to plan attachment height and service entrance location based on actual conditions at your site, call Field Engineering; people trained and equipped to safely measure the height of conductors and discuss design options will assist you.

TABLE 3
MATERIAL REQUIREMENTS FOR USE IN ELECTRIC SERVICE LINE CONSTRUCTION

Item Description	Designation	Approved Manufacturer * or Material Requirements
4/0 AWG AL with 2/0 AWG AL Neutral Service Wire	600V UD "SureSeal" or "SuperSeal" Self-repairing wire types only	Southwire (SureSeal):* • Wesco- Utility, Denver • Western United Electric Supply Prysmian/Pirelli (SuperSeal):* • Wesco- Utility, Denver • Utility Products Supply
350 MCM AL with 4/0 AWG AL Neutral	Abuse-Resistant type only	All manufacturers including: • Southwire* • Prysmian (Pirelli)* • Alcan* • General Cable (BICC)*
500 kcmil AL Hyplug Adapter	AYP500	• Burndy*
2" SCH 40 PVC Conduit	Electrical Rated (grey only)	All manufacturers including: • Prime* • Cantex* • Heritage*
3" & 4" DB120 or SCH 40 PVC Conduit	Electrical Rated (grey only)	All manufacturers including: • Prime* • Cantex* • Heritage*
2" SCH 40 Polyethylene Conduit (HDPE)	Electrical Rated (black only- with 3 red stripes, per Utilities Material Specification 194-2, Appendix-E)	• JM Eagle* • Dura-Line* • Blue Diamond Industries* • Plexco* • Petroflex*
4" SCH 40 or DR 13.5 Polyethylene Conduit (HDPE)	Electrical Rated (black only- with 3 red stripes, per Utilities Material Specification 194-2, Appendix-E)	• JM Eagle* • Dura-Line* • Blue Diamond Industries* • Plexco* • Petroflex*
6" SCH 80 Polyethylene Conduit (HDPE)	Electrical Rated (black only- with 3 red stripes, per Utilities Material Specification 194-2, Appendix-E)	• JM Eagle* • Dura-Line* • Blue Diamond Industries* • Plexco* • Petroflex*
2" Fiberglass Conduit, 90 degree, 48" Radius (Standard Wall with a Deep socket coupling on one end)	Black	Champion Fiberglass:* 2", 90 Deg, 48" Radius = 20C-SW-93-1D

4” Fiberglass Conduit, 90 degree, 36” Radius (Heavy Wall with a Deep socket coupling on one end)	Black	Champion Fiberglass:* 4”, 90 Deg, 36” Radius = 40C-HW-92-1D
4” & 6” Fiberglass Conduit, 90 degree, Long Radius (48”) (Heavy Wall with one Deep socket coupling)	Black	Champion Fiberglass:* 4”, 90 Deg, 48” Radius=40C-HW-93-1D 6”, 90 Deg, 48” Radius=60C-HW-93-1D
Breaker, 1 Pole, 120V, 10A, Auto Reset	CDA-10	Texas Instruments*
Connector, Deadend, Fused, #10AWG	65U	Elastimold*
Meter Socket, 4 Terminal, 100A or 200A, Horn Bypass (Residential, 1-Phase, self-contained meters)	• Single Phase, 2 Wire, 120V • Single Phase, 3 Wire, 120/240V	See Chapter 5, 5.05 “Self-Contained Meter Sockets”, Appendix E - Specification 102-1, and Appendix F – Standard 14-11 “Meter Socket Wiring Schematics” for meter socket requirements.
Meter Socket, 5 Terminal, 100A or 200A, Horn Bypass (Residential, 1-Phase, self-contained meters)	• Single Phase, 2 Wire, 120V • Single Phase, 3 Wire, 120/240V • Single Phase, 3 Wire, Network, 120/208V	See Chapter 5, 5.05 “Self-Contained Meter Sockets”, Appendix E - Specification 102-1, and Appendix F – Standard 14-11 “Meter Socket Wiring Schematics” for meter socket requirements.
Meter Socket, 4 Terminal, 100A or 200A, Lever Bypass (Commercial or Residential, 1-Phase, self-contained meters)	• Single Phase, 2 Wire, 120V • Single Phase, 3 Wire, 120/240V	See Chapter 5, 5.05 “Self-Contained Meter Sockets”, Appendix E - Specification 102-1, and Appendix F – Standard 14-11 “Meter Socket Wiring Schematics” for meter socket requirements.
Meter Socket, 5 Terminal, 100A or 200A, Lever Bypass (Commercial or Residential, 1-Phase, self-contained meters)	• Single Phase, 2 Wire, 120V • Single Phase, 3 Wire, 120/240V • Single Phase, 3 Wire, 240/480V (Limited Use) • Single Phase, 3 Wire, Network, 120/208V	See Chapter 5, 5.05 “Self-Contained Meter Sockets”, Appendix E - Specification 102-1, and Appendix F – Standard 14-11 “Meter Socket Wiring Schematics” for meter socket requirements.
Meter Socket, 4 Terminal, 320A, Lever Bypass (Residential or Commercial, 1-Phase, underground, self-contained meters)	• Single Phase, 3 Wire, 120/240V	See Chapter 5, 5.05 “Self-Contained Meter Sockets”, Appendix E - Specification 102-1, and Appendix F – Standard 14-11 “Meter Socket Wiring Schematics” for meter socket requirements.

Meter Socket, 7 Terminal, 200A, Lever Bypass (Commercial, 3-Phase, only for self-contained meters)	• Three Phase, 4 Wire- Wye, 120/208V • Three Phase, 4 Wire- Wye, 277/480V • Three Phase, 4 Wire- Delta,120/240V	Milbank Manufacturing Co:U4701-RRL Cutler Hammer: UTE7213BCH Siemens/Landis & Gyr: 40407-025 Suggested manufacturers listed above or other equivalent. See Chapter 5, "5.05 Self-Contained Meter Sockets", Appendix E – Specification 102-600-130, and Appendix F – Standard 14-11 "Meter Socket Wiring Schematics" for meter socket requirements.
Meter Socket, 13 Terminal, 20A, Pre-wired Test Switches, Instrument Transformer Rated (Commercial, 3-Phase, for CT meter)	• Three Phase, 4 Wire- Wye, 120/208V • Three Phase, 4 Wire- Wye, 277/480V • Three Phase, 4 Wire- Delta, 120/240V	Milbank Manufacturing Co:* UC3913-RL-WC-11 Siemens 9837-0701* Tesco:* 9070822-CL See Appendix E for Material Specification 102-600-077.
Meter Socket, 8 Terminal, 20A, Pre-wired Test Switches, Instrument Transformer Rated (Commercial, 3-Phase & 1-Phase, for CT meter)	• Single Phase, 3 Wire-Wye, 120/208V • Single Phase, 3 Wire-Wye, 120/240V • Three Phase, 3 Wire-Delta, 120/240V • Single Phase, 4 Wire-Delta, 120/240V	Milbank Manufacturing Co:* UC4415-RL-WC-21 Tesco:* 9070815-CL See Appendix E for Material Specification 102-600-070.
Streetlight J-Box 13"x24"x18"	Streetlight feeder connection J-Box	Armorcast Products: A6001946TAPCX18 STREETLIGHT Oldcastle Enclosure Solutions: 13241409 Hubbell: A54132418A041
FUSE, CABLE LIMITER, 250 KCMIL, 600 V	250 KCMIL Cable Limiter	Eaton:* Bussman KFT

* Approved manufacturer as listed or approved equal. Approval must be in writing by Colorado Springs Utilities Engineering Standards.

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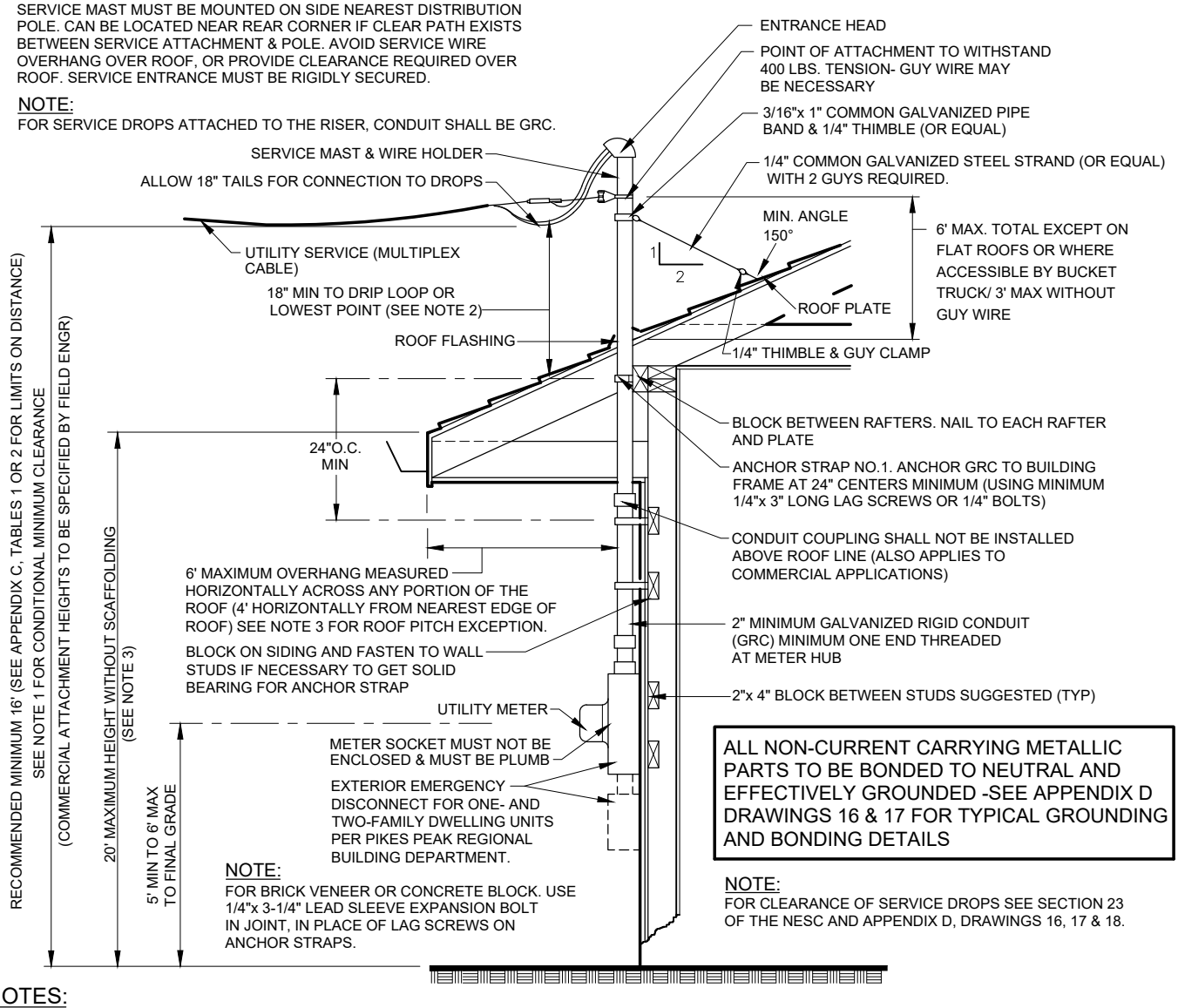
APPENDIX D
Drawings and Photos

DRAWING 1 - TYPICAL RESIDENTIAL SERVICE MAST INSTALLATION WITH SUGGESTED GUYING FOR OVERHEAD SERVICE

NOTE:
SERVICE MAST MUST BE MOUNTED ON SIDE NEAREST DISTRIBUTION POLE. CAN BE LOCATED NEAR REAR CORNER IF CLEAR PATH EXISTS BETWEEN SERVICE ATTACHMENT & POLE. AVOID SERVICE WIRE OVERHANG OVER ROOF, OR PROVIDE CLEARANCE REQUIRED OVER ROOF. SERVICE ENTRANCE MUST BE RIGIDLY SECURED.

NOTE:
FOR SERVICE DROPS ATTACHED TO THE RISER, CONDUIT SHALL BE GRC.



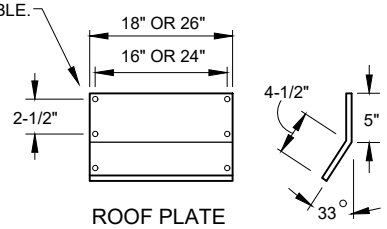
NOTE:
FOR BRICK VENEER OR CONCRETE BLOCK. USE 1/4"x 3-1/4" LEAD SLEEVE EXPANSION BOLT IN JOINT, IN PLACE OF LAG SCREWS ON ANCHOR STRAPS.

NOTE:
FOR CLEARANCE OF SERVICE DROPS SEE SECTION 23 OF THE NESC AND APPENDIX D, DRAWINGS 16, 17 & 18.

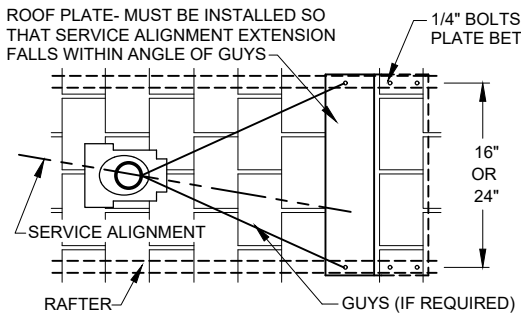
NOTES:

1. If the land under the cable is accessible to truck traffic, to other vehicles over 8 feet in height, or to riders on horseback, minimum attachment height is 16 feet. If area is subject to pedestrian or restricted traffic only (no equestrian or vehicles over 8' in height), the minimum attachment height is 12 feet; refer to NESC Table 232-1 and Appendix F, Construction Standard 18-208 for all conditional minimum clearances.
2. If the service is crossing the roof for more than 6 feet horizontally in any direction, or more than 4 feet horizontally from the nearest edge of the roof, refer to NESC 234C3 and Appendix F, Construction Standard 18-209 for the appropriate clearance.
3. If service access point (roof edge, etc.) exceeds 20' height above grade, and is not accessible by bucket truck, customer is required to provide scaffolding or ladder prior to service work performed, and if the roof pitch is also greater than 45 degree angle, the riser must be located a maximum of 2' from the edge of the roof for access to the point of attachment without standing on the roof. Scaffolding & ladder must meet OSHA safety requirements.
4. See Appendix C, Tables 1&2 for additional overhead service drop sizing and maximum spans.

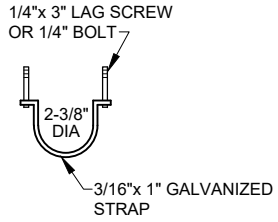
3/8" EYE BOLTS & WASHERS WITH HEADER BLOCK BETWEEN RAFTERS ARE ACCEPTABLE, BUT EYE LAGS ARE NOT ACCEPTABLE. AS AN ALTERNATE, ONE GUY ALIGNED WITH THE SERVICE WIRE AND ADEQUATELY ATTACHED TO A 3/8" EYE BOLT (NOT EYE LAG) THROUGH A HEADER BLOCK BETWEEN RAFTERS IS ACCEPTABLE.



ROOF PLATE (OR EQUAL)

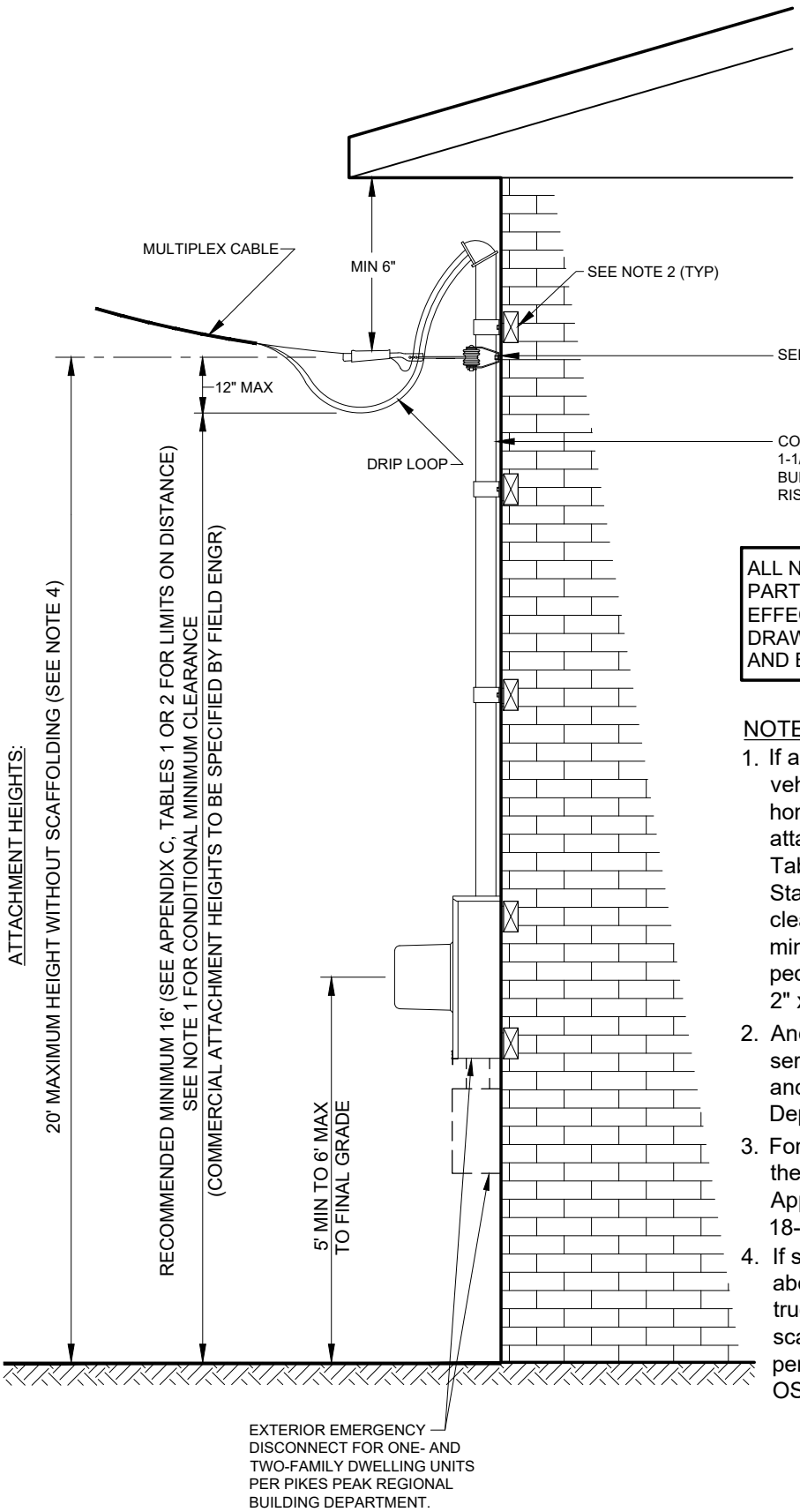


GUY DETAIL



ANCHOR STRAP NO.1 (OR EQUAL)

DRAWING 2 - TYPICAL RESIDENTIAL UNDER EAVES SERVICE INSTALLATION

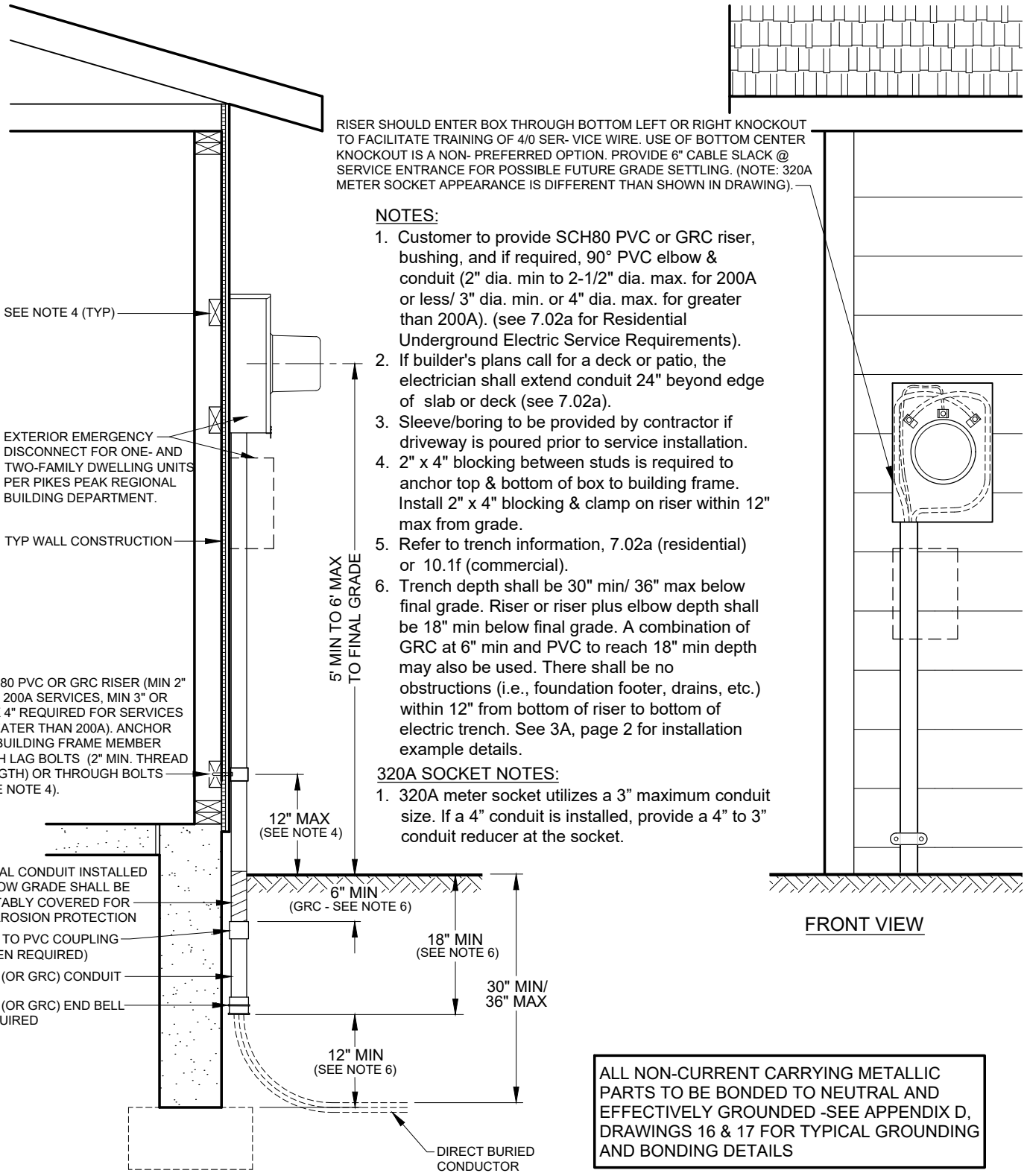


ALL NON-CURRENT CARRYING METALLIC PARTS TO BE BONDED TO NEUTRAL AND EFFECTIVELY GROUNDED -SEE APPENDIX D, DRAWINGS 16 & 17 FOR TYPICAL GROUNDING AND BONDING DETAILS

NOTES:

1. If accessible to truck traffic or to other vehicles over 8 feet in height, or to riders on horseback, minimum clearance (and attachment height) is 16 feet; refer to NESC Table 232-1 and Appendix F, Construction Standard 18-208 for conditional minimum clearances. Clearances shown as 12 feet minimum are suitable for areas subject to pedestrians and restricted traffic only. 2" x 4" blocks between studs is suggested.
2. Anchor to building frame at 24" centers for service drops attached to the riser, otherwise anchor per NEC as required by Regional Building Department.
3. For clearance of service drops, see section 23 of the National Electric Safety Code, and Appendix-F, Construction Standards 18-(208-304).
4. If service access point exceeds 20' height above grade, and is not accessible by bucket truck, customer is required to provide scaffolding or ladder prior to service work performed. Scaffolding & ladder must meet OSHA safety requirements.

DRAWING 3A - UNDERGROUND SERVICE METER INSTALLATION



NOTES:

1. Customer to provide SCH80 PVC or GRC riser, bushing, and if required, 90° PVC elbow & conduit (2" dia. min to 2-1/2" dia. max. for 200A or less/ 3" dia. min. or 4" dia. max. for greater than 200A). (see 7.02a for Residential Underground Electric Service Requirements).
2. If builder's plans call for a deck or patio, the electrician shall extend conduit 24" beyond edge of slab or deck (see 7.02a).
3. Sleeve/boring to be provided by contractor if driveway is poured prior to service installation.
4. 2" x 4" blocking between studs is required to anchor top & bottom of box to building frame. Install 2" x 4" blocking & clamp on riser within 12" max from grade.
5. Refer to trench information, 7.02a (residential) or 10.1f (commercial).
6. Trench depth shall be 30" min/ 36" max below final grade. Riser or riser plus elbow depth shall be 18" min below final grade. A combination of GRC at 6" min and PVC to reach 18" min depth may also be used. There shall be no obstructions (i.e., foundation footer, drains, etc.) within 12" from bottom of riser to bottom of electric trench. See 3A, page 2 for installation example details.

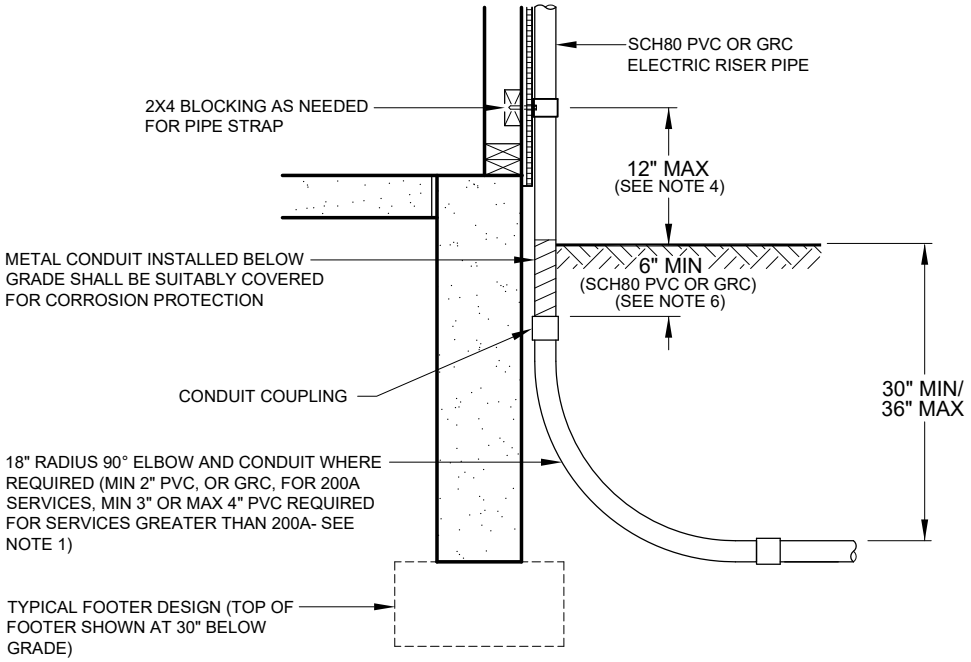
320A SOCKET NOTES:

1. 320A meter socket utilizes a 3" maximum conduit size. If a 4" conduit is installed, provide a 4" to 3" conduit reducer at the socket.

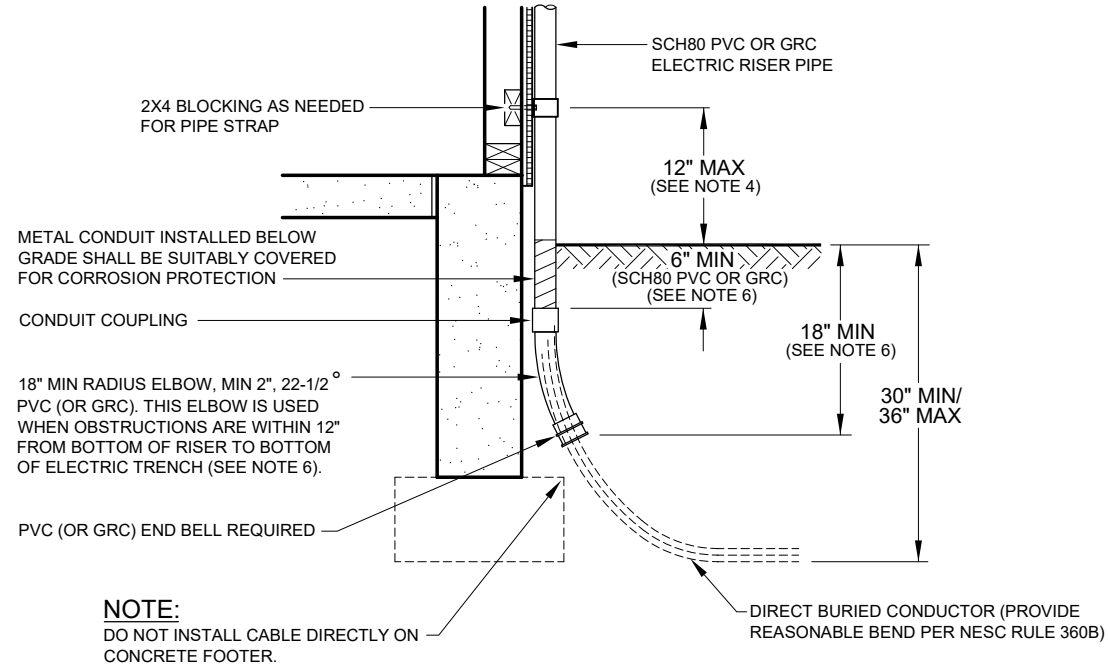
ALL NON-CURRENT CARRYING METALLIC PARTS TO BE BONDED TO NEUTRAL AND EFFECTIVELY GROUNDED -SEE APPENDIX D, DRAWINGS 16 & 17 FOR TYPICAL GROUNDING AND BONDING DETAILS

TYPICAL RISER DEPTH DETAIL

UNDERGROUND SERVICE METER INSTALLATION (CONTIN)



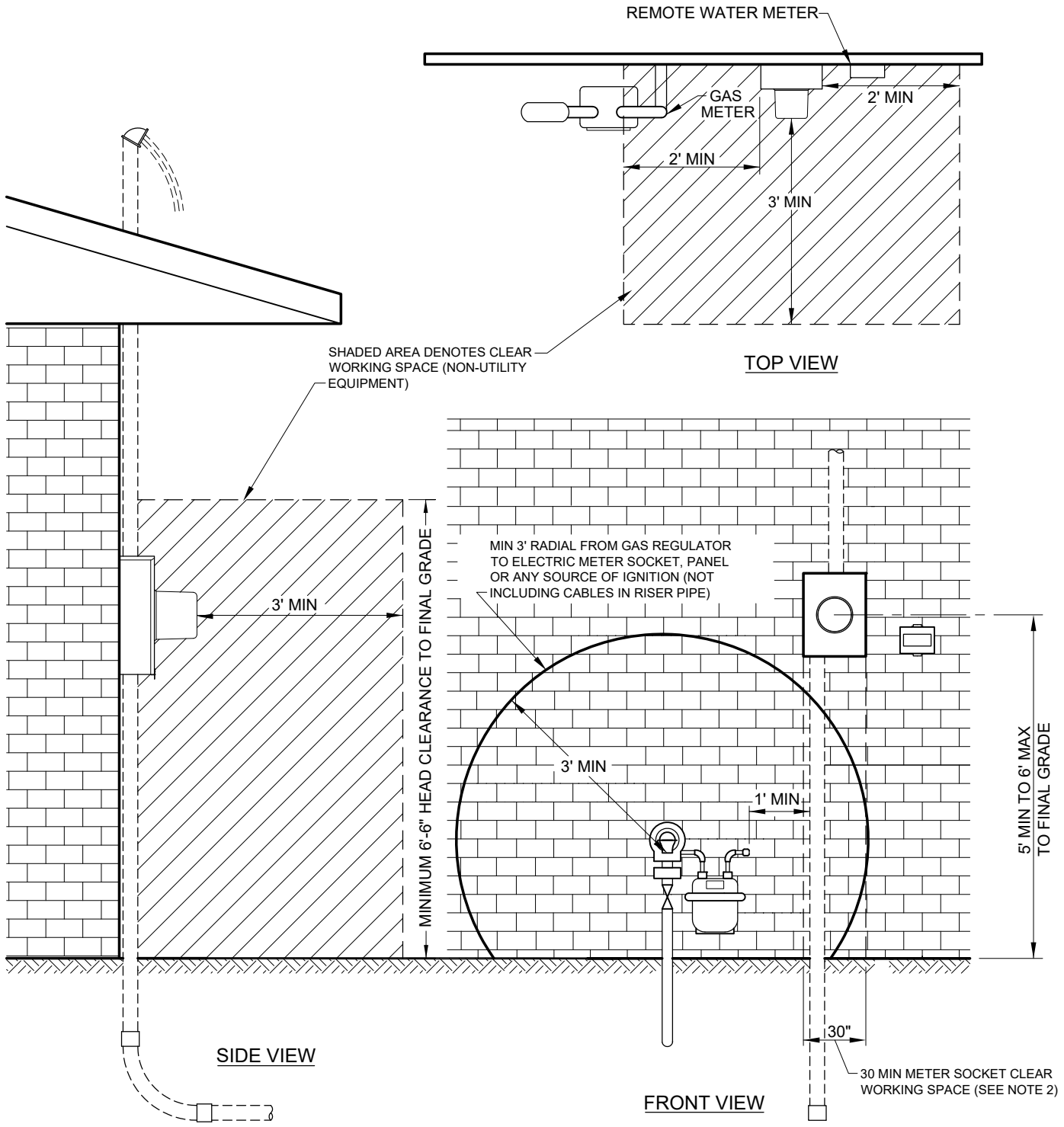
TYPICAL RISER DEPTH DETAIL
WHERE CONDUIT IS REQUIRED



NON-TYPICAL RISER DEPTH DETAIL

NESC RULE 360B:
Supply conductors or cable should rise vertically from the cable trench with only such deviation as necessary to permit a reasonable cable-bending radius.

DRAWING 3B - REQUIRED METER WORKING & SAFETY CLEARANCES



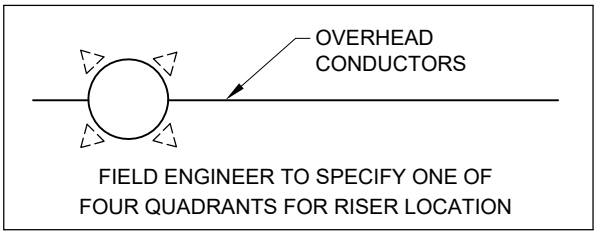
NOTES:

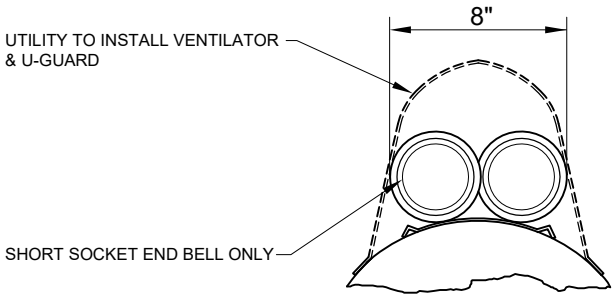
1. A 2' minimum clear working space is required on each side of the meter socket with 3' of clear area required in front of the meter for all non-utility owned equipment. This clear working space shall extend from the final grade up to the required 6'-6" headroom clearance. Obstructions that can hinder maintenance or reading of meters such as wood piles, stairways, window wells or other debris are prohibited within this clear space.
2. Regional Building Department requires all above ground gas piping materials to be installed outside of 30" meter socket working space (see drawing).
3. These working clearances apply to both overhead and underground services.

DRAWING 4A - OVERHEAD TO UNDERGROUND
COMMERCIAL SECONDARY SERVICE INSTALLATION

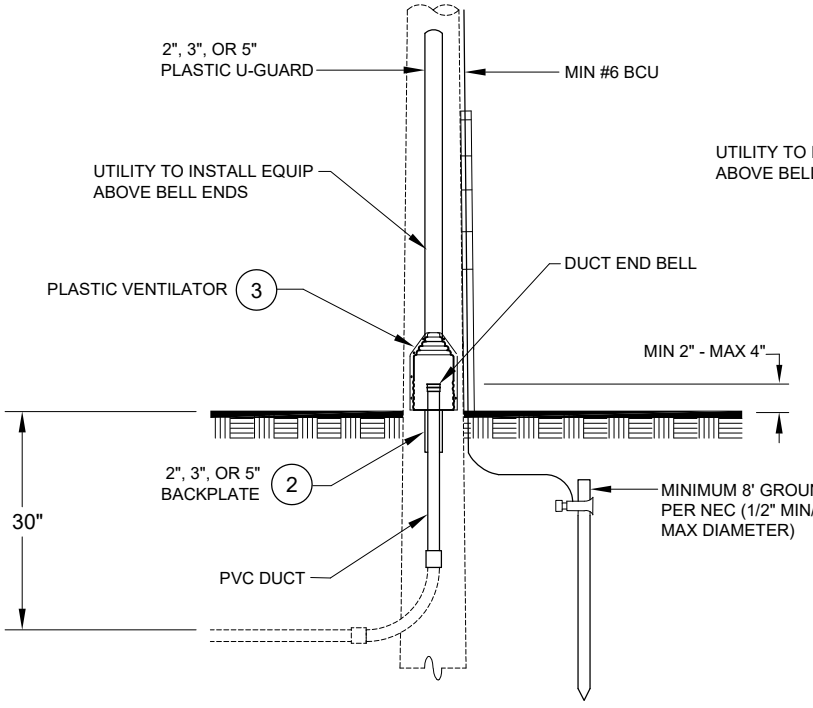
NOTES:

1. Customer to furnish and install duct, 90° PVC elbow and bell ends.
2. Commercial customers to furnish and install secondary cables in the duct with sufficient excess cable at the riser pole to provide 12 " drip loop and connection to overhead secondary conductors. The Field Engineer will specify on the load data form the additional length of cables needed to make connections up the pole.
3. Utility to furnish and install pole, grounding, 3" or 5" U-guard riser cover, and install customer furnished cable up the pole and connections at the pole.
4. Service to be 12" minimum below any gas line.
5. Notify Colorado Springs Utilities Inspector for conduit and trench inspection prior to backfilling.
6. Refer to trench information 10.1f.

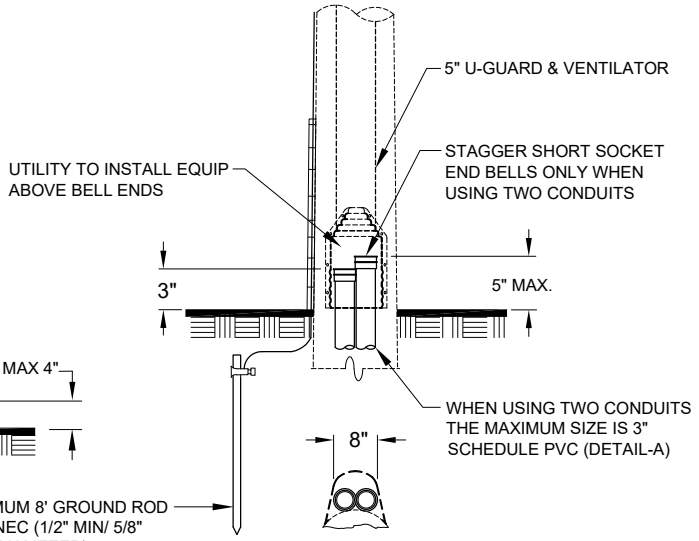




DETAIL "A"
BOTTOM VIEW
OF VENTILATOR WITH
TWO 3" CONDUITS



FRONT VIEW
VENTILATOR WITH ONE CONDUIT

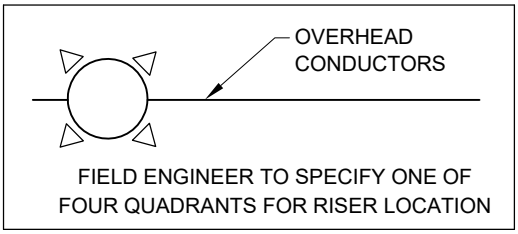


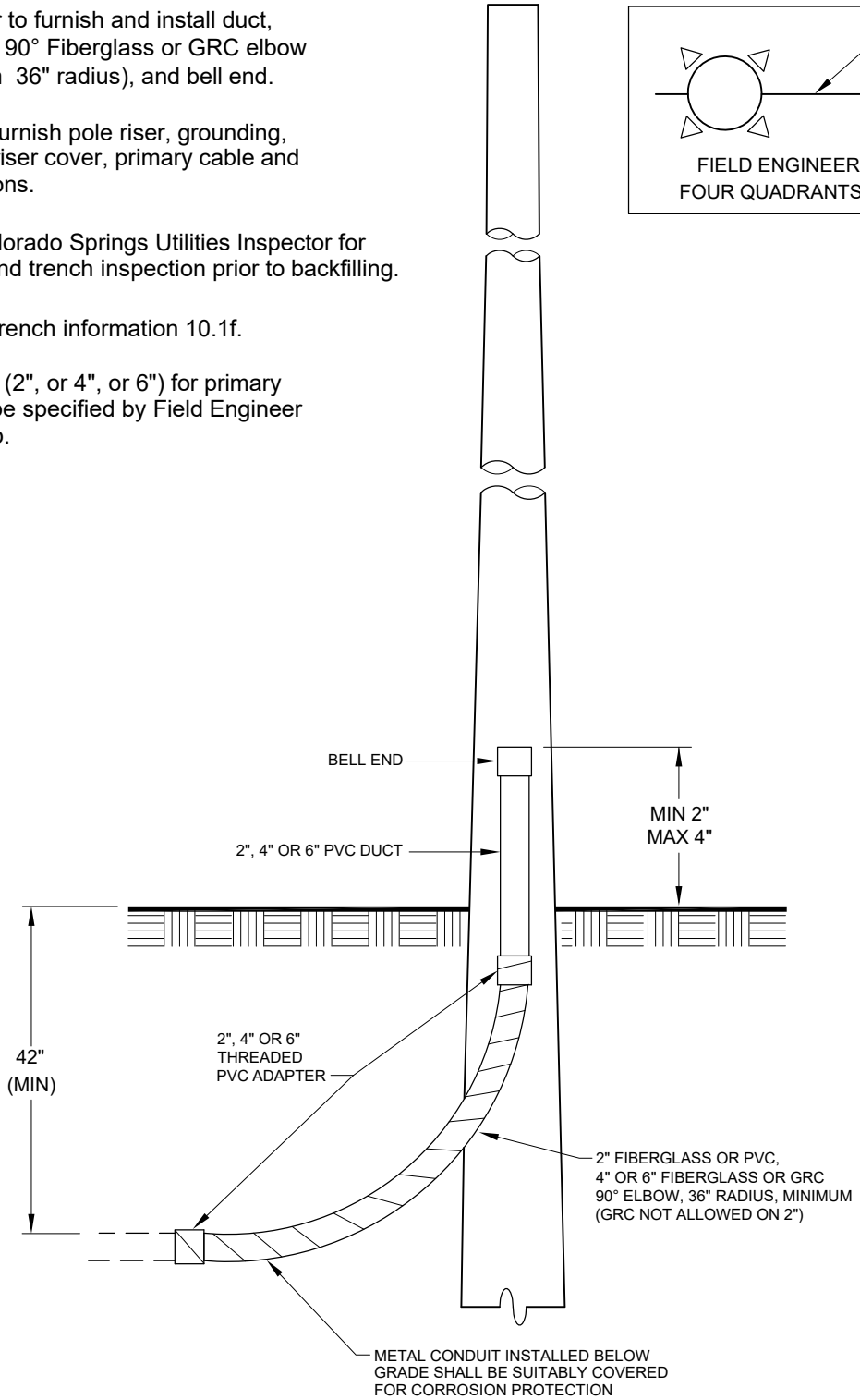
FRONT AND PLAN VIEW
VENTILATOR WITH TWO 3" CONDUITS

DRAWING 4B - OVERHEAD TO UNDERGROUND
COMMERCIAL PRIMARY INSTALLATION

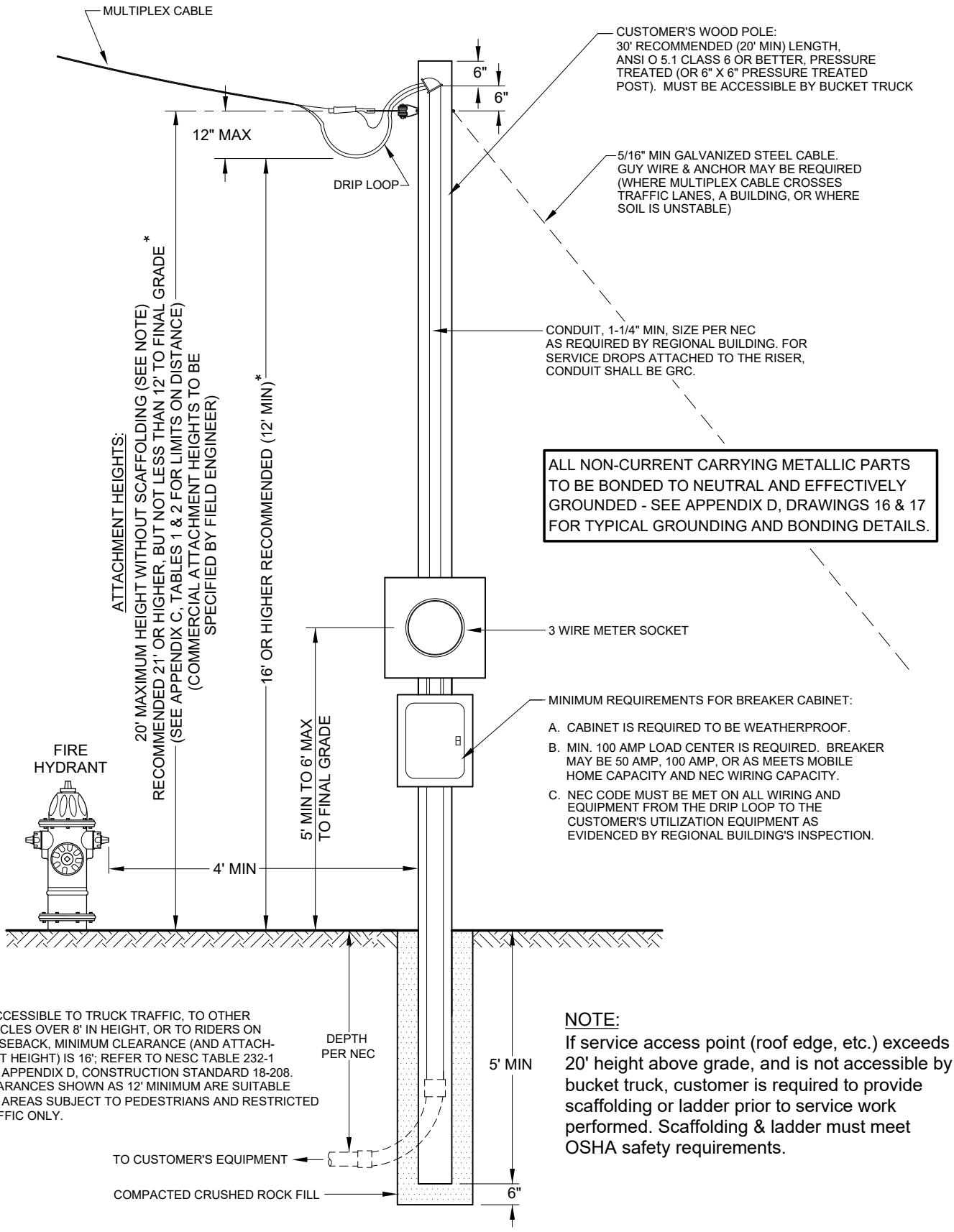
NOTES:

1. Customer to furnish and install duct, adapters, 90° Fiberglass or GRC elbow (minimum 36" radius), and bell end.
2. Utility to furnish pole riser, grounding, U-guard riser cover, primary cable and terminations.
3. Notify Colorado Springs Utilities Inspector for conduit and trench inspection prior to backfilling.
4. Refer to trench information 10.1f.
5. Duct size (2", or 4", or 6") for primary cable to be specified by Field Engineer on the job.





DRAWING 5 - CUSTOMER OWNED PERMANENT SERVICE POLE

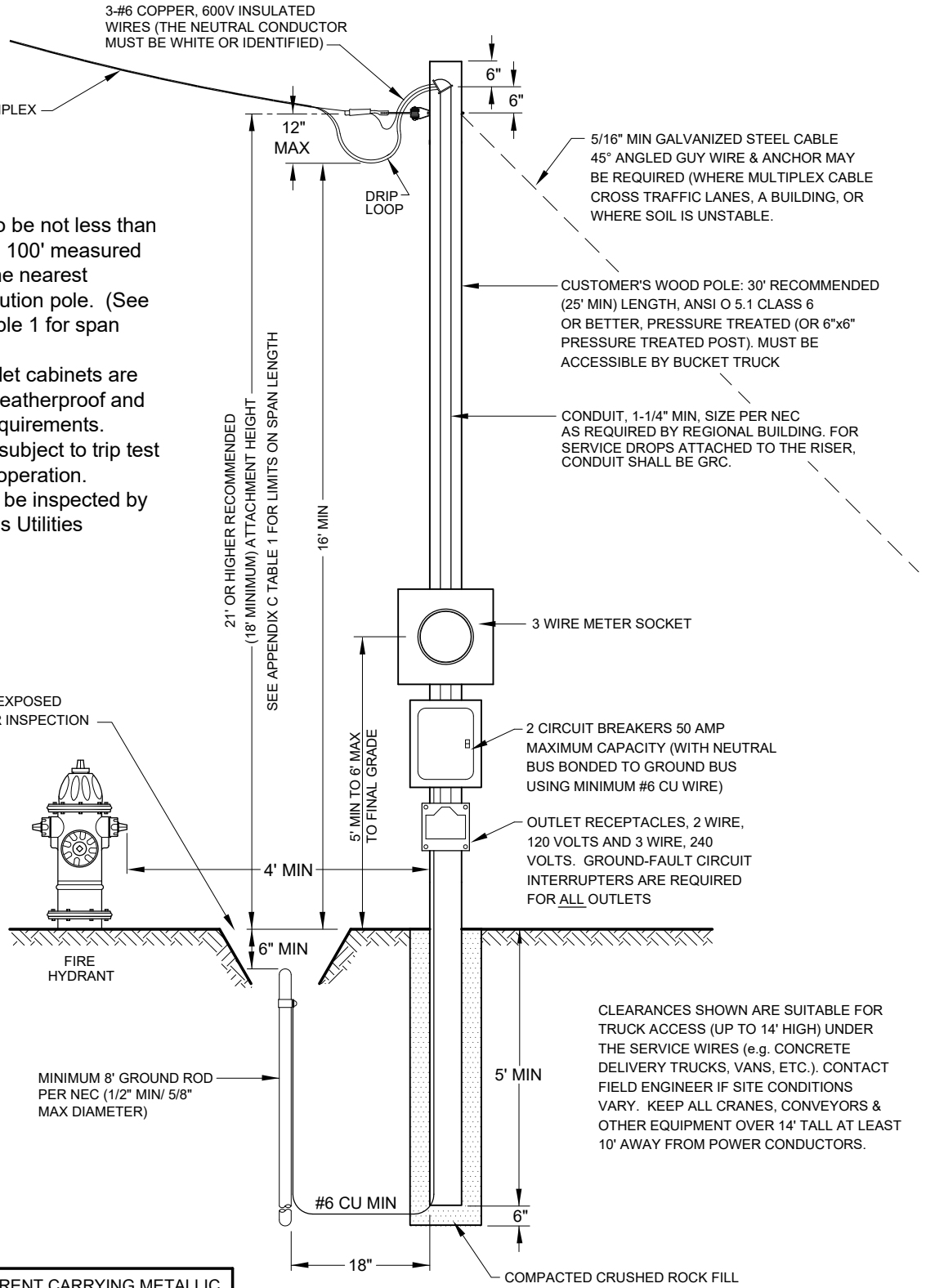


* IF ACCESSIBLE TO TRUCK TRAFFIC, TO OTHER VEHICLES OVER 8' IN HEIGHT, OR TO RIDERS ON HORSEBACK, MINIMUM CLEARANCE (AND ATTACHMENT HEIGHT) IS 16'; REFER TO NESC TABLE 232-1 AND APPENDIX D, CONSTRUCTION STANDARD 18-208. CLEARANCES SHOWN AS 12' MINIMUM ARE SUITABLE FOR AREAS SUBJECT TO PEDESTRIANS AND RESTRICTED TRAFFIC ONLY.

NOTE:

If service access point (roof edge, etc.) exceeds 20' height above grade, and is not accessible by bucket truck, customer is required to provide scaffolding or ladder prior to service work performed. Scaffolding & ladder must meet OSHA safety requirements.

DRAWING 6A - 50 AMP TEMPORARY CONSTRUCTION SERVICE POLE
(WITH TRUCK ACCESS UNDER SERVICE WIRES)

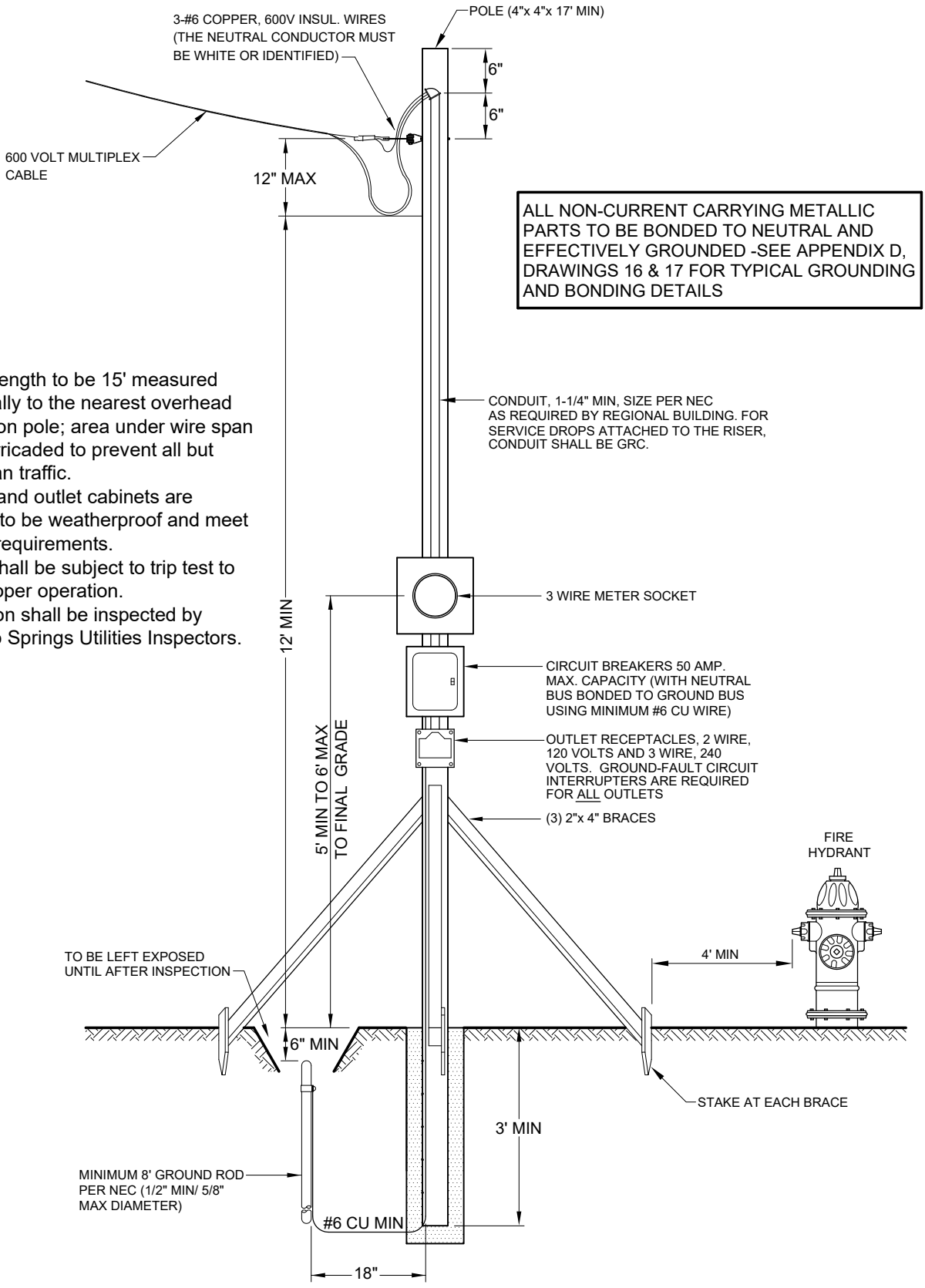


NOTES:

1. Service length to be not less than 15' or more than 100' measured horizontally to the nearest overhead distribution pole. (See Appendix C, Table 1 for span length limits.)
2. Breaker and outlet cabinets are required to be weatherproof and meet all NEC requirements.
3. GFCI's shall be subject to trip test to verify proper operation.
4. Installation shall be inspected by Colorado Springs Utilities Inspectors.

ALL NON-CURRENT CARRYING METALLIC PARTS TO BE BONDED TO NEUTRAL AND EFFECTIVELY GROUNDED

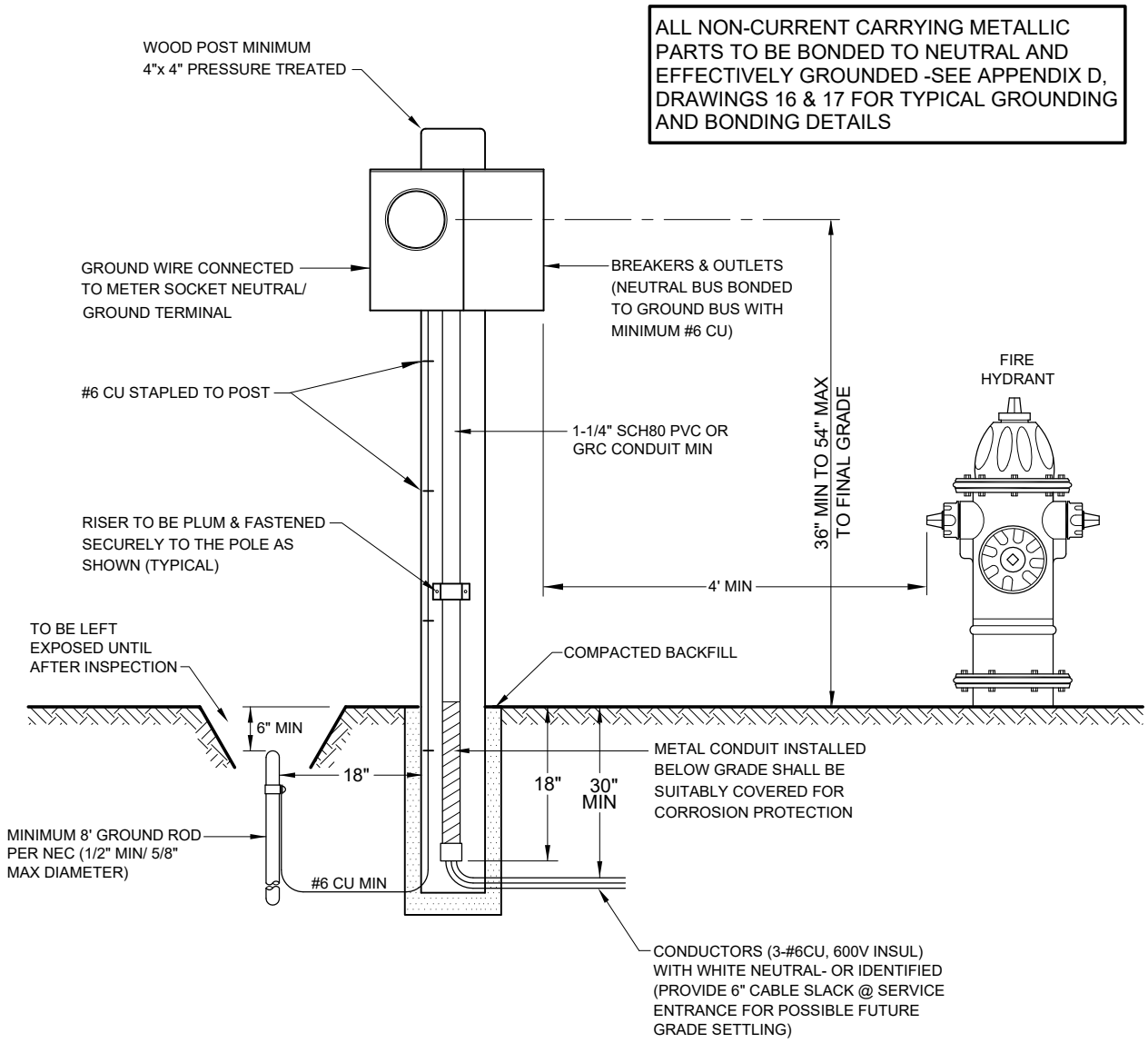
DRAWING 6B - 50 AMP TEMPORARY CONSTRUCTION SERVICE POLE
(NO RIDERS ON HORSEBACK NOR TRUCK ACCESS
TO SPACE UNDER SERVICE WIRES)



NOTES:

1. Service length to be 15' measured horizontally to the nearest overhead distribution pole; area under wire span to be barricaded to prevent all but pedestrian traffic.
2. Breaker and outlet cabinets are required to be weatherproof and meet all NEC requirements.
3. GFCI's shall be subject to trip test to verify proper operation.
4. Installation shall be inspected by Colorado Springs Utilities Inspectors.

DRAWING 7 - 50 AMP TEMPORARY POWER
POST TYPE INSTALLATION

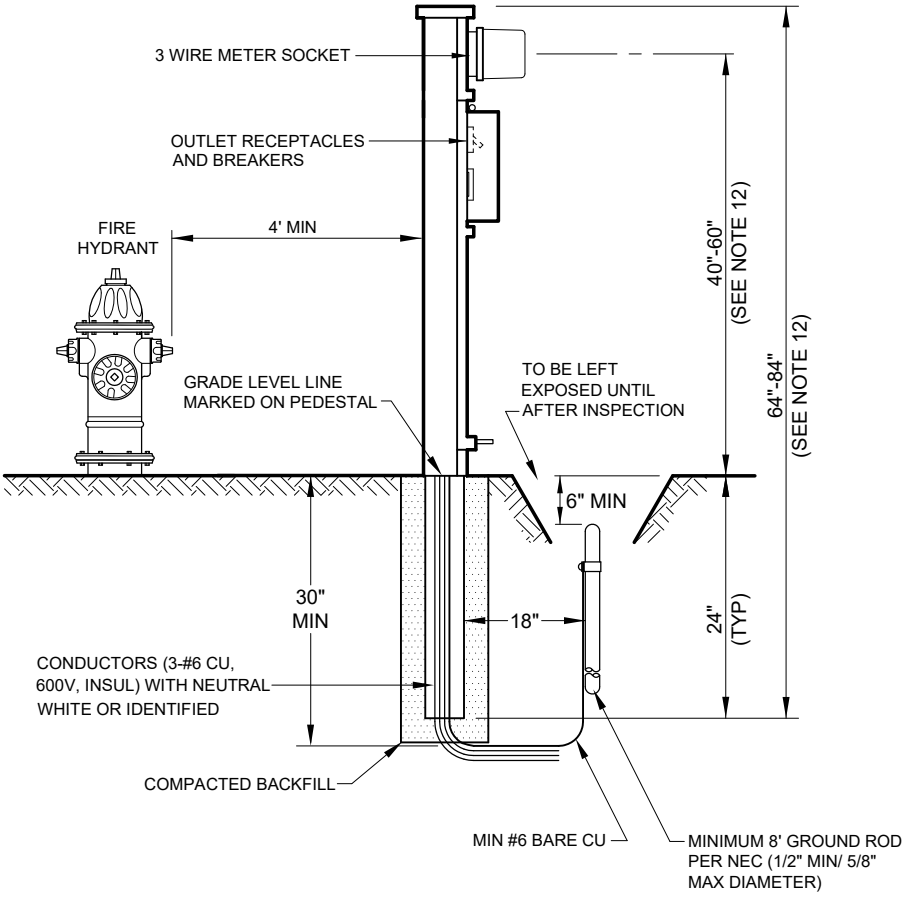


NOTES:

1. Weatherproof, 3 wire, 240 volt meter socket, breaker and outlet cabinets are required and shall meet all NEC requirements.
   A. Ground fault circuit interrupters are required on all outlets.
2. Post, cabinets, and related equipment furnished by customer.
3. Installation by customer (temporary meter policy).
4. Pedestal must be placed within 10 feet of existing transformer or secondary junction box (commercial policy). When served from an overhead source, post type pedestal must be no closer than 15 feet from the pole.
5. Wire and trench to be furnished by customer.
6. Installations will be inspected by Colorado Springs Utilities Inspectors.
7. Coordinate access to transformer enclosures with Colorado Springs Utilities Inspectors.
8. Temporary power requirements larger than 50A will be approved by Field Engineering, installed by the customer and inspected by Regional Building Department.
9. Refer to trench information 10.1f (commercial).
10. GFCI's shall be subject to trip test to verify proper operation.

DRAWING 8 - 50 AMP TEMPORARY POWER PEDESTAL

ALL NON-CURRENT CARRYING METALLIC PARTS TO BE BONDED TO NEUTRAL AND EFFECTIVELY GROUNDED -SEE APPENDIX D, DRAWINGS 16 & 17 FOR TYPICAL GROUNDING AND BONDING DETAILS

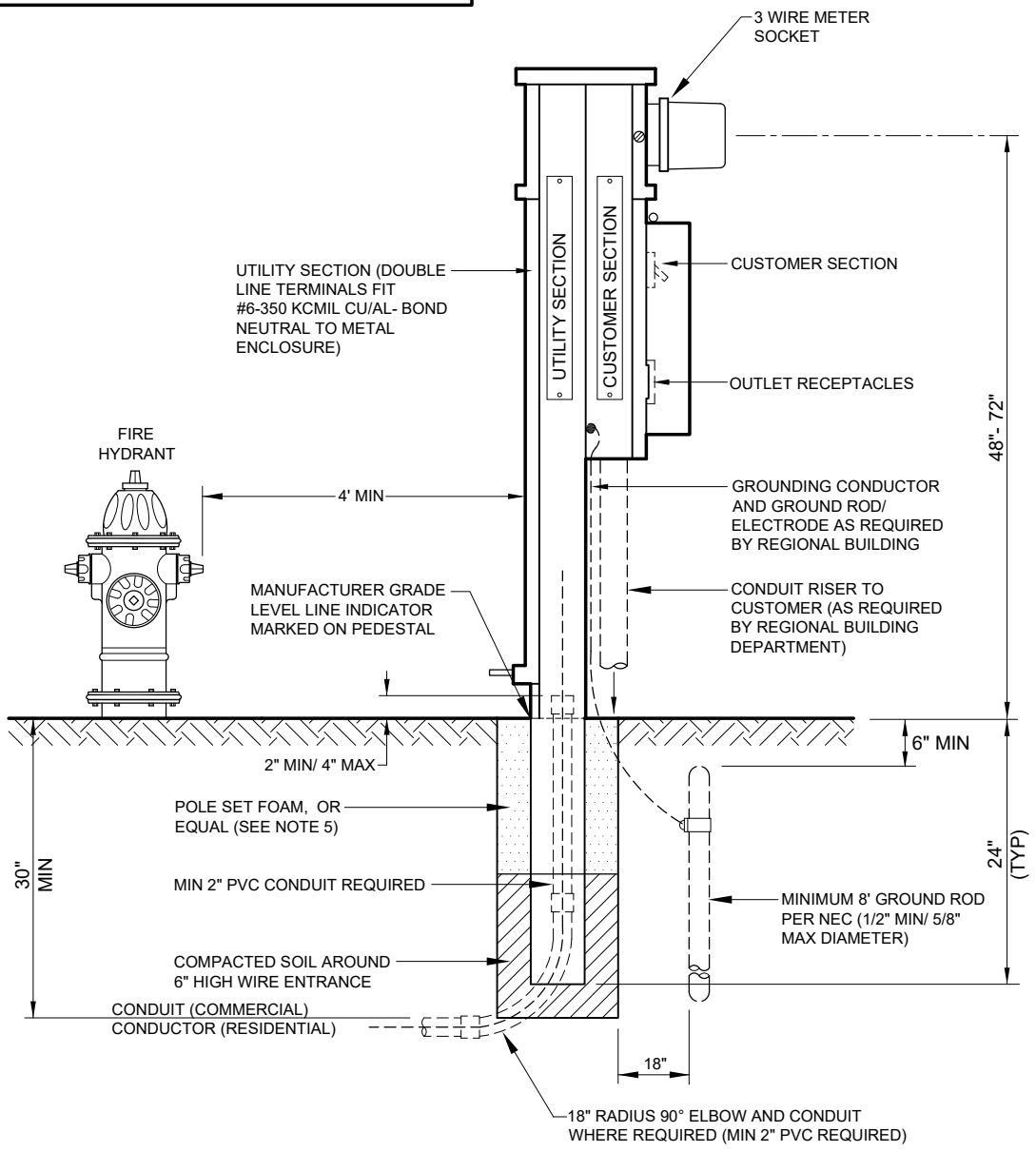


NOTES:

1. Weatherproof, 3 wire, 240 volt breaker and outlet cabinets are required and shall meet all NEC requirements:
   A. Ground fault circuit interrupters are required on all outlets.
   B. Neutral bus shall be bonded to ground bus with minimum #6 Copper.
2. Pedestal and related equipment furnished by customer.
3. Installation by customer (temporary meter policy).
4. Pedestal must be placed within 10 feet of existing transformer or secondary junction box (commercial policy). When served from an overhead source, meter pedestal must be no closer than 15 feet from the pole.
5. Wire and trench to be furnished by customer.
6. Installation shall be inspected by Colorado Springs Utilities Inspector.
7. Coordinate access to transformer enclosures with Utility Inspectors.
8. Temporary power requirements larger than 50A will be approved by Field Engineering, installed by the customer, and inspected by Regional Building Department.
9. Refer to trench information 10.1f.
10. GFCI's shall be subject to trip test to verify proper operation.
11. Actual dimensions may vary by meter pedestal manufacturer. See manufacturer instructions for proper installation. Bury to the grade level line marker located on the pedestal.

DRAWING 9 - PERMANENT AND TEMPORARY METER PEDESTAL (100 OR 200 AMP)

ALL NON-CURRENT CARRYING METALLIC PARTS TO BE BONDED TO NEUTRAL AND EFFECTIVELY GROUNDED -SEE APPENDIX D, DRAWINGS 16 & 17 FOR TYPICAL GROUNDING AND BONDING DETAILS



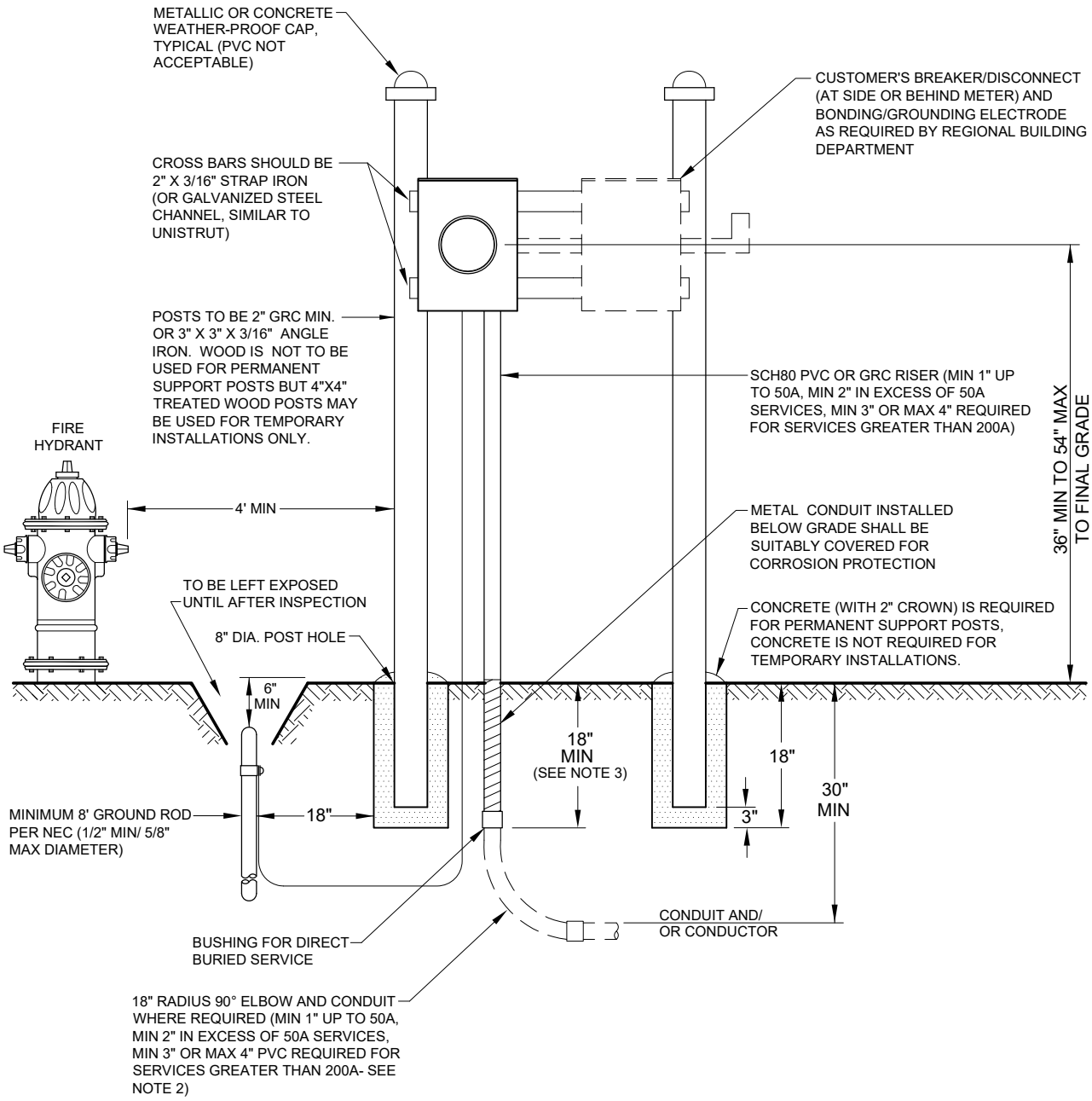
NOTES:

1. May be used for commercial services, i.e., traffic signals, site lighting and sprinkler systems, as well as mobile home sites.
2. Pedestal and related equipment furnished by customer. Pedestal to meet Colorado Springs Utilities Electric Distribution Construction Standard 8-5 (Appendix-F) and Material Specification 194-113-406 (Appendix-E).
3. Installation by customer with Regional Building inspections.
4. Refer to trench information: 7.02a (residential) or 10.1f (commercial).
5. Concrete flowable fill may be used as long as conductor is not encased.
6. Pedestal must be placed within 10 feet of existing transformer or secondary junction box (commercial policy). When served from an overhead source, meter pedestal must be no closer than 15 feet from the pole.

DRAWING 10A - PERMANENT AND TEMPORARY POST TYPE METER INSTALLATION

(SELF-CONTAINED METERING)

ALL NON-CURRENT CARRYING METALLIC PARTS TO BE BONDED TO NEUTRAL AND EFFECTIVELY GROUNDED -SEE APPENDIX D, DRAWINGS 16 & 17 FOR TYPICAL GROUNDING AND BONDING DETAILS



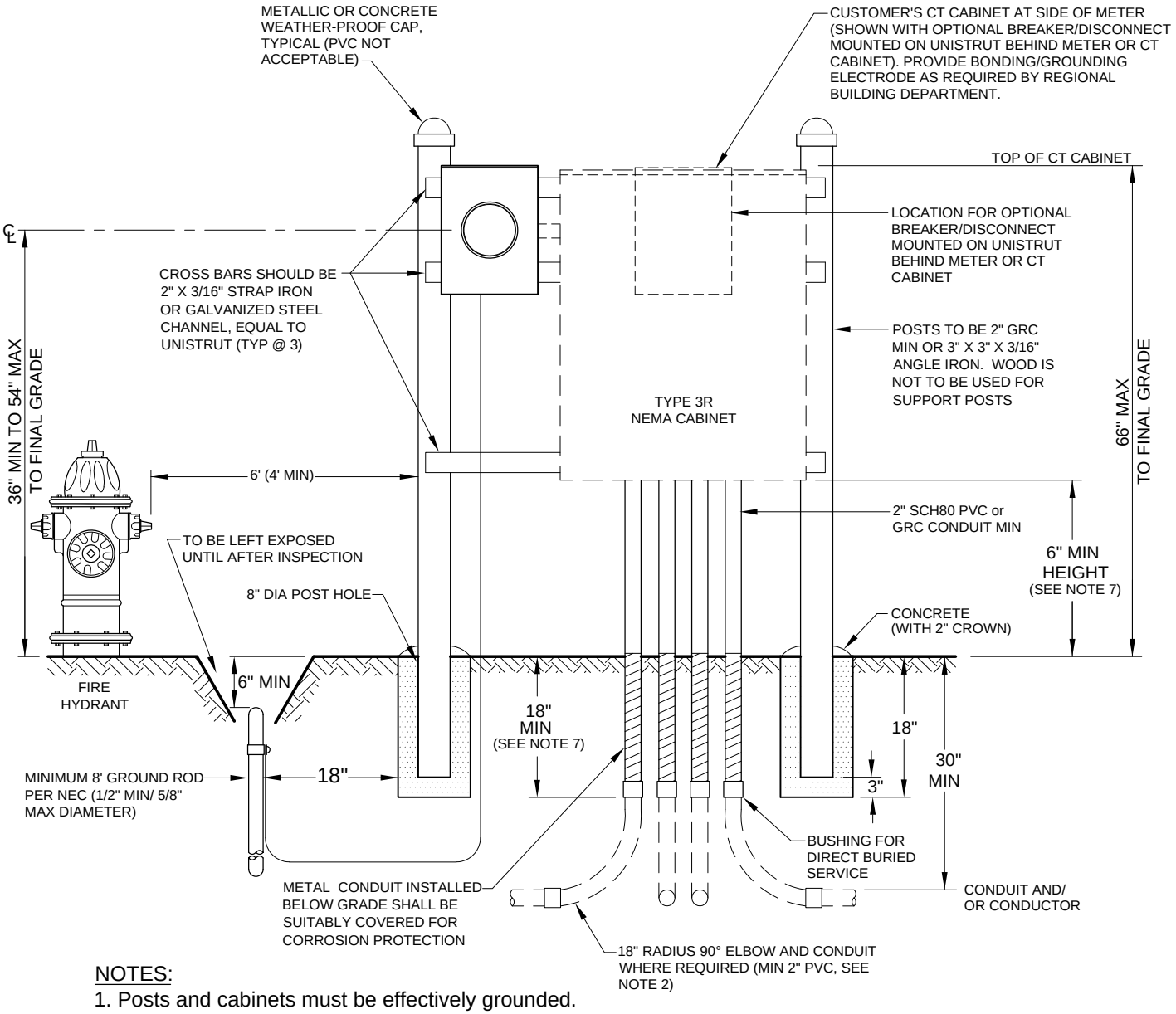
NOTES:

1. Post must be effectively grounded.
2. Refer to trench information 7.02a (residential) or 10.1f (commercial).
3. SCH80 PVC, GRC riser or combination of GRC/ PVC conduit must extend 18" below final grade, minimum.
4. Meter post must be placed within 10 feet of existing transformer or secondary junction box (commercial policy). When served from an overhead source, meter post must be no closer than 15 feet from the pole.

DRAWING 10B - PERMANENT AND TEMPORARY POST TYPE METER & INSTRUMENT TRANSFORMER (CT & VT) INSTALLATION

(NON-PREFERRED INSTALLATION)

ALL NON-CURRENT CARRYING METALLIC PARTS TO BE BONDED TO NEUTRAL AND EFFECTIVELY GROUNDED -SEE APPENDIX D, DRAWINGS 16 & 17 FOR TYPICAL GROUNDING AND BONDING DETAILS

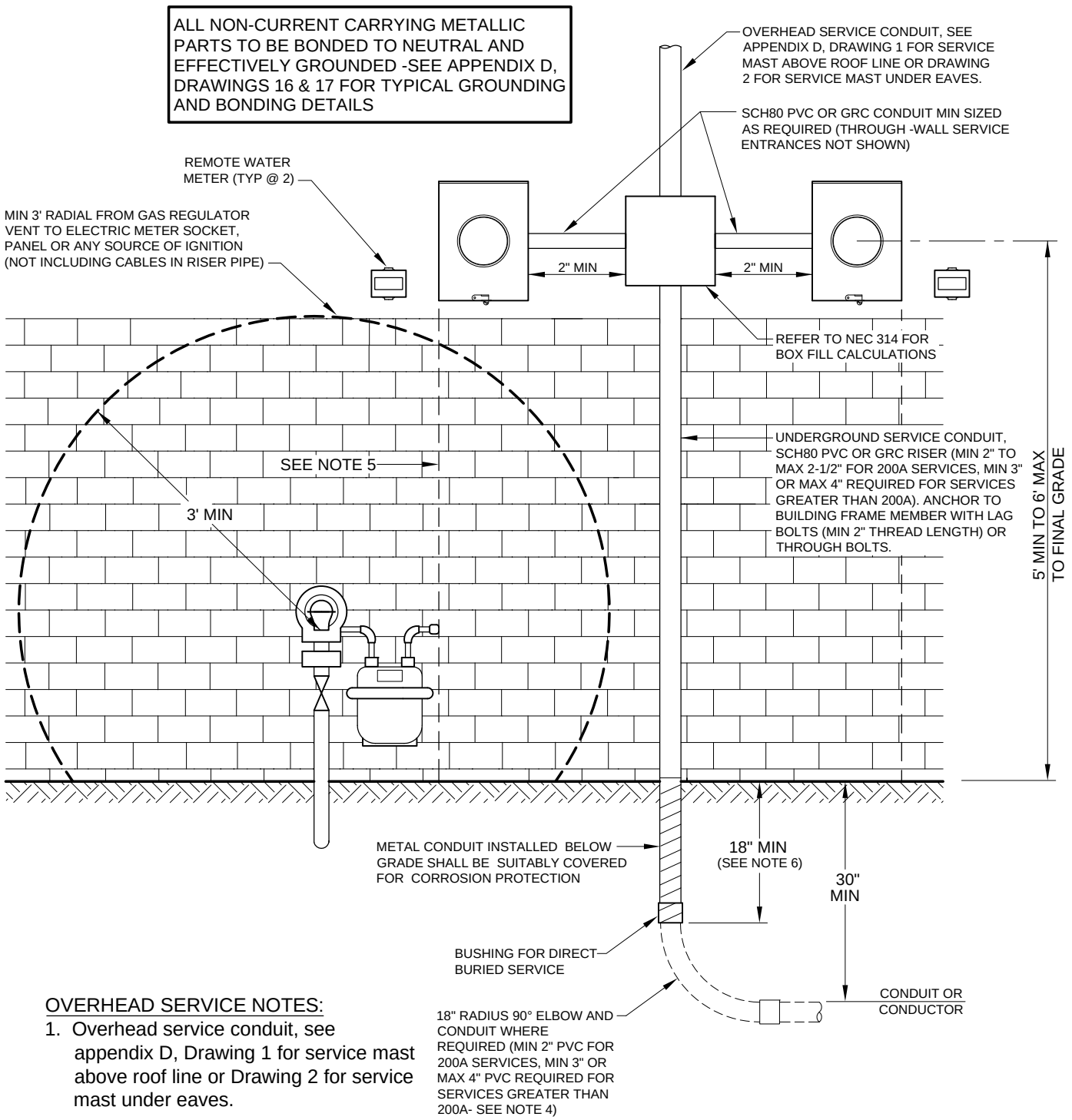


NOTES:

1. Posts and cabinets must be effectively grounded.
2. Refer to trench information, 7.02a (residential) or 10.1f (commercial).
3. Bumper posts should be installed to protect equipment when installation is in a traffic area.
4. Installation shall not violate line-of sight visibility clearances. Contact Colorado Springs Utilities Inspector for required visibility clearances.
5. Adequate clearance shall be maintained from driveways, or other obstructions. Maintain 3' clearance in front of meter and 2' clearance at sides of meter.
6. For 277/480 volt services, a VT ("VT Pack") is required.
7. SCH80 PVC, GRC riser or combination of GRC/ PVC conduit must extend 18" below final grade, minimum.
8. Meter post must be placed within 10 feet of existing padmount / submersible transformer or secondary junction box (commercial policy). When served from an overhead source, post type meter, CT & VT must be no closer than 15 feet from the pole.

DRAWING 11 - DUAL METER INSTALLATION SERVICE

(SELF-CONTAINED METERING)



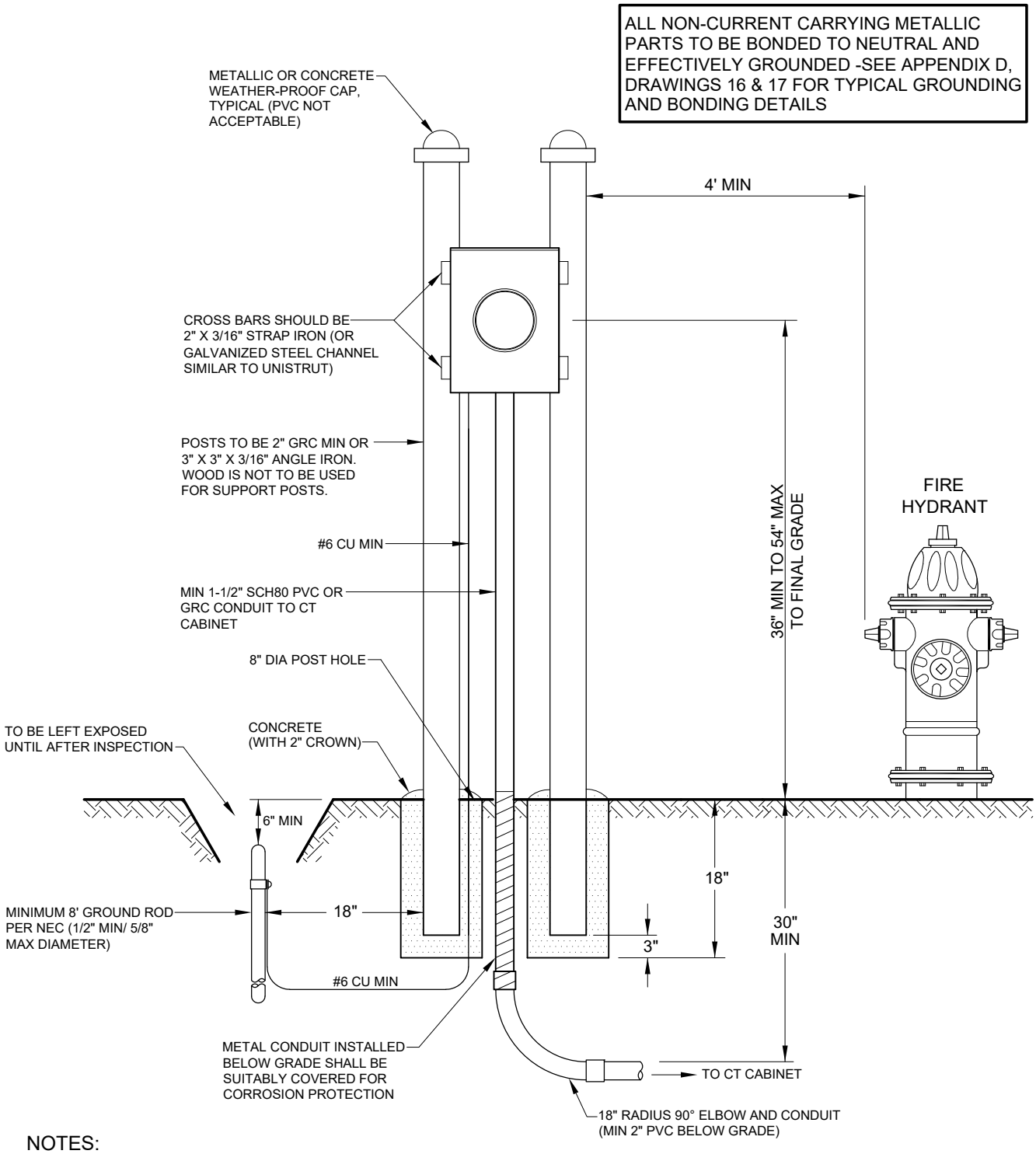
OVERHEAD SERVICE NOTES:

1. Overhead service conduit, see appendix D, Drawing 1 for service mast above roof line or Drawing 2 for service mast under eaves.

UNDERGROUND SERVICE NOTES:

1. Customer shall pre-wire the line side of the meter socket to the junction box.
2. Conduit clamp must be above ground.
3. If builder's plans call for a patio or deck, electrician to extend conduit beyond edge of slab or deck.
4. Refer to trench information, 7.02a (residential) or 10.1f (commercial).
5. All above ground gas piping to be installed outside of each meter socket (30" minimum) clear working space.
6. SCH80 PVC, GRC riser or combination of GRC/ PVC conduit must extend 18" below final grade, minimum. Trench depth shall be 30" min/ 36" max below final grade. There shall be no obstructions (i.e., foundation footer, drains, etc.) below riser within 12" from bottom of riser to bottom of electric trench. See Drawing 3A for installation example details when obstructions occur.

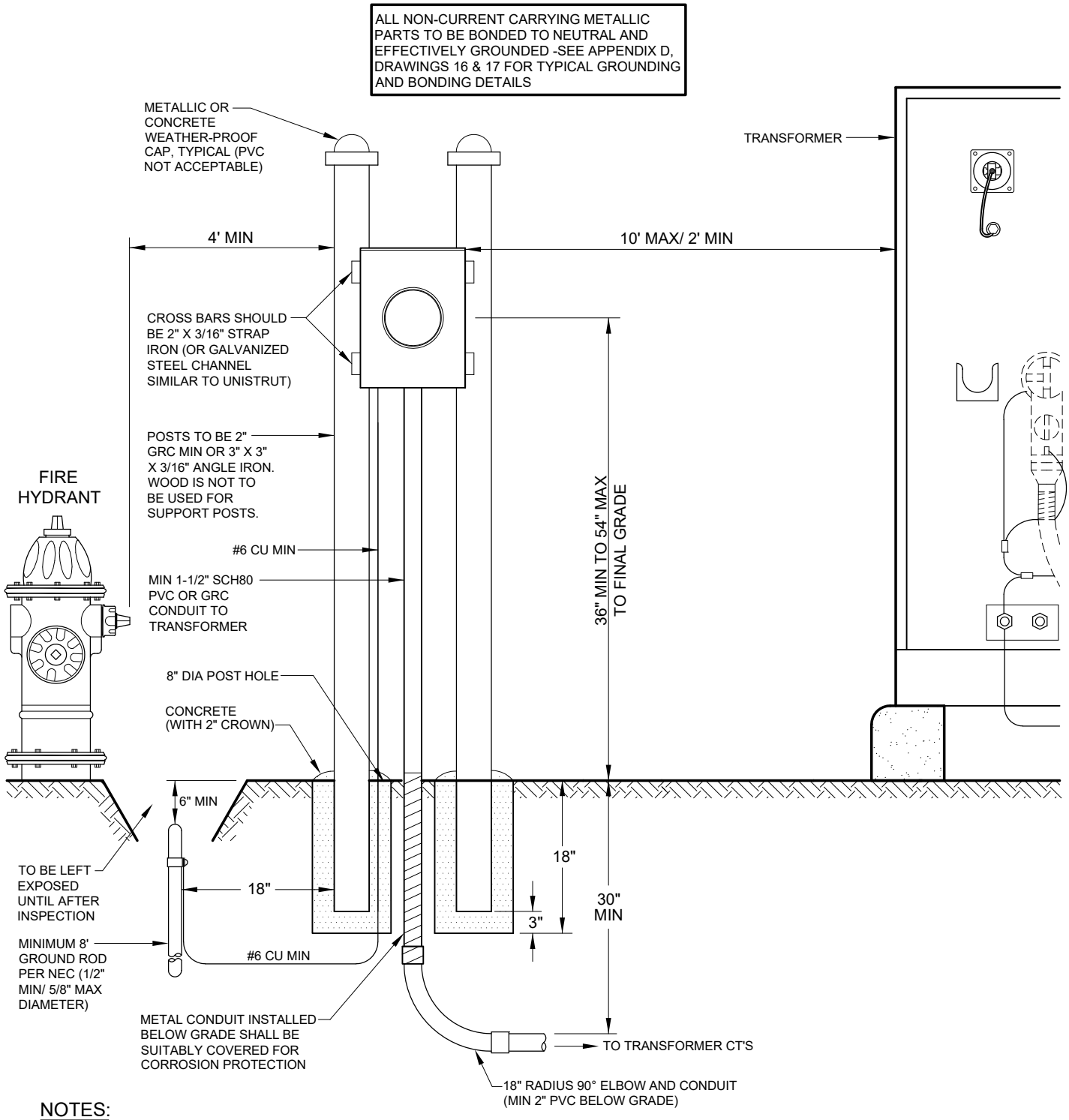
DRAWING 12A - POST TYPE INSTRUMENT TRANSFORMER (CT & VT)
METER INSTALLATION (FROM A CT CABINET)



NOTES:

1. Meter to be mounted with a maximum distance (total length of conduit run including all bends) of 20' from instrument transformers (CTs & VTs), refer to paragraph 5.04e for instrument transformer conduit installation.
2. Both posts must be effectively grounded.
3. Refer to trench information, 10.1f (commercial).
4. Connect #6 copper conductor from ground rod to ground terminal inside meter enclosure; this ground is in addition to that which may be required by the Regional Building Department.
5. Provide pull line for instrument transformer (CT & VT) wire.
6. For 277/480 volt services, a VT ("VT Pack") is required.

DRAWING 12B - POST TYPE INSTRUMENT TRANSFORMER (CT & VT)
METER INSTALLATION (FROM CT'S IN A TRANSFORMER)

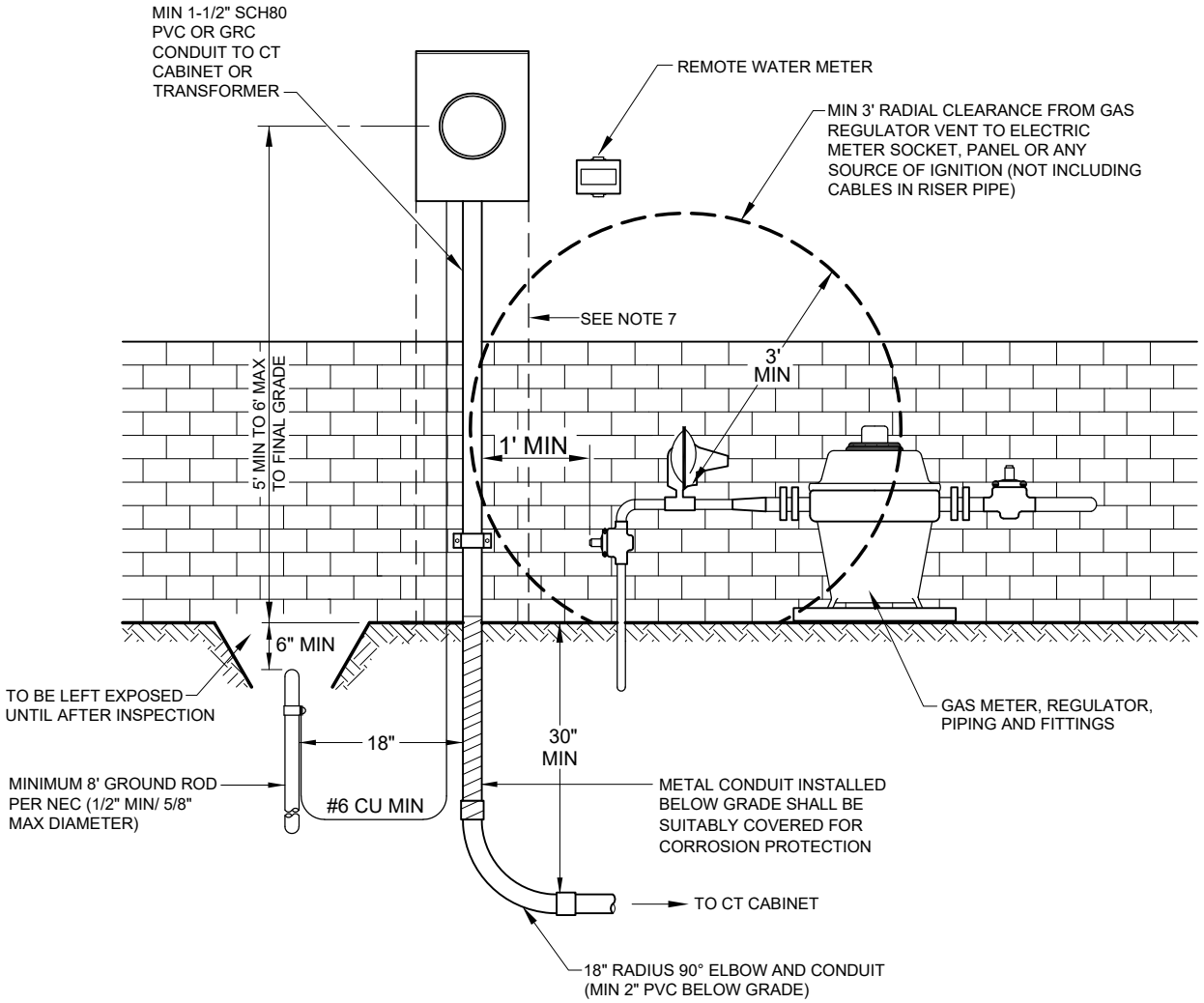


NOTES:

1. Meter Socket must be mounted along side or behind the transformer on a pedestal or post (unistrut or other), at least 2' but not to exceed 10' as shown. Socket location cannot be in front of the transformer or in a location that interferes with truck access. See Appendix F, 18-302 page 2 for padmount equipement clearances for working space. See Chapter 5, paragraph 5.04e for instrument transformer conduit installation.
2. Both posts must be effectively grounded.
3. Refer to trench information, 10.1f (commercial).
4. Connect #6 copper conductor from ground rod to ground terminal inside meter enclosure; this ground is in addition to that which may be required by the Regional Building Department.
5. Provide pull line for instrument transformer (CT & VT) wire.
6. For 277/480 volt services, a VT ("VT Pack") is required.

DRAWING 13 - INSTRUMENT TRANSFORMER (CT & VT) METERING INSTALLATION

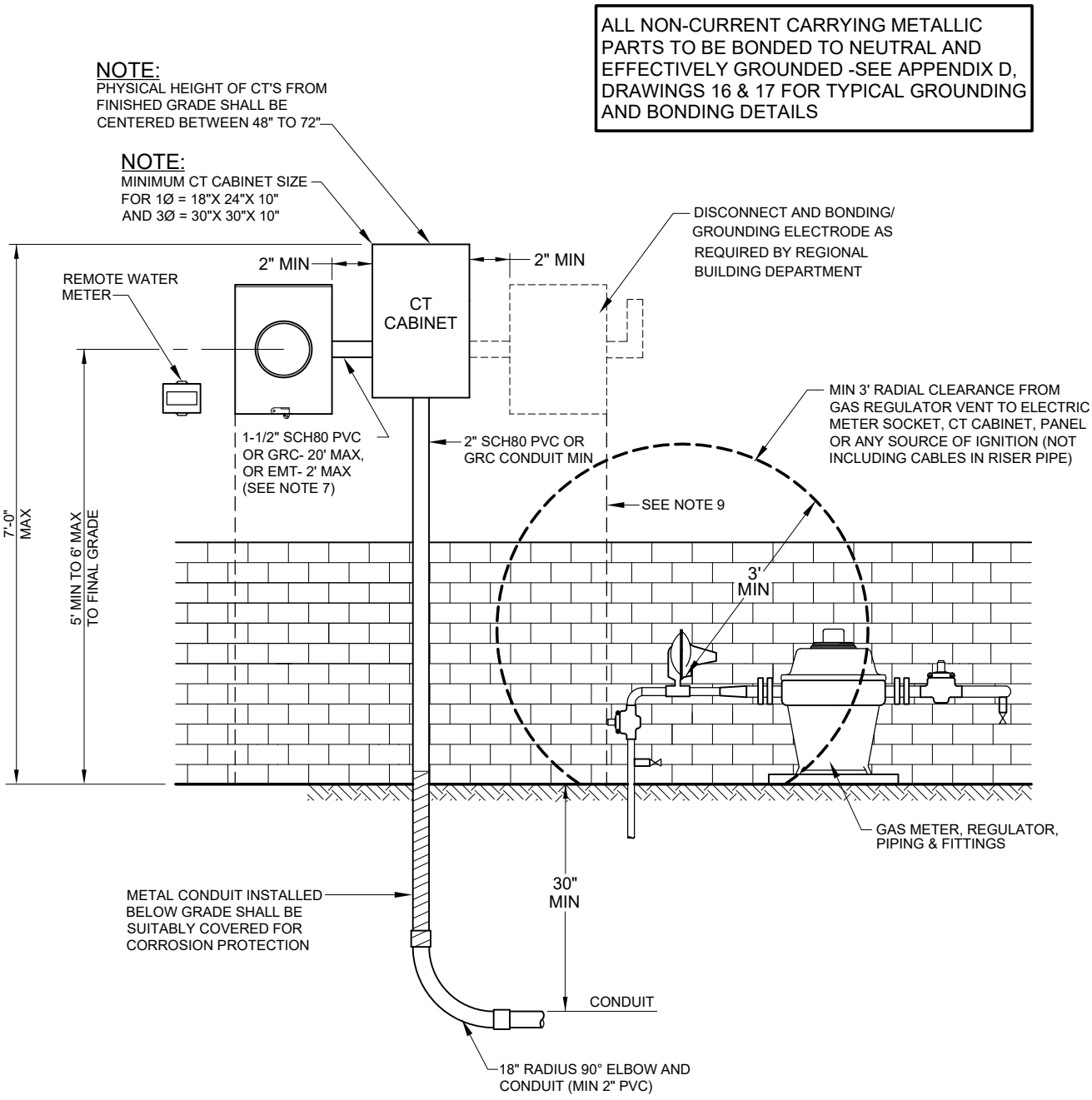
ALL NON-CURRENT CARRYING METALLIC PARTS TO BE BONDED TO NEUTRAL AND EFFECTIVELY GROUNDED -SEE APPENDIX D, DRAWINGS 16 & 17 FOR TYPICAL GROUNDING AND BONDING DETAILS



NOTES:

1. Meter to be mounted with a maximum distance (total length of conduit run including all bends) of 20' from instrument transformers (CTs & VTs), refer to paragraph 5.04e for instrument transformer conduit installation.
2. Conduit clamp must be above ground.
3. Refer to trench information, 10.1f (commercial).
4. Connect #6 copper conductor from ground rod to ground terminal inside meter enclosure; this ground rod is in addition to that which may be required by the Regional Building Department.
5. Provide pull line for instrument transformer (CT & VT) wire.
   For 277/480 volt services, a VT ("VT Pack") is required.
6. All above ground gas piping to be installed outside of meter socket (30" minimum) clear working space.

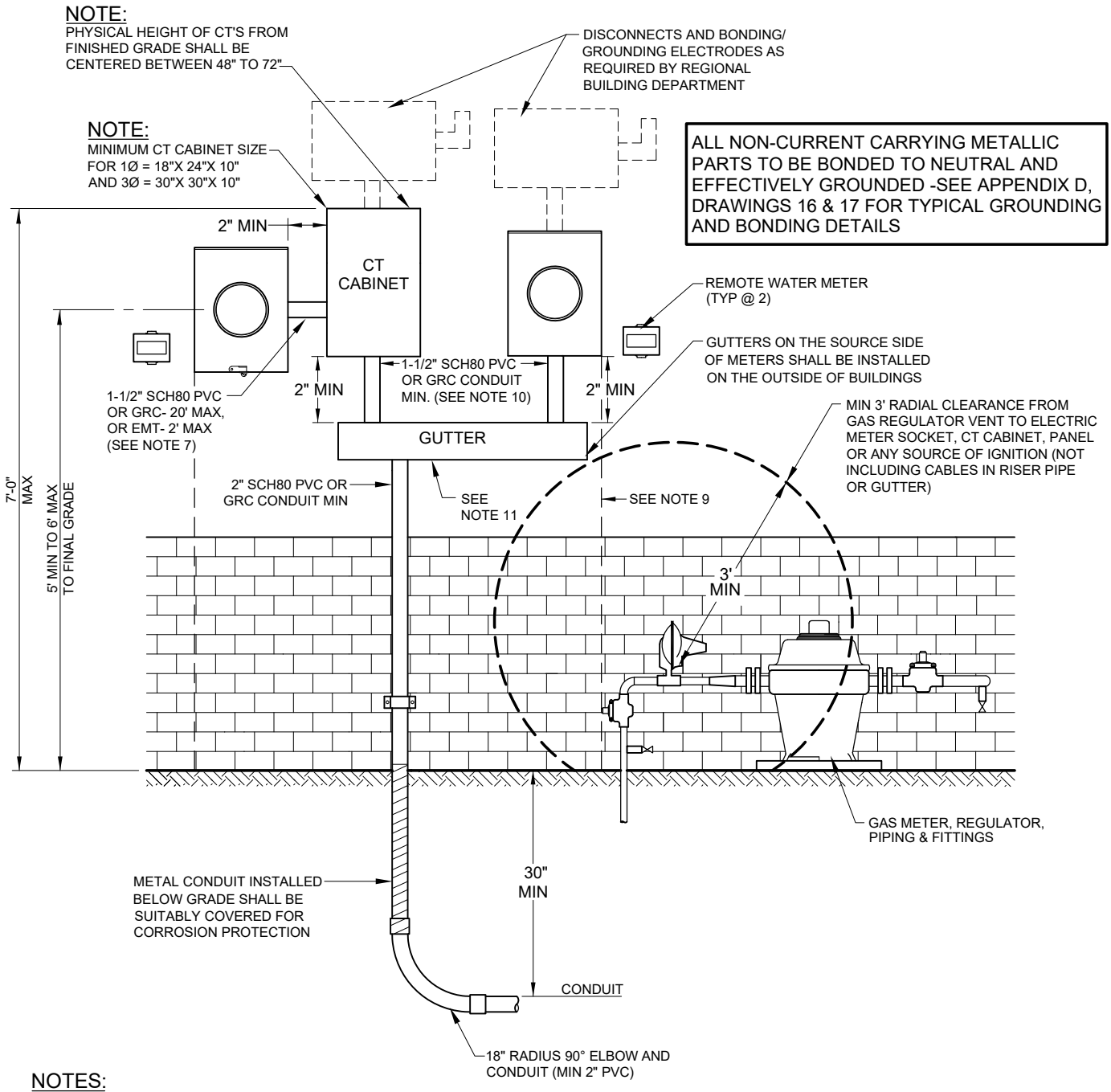
DRAWING 14 - CT CABINET INSTALLATION



NOTES:

1. CT cabinet to be sealable by Colorado Springs Utilities.
2. See Section 5.12 regarding equipment ahead of the meter.
3. Installation to conform with Chapter 10 Commercial/Industrial Development.
4. Conduit clamp must be above ground.
5. GRC conduit shall be suitably covered below grade for corrosion protection.
6. Refer to trench information, 7.02a (residential) or 10.1f (commercial).
7. Install conduit towards front of CT cabinet to avoid CT secondary wiring behind service entrance conductors.
8. For 277/480 volt services, a VT ("VT Pack") is required to be installed inside the CT cabinet.
9. All above ground gas piping to be installed outside of each meter socket (30" minimum) clear working space.

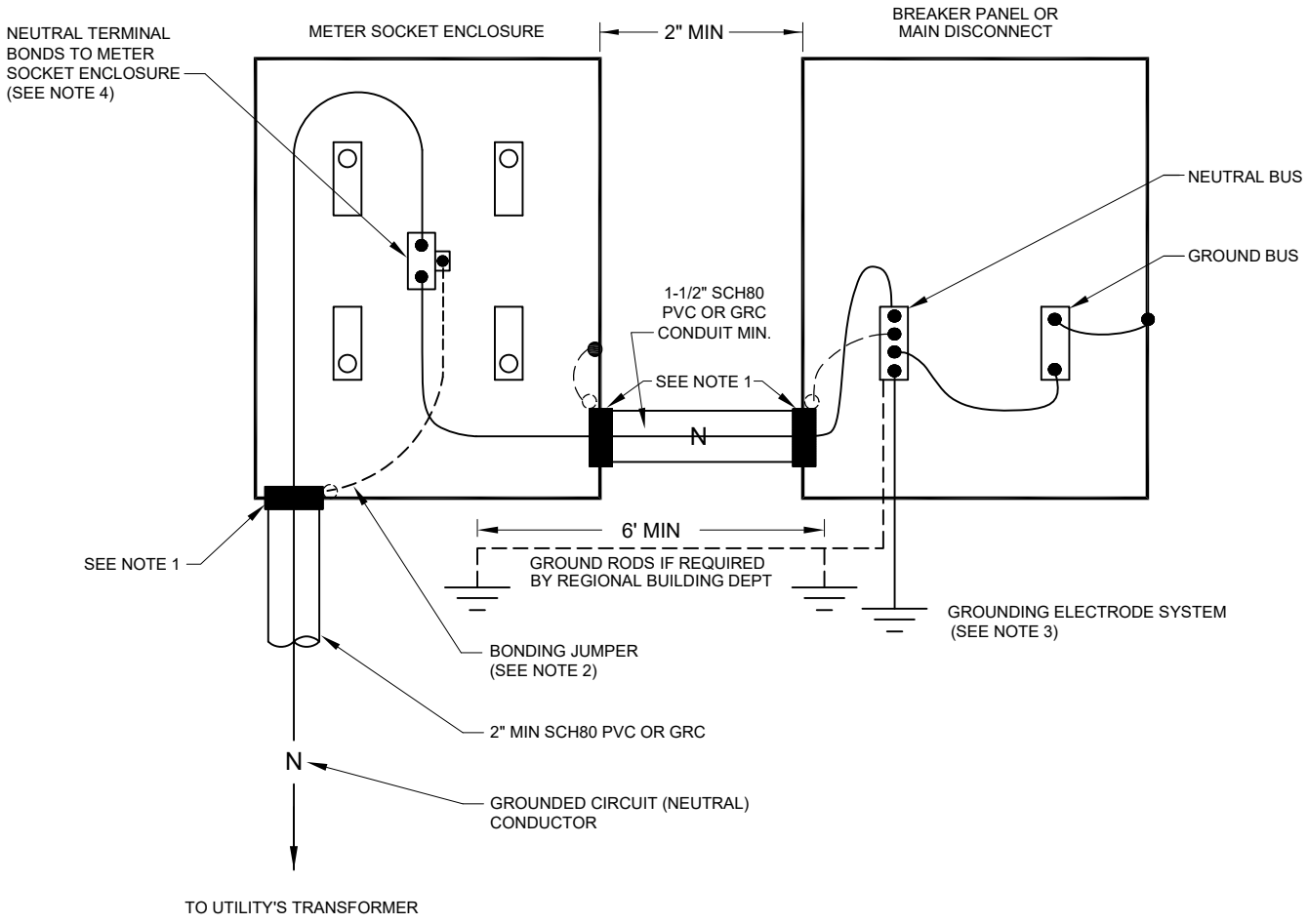
DRAWING 15 - COMBINATION METERING INSTALLATION



NOTES:

1. CT cabinet and gutter to be sealable by Colorado Springs Utilities.
2. See Section 5.12 regarding equipment ahead of the meter.
3. Installation to conform with Chapter 10 Commercial/Industrial Development.
4. Conduit clamp must be above ground.
5. GRC conduit shall be suitably covered below grade for corrosion protection.
6. Refer to trench information, 10.1f (commercial).
7. Install conduit towards front of CT cabinet to avoid instrument transformer (CT & VT) secondary wiring behind entrance conductors.
8. For 277/480 volt services, a VT ("VT Pack") is required to be installed inside the CT cabinet.
9. All above ground gas piping to be installed outside of each meter socket 30" minimum clear working space.
10. See 5.12 for requirements for sealing equipment ahead of the meter.
11. Avoid passing one customer's service entrance conductors through another customer's equipment.

DRAWING 16 - TYPICAL GROUNDING/BONDING FOR ALL SELF-CONTAINED SERVICES UP TO 480 VOLTS



NOTES:

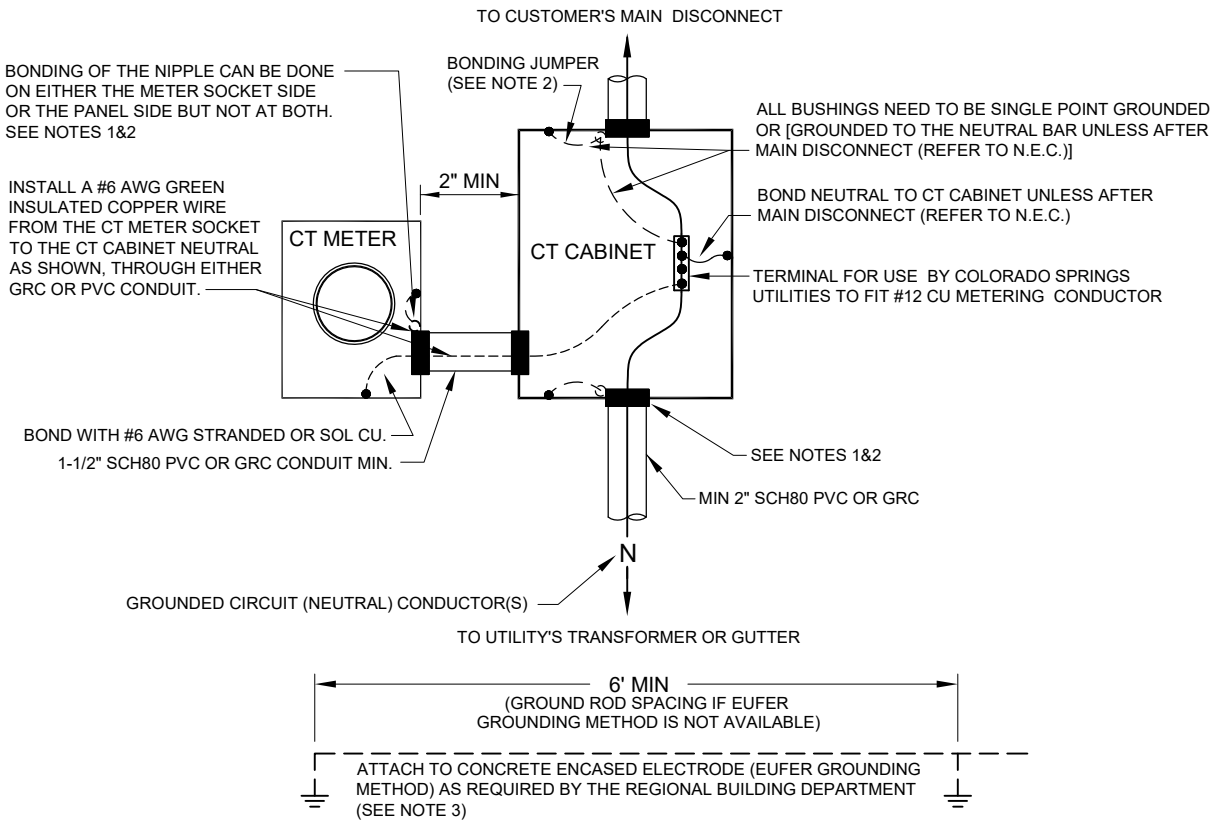
1. Metal conduit raceway (SCH80 PVC also allowed) shall be bonded to the neutral conductor by the use of a grounding bushing (with bonding jumper), bonding locknuts, threaded conduit hub, or other as approved by the Regional Building Department. Bonding of the nipple can be done on either the meter socket side or the panel side but not at both.

2. When a grounding bushing is used, a bonding jumper shall be installed to connect with the neutral grounding terminal as required by the Regional Building Department. (For a 100 amp service, the minimum size of bonding jumper shall be #6 Copper and for a 200 amp service, it shall be #4 Copper).

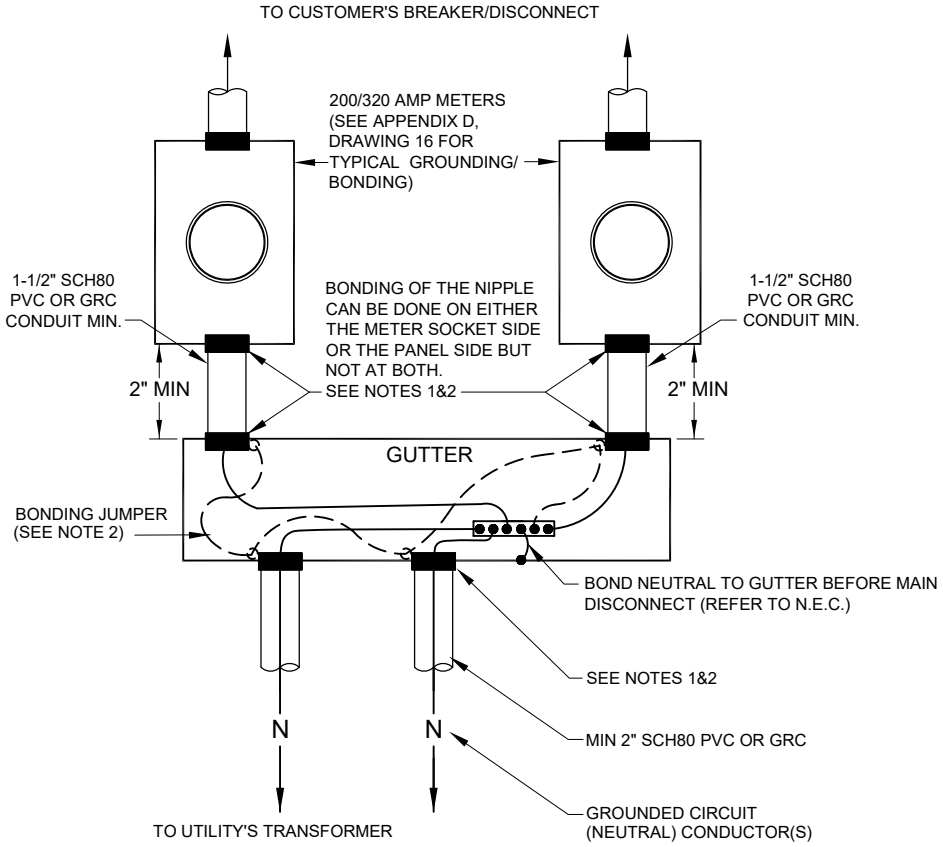
3. The Eufer grounding method is required in foundations for all residential and commercial buildings, as per the 2005 NEC. Exterior ground rods are no longer acceptable unless the building does not meet the necessary criteria for the Eufer grounding method, i.e., where there is not an approved concrete encased electrode available. This concrete encased electrode (along with approved alternate grounding methods, consisting of metal water pipes, metal building frame, ground ring, driven ground rods, etc.) shall be bonded to the neutral conductor, unless after main disconnect, and installed as required by the Regional Building Department. The grounding electrode system may be attached to the neutral terminal in either the CT Cabinet or the gutter.

4. If the meter socket is fed from an upstream (supply side) breaker or disconnect, where the neutral is already bonded to the grounding electrode system, do not connect the neutral ground lug (NEC 250).

DRAWING 17 - TYPICAL GROUNDING/BONDING FOR CT CABINET AND GUTTER

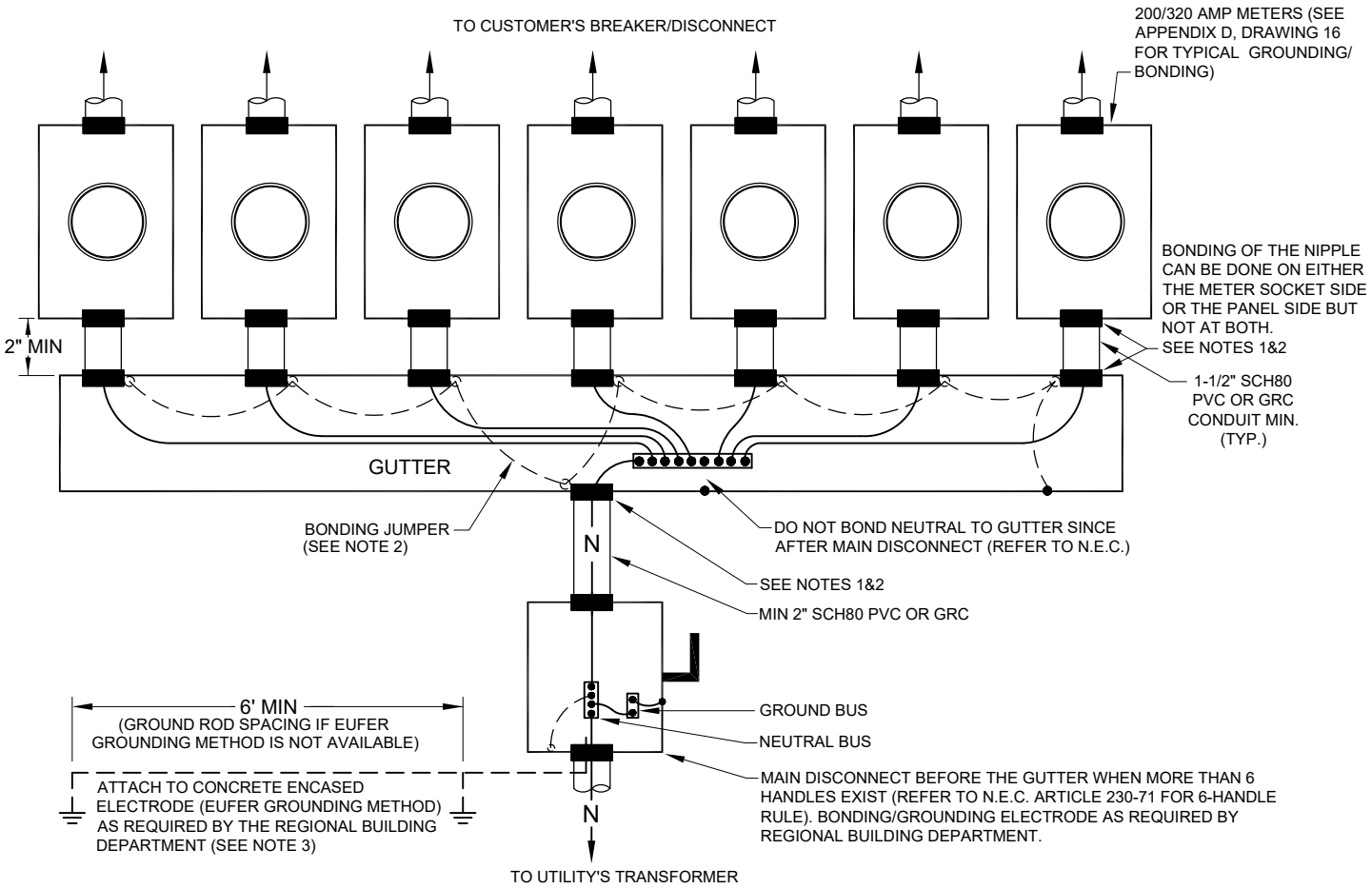


GROUNDING/BONDING FOR CT CABINET DETAIL



GROUNDING/BONDING FOR GUTTER DETAIL

DRAWING 17 - TYPICAL GROUNDING/BONDING FOR CT CABINET AND GUTTER (CONTINUED)



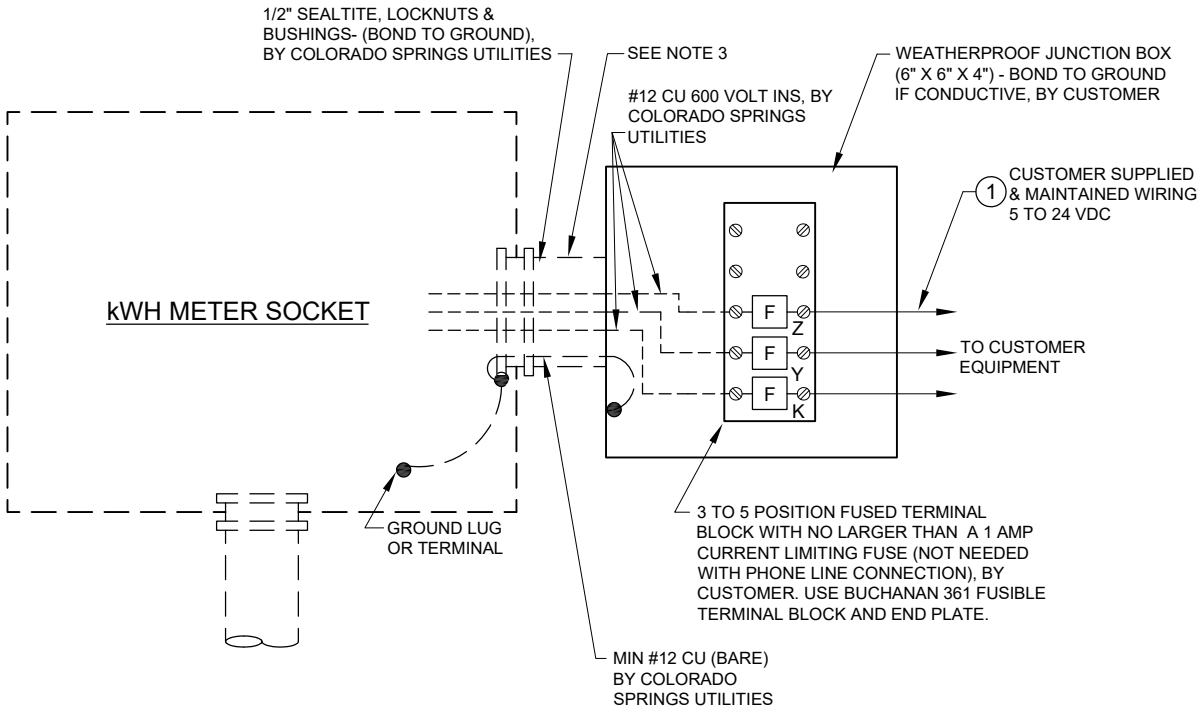
GROUNDING/BONDING FOR MAIN DISCONNECT BEFORE THE GUTTER DETAIL

NOTES:

1. Metal conduit raceway (SCH80 PVC also allowed) shall be bonded to the neutral or grounding conductor by the use of a grounding bushing (with bonding jumper), bonding locknuts, threaded conduit hub, or other as approved by the Regional Building Department. See Appendix D, drawings 14 & 15.
2. When a grounding bushing is used, a bonding jumper shall be installed to connect with the bonded enclosure. The bonding jumpers shall be sized to meet NEC Table 250-66 as required by the Regional Building Department; this table is duplicated in part below. Bonding to be completed by contractor.
3. The Eufer grounding method is required in foundations for all residential and commercial buildings, as per the 2005 NEC. Exterior ground rods are no longer acceptable unless the building does not meet the necessary criteria for the Eufer grounding method, i.e., where there is not an approved concrete encased electrode available. This concrete encased electrode (along with approved alternate grounding methods, consisting of metal water pipes, metal building frame, ground ring, driven ground rods, etc.) shall be bonded to the neutral conductor, unless after main disconnect, and installed as required by the Regional Building Department. The grounding electrode system may be attached to the neutral terminal in either the CT Cabinet or the gutter.
4. All neutral conductors shall be terminated in CT cabinets and gutters to a common connection.

SIZE OF LARGEST SERVICE-ENTRANCE CONDUCTOR OR EQUIVALENT AREA FOR PARALLEL CONDUCTORS		SIZE OF BONDING JUMPER CONDUCTOR
COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM	COPPER
#1/0 or smaller	#3/0 or smaller	6
#2/0 or #3/0	#4/0 or 250 kcmil	4
Over #3/0 thru 350 kcmil	Over 250 kcmil thru 500 kcmil	2
Over 350 kcmil thru 600 kcmil	Over 500 kcmil thru 900 kcmil	#1/0
Over 600 kcmil thru 1100 kcmil	Over 900 kcmil thru 1750 kcmil	#2/0
Over 1100 kcmil	Over 1750 kcmil	#3/0 or 12-1/2% of conductor kcmil, whichever is larger

DRAWING 18 - CUSTOMER CONNECTIONS FOR PULSE-INITIATING DEVICE INSTALLATION

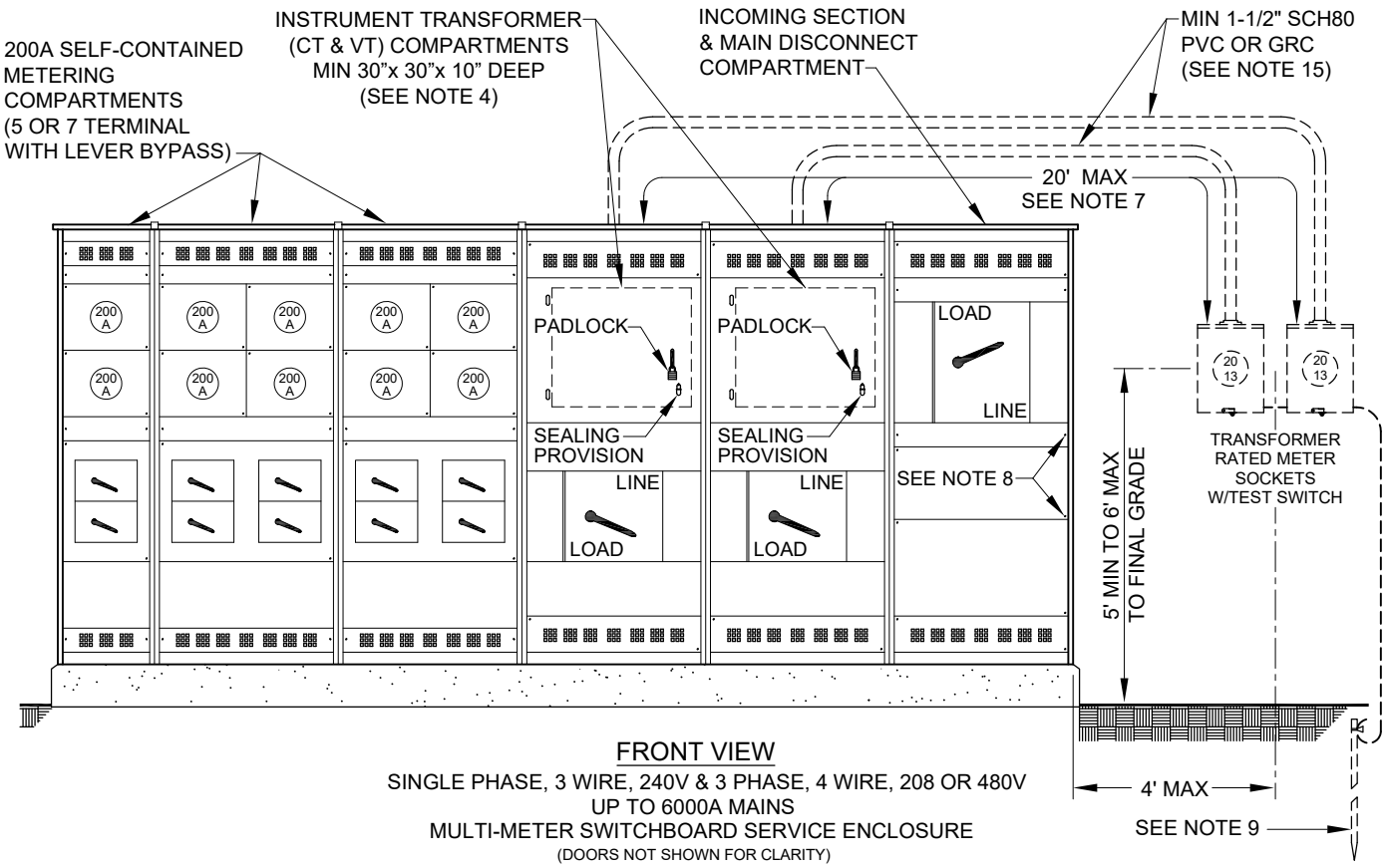


PULSE INITIATING DEVICE INSTALLATION

NOTES:

1. The wiring from the 3 to 5 position fused terminal block to the customer's equipment (item 1) is the customer's responsibility to install, own and maintain. All other wiring and equipment is Utilities' responsibility to install, own and maintain.
2. KYZ connection on the terminal strip may vary depending on the customer's connections.
3. Maximum distance of 12 inches.
4. The customer is responsible for supplied and maintained wiring to fuse block. The customer should supply wetting voltage no less than 5 VDC and no greater than 24 VDC.

DRAWING 19 - OUTDOOR COMMERCIAL SWITCHGEAR METERING OPTION



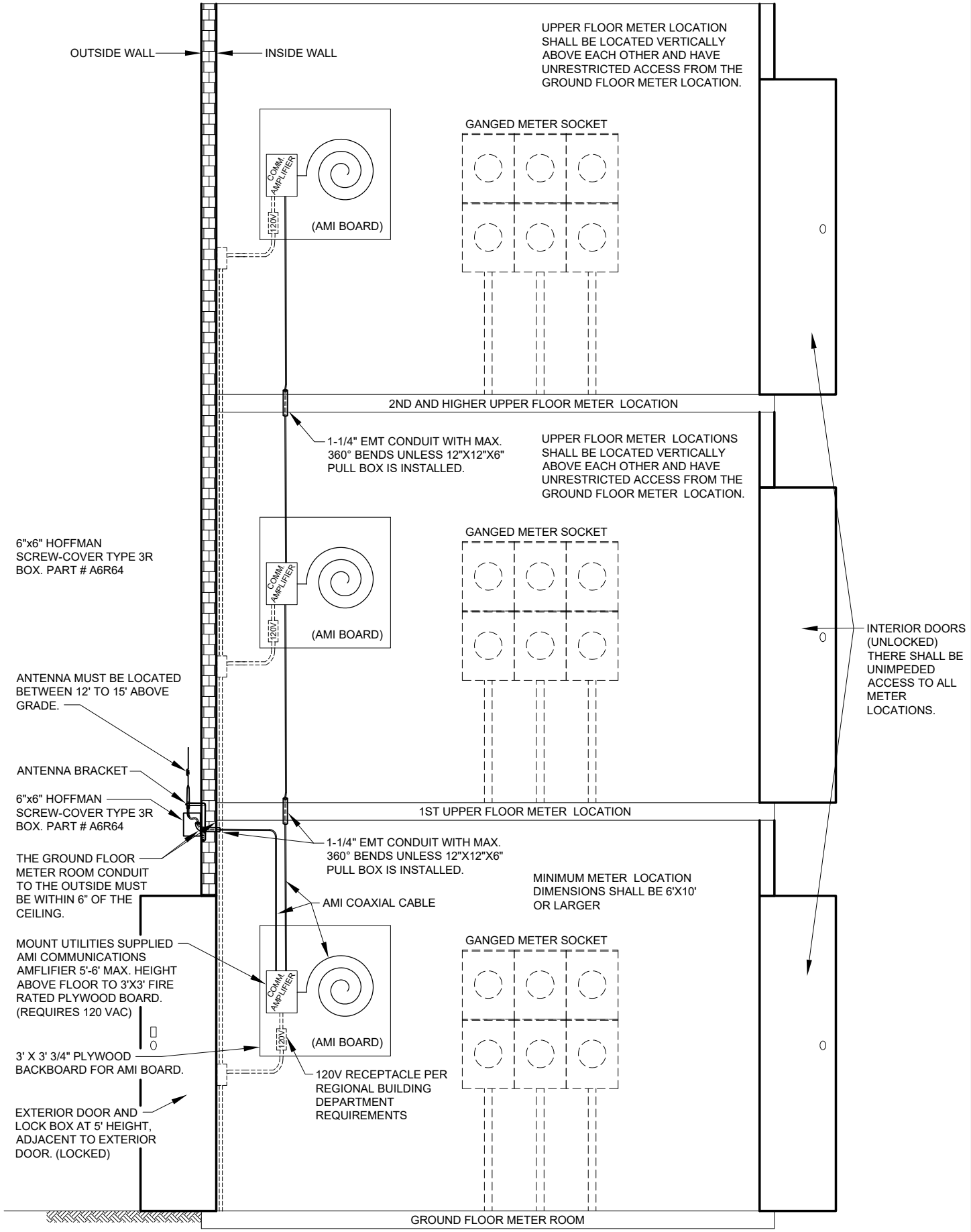
FRONT VIEW

SINGLE PHASE, 3 WIRE, 240V & 3 PHASE, 4 WIRE, 208 OR 480V
UP TO 6000A MAINS
MULTI-METER SWITCHBOARD SERVICE ENCLOSURE
(DOORS NOT SHOWN FOR CLARITY)

NOTES:

1. Metering switchgear (deadfront distribution switchboards rated 600 volts or less) is an option to be provided, installed and maintained by customer.
2. Metering switchgear shall consist of pad-mounted deadfront switchboards rated 6000 amperes or less, 600 volts or less, the enclosure sections shall contain circuit breakers (molded case and low-voltage power), fusible or non-fusible switches, mounting provision for instrument transformers (CTs & VTs), and metering or control equipment. Metering switchgear shall be constructed of galvanized steel or aluminum, and meet all applicable NEMA, ANSI, UL, and NFPA standards.
3. The electrical contractor will provide permanent brass identification tags placed at each meter in the self-contained metering compartments in conformance with the requirements outlined in 5.13. Duplicated brass identification tags will be placed on the outside access doors of the self-contained metering compartments.
4. The instrument transformer (CT & VT) compartments shall have slotted bolts installed by customer or contractors in the instrument transformer (CT & VT) metering conduit. The minimum size for the instrument transformer (CT & VT) compartment shall be 30"x 30"x 10" deep to accommodate both the CTs and if required, the VTs (VTs are required for 277/480v services only).
5. All compartment exterior doors shall have a dual locking (padlock) provision.
6. A spare terminal (replacement) block shall be provided by the manufacturer for every five (5) self-contained meter sockets.
7. The CT meter conduit shall be no longer than 20 feet (total length of conduit including all bends). The conduit shall not have any conductors other than the required grounding/ bonding as shown in Drawing 17. Conduit must be contiguous from the meter socket to the switchgear CT cubicle, refer to paragraph 5.04e for instrument transformer conduit installation.
8. Slotted sealing screws required on front covers and removable panels as shown.
9. A supplemental electrode (driven ground rod) must be installed and bonded to the CT metering sockets if sockets are more than four (4) feet from the switchgear.
10. Arrangement of compartments (sections) may differ from what is shown depending on customer requirements and load considerations.
11. All conductors or buss on load side of disconnects are not to be routed or re-enter the line side of the instrument transformer (CT & VT) or metering compartments, including main disconnects.
12. Self-contained metering compartments are required to have a lever bypass at each meter terminal. Meter socket covers are to be the ringless type, with no outer doors or other material covering the meter. See 5.02d for mounting height requirements.
13. Sections rated over 200A up to 1200A shall accommodate bar-type CT's furnished by Colorado Springs Utilities; over 1200A shall accommodate window-type CT's furnished by Colorado Springs Utilities. See 5.04d) for mounting height and other requirements.
14. Section rated 277/480 volts shall accommodate a VT Pack furnished by Colorado Springs Utilities.
15. A junction box is required for any conduit run with over 270° of bends. Refer to NEC 314 for Junction Box Fill Calculations.

DRAWING 20 - INTERIOR METERING ANTENNA AND LOCATION INSTALLATIONS



NOTE:
SEE 5.02C FOR ADDITIONAL INTERIOR METERING INFORMATION.

PHOTO 1 – THREE PHASE CT CABINET

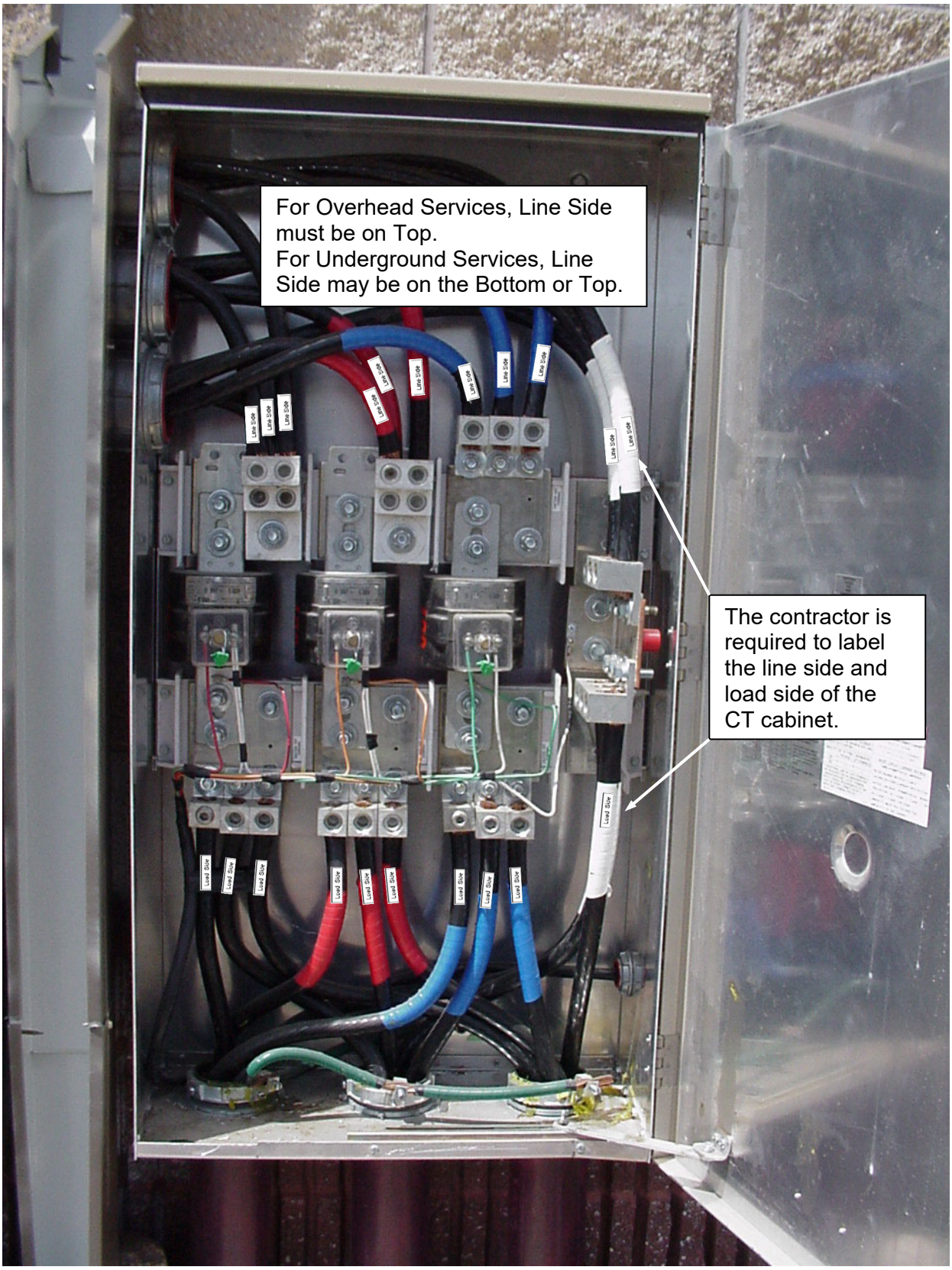


PHOTO 2 – THREE PHASE CT CABINET

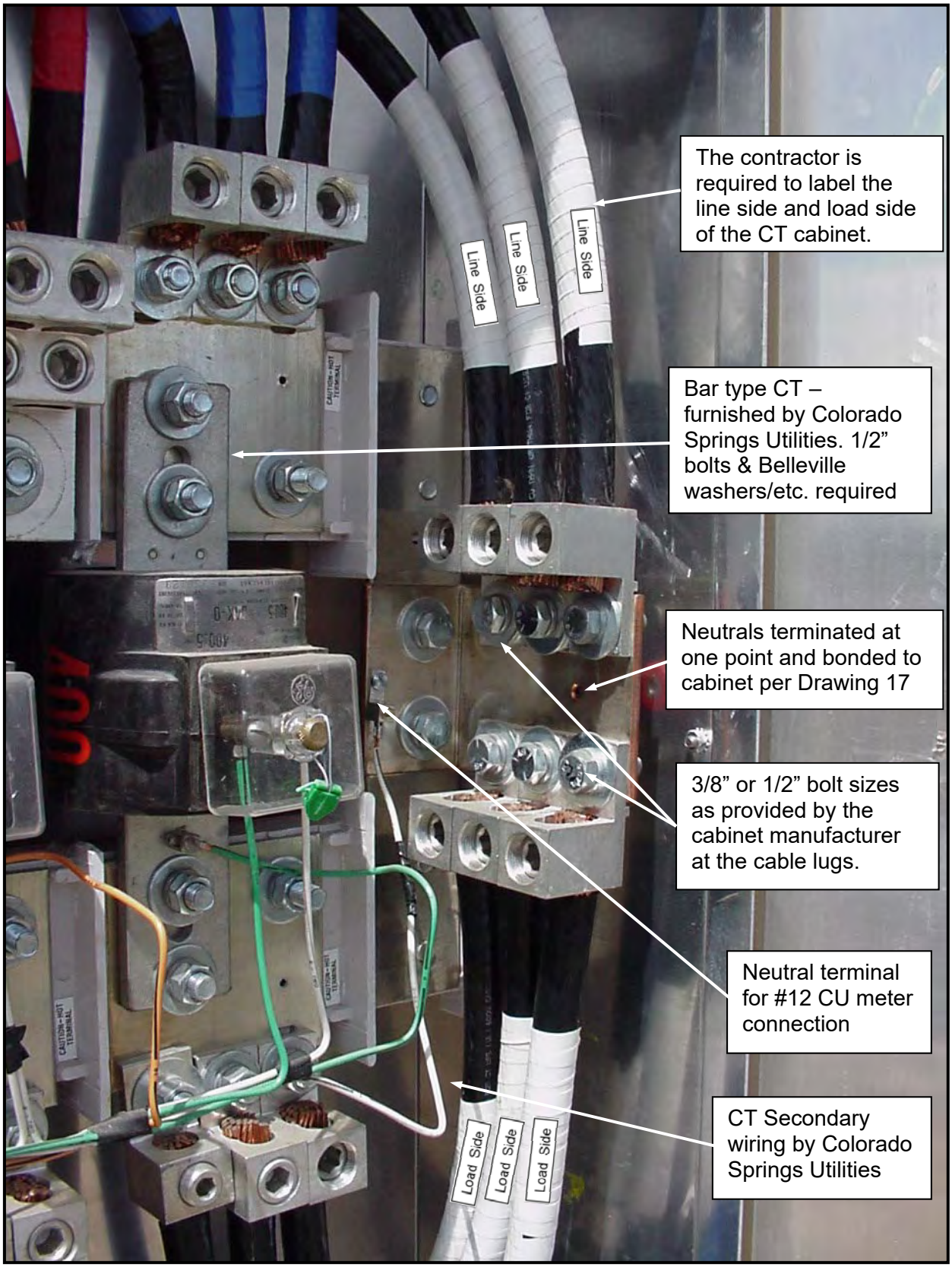


PHOTO 3 – THREE PHASE CT CABINET WITH "VT PACK"

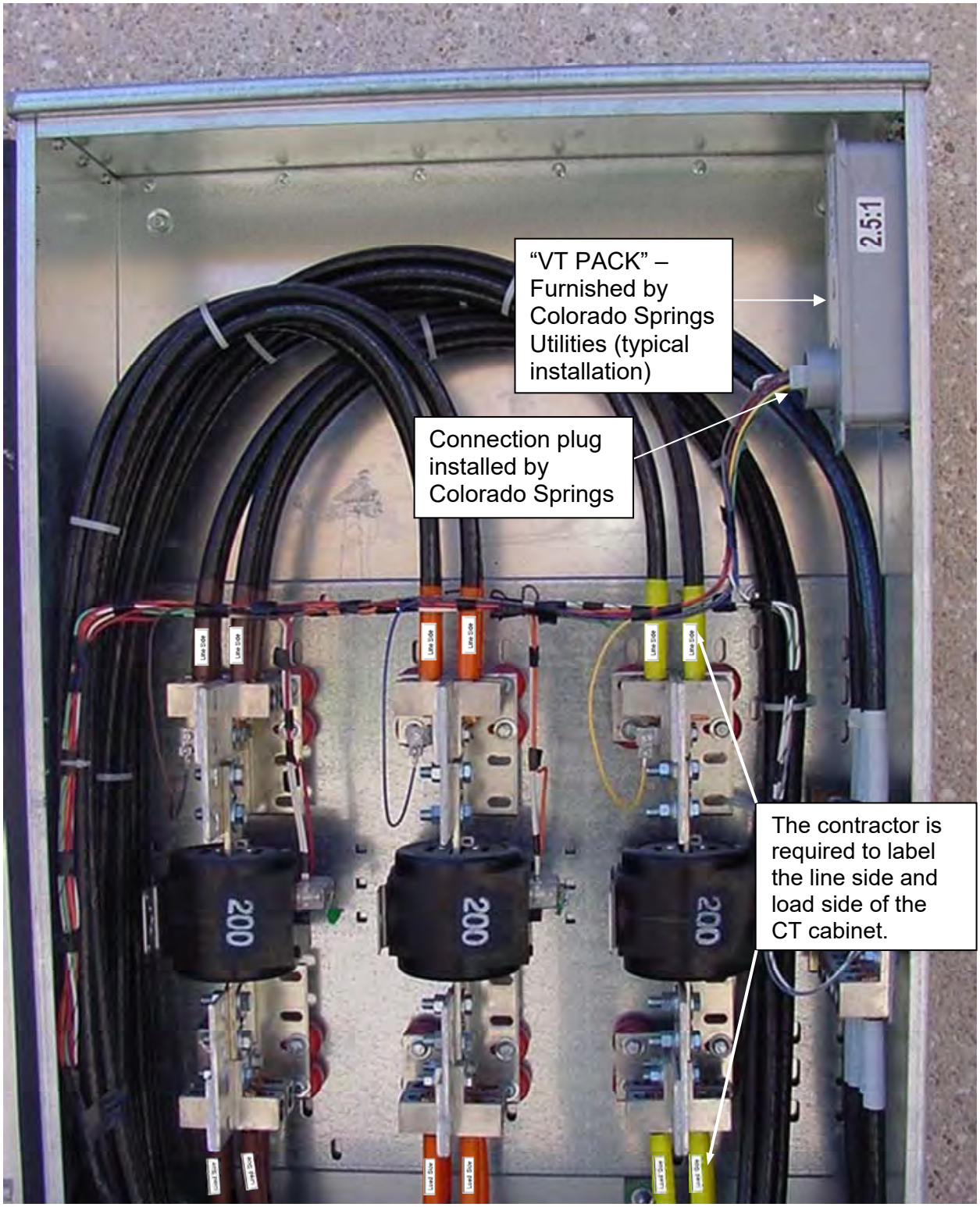


PHOTO 4 – Bar Type Current Transformer

(See 5.04c6 for installation conditions)

PHOTO 5 – PADMOUNT TRANSFORMER CABINET WITH "VT PACK"

(See 5.04b for installation conditions)

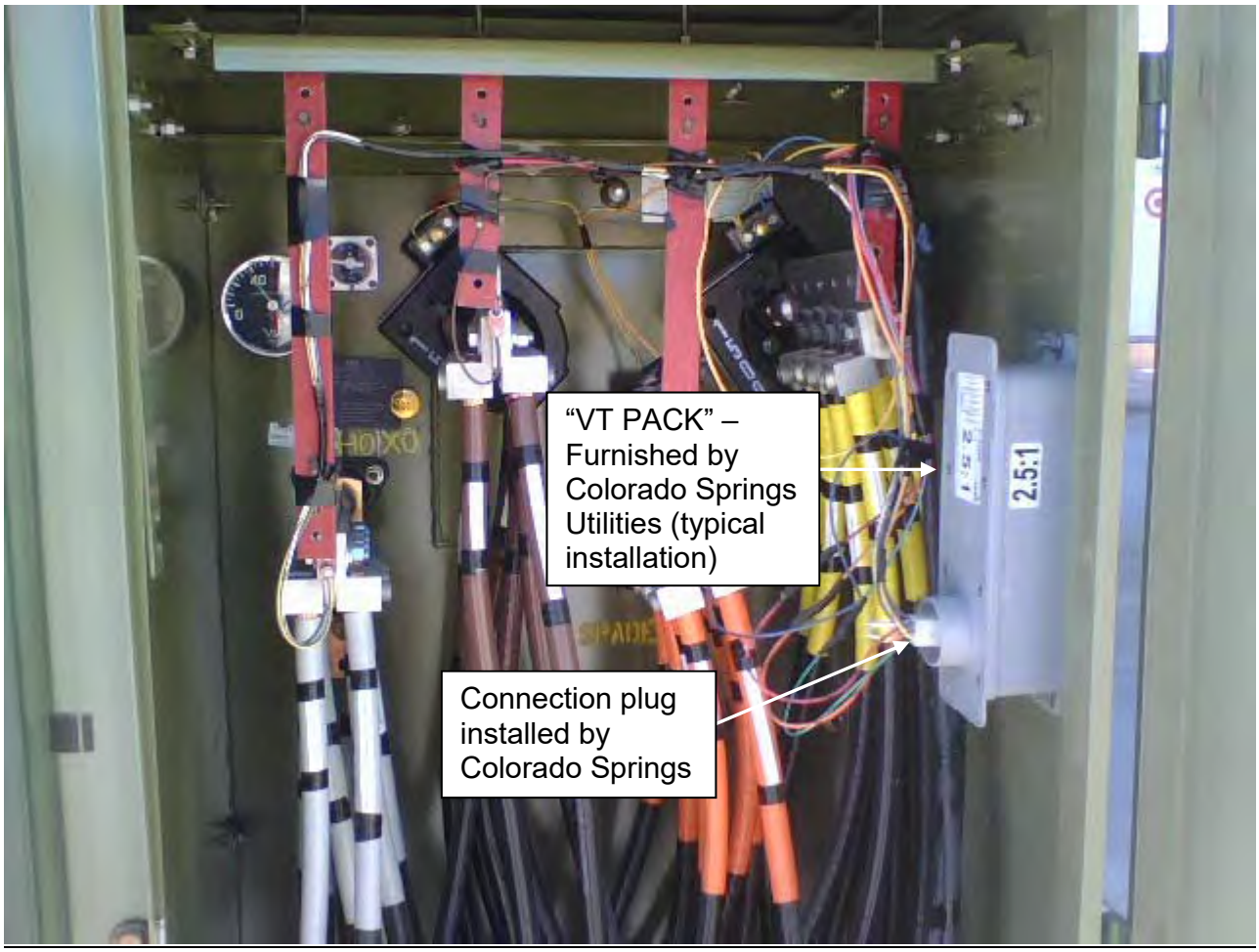
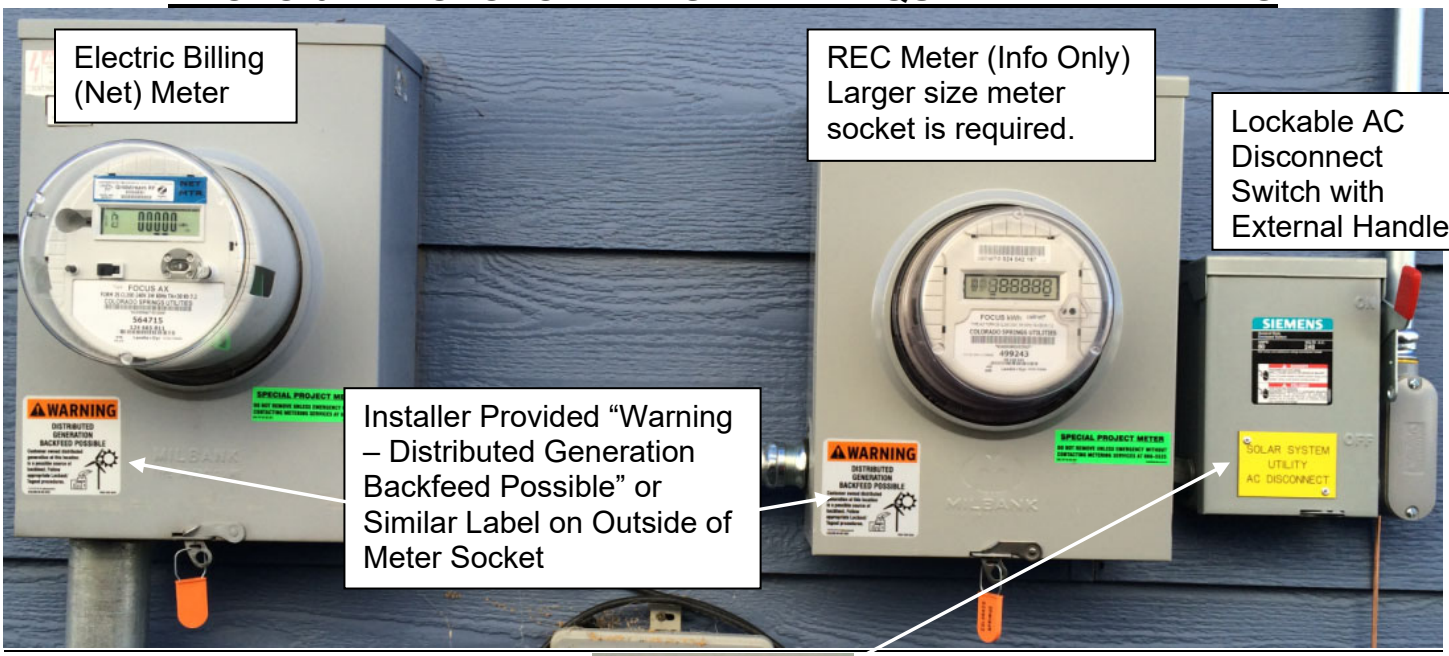


PHOTO 6 – PHOTOVOLTAIC SERVICE EQUIPMENT LABELING



Customer Provided "AC Disconnect" Placard on AC Disconnect Switch.
Color may be black text on yellow background or white text on red background.

Note: Various installations may require additional customer provided labeling.

TABLE OF CONTENTS

APPENDIX E
Material Specifications

Colorado Springs Utilities

Electric Distribution Specification Number 102-1
Dated 9-20-2012

For

Single Phase Self-Contained Electric Meter Sockets

Approved by Engineering Standards: William L Galloway 10/19/09

Approved by North Work Center Construction & Maintenance:

Approved by South Work Center Construction & Maintenance:

Approved by Meter Shop:

Written by: Steve Torres Date: 11/05/07

Drawn by: John Russel Date 11/01/07

Original Effective Date: August 1, 2001

Revision no: 7 Revision Date: 09/1/15
Changed pg.5/10: Wire from 3 to 2, Voltage from 120/240 to 120 and deleted "& 200" and "Residential" from label.
Changed pg.6/10: Deleted "Commercial" from label.
Changed pg.8/10: Deleted "Residential/Commercial" from label.
Changed pg.9/10 & pg.10/10: Deleted "Single Phase, 2 Wire, 120 Volt" from both labels.

Revision no: 8 Revision Date: 08/30/18
Added note to 3.5.1 that "For >100 amp and less than 200 amp Socket, use 200 amp Socket dimensions".

Revision no: 9 Revision Date: 10/13/21
Added sections 3.7 for meter sockets with integral disconnects and 3.8 for general construction information.

Revision no: 10 Revision Date: 12/5/22
Changed section 3.5.2 – 200 amp Socket minimum enclosure dimensions.

Scope

This specification establishes requirements for all meter sockets (housings) installed in the Colorado Springs Utilities distribution system. Sockets shall meet Colorado Springs Utilities standards for these devices as indicated/listed below. Colorado Springs Utilities will not connect a service or install a meter where the socket (housing) does not comply with **all** the requirements of this specification.

1. General

1.1 Description: Socket, Meter, 4 Terminal (May require fifth "Stinger" terminal installed – see 4.6), 100, 200, & 320 amp.

1.2 Use: Meter-mounting device for Colorado Springs Utilities electricity revenue meters.

1.2.1 100 amp Sockets: Mounting watt-hour meters for overhead and underground revenue metering of 100 amp loads or less. With the exception single residence underground services must be 200 amp sockets.

1.2.2 200 amp Sockets: Mounting watt-hour meters for overhead and underground revenue metering of 200 amp loads or less.

1.2.3 320 amp Sockets: Mounting watt-hour meters for overhead and underground revenue metering of 320 amp continuous/400 amps momentary loads or less.

2. Referenced Standards

Equipment/material covered by this specification shall be manufactured in conformance with the following standards including all standards referenced therein. It shall also comply with all other applicable standards of IEEE, ANSI, ASTM, NEMA, UL, and similar industry organizations. Where conflicts occur in referenced standards, the more stringent shall apply unless modified by this specification. The revisions in effect on the date of the order or blanket release shall apply. The term "approved equal" shall mean approved in writing by the Colorado Springs Utilities, Engineering Standards Section.

2.1 American National Standards Institute (ANSI)/Underwriters Laboratories (UL):

2.1.1 ANSI/UL 414 "Standard for Meter Sockets" latest revision.

2.1.2 ANSI C12.7, "American Nation Standard for Watt-hour Meter Sockets", latest revision.

2.2 National Electrical Manufacturers Association (NEMA):

2.2.1 NEMA "Type 3R for Enclosure Construction", latest revision.

3. Construction

3.1 Meter socket enclosure & cover shall be constructed of 16 gauge (minimum) galvanized sheet steel, 1-1/4 oz. Class zinc-coated.

3.2 Cover shall be of the one-piece ringless type over the utility accessible section, equipped with a suitable device for closing and sealing using a plastic padlock type seal with a 0.047" diameter stainless steel shackle.

3.3 Finish shall be coated with a light neutral Gray (Munsell Gray #5B7.0/0/4) baked enamel.

3.4 A closure plate shall cover the socket hub opening (for underground service installations)

3.5 Minimum enclosure dimensions:

3.5.1 100 amp Socket, Length: 11-1/2", Width: 8", Depth: 3-5/16" (For >100 amp and less than 200 amp Socket, use 200 amp Socket dimensions)

3.5.2 200 amp Socket, Length: 14-1/2", Width: 11", Depth: 4-1/8"

3.5.3 320 amp Socket (OH), Length: 26", Width: 10-1/2", Depth: 4-3/8"

3.5.4 320 amp Offset Socket (UG), Length: 30", Width: 17", Depth: 6"

3.5.5 200 amp Meter Breaker Combination enclosures shall have the meter section minimum Length: 12", Width: 11", Depth: 4-3/8"

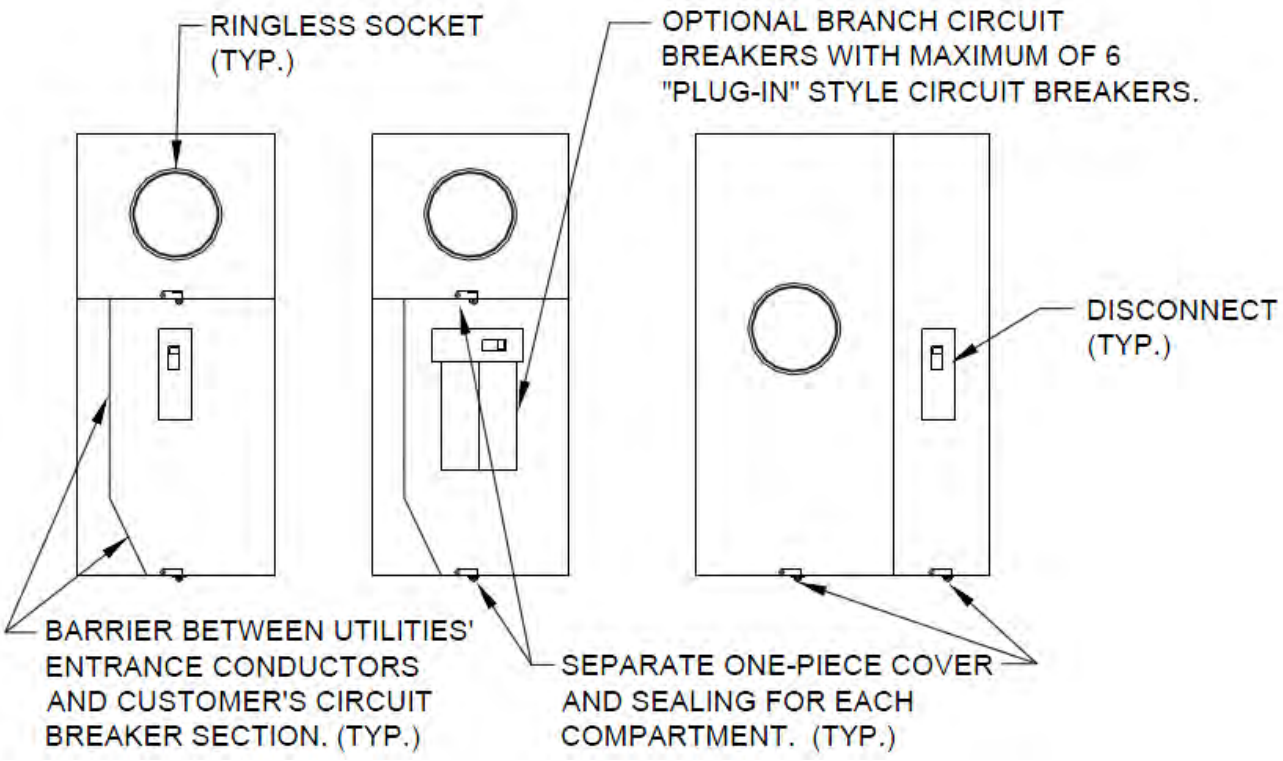
3.5.6 320 amp Meter Breaker Combination enclosures shall have the meter section minimum Length: 26", Width: 10-1/2", Depth: 4-3/8"

3.6 320 amp meter socket shall be supplied with a label designating “USE 320 AMP METER ONLY”.

3.7 For meter sockets with integral disconnects (Meter Breaker Combination Sockets),

3.7.1 The enclosure shall have two separate compartments with a barrier between Utilities’ meter section and the customer’s circuit breaker section. The separate compartments shall be factory bussed from the load side meter section to the line side circuit breaker section. Each compartment shall have a one-piece cover and equipped with a suitable device for closing and sealing. The Utility’s compartment shall be locked with a Colorado Springs Utilities padlock type seal and the customer’s compartment shall have the ability to be locked.”.

3.7.2 The Main breaker section of an integral disconnect socket shall have provisions for a maximum of 6 main, “plug-in” style circuit breakers and shall be “Dead Front”.



3.8 Knockouts of load carrying cable shall be concentric type ranging from 1 inch to 2-1/2 inches. If the top of the enclosure has a hub opening, a closing plate shall be supplied if used for underground service. Cable lugs shall be suitable for use with either copper or aluminum conductors.

3.9 The general construction of the socket shall provide protection to Colorado Springs Utilities personnel, contractors and customer/owners against contact with energized elements of the socket and installed meter; and shall provide protection to the electrical components against adverse environmental weather conditions.

4. Ratings

4.1 The neutral terminal shall be electrically bonded to the socket enclosure by means of a removable jumper with bolted or riveted connection.

4.1.1 An auxiliary ground lug shall be provided and capable of accepting a conductor range of #8 through #2 solid CU/AL.

4.1.2 For 320 amp sockets an auxiliary ground lug shall be provided and capable of accepting a conductor range of #6 through 1/0 CU/AL conductor.

4.2 The neutral terminal shall accept the same conductor range as the current carrying terminals see 4.7.

4.3 Terminals shall be suitable for use with both copper and aluminum conductors.

4.4 Jaws and terminals shall be rated 600 volts.

4.5 Ampere ratings for the jaws and terminals shall be a minimum of 100 amps continuous for the 100 amp rated socket, 200 amps continuous for the 200 amp rated socket, and 320 amps continuous/400 amps momentary for the 320 amp rated socket.

4.6 The terminal block shall have a fifth “stinger” terminal mounted in the 9 o’clock position where needed to accommodate 120/208 volt services.

4.7 Conductor Range:

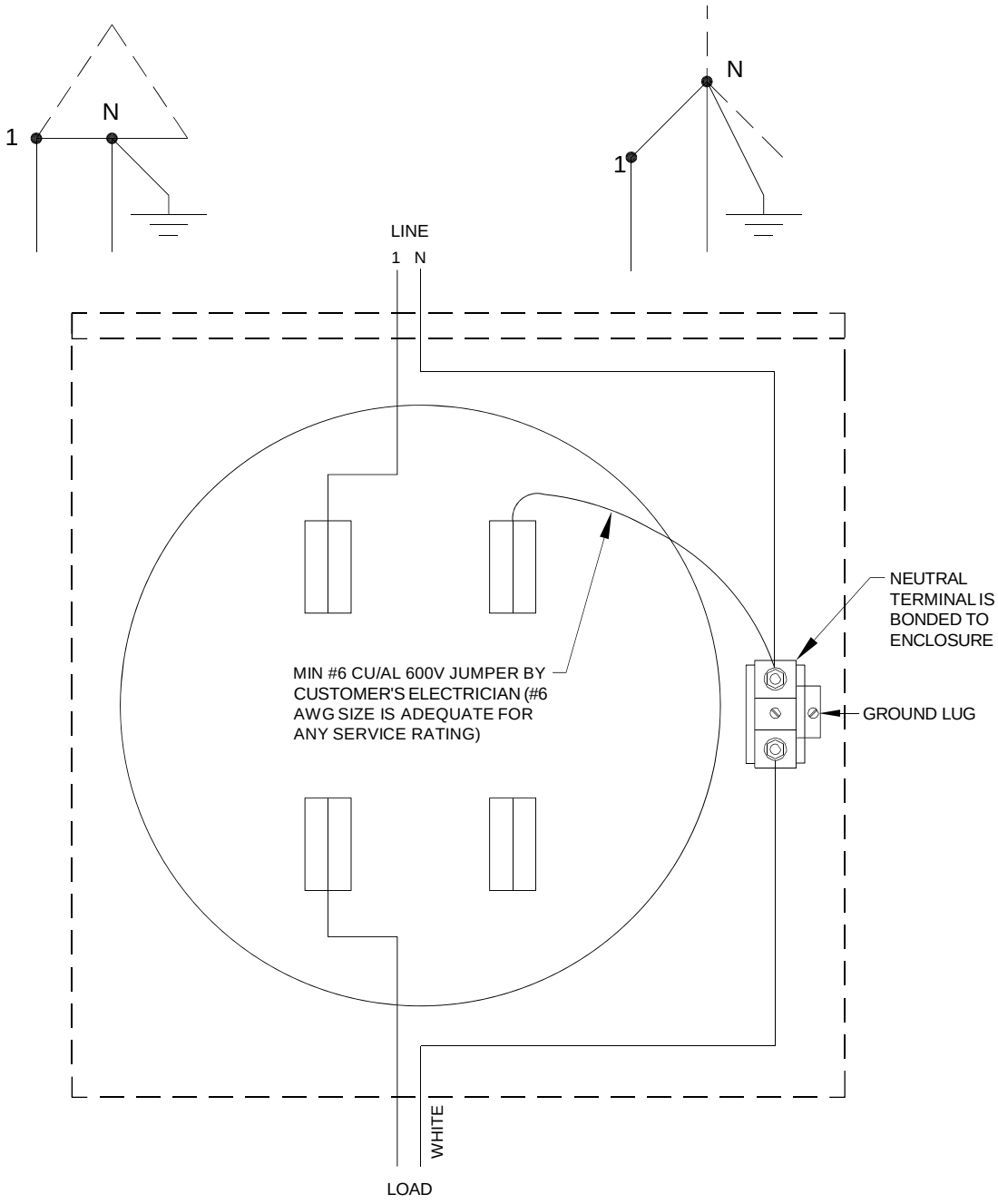
4.7.1 100 amp Socket #6 through #2/0 AWG.

4.7.2 200 amp Socket #6 through 350 kcmil.

4.7.3 320 amp Socket #4 through 600 kcmil.

4.8 100 & 200 amp meter socket line terminals shall be provided with a horn type bypass feature.

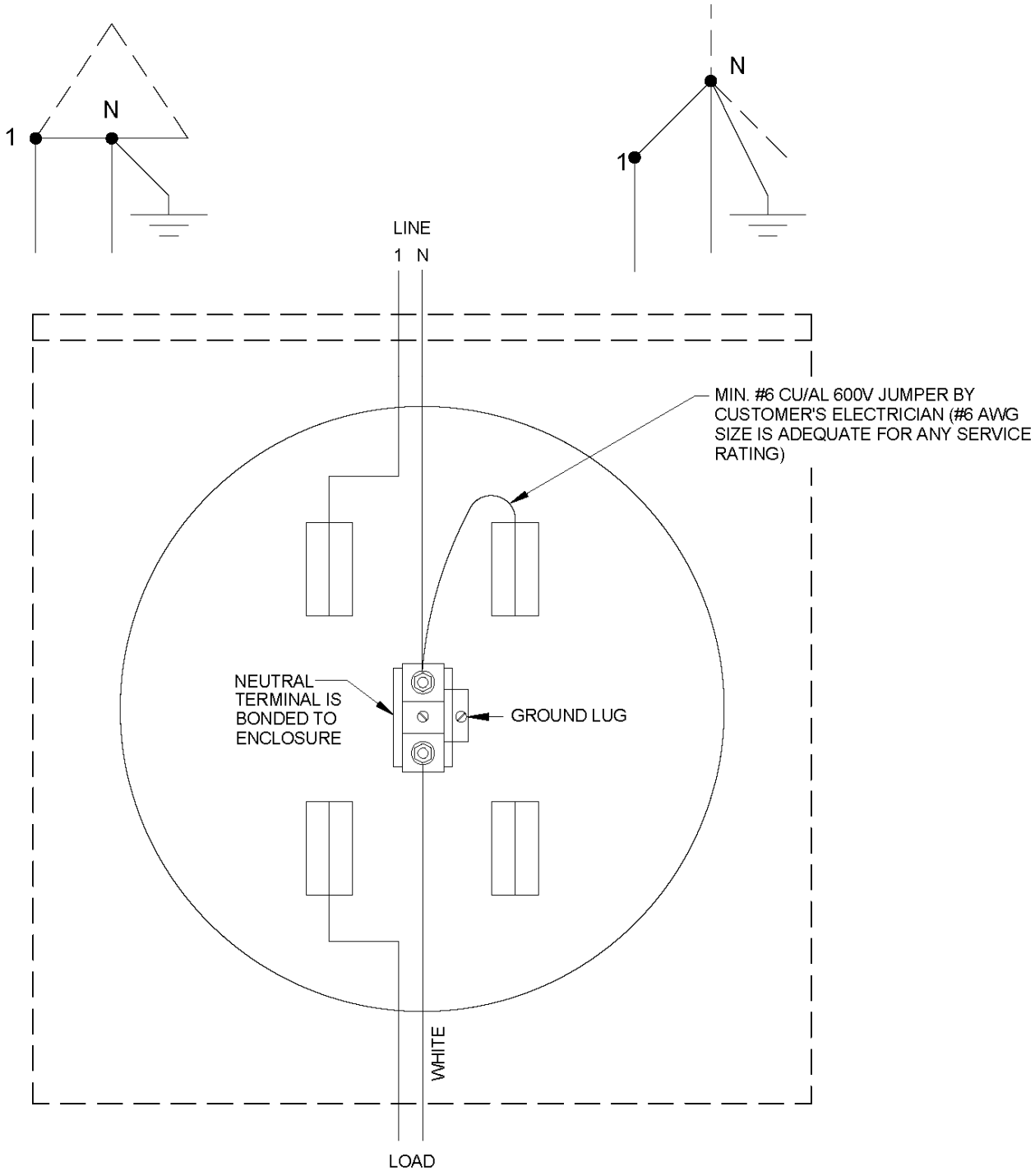
4.9 320 amp meter sockets shall be provided with a bypass of the manual jaw release, and lever type.



Single Phase, 2 Wire, 120 Volt

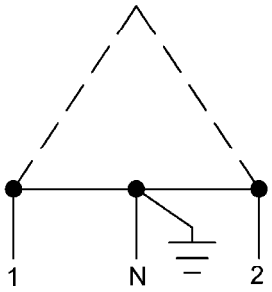
(100 Amp Traffic and Signal Pedestal)

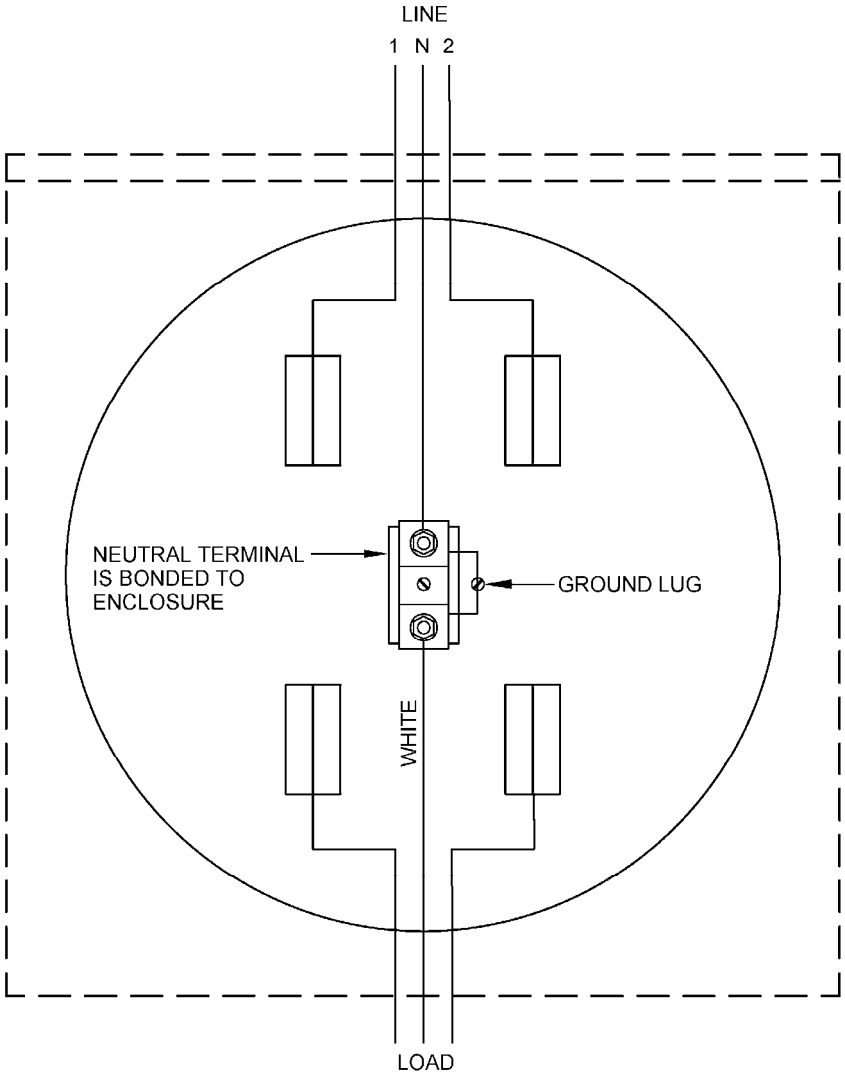
Colorado Springs Utilities
It's how we're all connected



Single Phase, 2 Wire, 120 Volt

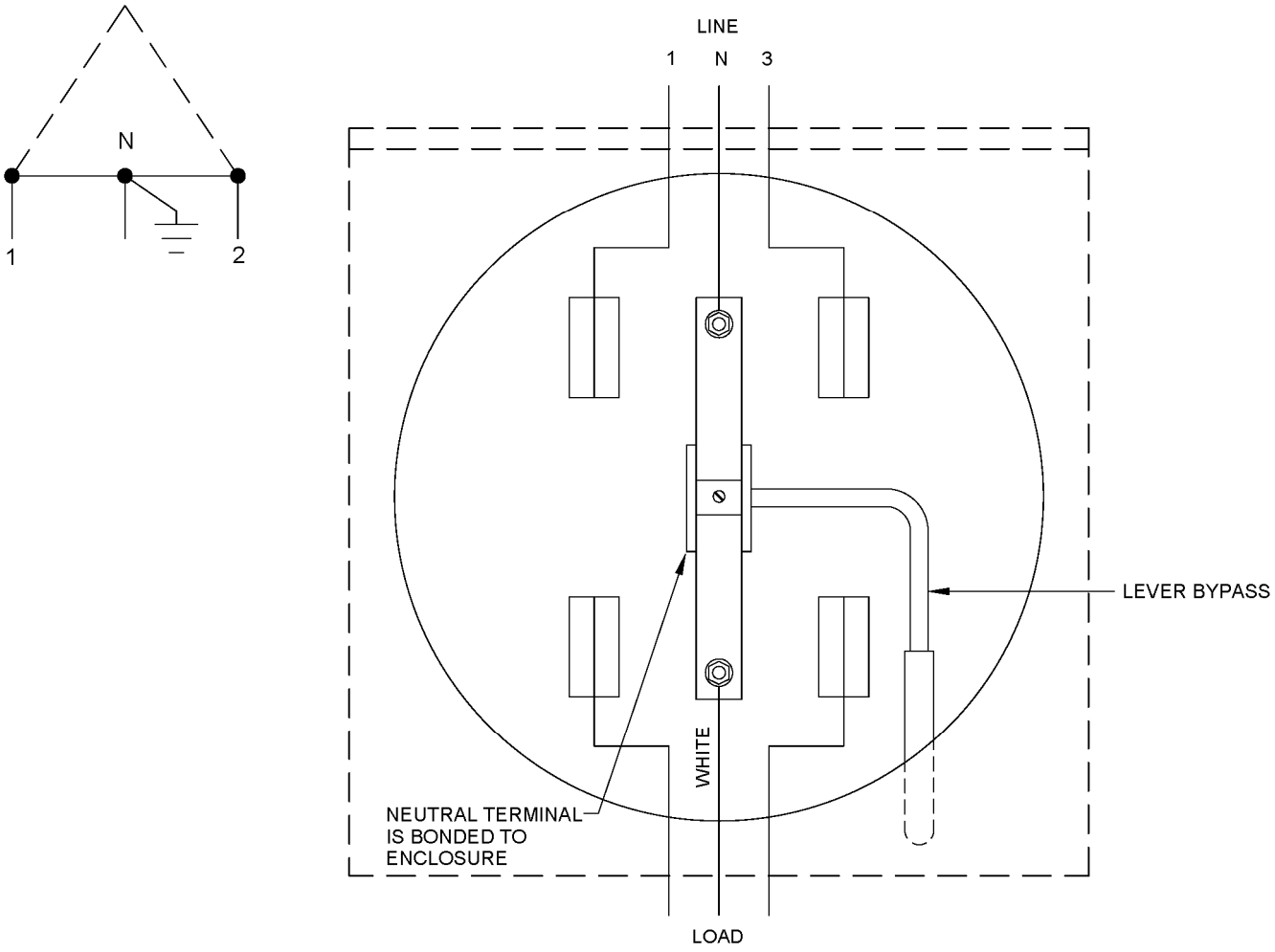
(100 Amp)





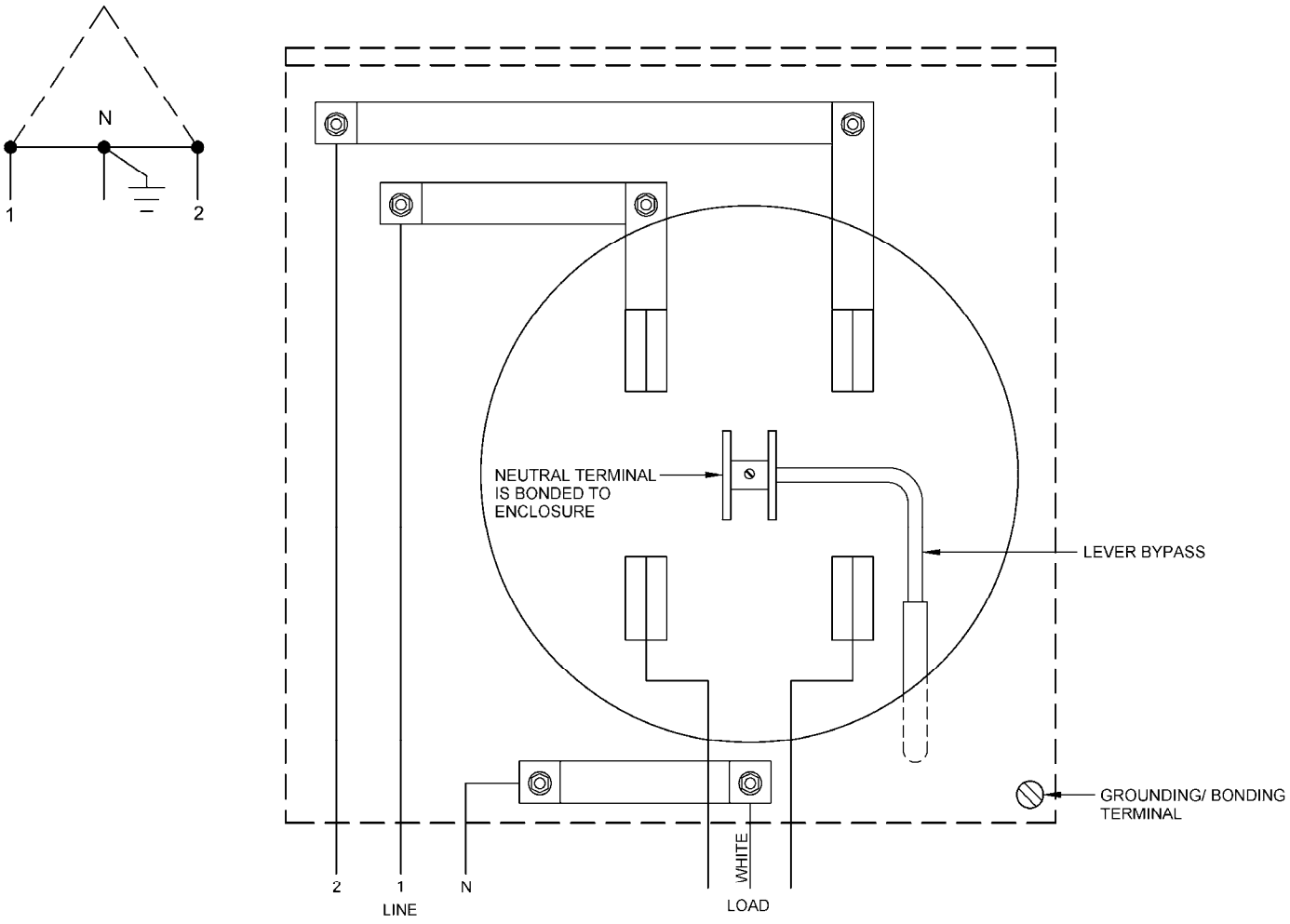
Single Phase, 3 Wire, 120/240 Volt

(100 & 200 Amp)



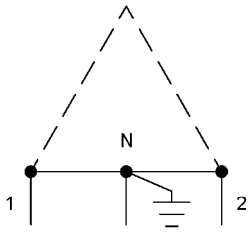
Single Phase, 3 Wire, 120/240 Volt

(100 & 200 Amp Required for Commercial, Approved for Residential)

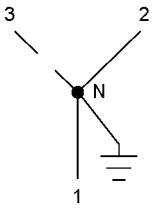


Single Phase, 3 Wire, 120/240 Volt

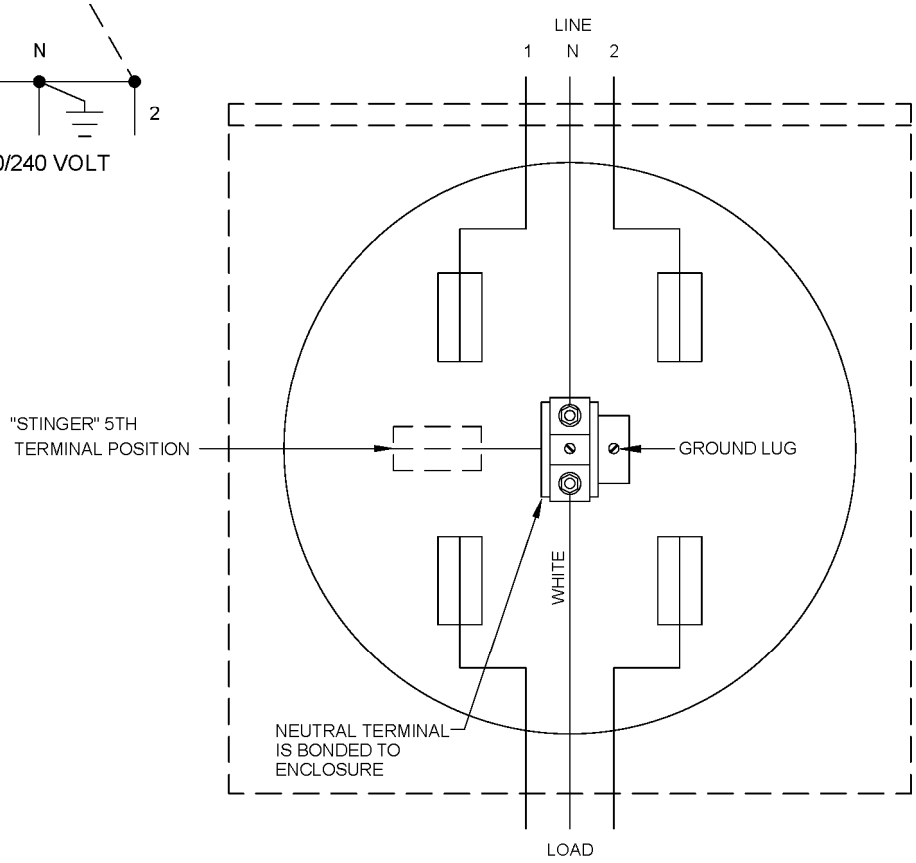
(320 Amp)



120/240 VOLT

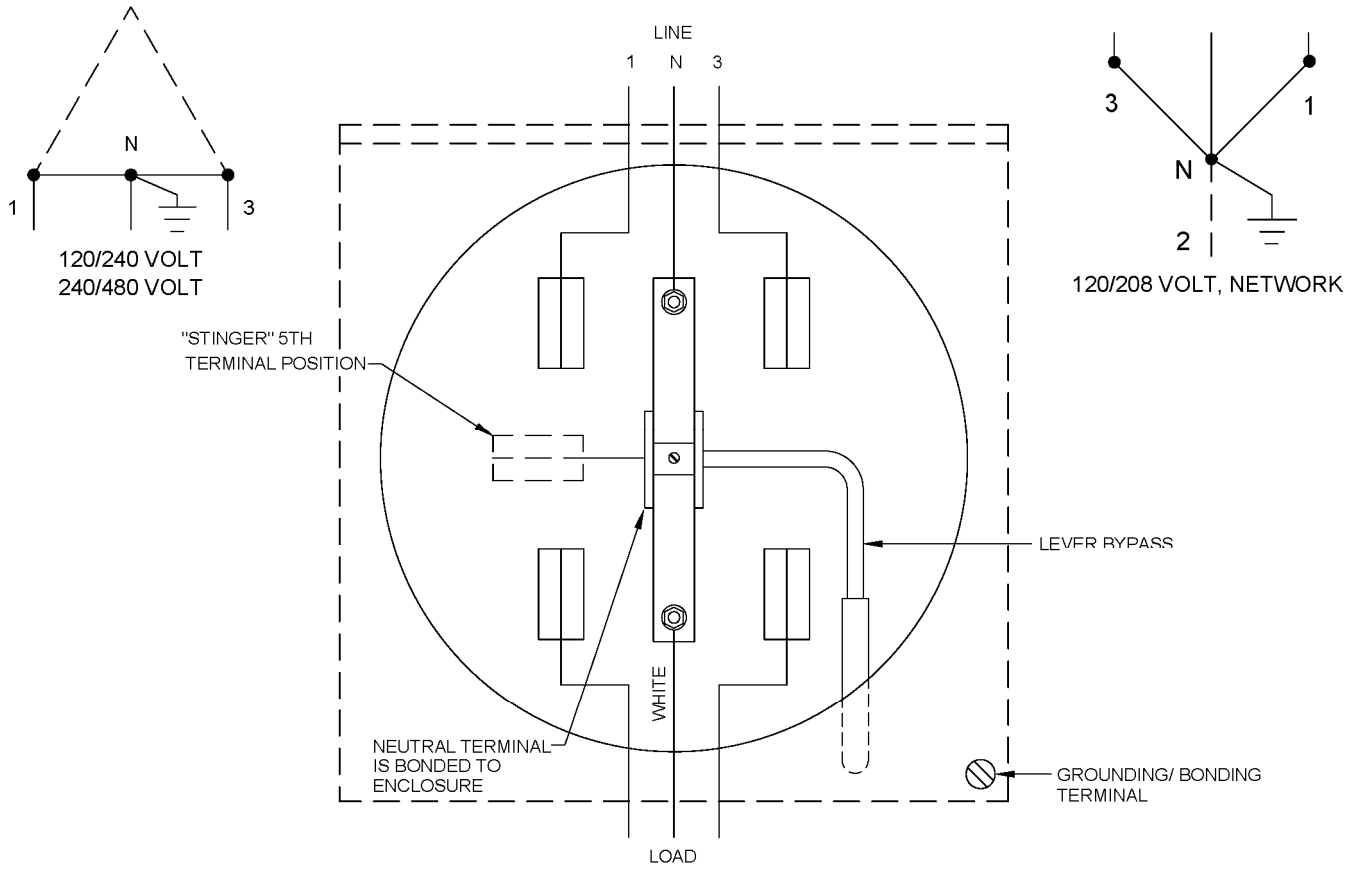


120/208 VOLT, NETWORK



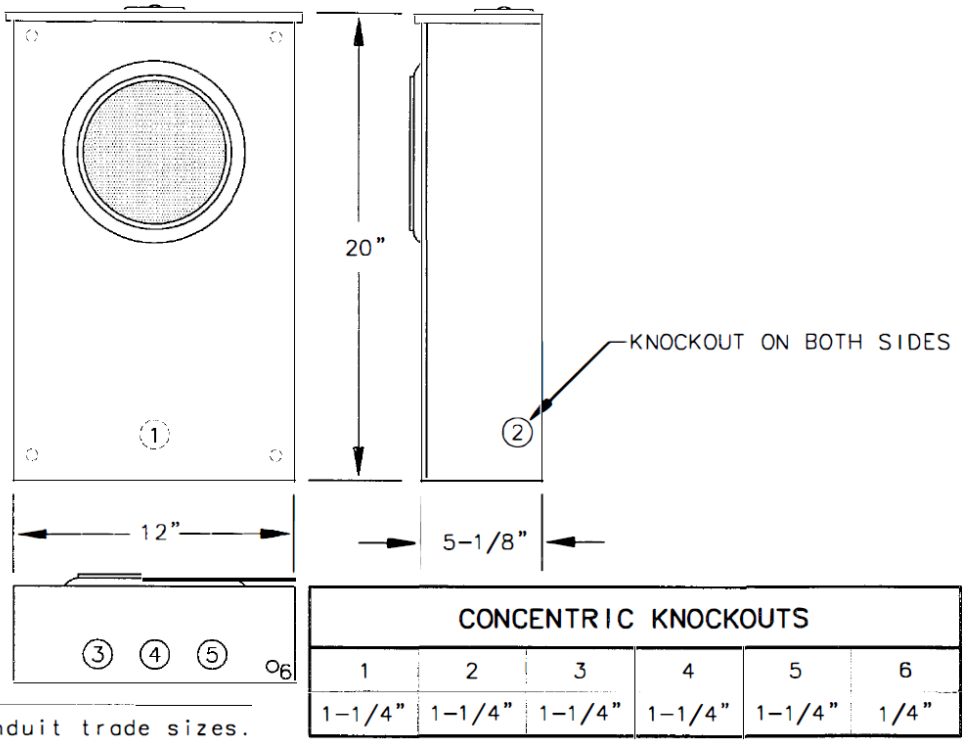
Single Phase, 3 Wire, 120/240 Volt
Single Phase, 3 Wire , 120/208 Volt, Network

(100 & 200 Amp Residential)



Single Phase, 3 Wire, 120/240 Volt
Single Phase, 3 Wire, 240/480 Volt (Limited Use)
Single Phase, 3 Wire , 120/208 Volt, Network

(100 & 200 Amp Required for Commercial, Approved for Residential)



CONCENTRIC KNOCKOUTS					
1	2	3	4	5	6
1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1/4"

NOTE:
Knockout dimensions are conduit trade sizes.

1. **General.**
   1.1. Item Number(s): 102-600-070 Dated 3/14/2024
   1.2. Description: Socket, Meter, Prewired Test Switch, 8 Terminal, 20 Amp
   1.3. Where used: Mounting transformer rated watthour meters for single and three phase revenue metering
   1.4. Material/Color: Galvanized Sheet Steel, Neutral Gray, Munsell #5BG7.0/0/4

2. **Electrical & Mechanical Requirements.**
   2.1. Voltage Class/Rating: 600 V
   2.2. Current rating: 20 A Continuous
   2.3. Terminals shall be 10-32 stud type for ring tongue connectors.
   2.4. The neutral terminal shall be electrically bonded to the enclosure by means of a bolted or riveted connection. A bonding jumper in the form of a separate screw, strap or other means shall bond the enclosure to the grounded (neutral) conductor using a #6 AWG copper or #4 aluminum wire.
      2.4.1. The neutral terminal shall accept the same conductor range as the current carrying terminals, see 2.6.
   2.5. Wiring
      2.5.1. Current and potential terminals shall be wired from the top positions of the test switches to the socket terminals as shown in Figure 1.
      2.5.2. Conductors shall be thermoplastic-insulated #12 AWG stranded copper wire, using a Polyvinyl Chloride (PVC) covering, 10 mils in thickness and color coded as specified in 2.5.3; and shall be rated for 600 volts and 75° C; and terminated using a "Burndy HY" lug (catalog no. YAV10) or approved equal.
      2.5.3. Color coding of conductors shall be as listed below (see Figure 1):
         (P1): A Potential – red with black tracer
         (P2): B Potential – not wired
         (P3): C Potential – green with black tracer
         (PN): Potential Neutral – white with black tracer

(C1): A Current line – red
(C2): B Current line – not wired
(C3): C Current line – green
(C11): Current returns – white
(C22): Current returns – not wired
(C33): Current returns – white

2.6. Conductor Range: #14 through #4 AWG.
2.7. Terminals shall be suitable for use with both copper and aluminum conductors.
2.8. A stud type grounding terminal (1/4" x 20 UNC) for accepting ring-tongue connectors on #12 through #6 AWG conductors shall be located in the lower right corner below the test switch.
2.9. A test switch in accordance with Colorado Springs Utilities material specification 102-700-(000-001) shall be included.

3. **Construction**
3.1. The socket shall be constructed of 16 gauge or heavier galvanized sheet steel; 1 ¼ oz. class zinc-coated.
3.2. The cover shall be of the one piece ringless type, equipped with a suitable device for sealing with padlock type seals.
3.3. The finish shall be bonderized and coated with neutral gray (Munsell #5BG7.0/0/4) baked enamel.
3.3.1. The finish shall be uniform and even, free of runs, sags, checks or blisters.
3.4. Knockouts shall be concentric type with maximum size for 1-1/4" GRC conduit, located as shown in the diagram in on page 1/3, with the exception of the knockout for training of the ground wire which shall be ¼" in diameter.
3.5. Socket shall be provided with a bridge for mounting the test switch.
3.5.1. Alternate test switches are acceptable with prior written approval from Colorado Springs Utilities Engineering Standards.
3.6. Internal socket ground lug shall be located in the lower right hand corner below the bridge, as shown in Figure 1. (See electrical requirements, paragraph 2.8)
3.7. An external grounding pad (nut) shall be welded to the meter socket with a ½ inch 13NC hole 7/16 inches deep; and located as shown in the diagram on page 1/3.
3.8. Socket shall be weather-resistant and suitable for outdoor use with a removable hub closing plate on top.

4. **Applicable Standards**
4.1. The socket shall be constructed in accordance with and conform to the following publications.
4.1.1. ANSI/UL 414, "Standard for Meter Sockets", dated 2023 (Ninth Edition) or latest revision.
4.1.2. ANSI C12.7, "American National Standard Requirements for Watthour Meter Sockets", dated 2022 or latest revision.
4.1.3. ANSI C12.9, "American National Standard for Test Switches for Transformer Rated Meters", dated 2021 or latest revision.

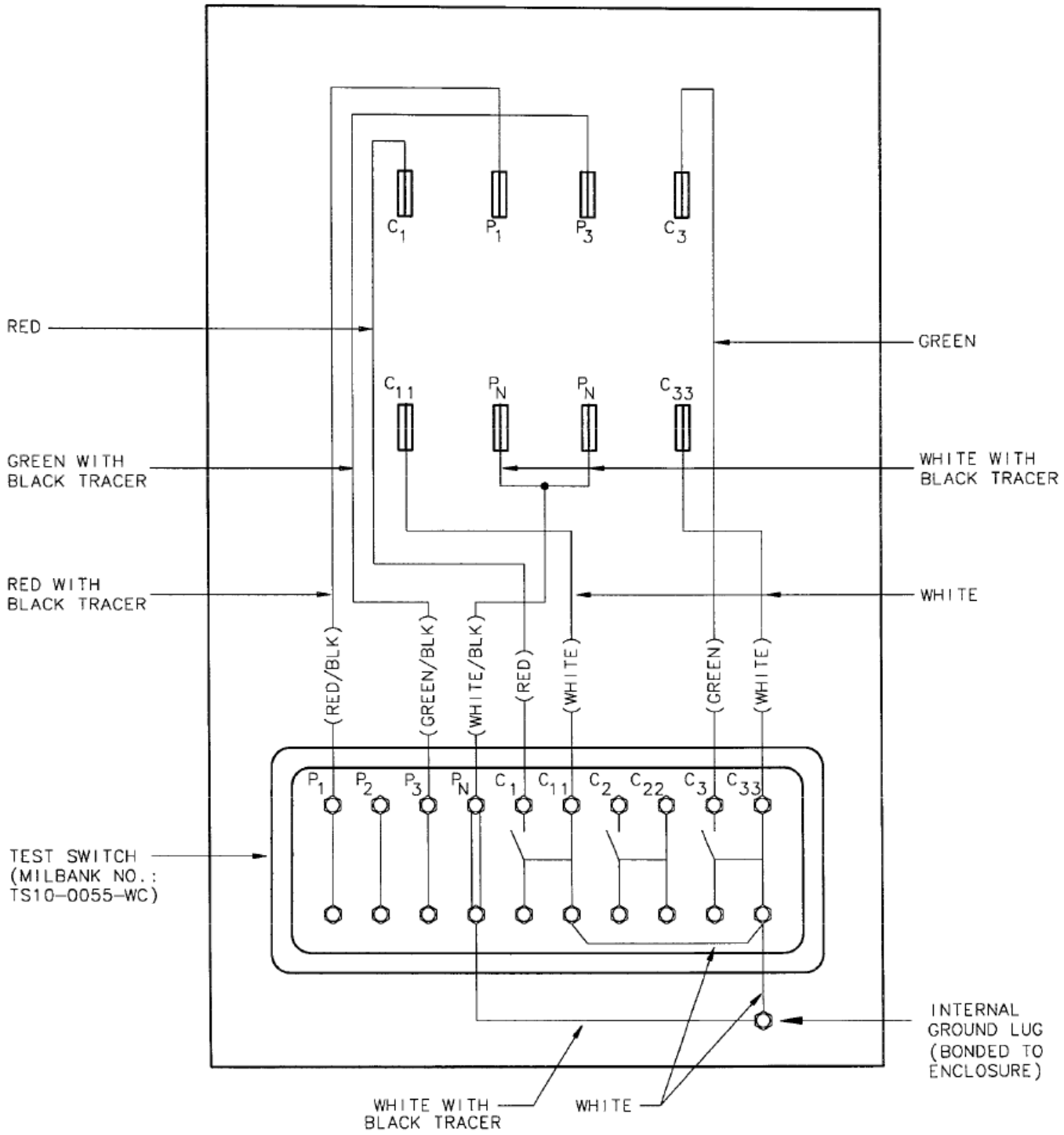
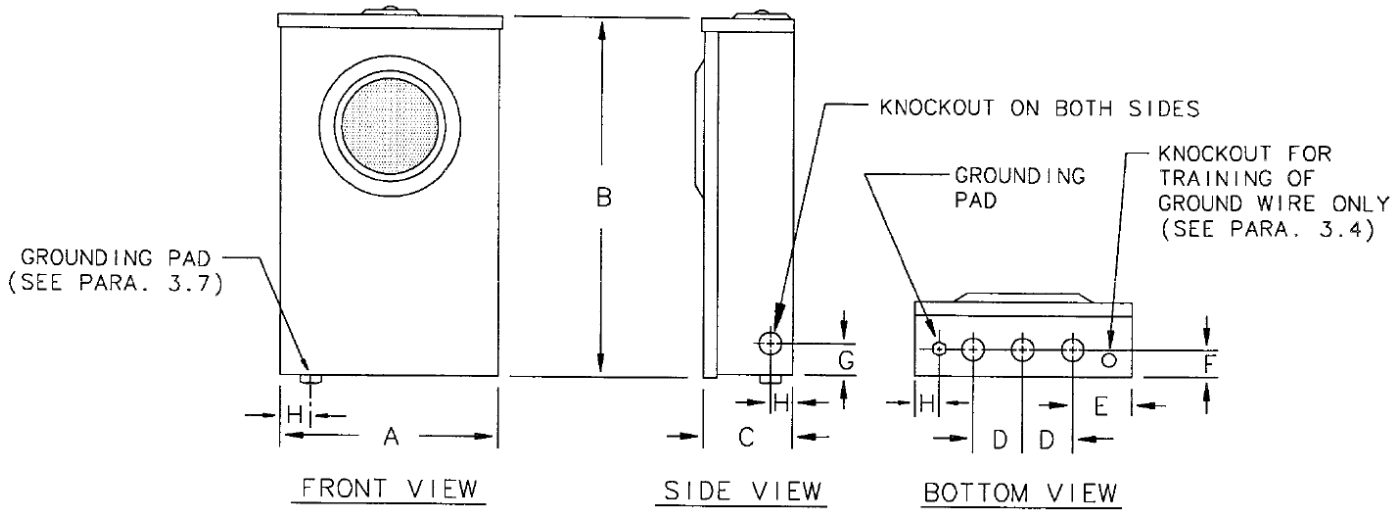


FIGURE 1



DIMENSIONS							
A	B	C	D	E	F	G	H
12	20	5–1/8	2–3/4	3–1/4	1–1/2	1–3/4	1–1/4

ALL DIMENSIONS IN INCHES

1. **General.**
   1.1. Item Number(s): 102-600-077 Dated 3/14/2024
   1.2. Description: Socket, Meter, Prewired Test Switch, 13 Terminal, 20 Amp
   1.3. Where used: Mounting transformer rated watthour meters for single and three phase revenue metering
   1.4. Material/Color: Bonderized Steel, Neutral Gray, Munsell #5BG7.0/0/4

2. **Electrical & Mechanical Requirements.**
   2.1. Voltage Class/Rating: 600 V
   2.2. Current rating: 20 A Continuous
   2.3. Terminals shall be 10-32 stud type for ring tongue connectors.
   2.4. The neutral terminal shall be electrically bonded to the enclosure by means of a bolted or riveted connection. A bonding jumper in the form of a separate screw, strap or other means shall bond the enclosure to the grounded (neutral) conductor using a #6 AWG copper or #4 aluminum wire.
      2.4.1. The neutral terminal shall accept the same conductor range as the current carrying terminals, see 2.6.
   2.5. Wiring
      2.5.1. Current and potential terminals shall be wired from the top positions of the test switches to the socket terminals as shown in Figure 1.
      2.5.2. Conductors shall be thermoplastic-insulated #12 AWG stranded copper wire, using a Polyvinyl Chloride (PVC) covering, 10 mils in thickness and color coded as specified in 2.5.3; and shall be rated for 600 volts and 75° C; and terminated using a "Burndy HY" lug (catalog no. YAV10) or approved equal.
      2.5.3. Color coding of conductors shall be as listed below (see Figure 1):
         (P1): A Potential – red with black tracer
         (P2): B Potential – orange with black tracer
         (P3): C Potential – green with black tracer
         (PN): Potential Neutral – white with black tracer

(C1): A Current line – red
(C2): B Current line – orange
(C3): C Current line – green
(C11): Current returns – white
(C22): Current returns – white
(C33): Current returns – white

2.6. Conductor Range: #14 through #4 AWG.
2.7. Terminals shall be suitable for use with both copper and aluminum conductors.
2.8. A stud type grounding terminal (1/4" x 20 UNC) for accepting ring-tongue connectors on #12 through #6 AWG conductors shall be located in the lower right corner below the test switch.
2.9. A test switch in accordance with Colorado Springs Utilities material specification 102-700-(000-001) shall be included.

3. **Construction**
3.1. The socket shall be constructed of 16 gauge or heavier galvanized sheet steel; 1 ¼ oz. class zinc-coated.
3.2. The cover shall be of the one piece ringless type, equipped with a suitable device for sealing with padlock type seals.
3.3. The finish shall be bonderized and coated with neutral gray (Munsell #5BG7.0/0/4) baked enamel.
3.3.1. The finish shall be uniform and even, free of runs, sags, checks or blisters.
3.4. Knockouts shall be concentric type with maximum size for 1-1/4 " GRC conduit, located as shown in the diagram on page 1/3, with the exception of the knockout for training of the ground wire which shall be ¼ " in diameter.
3.5. Socket shall be provided with a bridge for mounting the test switch.
3.5.1. Alternate test switches are acceptable with prior written approval from Colorado Springs Utilities Engineering Standards.
3.6. Internal socket ground lug shall be located in the lower right hand corner below the bridge, as shown in Figure 1. (See electrical requirements, paragraph 2.8)
3.7. An external grounding pad (nut) shall be welded to the meter socket with a ½ inch 13NC hole 7/16 inches deep; and located as shown in the diagram on page 1/3.
3.8. Socket shall be weather-resistant and suitable for outdoor use with a removable hub closing plate on top.

4. **Applicable Standards**
4.1. The socket shall be constructed in accordance with and conform to the following publications.
4.1.1. ANSI/UL 414, "Standard for Meter Sockets", dated 2023 (Ninth Edition) or latest revision.
4.1.2. ANSI C12.7, "American National Standard Requirements for Watthour Meter Sockets", dated 2022 or latest revision.
4.1.3. ANSI C12.9, "American National Standard for Test Switches for Transformer Rated Meters", dated 2021 or latest revision.

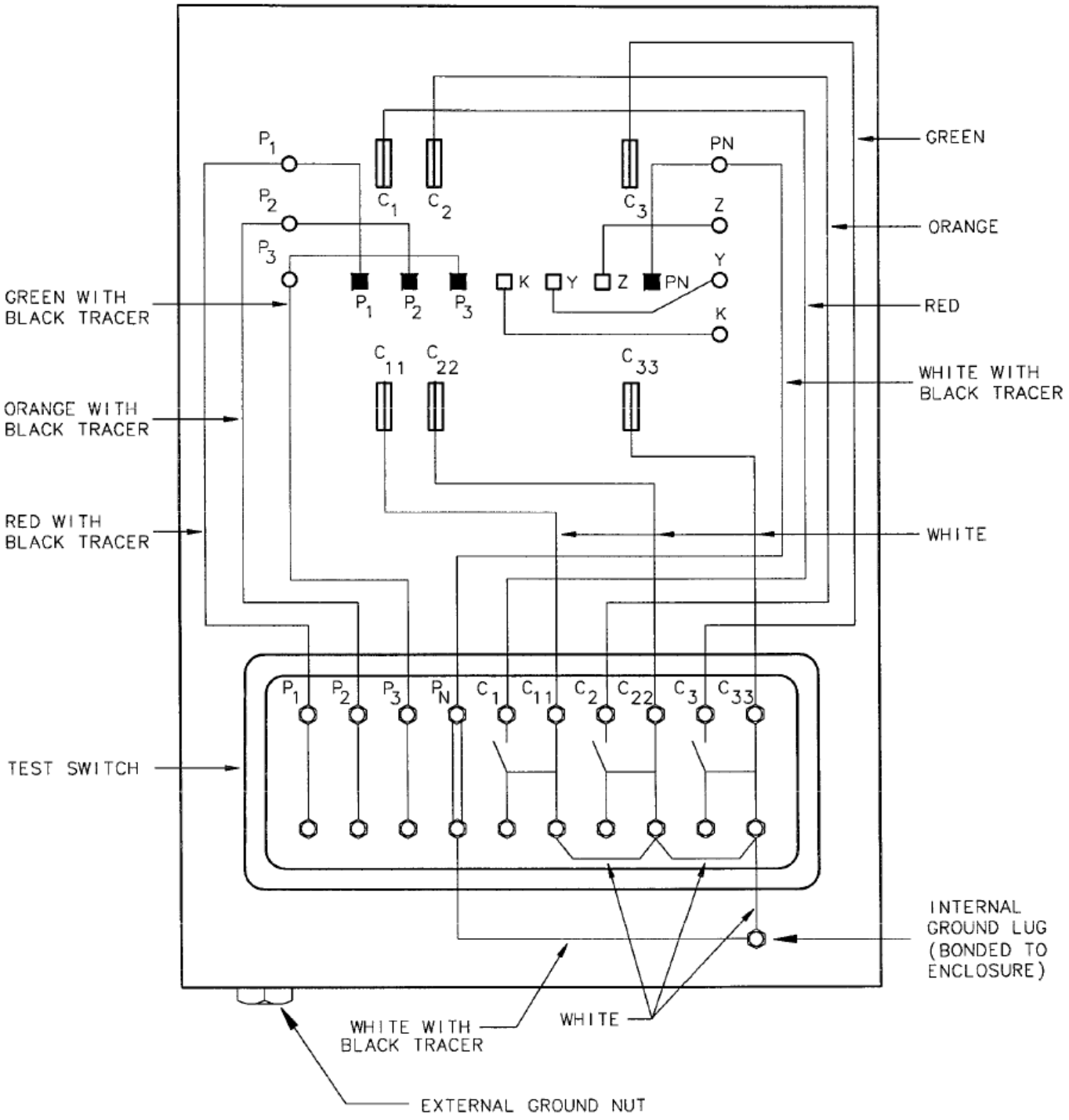
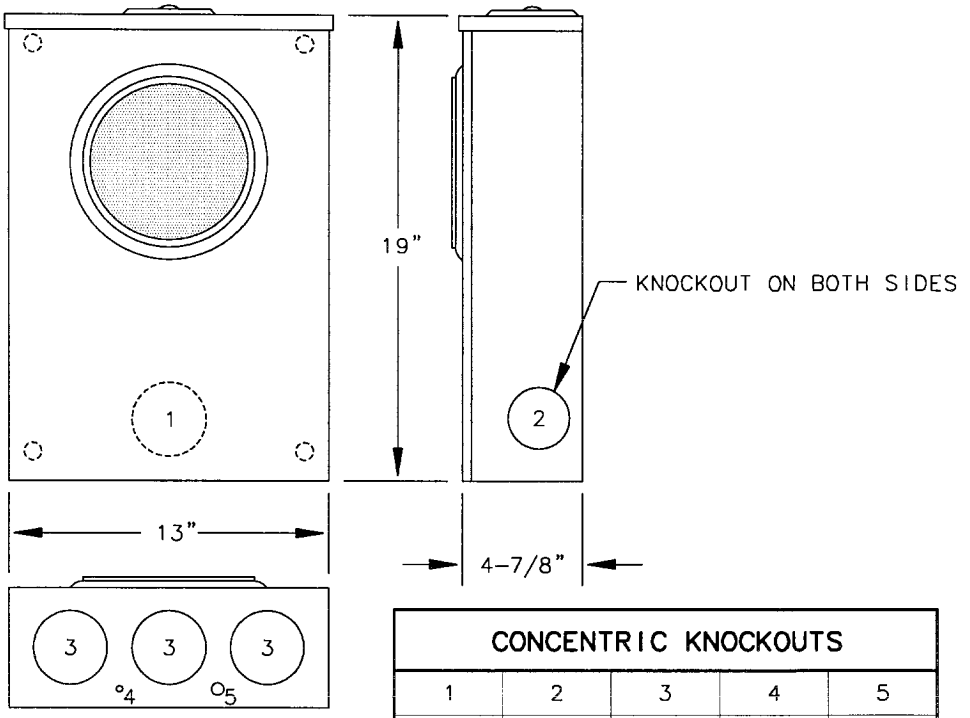


FIGURE 1



CONCENTRIC KNOCKOUTS				
1	2	3	4	5
3"	2-1/2"	3"	1/4"	1/2"

NOTE:

Knockout dimensions are conduit trade sizes.

1. General.

1.1 Description: Socket, Meter, 7 Terminal, 200 Amp with Lever Bypass.
1.2 Unit of Measure: Each.
1.3 Use: Mounting watthour meters for commercial three phase revenue metering, 200 amp load or less, overhead or underground.

2. Standards.

2.1 Sockets shall be constructed in accordance with and conform to the following ANSI (American National Standards Institute) publications:
2.1.1 ANSI/UL 414, "Standard for Meter Sockets", dated 1993 (Fifth Edition) or latest revision.
2.1.2 ANSI C12.7, "American National Standard Requirements for Watthour Meter Sockets", dated 1993 or latest revision.

3. Construction.

3.1 Sockets shall be constructed of 16 gauge (minimum) galvanized sheet steel, 1-1/4 oz. class zinc-coated.
3.2 Cover shall be of the one piece ringless type, equipped with a suitable device for closing and sealing with padlock type seals.
3.3 Finish shall be bonderized and coated with a light neutral Gray (Munsell Gray #5BG7.0/0/4) baked enamel.
3.4 Knockouts for load carrying cable shall be concentric type.
3.5 The general construction of the socket shall provide protection to personnel against accidental contact with energized elements of the meter and socket; and shall provide protection to the electrical components against adverse environmental weather conditions.

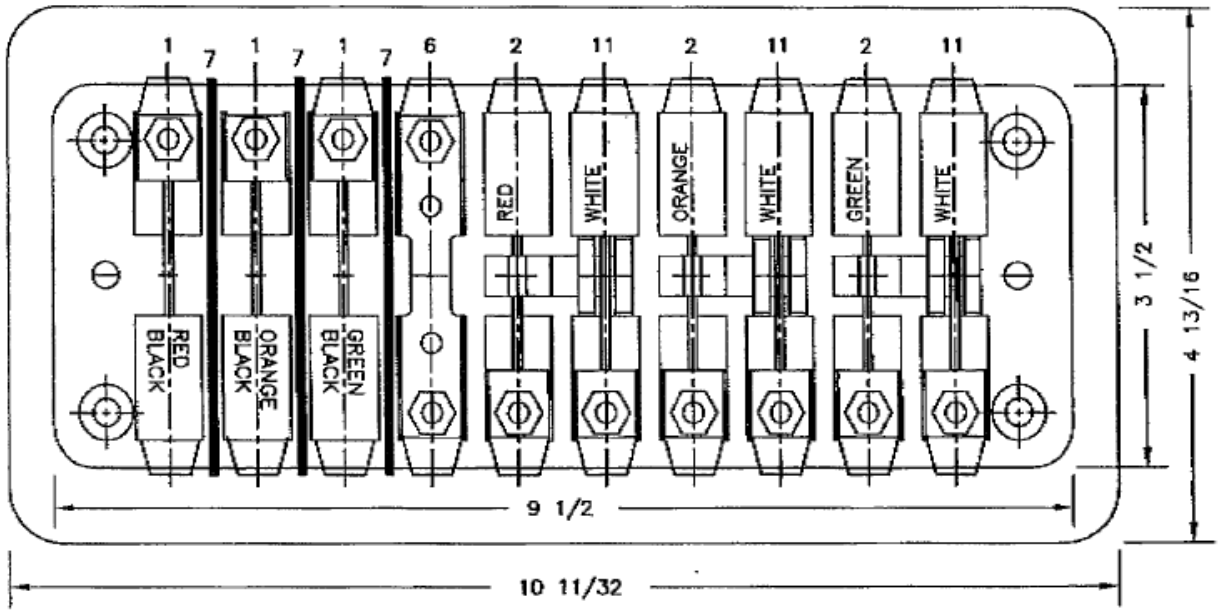
4. Electrical.

4.1 The neutral terminal shall be electrically bonded to the enclosure by means of a bolted or rivited connection. A bonding jumper in the form of a seperate screw, strap or other means shall bond the enclosure to the grounded (neutral) conductor using a #4 AWG copper or #2 AWG aluminum wire.
4.2 The neutral terminal shall accept the same conductor range as the current carrying terminals, see 4.7.
4.3 Terminals shall be suitable for use with both copper and aluminum conductors.
4.4 Jaws and terminals shall be rated at 600 volts.
4.5 Ampere rating for the jaws and terminals shall be a minimum 200 amps continuous.
4.6 Socket shall have a lever operated jaw release bypass.
4.7 Conductor Range: #6 through 350 kcmil.

MATERIAL SPECIFICATION

REV. 1	DATE 9-19-95	ENG. STDS D. Horse	SOCKET, METER, 7 TERMINAL,	COLORADO SPRINGS UTILITIES ELECTRIC DEPARTMENT
ORIG. DATE	3-30-81	ELEC. SER Larry Haines	200 AMP, WITH LEVER BYPASS	
DRAWN BILL MORSE		METER SHOP D. Parlow	102-600-130	PG. 1/1

FORM EES-47MS (3/94)



1. General

1.1. Item Number: 102-700-(000-001) dated 03/14/2024

1.2. Item Description: Switch, Color Coded Meter Test – (VARIES) Connected

1.3. Long Description: In Conformance with CSU Material Specification 102-700-(000-001) dated 02/02/2015

1.4. Where Used: Electric Revenue Meter C.T. and P.T. testing switch.

2. In Conformance with the following Standards

2.1. ANSI: C12.9

3. Electrical & Mechanical Requirements

3.1. Insulation Rating(s): 600 VAC

3.2. Continuous Current Rating: 30 A

4. Optional Features and Functions Included

4.1. Front Connected Wire Connections for item 102-700-000 and Back Connected Wire Connections for item 102-700-001.

4.2. Ten Position Switch Layout from left to right is:
Potential (Red w/Black), Potential (Orange w/Black), Potential (Green w/Black), Neutral (No Color - Solid), Shorting Switch (Red), Test Jack (White), Shorting Switch (Orange), Test Jack (White), Shorting Switch (Green) and Test Jack (White).

4.2.1. Potential switches shall open upward.

4.2.2. Current switches shall open downward.

4.3. Current Carrying components are tin plated.

4.4. Clear Lexan Cover.

Colorado Springs Utilities

Specification 193-SPP-SCA

For

GENERATION POWER PLANT SCADA PANELS

Approved by Engineering Standards: Bill Galloway Digitally signed by Bill Galloway Date: 2024.08.01 11:34:57 -06'00'

Approved by Electric Distribution Control:

Approved by Relay, Instrumentation, and Control:

Approved by Network Infrastructure Services:

Approved by Substation and Transmission Engineering:

Approved by Measurement Engineering:

Written by: Melissa Garza Date: 09/20/2018

Drawn by: Jonathon O'Donoghue Date: 11/22/2023

Original Effective Date: 09/25/2018

Revision no: 1	Revision Date: 8/3/2023
Revision no: 2	Revision Date: 9/22/2023
Revision no: 3	Revision Date: 10/4/2023
Revision no: 4	Revision Date: 11/17/2023
Revision no: 5	Revision Date: 12/18/2023
Revision no: 6	Revision Date: 6/3/2024

1. Scope

This specification establishes requirements for electrical and mechanical performance, interchangeability, and safety of the equipment covered. This specification covers the requirements of SCADA panels for Generation Power Plants requiring primary metering for production and not interconnecting with other utilities or power authorities.

2. General

2.1 Description: Panel, SCADA, Solar Array, Wind, Battery Storage Systems.

2.2 Unit of Measure: Each

2.3 Use: For indication metering and statuses of Generation Power Plants.

3. Referenced Standards

Equipment/material covered by this specification shall be manufactured in conformance with the following standards including all standards referenced therein. It shall also comply with all other applicable standards of IEEE, ANSI, ASTM, NEMA, UL, and similar industry organizations. Where conflicts occur in referenced standards, the more stringent shall apply unless modified by this specification. The revisions in effect on the date of the order or blanket release shall apply. The term "approved equal" shall mean approved in writing by the Colorado Springs Utilities, Engineering Standards.

3.1 American National Standards Institute (ANSI), Institute of Electrical and Electronics Engineers (IEEE), National Fire Protection Association (NFPA), or UL latest edition:

- 3.1.1 ANSI C2, "National Electrical Safety Code."
- 3.1.2 IEEE 929 “Recommended Practice for Utility Interface of Photovoltaic (PV) Systems"
- 3.1.3 NFPA 70: “National Electric Code (NEC)”
- 3.1.4 NFPA 70E: “Standard for Electrical Safety in the Workplace”
- 3.1.5 UL 1741 Standard for Safety for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
- 3.1.6 NEMA 250: “Enclosures for Electrical Equipment”

4. Performance Requirements

4.1 The enclosures shall be a 36” x 48” x 16” SCADA enclosure with a swing out panel kit.

4.2 Any generation site that is 150 kW and greater, but less than 500 kW in size requires an Aclara KV2c meter. Any generation size equal to or greater than 500 kW in size requires an SEL-735 meter.

4.3 The SCADA Panel will be used to perform indication metering of Generation Power Plants with analog points for various parameters including:

- 4.3.1 Total kW
- 4.3.2 Total kvar
- 4.3.3 Total kVA
- 4.3.4 I_n (neutral) current
- 4.3.5 Frequency
- 4.3.6 Maximum kW import sliding window demand
- 4.3.7 kW import accumulated demand
- 4.3.8 Maximum kVA sliding window demand
- 4.3.9 kVA accumulated demand
- 4.3.10 I_1 maximum ampere demand
- 4.3.11 I_2 maximum ampere demand
- 4.3.12 I_3 maximum ampere demand
- 4.3.13 kWh import
- 4.3.14 kWh export
- 4.3.15 kvarh net
- 4.3.16 kVAh
- 4.3.17 kvarh import

4.3.18 kvarh export
4.3.19 phase 1-N volts
4.3.20 phase 2-N volts
4.3.21 phase 3-N volts
4.3.22 phase 1 amps
4.3.23 phase 2 amps
4.3.24 phase 3 amps
4.3.25 phase 1 kW
4.3.26 phase 2 kW
4.3.27 phase 3 kW

4.4 Meter shall provide 5-minute interval data including:

4.4.1 kWh Delivered
4.4.2 kVAR Delivered
4.4.3 kVAR Received
4.4.4 kWh Received

4.5 The SCADA Panel will be used to perform status indication of Generation Power Plants with digital points for various parameters including:

4.5.1 Breaker status (only applicable if generation site is 500 kW or larger)

4.5.1.1 Customer will need to install 52a contacts on their breaker and hardwire into the customer-owned RTU. This enables "soft points" to be sent to the Utilities' RTU.

4.5.2 Load switch status (only applicable if generation site is 500 kW or larger)

4.5.2.1 Customer will need to install 89a contacts on their load switch and hardwire into the customer-owned RTU. This enables "soft points" to be sent to the Utilities' RTU.

4.5.3 RTU status

4.6 The SCADA Panel shall perform those functions as well as other service imposed duties within ratings without deterioration below design ratings during its useful service life.

4.7 The SCADA Panel shall be designed for a useful service life of at least 30 years. The failure rate over the useful service life shall not exceed 0.1% per year.

4.8 Soft data points to be provided by the customer’s RTU.

4.8.1 For Solar Arrays and Wind Generation, weather data points, from a weather station or other sensors, are to be provided at 4-second intervals, unless otherwise stated, to include:

4.8.1.1 Wind speed - Telemetered wind speed measured in meters per second (m/s) taken directly from the specified meteorologic station.

4.8.1.2 Wind direction - Telemetered wind direction measured in compass heading degrees (1 – 360) taken directly from the specified met station.

4.8.1.3 Air Temp - Telemetered air temperature measured in degrees Celsius (C) taken directly from the specified met station.

4.8.1.4 Barometric pressure - Telemetered barometric pressure measured in kilopascals (kPa) taken directly from the specified met station.

4.8.1.5 Relative Humidity - Telemetered relative humidity measured in percent (%) taken directly from the specified met station.

4.8.1.6 Back panel temp - Telemetered temperature measured in degrees Celsius (C) taken from a thermocouple probe attached to the back of a unit.

4.8.1.7 Irradiance - Telemetered irradiance measured in watt per square meter (W/m2) required for the type of technology that is employed.

4.8.1.8 Irradiance requirements may be a combination of direct irradiance, global horizontal irradiance, or plane of array/global irradiance.

4.8.2 Real-Time Availability - Percentage of installed nameplate capacity of the generation site that is able to generate power. A snapshot of the instantaneous availability at the generation site is required at a maximum periodicity of 60 seconds.

4.8.3 Real-Time Capability - The amount (MW) of real power output the resource is capable of instantaneously producing, excluding any dispatch, deployment, or curtailment instructions. This item is only required for resources that are qualified to provide operating reserve. (This only applies if there is control through the SCADA system for generation sites that are 10MW or larger.)

4.8.4 A market Participant for a generation site must provide planned and forced outage and availability data through the Control Room Operations Window (CROW).

4.8.5 For Battery Storage Systems, state of charge in real time.

5. Unusual Service Conditions

5.1 All materials used shall be suitable for operating temperature of between -20ºC to 60ºC (-4 ºF to 140 ºF).

5.2 SCADA Panels shall be suitable for operation in air up to an elevation of at least 7500 feet above sea level and resistant to UV degradation that would shorten expected useful service life.

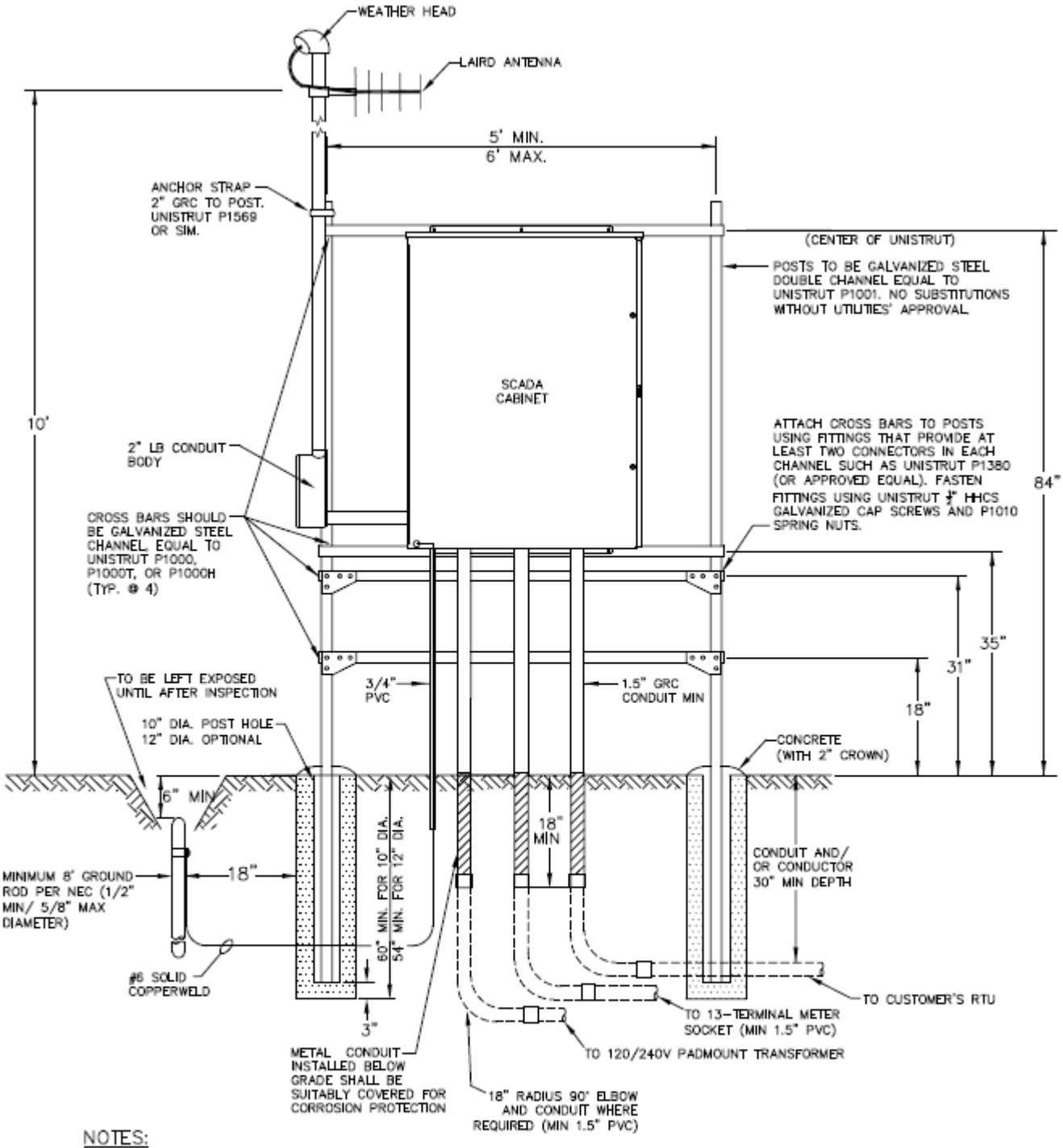
6. Testing Requirements

6.1 Design and production testing shall be performed as specified by the ANSI and IEEE standards referenced herein.

7. Construction Requirements

7.1 Dimensions

7.1.1 Overall SCADA cabinet, conduit, and grounding shall conform to dimensions as indicated in Figure 1 shown below.



NOTES:

1. Enclosure requires grounding to ground rod. Cabinet doors to be grounded.
2. Maintain 3' clearance in front of meter and 2' clearance at sides of meter.
3. GRC riser conduit must extend 18" below final grade, minimum.
4. Ground conduits to cabinet per CSU Substation Construction Standard 8-8
5. Assembly piece sizes, dimensions, and foundation are based on support of a cabinet up to 36" wide, 48" tall and 16" deep with a total installed weight of approx. 230 lbs. Further evaluation is recommended for any installations deviating from these conditions.
6. Touch up all field drilled holes and/or cut edges with galvanizing spray.

Figure 1: SCADA cabinet, conduit, and grounding details

7.2 Material List

7.2.1 Overall SCADA Panel shall consist of the materials as listed in Table 1 on page 6.

Material List

Item	Qty	Description	Manufacturer Part No.	CSU Part No.
1	1	SEL-735 Electric Meter	0735HX10944CFXDXXX16101XX	*
2	1	SEL-3061 Cellular Router (Includes omnidirectional antennas, surge suppressor, and coaxal cables)	3061#NC6L	*
3	2	2' SEL-C980 Coaxial RG-8 Cables (SMA Male/N-Type Male)	C980#42NN (C980-02)	*
4	1	TEST SWITCH FOR SEL-735 METER	ABB: C9652A25G01	193-900-386
5	1	Cover, Test Switch, Standard, Individual, Deep Cover, Clear		193-900-378
6	1	GE Orbit Licensed Narrowband 450-520 MHz Frequency Range: 450 to 520 MHz 1 Ethernet, 2 Serial Din Rail Mount w/ 120V POWER SUPPLY	GE Orbit MCR: MXNXL4CNNNNNNS2F9DUNN	TELECOM *
7	1	450-470MHz 7.1dB 3 Element Yagi Antenna	Y4503	TELECOM *
8	1	Antenna Surge Suppressor	POLYPHASER CO.: IS-B50LN-C2	TELECOM *
9	4	N M Hex/Knurl Combo No Braid Trim LMR400	EZ-400-NMH-X	TELECOM *
10	1	3 ft TWS-240 N Female to TNC Male	T3RFC-16187-36	TELECOM *
11	1	Fiber to Copper Media Converter w/ Din Rail Mount Bracket	Transition Networks - J/RS232-CF-01(SC)-NA	TELECOM *
12	1	Cabeling from Radio to Antenna		TELECOM *
13	2	Custom CAT 5 cable (RJ45/RS232) (Made in-house so no cost)		TELECOM *
14	1	CAT 5 cable (RJ45/RJ45)		TELECOM *
15	1	120V AC to 24V DC Power Supply	MEAN WELL MDR-60-24	*
16	1	200 Watt, W/Fan Temperature Activated Positive Temperature Heater	WAUKESHA SERVICE & COMPONENTS: PTC2-H02	*
17	1	2-Gang Metal Square Electrical Box	RACO - 70965	*
18	1	2-Gang Metal Square Electrical Box Cover	RACO - 72449	*
19	1	GFCI Duplex Receptacle	LEVITON: 7899-I	194-106-092
20	1	2-Gang Wall Plate	Eaton - 97918	*
21	1	15A Single Pole Toggle Light Switch	Eaton - 70610	*
22	1	Hoffman Comapct LED Light	Hoffman: CEL550	*
23	1	Hoffman Compact LED Light Mounting Magnets	Hoffman: CELA02MF	*
24	1	Hoffman Compact LED Light Connection Cable	Hoffman: CELC3001PBUL	*
25	1	48X36X16 Medium Drip-Shield Hinged-Cover Type 3R Hoffman	Hoffman: A48R3616HCR	*
26	1	Swing-Out Panel Kit for Wall-Mount Enclsoure	Hoffman: ANADFK	*
27	2	Steel Panel for Type 3R Enclosure	Hoffman: A48P36	*
28	2	Grounding Lug Kit	Hoffman: AGLK2	*
29	1	GROUNDING KIT, HOFFMAN ENCLOSURE CABINET	HOFFMAN ENGINEERING COMPANY: 99411400	193-100-907
30	1	3-POLE FINGERSAFE STYLE FUSEHOLDER	FERRAZ SHAWMUT: USM3	193-100-602
31	6	1-POLE FINGERSAFE STYLE FUSEHOLDER		193-100-600
32	1	BLOCK, TERMINAL, SHORTING, (4 POSITION)		193-100-170
33	11	MODULAR TERMINAL BLOCK WITH STACKABLE SECTIONS (35 MM DIN RAIL)	IDEC CORPORATION: BNH30W	193-100-150
34	2	MODULAR TERMINAL BLOCK END STOP (35MM DIN RAIL)	IDEC CORPORATION: BNE30W	193-100-155
35	17	MODULAR TERMINAL BLOCK END CLAMP (35MM DIN RAIL)	IDEC CORPORATION: BNL5	193-100-157
36	9	MODULAR TERMINAL BLOCK SNAP ON LABEL (35MM DIN RAIL)	ABB: 0116 914.00, OR ENTRELEC: PEBP 0116 914.00	193-100-151
37	2	FUSE, MIDGET FAST ACTING 1-1/2" X 13/32" (1A)	COOPER BUSSMAN: BAF-1, LITTLE FUSE: BLF-1, OR FERRAZ SHAWMUT: ATM-1	193-100-610
38	3	FUSE, MIDGET FAST ACTING 1-1/2" X 13/32" (2A)	COOPER BUSSMAN: BAF-2, LITTLE FUSE: BLF-2, OR FERRAZ SHAWMUT: ATM-2	193-100-612
39	2	FUSE, MIDGET FAST ACTING 1-1/2" X 13/32" (3A)	COOPER BUSSMAN: BAF-3, LITTLE FUSE: BLF-3, OR FERRAZ SHAWMUT: ATM-3	193-100-613
40	1	FUSE, MIDGET FAST ACTING 1-1/2" X 13/32" (20A)	COOPER BUSSMAN: BAF-20, LITTLE FUSE: BLF-20, OR FERRAZ SHAWMUT: ATM-20	193-100-630
41	1	FUSE, MIDGET FAST ACTING 1-1/2" X 13/32" (30A)	COOPER BUSSMAN: BAF-30, LITTLE FUSE: BLF-30, OR FERRAZ SHAWMUT: ATM-30	*
42	165	WIRE, SIS #12 for CT Wiring and General Wiring Inside Scada Enclosure		193-650-012
43	35	WIRE, SIS #12 for Ground Wiring		193-650-014
44	2	#12 yellow termination lugs		193-500-515

45	1	Cable Tie Mounts		850-900-072
46	1	Zip Ties		(Minor Material)
47	2	RAIL, DIN TYPE, MOUNTING TRACK, SLOTTED, 35MM X 7.5MM, 1 METER (39.4")		193-900-005
48	20	CABLE, CONTROL, 10 CONDUCTOR, 600V, #12, K1 COLOR CODE PER ICEA AND NEC		102-900-100
49	3	TRANSFORMER, CURRENT 15KV OUTDOOR 200/400:5		102-800-032
50	3	TRANSFORMER, VOLTAGE 7.2KV 110KV BIL 60:1		102-900-000
51	25	CABLE, CONTROL, 10 CONDUCTOR, 600V, #12, K1 COLOR CODE PER ICEA AND NEC		102-900-100
52	20	WIRE, 1/0 BLACK XHHW, 600V, COPPER, 19 STR, 500'		190-652-100
53	1	KIT, CABLE SUPPORT BRACKET ASSEMBLY, 71" CHANNEL AND TWO ANGLE FITTINGS		194-105-112
54	1	COVER, VAULT, CONCRETE, WITH (1) 17"X 64" KNOCKOUT & (1) 17"X 69" WINDOW, 10"X 81"X 84" (A LID)		194-115-103
55	1	COVER, VAULT, CONCRETE, WITH 36" RING & MANHOLE COVER 84"X 81"X 10" (B LID)		194-115-115
56	10	WIRE, 2/0, COPPER, BARE 19 STR, 1000'		194-117-102
57	1	VAULT, PRECAST CONCRETE 6" X 12'-6' X 7'		194-115-106
58	1	CABINET, PRIMARY METERING PADMOUNT 15KV		194-107-150
59	1	SOCKET, METER PREWIRED TEST SWITCH 13 TERMINAL		102-600-077

Table 1: SCADA Panel and Primary Meter Enclosure Material List

7.3 Electrical

7.3.1 Overall SCADA Panel shall be wired as shown in Figures 2-7 on pages 7-12.

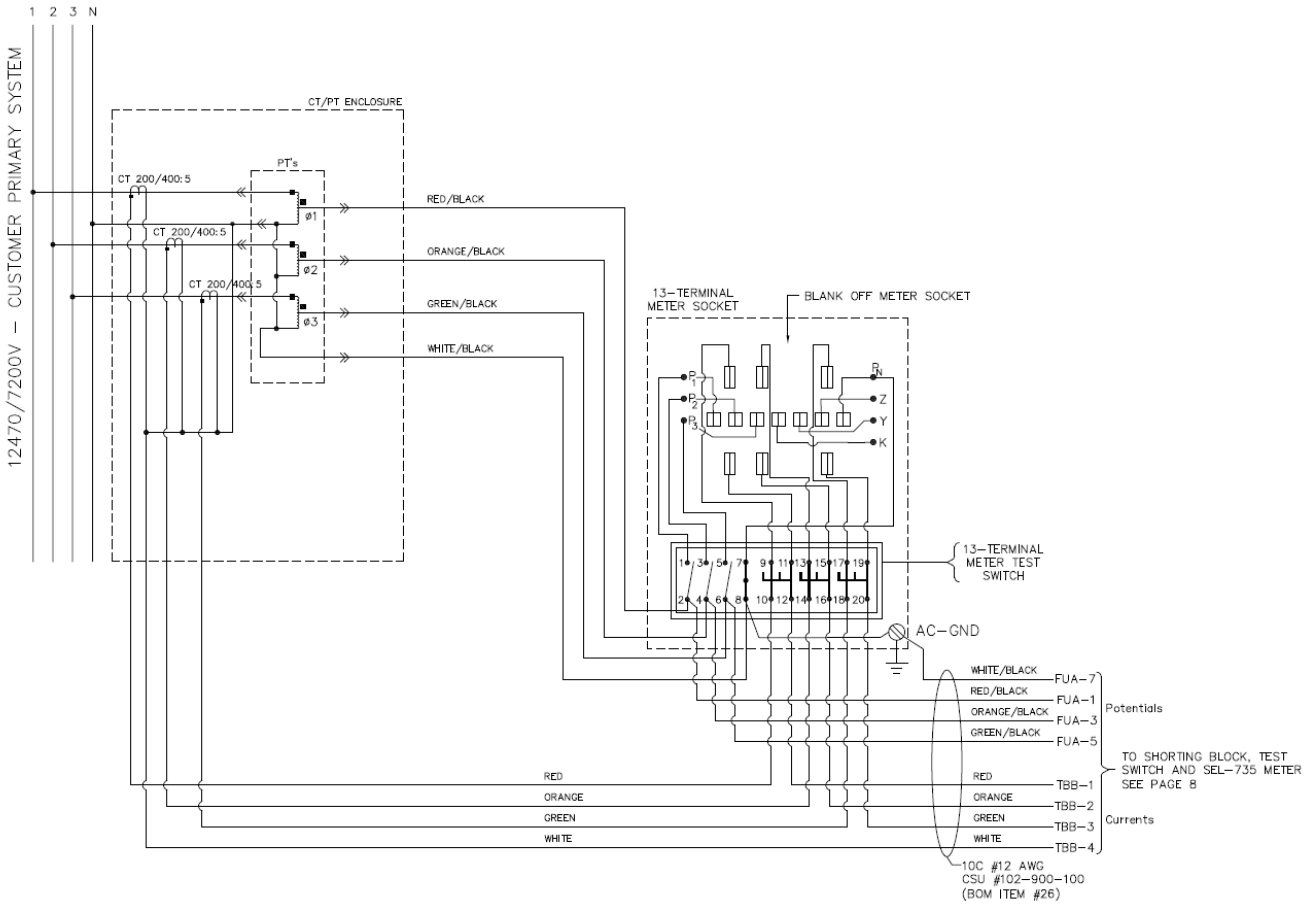


Figure 2: Revenue Metering Three-Line (CSU Reference Only)

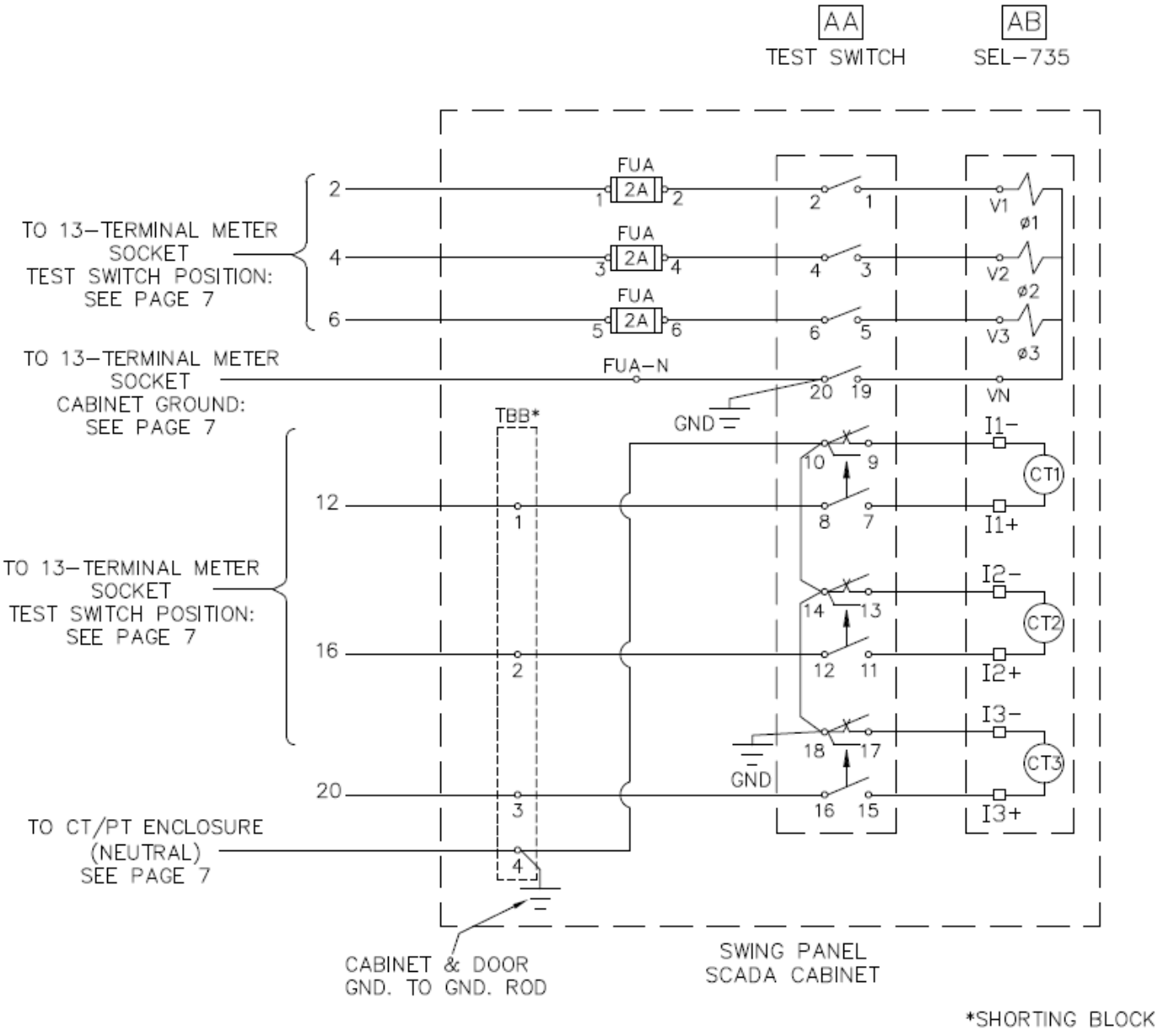


Figure 3: SCADA Cabinet Three-Line

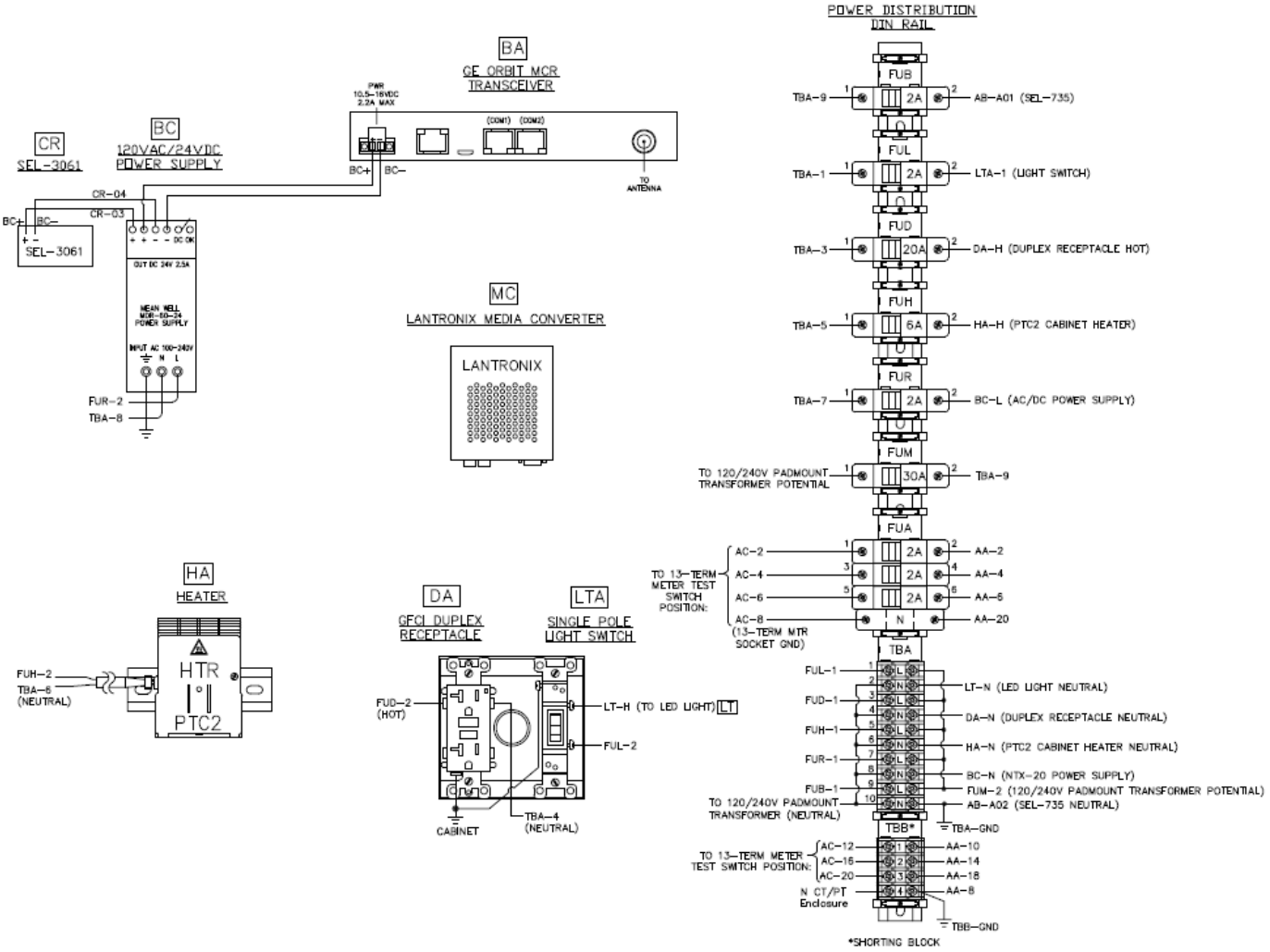


Figure 4: SCADA Cabinet Wiring Diagram

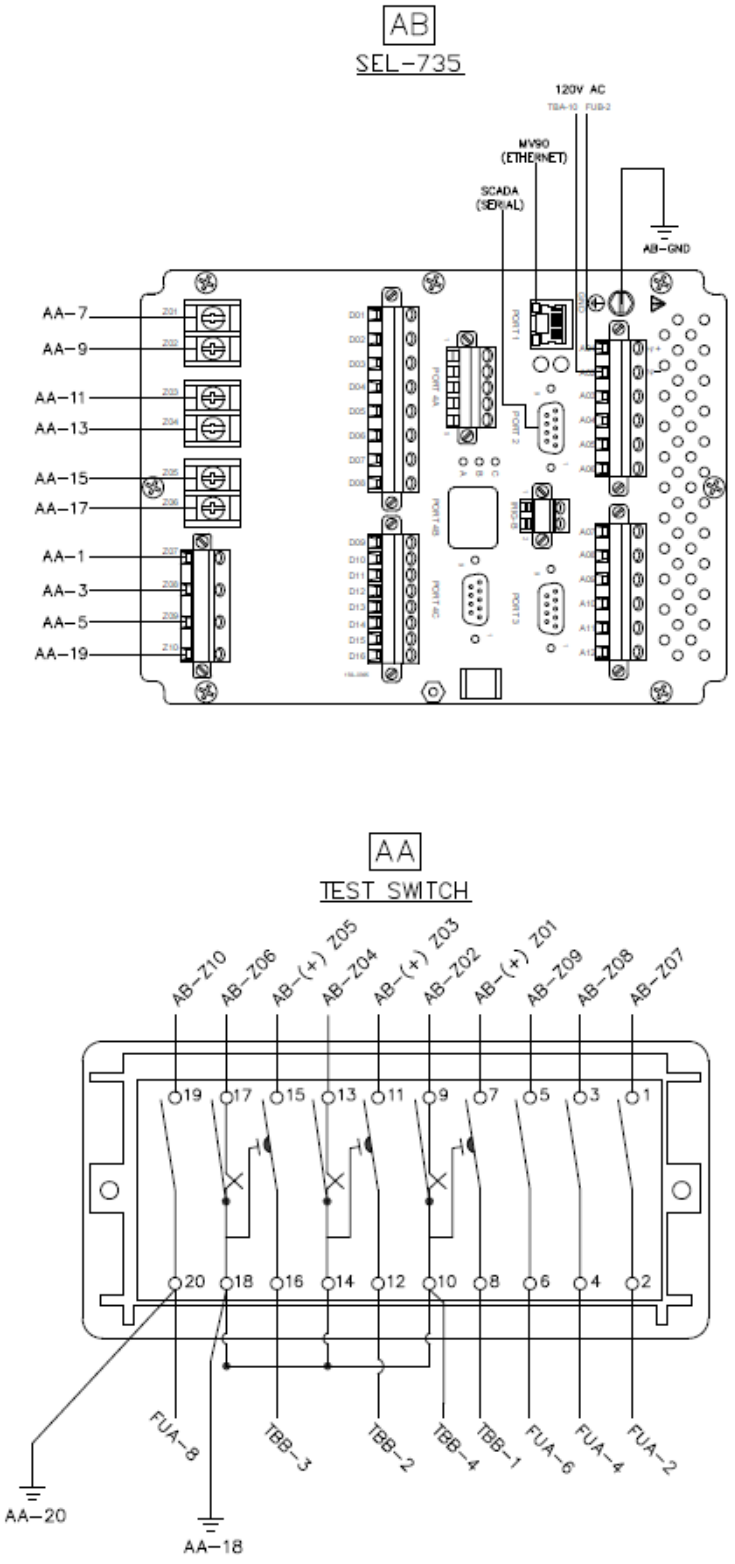
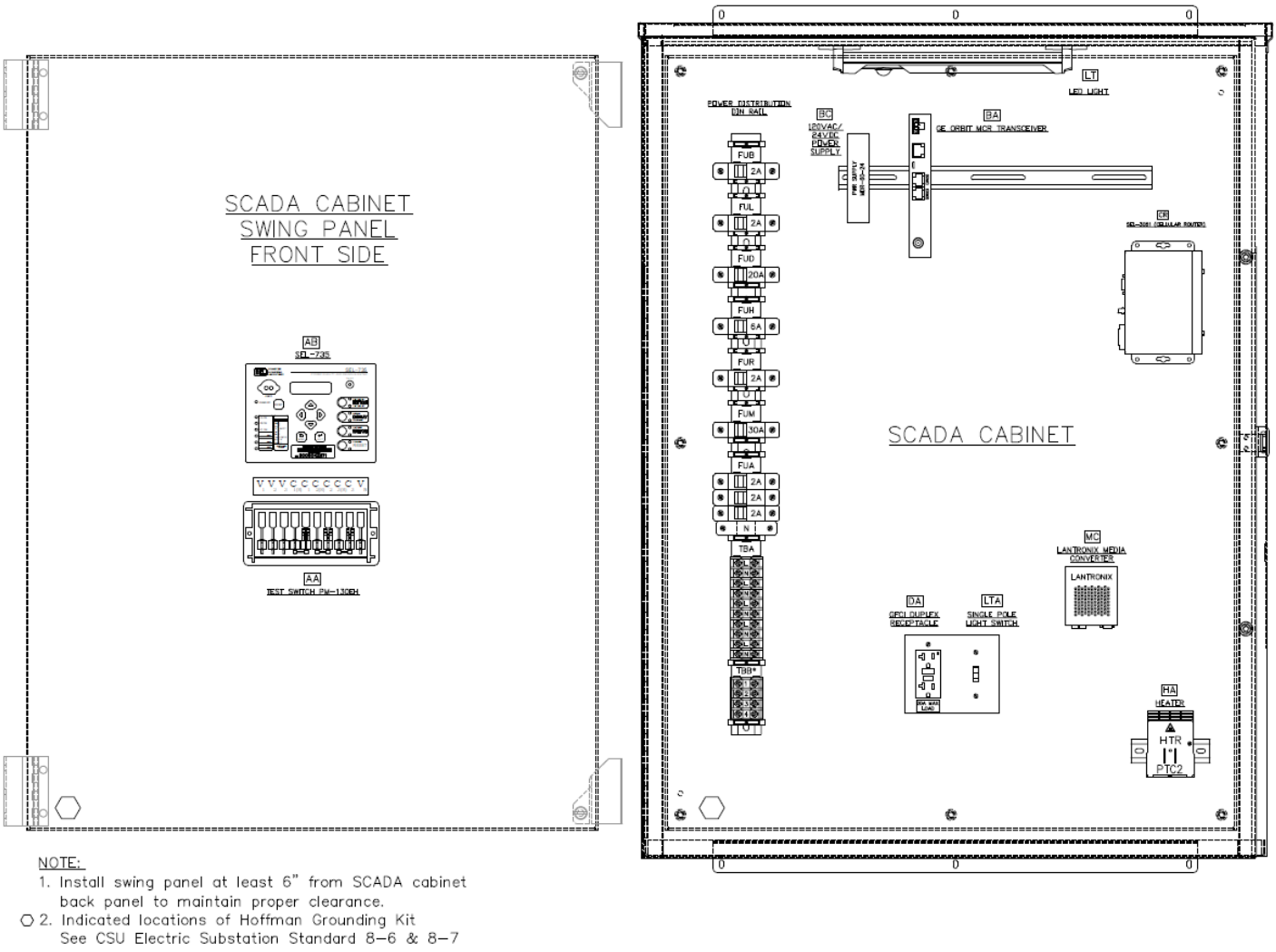


Figure 5: SCADA Cabinet Swing Panel – Rear Side Wiring Diagram



NOTE:
1. Install swing panel at least 6" from SCADA cabinet back panel to maintain proper clearance.
2. Indicated locations of Hoffman Grounding Kit See CSU Electric Substation Standard 8–6 & 8–7

Figure 6: SCADA Cabinet and CPT Enclosure Device Layout

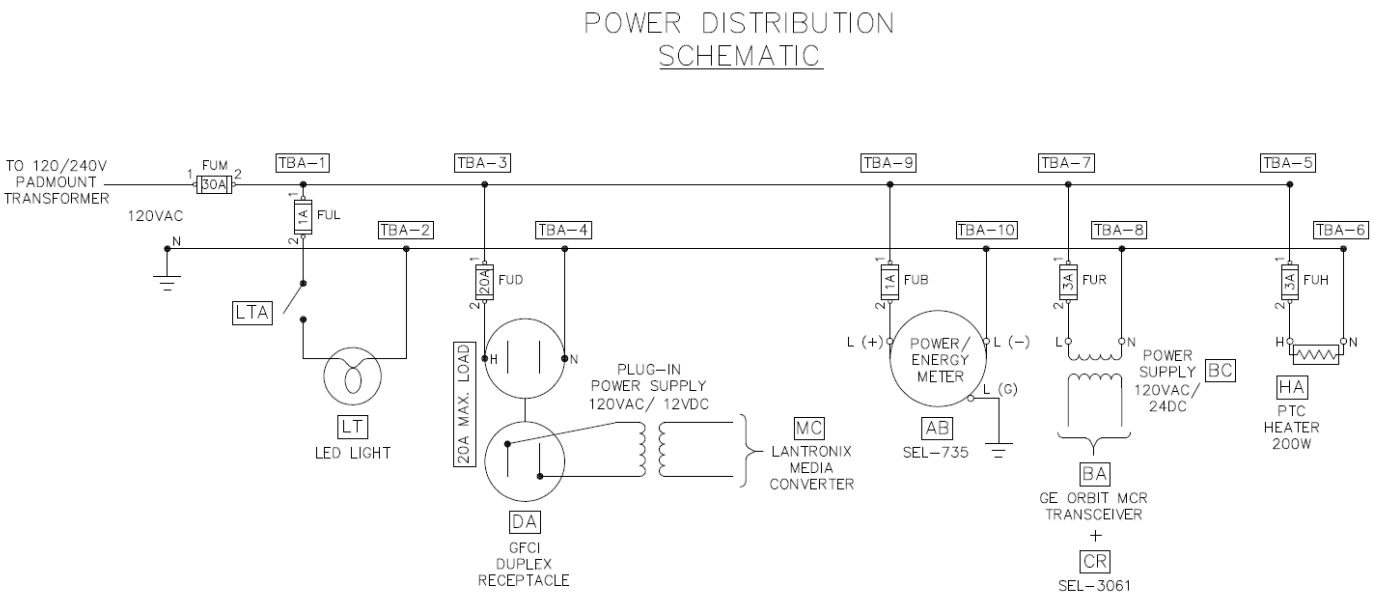


Figure 7: SCADA Cabinet Power Distribution Schematic

7.4 Cabinet

7.4.1 The SCADA Panel cabinet compartments and outside enclosures shall be electrically bonded to each other using a quick lug terminals, #6AWG copper wire, and a Hoffman Grounding Kit. The Hoffman Grounding Kit is used to bond the cabinet doors and other cabinet partitions to the back of the enclosure.

7.4.2 The solid copper cable grounding electrode for each compartment shall be at least #8-gauge wire size.

7.5 Radio and Antenna

7.5.1 Telecom is the governing group for material procurement, equipment testing, and installation for the radio and antenna. This consists from the antenna to the wiring to the local RTU. Telecom has group specific testing and installation procedures consisting of locating the master unit, line loss specifications, etc. Any modification performed on the equipment listed in this section will be under Telecom's direction and approval. The conduit and fitting will be provided outside of Telecom.

7.6 Construction Safety

7.6.1 The external construction shall be such that there are no sharp or jagged edges which could cut, scrape, or injure.

7.6.2 The cabinet corners shall be blunted so that piercing or cutting cannot occur during an accidental contact.

7.6.3 In general, external design of the SCADA Panel shall be such that it minimizes possible injury to the public.

7.7 Nameplates

7.7.1 Danger/Warning Labels

7.7.1.1 Colorado Springs Utilities will furnish and install Danger and Warning Labels on the outside of cabinets per Colorado Springs Utilities Electric Distribution Construction Standard (EDCS) in order to include local phone numbers and other information. The manufacturer shall not furnish nor install exterior danger/warning labels.

7.7.1.2 Appropriate danger/warning labels shall be applied to the termination compartments, fuse/interrupter doors, and to the inside of the cabinet doors, and shall be visible after the installation of cable and connectors.

8. Instruction Manuals

8.1 Each SCADA Panel shall be provided with detailed instruction manuals to cover the installation, operation, maintenance, and testing of the SCADA Panel. These instructions shall be provided with step-by-step procedures and the necessary drawings, photographs, charts and diagrams.

8.2 The manual shall be provided in a clear resealable plastic bag and stored in a permanent storage pocket on the inside of one of the access doors to the cable termination compartments.

8.3 A complete set of certified test reports shall be included with the construction manuals.

8.4 A complete set of construction drawings shall be included with the manuals.

Colorado Springs Utilities
Electric Transmission & Distribution Department

CSU E/T&D Specification For

(Socket Meter Pedestal 200 amp)

Item Number : 194-113-406

Approved by Electrical Engineering Standards: Jim Black

Approved by PC&M North District:

Approved by PC&M South District: Lucky

Approved by PC&M Electric Service: Harlon Stillgmon LGH

Approved by Distribution Operations: Don Deutsch RLM

Approved by Field Engineering:

Approved by Materials Management: Mark Caton

Approved by Planner/Analyst: JW.

Written by: Tony Vigil

Drawn by: John Russell

Original Effective Date: 5/12/1993

Revision No.: 1 Revision Date: 2/02/1994

1. Scope

This specification establishes requirements for 200 amp at 120/240 volt single-phase three-wire mobile home service equipment. The design of the pedestal shall be such that the utility landing and metering sections shall be completely isolated from the customer distribution section. Each of the two compartments shall have a metal plate affixed to the outside of the pedestal with rivets to clearly identify the separate customer and utility sections.

2. General

2.1 Description: Socket, meter pedestal, 200 amp.
2.2 Unit of Measure: Each
2.3 Use: Metering equipment for mobile home parks.

3. Referenced Standards

Equipment/material covered by this specification shall be manufactured in conformance with the following standards including all standards referenced therein. It shall also comply with all other applicable standards of IEEE, ANSI, ASTM, NEMA, UL, EEI, and similar industry organizations. Where conflicts occur in referenced standards, the more stringent shall apply unless modified by this specification. The revisions in effect on the date of the bid shall apply. The term "approved equal" shall mean approved in writing by the Colorado Springs Utilities, Electric Transmission & Distribution Department, Electrical Engineering Standards Section.

3.1 American National Standards Institute (ANSI)

3.1.1 ANSI/UL 414, "Meter Sockets" dated 1986 or latest revision.

3.1.2 ANSI C12.7, "Watthour Meter Sockets" dated 1987 or latest revision.

3.1.3 ANSI/ASQC Z1.4 latest edition: American National Standards Committee on Quality Assurance.

3.2 Underwriters Laboratories (UL)

3.3 National Electrical Manufacturers Association (NEMA)

3.3.1 NEMA - E 1 - 17 latest revision.

3.3.2 NEMA - 250 latest edition: "Enclosures for Electrical Equipment" (1000 volts maximum).

4. Colorado Springs Utilities Electric E/T&D: Material specification 102-1 is made a part of this standard with the following additions.

5. Service Conditions

5.1 This item shall be suitable for installation and operation in ambient temperatures from -40°C to +50°C.

5.2 It shall be suitable for operation in air up to an elevation of at least 7500 feet above sea level and resistant to UV degradation that would shorten expected useful service life.

6. Ratings

6.1 Ratings shall be based on standard service conditions; recommendations for operating at unusual service conditions shall be furnished in writing.

6.2 Voltage Rating: 240 volts.

6.3 Current Rating: 200 amps.

7. Construction

7.1 Socket shall be constructed in accordance with NEMA-E1-17 and EEI Publication No. MSJ-7 latest revision, as well as any ANSI standards which apply.

7.2 Socket shall be outdoor weather resistant (NEMA TYPE 3R).

7.3 Socket and cover shall be constructed of 16 gauge galvanized sheet steel; 1-1/4 oz. class zinc-coated.

7.4 Meter pedestal post shall be constructed of 14 gauge galvanized sheet steel; 1-1/4 oz. class zinc-coated.

7.5 Cover shall be of the removable one-piece ringless type, equipped with a suitable device for sealing with padlock type seals.

7.6 The meter socket and pedestal finish shall be polyurethane powder coating (ANSI # 49 GRAY). The finish shall be uniform and even, free of runs, sags, checks or blisters.

8. Terminal connector and jaws.

8.1 Jaws and terminals shall be rated 200 amperes continuous.

8.2 Jaw assembly shall be Milbank, manufacturers catalog # S1697-RL-KK or equivalent.

8.3 All jaws and terminals shall be rated 600 volts.

8.4 Terminals shall have a horn-type bypass furnished on line and load sides of the blocks.

8.5 Blocks shall be capable of accepting a 5th terminal for 120/208 and 120/240 volt 3 wire service.

8.6 All breakers shall be installed and wired at factory.

8.7 All breakers shall be (GENERAL ELECTRIC) or equivalent.

9. Electrical Requirements

9.1 Volt: 120/240.

9.2 Wire range: CU/AL. #2 through 350 Kcmil rated for 90 degree C wire insulation.

9.3 Separate grounding provisions shall be provided for post and equipment.

9.4 All meter pedestals shall contain a label on the inside of the door with a typical wiring diagram which gives electrical data and wiring information for the unit.

10. Electrical Breakers

10.1 The main load center shall be 200 amp rated capable of accepting a General Electric 100 amp or 200 amp breaker. Meter pedestals are to be shipped with General Electric 100 amp breaker, unless specified otherwise at time of order. Catalog # THQL 21100 or approved equivalent.

10.2 One 50 amp two-pole breaker, with NEMA 14-50R 125/250 volt 4 wire receptacle, installed with permanent wiring. 50 amp breaker shall be General Electric, catalog # THQL 2150 or equivalent.

10.3 One twenty amp one pole breaker, will permanently wired to a 125 volt GFI receptacle. Breaker shall be General Electric, catalog # THQL-1120, or equivalent.

10.4 Both auxiliary breakers shall be subfeed from the 100 amp breaker.

11. Identification

11.1 All meter pedestals shall be permanently marked with the manufacturer's identification, month and year made.

12. Performance Requirements

12.1 Expected useful service life shall be a minimum of 30 years.

12.2 The failure rate over the useful service life shall not exceed 0.1% per year.

13. Packaging and Shipping Requirements

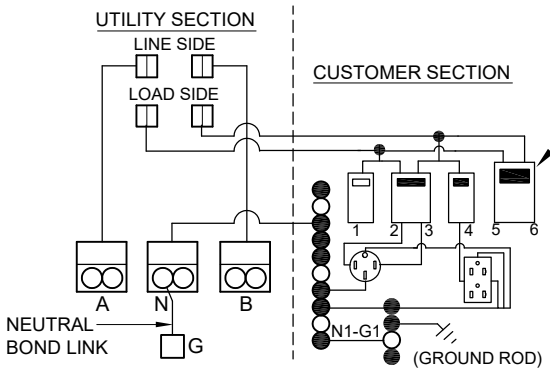
13.1 Weight: Approximately 70 pounds each.

13.2 Standard ordering package: 12.

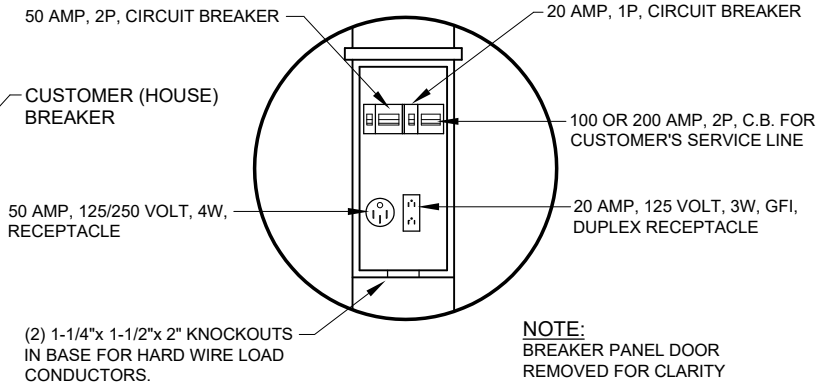
13.3 All pedestals shall be shipped with adequate dunnage, palletized and banded for warehouse handling.

14. Incoming QC or Factory Inspection

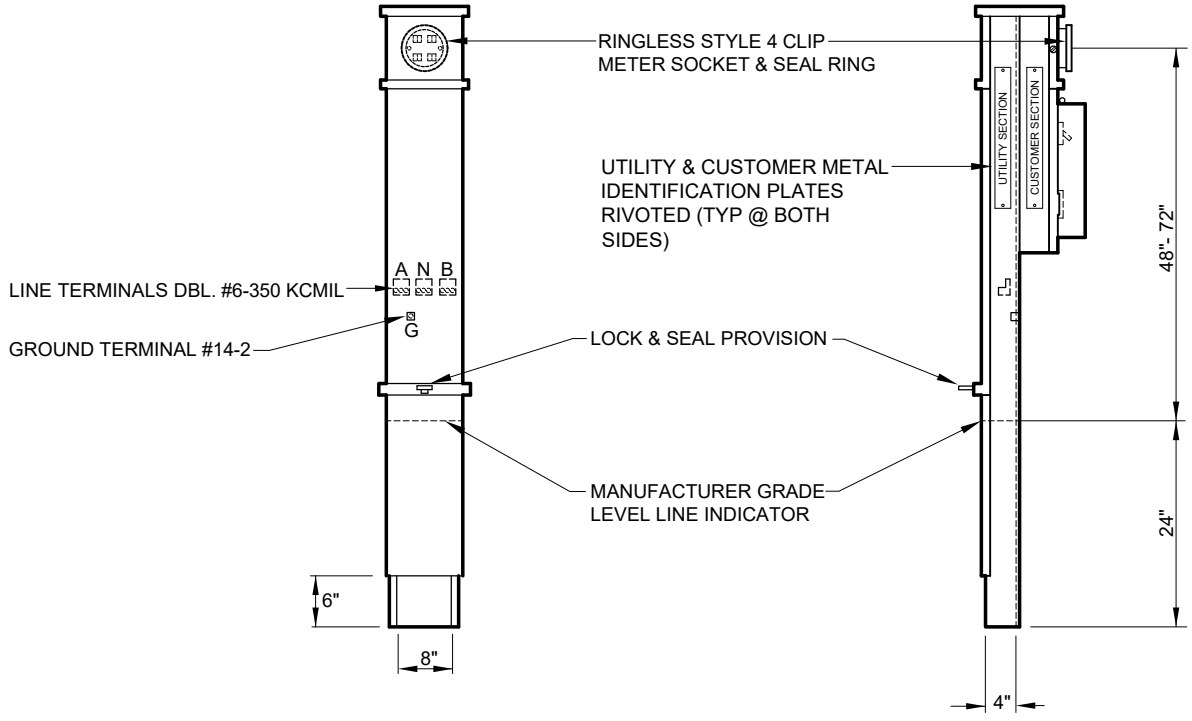
14.1 All items shall be subject to incoming tests and inspection and/or factory inspections. Shipments are subject to rejection based on unacceptable results during these tests and inspections. The supplier shall be responsible for all costs including return shipping.



ONE-LINE WIRING DIAGRAM



NOTE:
WHERE CUSTOMER LOAD IS HARD-WIRED, RECEPTACLES ARE OPTIONAL.



FRONT VIEW

RIGHT SIDE VIEW

PERMANENT METER PEDESTAL

Colorado Springs Utilities
Electric Distribution Material Specification

194-2

For
Polyethylene Conduit for Underground Installation

Approved by Engineering Standards: William L Galloway 3-14-2011

Approved by North Work Center Line Supervisor: 3-15-2011

Approved by South Work Center Line Supervisor: 3/14/2011

Approved by Materials Management: 3/14/2011

Written by: Craig R. Sawall Date: 3-10-2011

Revision no: 1 Revision Date: 11-18-2014
Added 5.4.7 "4" Duct (Item 194-214-524) on Steel Reels shall have conduit strapping on each layer of conduit that is wrapped around the reel." to page 3.

The following specification establishes requirements for Polyethylene conduit & fittings used for underground installation.

1. General:

1.1. Item Numbers & Descriptions:
- 1.1.1. 194-117-172: Cable-In-Conduit, 15kV #1 Solid Cable in 2" HDPE Conduit
- 1.1.2. 194-214-514: Duct, High Density Polyethylene (HDPE), 4", 40 Ft. Lengths
- 1.1.3. 194-214-515: Duct, High Density Polyethylene (HDPE), 4", 20 Ft. Lengths (Red)
- 1.1.4. 194-214-516: Duct, High Density Polyethylene (HDPE), 6", 40 Ft. Lengths
- 1.1.5. 194-214-522: Duct, High Density Polyethylene (HDPE), 2", 2,000' Reel
- 1.1.6. 194-214-524: Duct, High Density Polyethylene (HDPE), 4", 550 Ft. Reel

1.2. Long Description: In conformance with Material Specification 194-2, dated 3-10-2011

1.3. Use: Underground guided boring, construction of temporary power pedestals, and cable-in-conduit applications

2. Referenced Standards:

2.1. ASTM F2160, latest edition "Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD)"

2.2. ASTM D3350, latest edition "Polyethylene Plastics Pipe and Fittings Materials"

3. Dimensions:

Item	Size (Inches)	Color	Type	Nominal OD (inches)	Minimum Wall Thickness & Tolerance (inches)
194-117-172	2	Black w/Red Stripes	Sch 40	2.375	0.154 + 0.020
194-214-514	4	Black w/Red Stripes	Sch 40	4.500	0.237 + 0.028
194-214-515	4	Solid Red (used for Utilities temporary power pedestals only)	Sch 40	4.500	0.237 + 0.028
194-214-516	6	Black w/Red Stripes	Sch 80	6.625	0.432 + 0.052
194-214-522	2	Black w/Red Stripes	Sch 40	2.375	0.154 + 0.020
194-214-524	4	Black w/Red Stripes	DR 13.5	4.500	0.333 + 0.040

NOTE: Chart dimensions per ASTM F2160

4. Mechanical Requirements:

4.1. Conduit shall be High Density Polyethylene (HDPE) per ASTM D3350

4.2. Manufactured in accordance with ASTM F2160

4.3. Minimum Cell Classification of 334430C (Black) or 334430E (Red) per ASTM D3350

4.4. Conduit shall be rated for 90°C cable conductor temperature

4.5. Markings:
- 4.5.1. The marking on the conduit shall include at minimum, the following information at intervals not exceeding 5 ft. as stated in ASTM F2160:

4.5.1.1. The letters "ASTM F2160"
4.5.1.2. The letters "HDPE"
4.5.1.3. Nominal conduit size (example: "XX IPS")
4.5.1.4. Dimension Ratio or Schedule
4.5.1.5. Name or Trademark of the manufacturer
4.5.1.6. Production Code from which location and date of manufacture can be identified
4.5.1.7. On coils, sequential footage (meterage) marks, accurate within ±2% of the marking interval

4.5.2. Stripes shall spaced approximately 120 degrees apart
4.5.2.1. Minimum width 0.125"
4.5.2.2. Minimum embedment of 0.025" into the wall of the conduit

5. Packaging:

5.1. Both inside and outside ends of the conduit shall be capped to protect against water and debris entering conduit during shipment and storage.
5.2. Steel reels shall be shipped to protect outer wraps from damage.
5.3. Kinks in a reel coil shall not be acceptable
5.4. Bundles:

Item	Length (ft)	Package	Package Quantity (ft)
194-117-172	2500	Steel Reel	2500
194-214-514	40	Bundle	1040
194-214-515	20	Bundle	1080
194-214-516	40	Bundle	520
194-214-522	2000	Steel Reel	2000
194-214-524	550	Steel Reel	550

5.4.1. Shall have frames made of 2”x4” wood blocks top and bottom wrapped with steel banding.
5.4.2. All bundles shall a frame 2’ from each end.
5.4.3. 20’ bundles shall have 2 additional frames equally spaced along the bundle.
5.4.4. 40’ bundles shall have 4 additional frames equally spaced along the bundle.
5.4.5. Frames shall be spaced to allow stacking of bundles.
5.4.6. Shall be shipped on open bed trucks for unloading with a forklift.
5.4.7. 4” Duct (Item 194-214-524) on Steel Reels shall have conduit strapping on each layer of conduit that is wrapped around the reel.

Colorado Springs Utilities
Specification Number

194-5

Dated 7/4/2012

For

Junction Box, Subsurface, Heavy Duty, Electric & Streetlight

Item Numbers:
194-115-113, 194-115-126, 195-300-010, 195-300-011, 195-300-012, 194-115-179, 194-115-180 & 194-115-181

Approved by Engineering Standards: William L Galloway 6-25-2012

Approved by North Work Center Construction & Maintenance: [signature] 6/25/12

Approved by South Work Center Construction & Maintenance: [signature] 7/16/2012

Approved by North Work Center Field Engineering: [signature] 7/12/12

Approved by South Work Center Field Engineering: Dan J Spokan 7/6/2012

Approved by Materials Management: Greg Mitchell 6/25/12

Written by: John C. Russel

Drawn by: John C. Russel

1. Scope:

This specification establishes requirements for Colorado Springs Utilities subsurface junction box (J-Box) enclosures for Incidental, non-deliberate traffic loading.

2. General Requirements:

2.1 Descriptions:

- 2.1.1 194-115-113: J-Box, Subsurface, Electric, Heavy Duty, 17”x 30”x 18”
- 2.1.2 194-115-126: J-Box, Subsurface, Electric, Heavy Duty, 13”x 24”x 18”
- 2.1.3 195-300-010: J-Box, Subsurface, Streetlight, Heavy Duty, 13”x 24”x 18”
- 2.1.4 195-300-011: J-Box, Subsurface, Streetlight, Heavy Duty, 12”x 12”x 12”
- 2.1.5 195-300-012: Cover, Replacement, Heavy Duty, JBox, Streetlight, 12”x 12”x 1-1/2”
- 2.1.6 194-115-179: Cover, Replacement, Heavy Duty, JBox, Streetlight, 13”x 24”x 2”
- 2.1.7 194-115-180: Cover, Replacement, Heavy Duty, JBox, Electric, 17”x 30”x 2”
- 2.1.8 194-115-181: Cover, Replacement, Heavy Duty, JBox, Electric, 13”x 24”x 2”

2.2 Unit of Measure: Each.

2.3 Use: Enclosure junction box/ handhole for terminating 600 volt service wires.

2.4 Requirements:

- 2.4.1 The enclosure & cover shall be manufactured with non-metallic materials, except in the captive bolt system. The enclosure shall be manufactured with an open bottom and removable cover.

- 2.4.2 The enclosure shall be designed to be installed flush to grade with cover fitting flush to top of enclosure.

- 2.4.3 Certified test reports will be required for all enclosure and cover materials submitted for approval. The certified test reports must be signed and stamped by a registered professional engineer and submitted to Utilities Engineering Standards prior to manufacturer approval.

2.5 Design:

- 2.5.1 Junction box enclosure and cover details to match, or be of equal performance modifications, to the drawings reflected in this specification. Manufacturer to provide final detailed drawings of enclosure and cover designs to Colorado Springs Utilities Engineering Standards prior to manufacturer approval.

3. Referenced Standards:

Equipment/material covered by this specification shall be manufactured in conformance with the following standards including all standards referenced therein. It shall also comply with all other applicable standards of IEEE, ANSI, ASTM, NEMA, UL, WUC and similar industry organizations. Where conflicts occur in referenced standards, the more stringent shall apply unless modified by this specification.

3.1 American National Standards Institute (ANSI)

- 3.1.1 ANSI C2, 2007 or latest revision, "National Electrical Safety Code"
- 3.1.2 ANSI/SCTE 77, 2010 or latest revision, "Underground Enclosure Integrity"

3.2 Western Underground Committee (WUC)
3.2.1 WUC 3.6 "Nonconcrete Enclosures", latest revision

4. Service Conditions:

4.1 This item shall be suitable for installation and operation in ambient temperatures between -40°C to +50°C.

4.2 Product shall be suitable for indefinite storage outdoors and installation at an elevation of 7500 feet minimum above sea level and resistant to UV degradation that would shorten expected useful service life.

5. Ratings:

5.1 The enclosure and cover shall comply to the Tier-15 load rating as described in ANSI/SCTE 77.

5.2 The coefficient of friction shall be a minimum of 0.60 on top surface of enclosure cover.

6. Identification:

6.1 Cover shall be identified with the appropriate logo:

6.1.1 Item 194-115-113, 194-115-126, 194-115-180, & 194-115-181:

ELECTRIC

6.1.2 Item 195-300-010, 195-300-011, 195-300-012 & 194-115-179:

STREETLIGHT

6.2 The enclosure and cover shall be embossed with the manufacturer's name, date of manufacture, and required Tier rating.

6.3 Each piece over 50 lbs. shall be labeled with its lifting weight in pounds. This may be a temporary labeling, such as a grease pencil, stamp, or stencil, and shall be on the outside wall of the box visible to the installer. An example of the wording may be:

COVER LIFTING WEIGHT= 65 LBS
BOX LIFTING WEIGHT= 60 LBS

7. Construction:

7.1 Enclosure Box:

7.1.1 Enclosure box shall be designed with straight & smooth sidewalls only, at both inside & outside walls, and shall conform to the dimensions shown on pages 5 & 6. No flared walls or outside footers will be accepted.

7.1.2 Enclosure box may be manufactured with fiberglass reinforced sidewalls or other materials which meet or exceed the required Tier-15 vertical and lateral load testing, as described in ANSI/SCTE 77.

7.1.3 Enclosure box shall not exceed 60 pounds, with 50 pounds preferred for safe lifting conditions.

7.1.4 Enclosure box color may vary.

7.2 Enclosure Cover:

7.2.1 Enclosure cover shall conform to the dimensions shown on pages 5 & 6. Cover shall be interchangeable with other manufacturer's boxes of the same size manufactured to this specification. The construction and material used for the cover shall be manufactured with materials which meet or exceed the enclosure strength rating and service life.

7.2.2 Enclosure cover shall withstand the required Tier-15 vertical test load as described in ANSI/SCTE 77.

7.2.3 The enclosure cover shall be provided with two recessed holes, each with (1) 1/2-6x 3-1/2" captive (fixed) stainless steel pentahead, coil-threaded bolt. The coil-threaded bolt is used to prevent jamming due to sand and other debris present when removing cover from the enclosure. A drain hole or slotted groove shall be incorporated into the captive bolt system for natural removal of sand and debris. The enclosure must include a captive floating stainless steel nut design which is easily replaceable. No other design substitutions shall be made to this captive bolt and nut system without prior approval from Utilities Engineering Standards (see detail on page 7).

7.2.4 When enclosure cover is fastened in place, the enclosure shall be tamper-resistant and secure by recessing pentahead bolts below the surface of the cover, and by preventing entry of any foreign probes or objects that might result in electrical contact with equipment within the enclosure.

7.2.5 Enclosure cover shall not exceed 70 pounds, with 50 pounds preferred for safe lifting conditions.

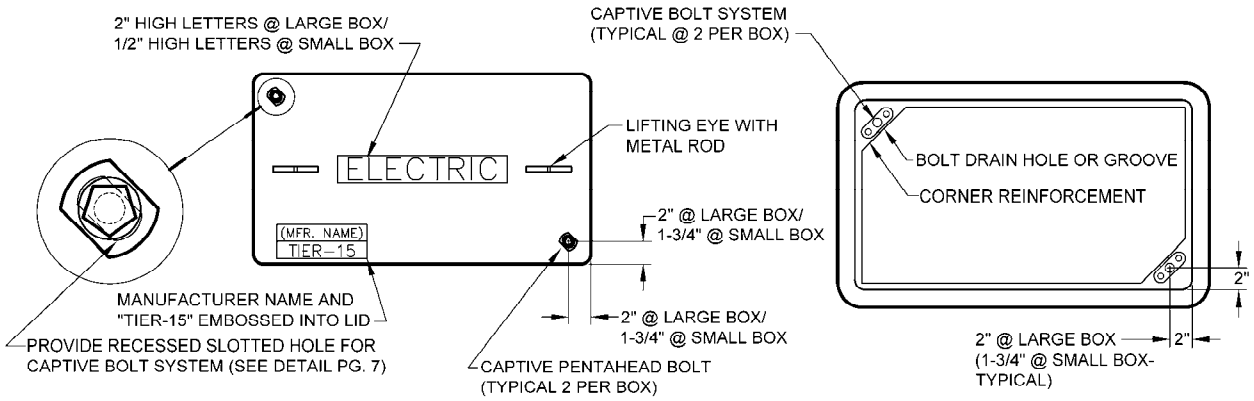
7.2.6 Enclosure collar and cover color shall be concrete gray or color approved by Engineering Standards.

8. Performance Requirements:

8.1 Expected useful service life shall be 30 years.

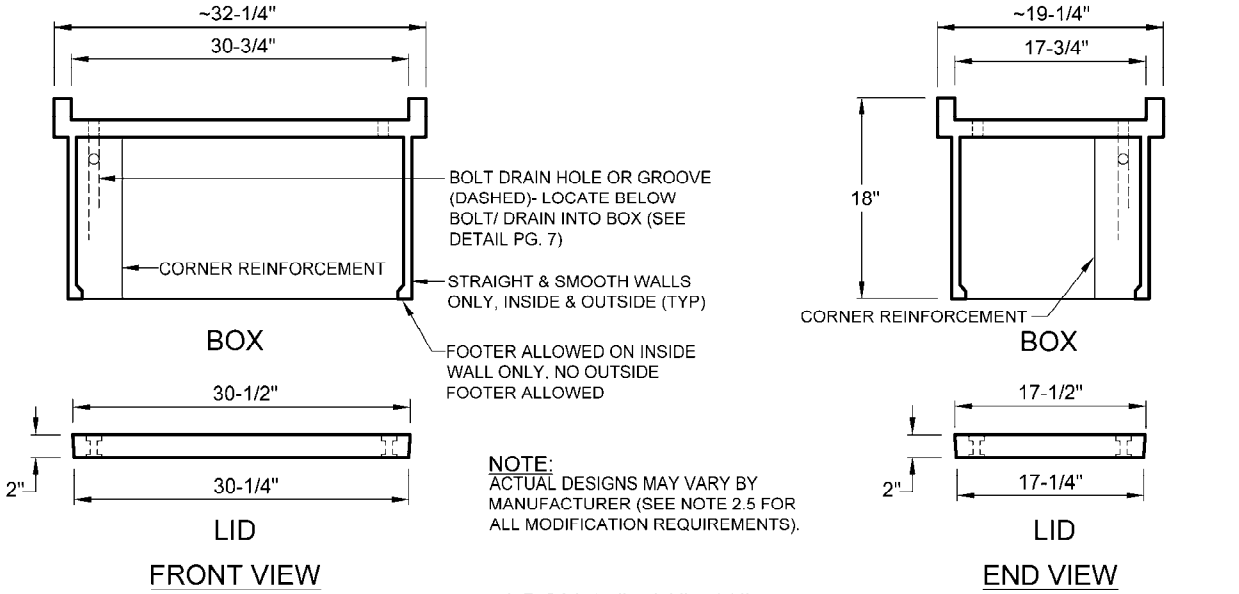
9. Incoming QC or Factory Inspection:

9.1 All enclosures shall be subject to incoming tests and inspection and/or factory inspections. Shipments are subject to rejection based on unacceptable results during these tests and inspections. The supplier shall be responsible for all costs including return shipping.



LID - TOP VIEW

BOX - TOP VIEW



BOX

BOX

LID

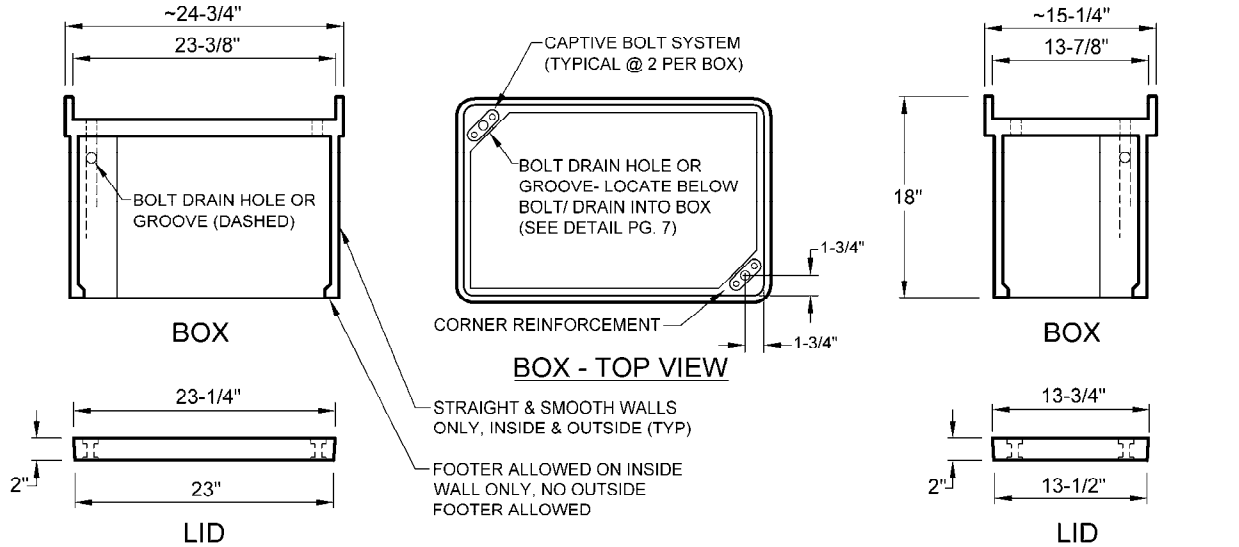
LID

FRONT VIEW

END VIEW

NOTE:
ACTUAL DESIGNS MAY VARY BY MANUFACTURER (SEE NOTE 2.5 FOR ALL MODIFICATION REQUIREMENTS).

J-BOX 17"x 30"x 18"
(ITEM #194-115-113)



BOX

BOX - TOP VIEW

BOX

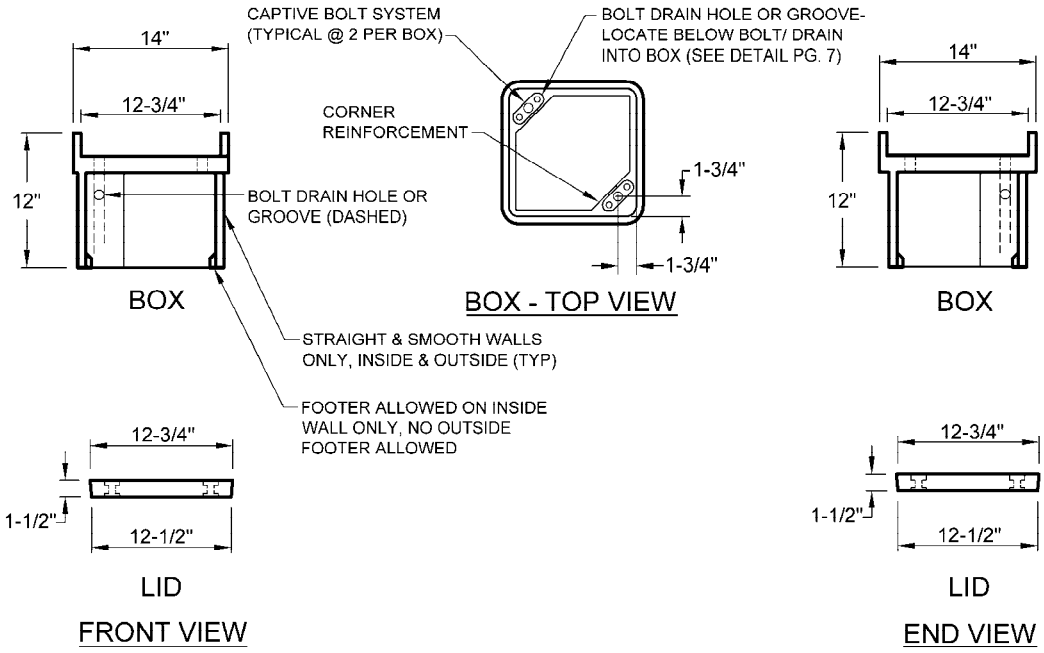
LID

LID

FRONT VIEW

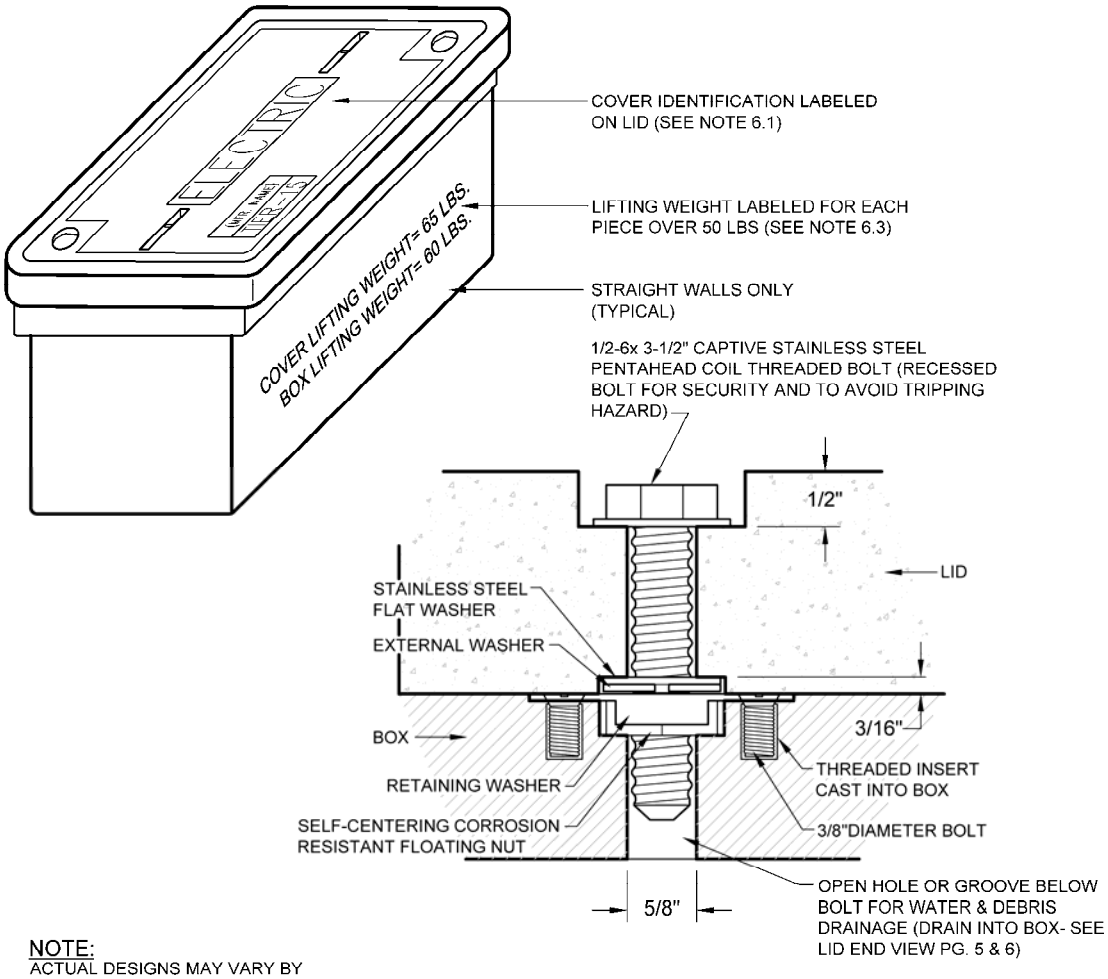
END VIEW

J-BOX 13"x 24"x 18"
(ITEM #194-115-126 & 195-300-010)



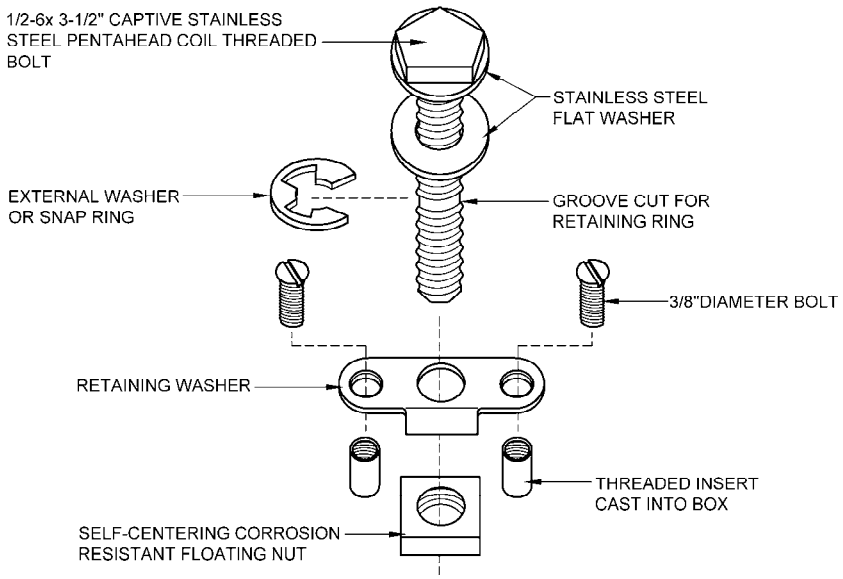
J-BOX, 12"x 12"x 12"
(ITEM #195-300-011)

NOTE:
ACTUAL DESIGNS MAY VARY BY MANUFACTURER (SEE NOTE 2.5 FOR ALL MODIFICATION REQUIREMENTS).



NOTE:
ACTUAL DESIGNS MAY VARY BY MANUFACTURER (SEE NOTE 2.5 FOR ALL MODIFICATION REQUIREMENTS).

CAPTIVE BOLT SYSTEM
(TYPICAL @ 2 PER BOX)



HARDWARE ASSEMBLY
(EXPLODED VIEW)

Colorado Springs Utilities
Electric Distribution Material Specification

194-8

Dated 1/16/2013
For
Low Voltage Busway for 277/480V Spot Networks

Approved by Engineering Standards: William L Galloway 1-16-2013

Approved by Planning and Engineering: 1/16/2013

Approved by South Work Center Field Engineering: 1/16/2013

Approved by South Work Center Line Supervisor: 1-7-13

Approved by Energy Field Operations: 2/11/13

Approved by Materials Management: 1-23-13

Written by: Craig Sawall

Date: 1/16/2013

General: The following specification establishes requirements for electrical and mechanical performance, interchangeability, and safety of the equipment covered. This specification covers “Low Voltage Busway” located in the Downtown Network and its installation.

1.1. Item Number: 194-8
1.2. Descriptions: Busway, Low Voltage, Spot Networks
1.3. Long Description: 600 Volt, Continuous Current Rating to be Determined at Time of Order, 3 Phase 4 Wire with 100% neutral and 50% Ground, Outdoor rated (IP 55) metal enclosure.
1.4. Use: Connects Colorado Springs Utilities network transformers and protectors to the customer switchgear in a 277/480 volt spot network. This is a customer supplied item that shall conform to specification 194-8.
1.5. Utilities will collaborate with the customer on a case by case basis to develop the best placement for the bus duct and to review all modifications or deviations due to routing or placement, before implementation.
1.6. The customer/contractor shall submit all engineered stamped drawings and test reports from the Project Engineer (PE) designing the project and manufacturer of the bus duct to Utilities for approval BEFORE the bus duct is purchased and installed.
Items needed for submittal include, but not limited to:
1.6.1. Fully dimensioned isometric, plan, side and frontal drawings of the busway
1.6.2. Product data sheet
1.6.3. Component list
1.6.4. Cable terminal size
1.6.5. Busway and major component ratings including:
1.6.5.1. Voltage
1.6.5.2. Continuous current
1.6.5.3. Short-circuit ratings
1.6.5.4. Interrupting ratings

2. Referenced Standards:

Equipment/material covered by this specification shall be manufactured in conformance with the following standards including all standards referenced therein. It shall also comply with all other applicable standards of IEEE, ANSI, ASTM, NEMA, UL, and similar industry organizations. Where conflicts occur in referenced standards, the more stringent shall apply unless modified by this specification. The revisions in effect on the date of the bid shall apply. The term "approved equal" shall mean approved in writing by Colorado Springs Utilities, Engineering Standards.

2.1. ANSI/UL: 857 “Busways”
2.2. NEMA: BU.1 “Busways”
2.3. CSA C22.2 No.27 “Busways (Tri-national Standard, with UL 857 and NMX-J-148-ANCE)”
2.4. ASTM: E814 “Through-Penetration Fire Stop Systems”

3. Service Conditions

3.1. The bus-way shall be capable of carrying rated current continuously without exceeding a temperature rise of 55 °C based on a 40 °C ambient.

3.2. It shall be suitable for operation in air up to an elevation of at least 6500 feet above sea level.

4. Ratings:

4.1. Ratings shall be based on IEEE standard service conditions; recommendations for operating at unusual service conditions shall be furnished in writing by the manufacturer.
4.2. The bus duct shall have an outdoor rating.
4.3. The busway continuous current rating shall be determined by the load data form submitted to Utilities' Field Engineering. The maximum rated continuous current shall not exceed 4000 amps.
4.4. The busway shall be rated at 600 volts.
4.5. Rated power frequency shall be 60 Hz.
4.6. The 6 cycle RMS symmetrical short circuit rating shall be 150,000 amps or greater.

5. Construction:

5.1. The bus duct and metal-enclosure shall be made of all new material. No used, refurbished, or rebuilt parts, pieces, or other apparatus shall be used.
5.2. The bus duct shall be a 4-wire design.
5.3. The busway and associated fittings shall consist of copper conductors.
5.4. The busway conductors shall be insulated over their entire length, except at their joints and contact surfaces with a NEMA Class B (130° C) or higher rated or UL listed insulating material consisting of a polyester film or thermo set epoxy.
5.5. All bus bar joints and contact surfaces shall be silver plated.
5.6. Each busway section shall be furnished complete with joint hardware and covers. The busway joints shall be a single-bolt, non-rotating, removable bridge design. All bridge joints shall be furnished with torque-indicating double head joint bolts and Belleville washers. The bridge joint shall utilize a captive nut retainer on the opposite side of the torque-indicating bolt. The bridge joint design shall ensure proper installation without the use of a torque wrench, and provide visual indication that the joint has been tightened to the proper torque value. Each busway joint shall allow for a minimum length adjustment of +/- 0.5 inchers. De-energization of busway shall not be required for safe testing of joint tightness.
5.7. The busway enclosure shall be a non-ventilated, extruded aluminum design classified as outdoor rated with an IP rating of 55 or higher.
5.8. The busway shall bear a UL label.
5.9. The contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed professional civil engineer in the state of Colorado. Mounting recommendations shall be provided by the manufacturer.
5.10. The busway shall be capable of being mounted flat-wise, edgewise, or vertically without de-rating.
5.11. The busway shall be seismic certified to the "International Building Code 2012" or latest rendition.
5.12. Where the bus duct passes through walls, roofs, or floors, the bus duct shall include an internal vapor/fire barrier for a 3 hour fire rating.
5.13. The point of common coupling (Tap-can) shall be a straight-in connection to avoid bending the cables from the protector to the tap-can, within the last 2 ft from the tap-can. **90° connections will NOT be allowed**. (See Drawing 1).
5.14. The following minimum information shall be given on the metal-enclosed bus assembly nameplate:
5.14.1. Manufacturer's name and address

5.14.2. Manufacturer's identification reference
5.14.3. Year of manufacture
5.14.4. Rated maximum voltage
5.14.5. Rated power frequency
5.14.6. Rated continuous current
5.14.7. Rated insulation levels
5.14.8. Power frequency withstand voltage
5.14.9. Rated short time withstand current
5.14.10. Rated momentary withstand current (kA rms asymmetrical)
5.14.11. Rated momentary withstand current (kA peak)

6. Operation, Maintenance Manuals and Test Reports:

6.1. A copy of all operation and maintenance manuals for busway shall be provided to Utilities.

6.2. The customer shall submit test reports showing compliance with the following ANSI C37.23 design test. The test shall include Temperature Rise, Insulation Withstand, BIL, Wet Dry Withstand, Insulation Flame Retardance, and Water tightness, etc.

7. Finish:

7.1. The preferred color for finish on the metal-enclosed bus duct shall be light gray No. 61 per ASTM D1535-2001 (Munsell Notation 8.3 G6. 0.54).

8. Installation:

Colorado Springs Utilities will collaborate with the customer to develop the best plan for installation of the bus duct. Listed below are the Required, Preferred and Non-Preferred methods.

8.1. Required for New Construction and Preferred for Upgrades to Existing Vaults: The bus duct shall reside in the customer's switch room and shall penetrate into Utilities' network vault at locations determined by Utilities. The customer shall provide outdoor rated tap- can(s); one tap-can per transformer is required.

8.1.1. The bus/tap-can shall extend from the vault wall a maximum of 18".

8.1.2. The bus/tap-can shall be a minimum of 18" from the ceiling.

8.1.3. For the tap-can location, the minimum distance between bus phases shall be determined by either a vertical or horizontal design.

8.1.3.1. Tap-cans with vertical placed bus bar shall have a minimum distance of 5-1/4" between phases for single sided lug connectors and 7-1/4" for double sided connectors.

8.1.3.2. Tap-cans with horizontal spaced bus bars shall have a center to center distance of 10" between phases.

8.1.4. Each phase bus bar shall be able to accept a minimum of (4) 750 kcmil cables and connectors.

8.1.5. The bus duct shall be permanently attached to the customer switch room wall and supported at intervals directed by the manufacturer.

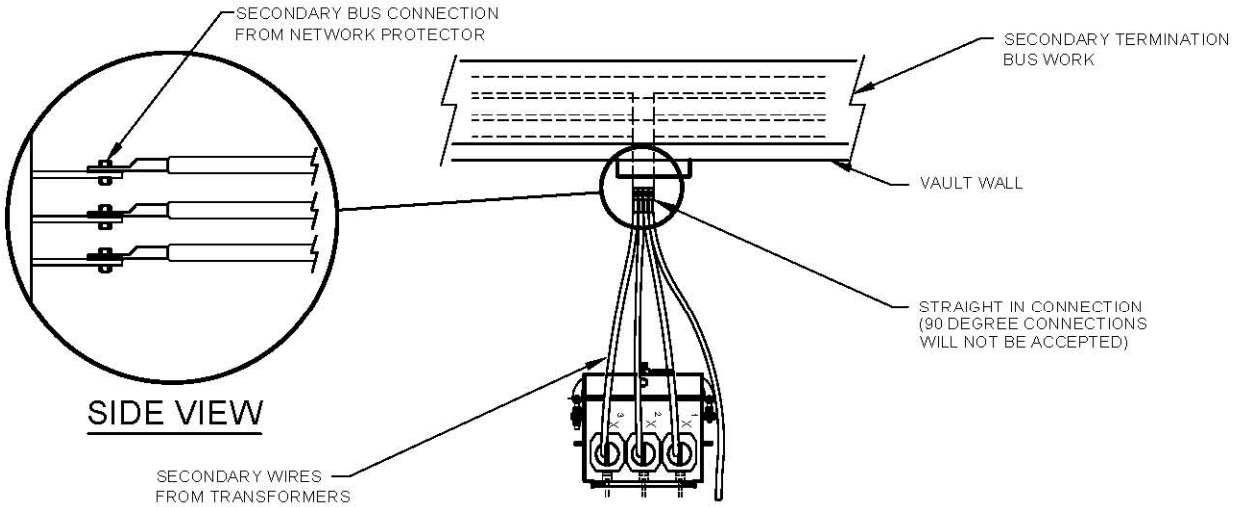
8.2. Non-Preferred (Upgrades to Existing Vaults Only):

8.2.1. The bus duct shall follow all specifications listed in the section 8.1, except that the bus duct may reside in the Utilities vault and penetrate into the customers switch room where determined by Utilities and the customer.

8.2.2. The bus duct shall be permanently attached to the Utilities vault wall and supported at intervals directed by the manufacturer.

8.3. Transition connector assembly for the bus duct that connects the bus duct to the customers system shall meet all criteria of ANSI, IEEE, ATSM and this specification.

DRAWING 1



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APPENDIX F
Electric Distribution Construction Standards
For Residential & Commercial Projects

CHECKLIST - SPECIFICATIONS FOR COMMERCIAL ELECTRIC PROJECT

The items with a ✓ adjacent to them are the necessary Electric Distribution Construction Standards for Field Engineering Work Order #:_____. Refer to booklet on the job site with the electrician at all times for utility inspections. Request utility inspections by calling 48 hours in advance. For South Area requests, call 668-5510. For North Area requests, call 668-5638.

THESE SPECIFICATIONS APPLY TO THIS PROJECT ONLY
AND ARE NOT TO BE REUSED FOR OTHER PROJECTS

CHECK IF REQUIRED	JOB PRINT SYMBOL		DESCRIPTION	DISTRIBUTION CONSTRUCTION STANDARD
	PROPOSED DESIGN	EXISTING INSTALLATION		
✓			CURRENT EDITION- UTILITIES ELECTRIC SERVICE STANDARDS BOOK	N/A
✓			ABBREVIATIONS	1-1
✓			SYMBOLS FOR JOB PRINTS & ONE-LINE MAPPING	1-2
			1-PHASE PADMOUNT TRANSFORMER, 42" X 42" POLYMER PAD	7-4
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			3-PHASE PADMOUNT TRANSFORMER, 12.5 kV RADIAL OPTION SECONDARY CONDUIT PLACEMENT FOR 45-150kVA	7-6
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			3-PHASE PADMOUNT TRANSFORMER, 12.5 kV LOOP FEED OPTION SECONDARY CONDUIT PLACEMENT FOR 45-150kVA	7-6
			3-PHASE PADMOUNT TRANSFORMER, 12.5 kV LOOP FEED OPTION SECONDARY CONDUIT PLACEMENT FOR 300-2500kVA	7-6
			TRANSFORMER SECONDARY SPADE CONNECTIONS &	7-15
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			VAULT 6' X 12' - 6" WITH COVERS (7' HIGH)	10-4
			15 kV 200 AMP 1-PHASE VAULT 4' X 4'	10-6
			15 kV 200 AMP 3-PHASE VAULT 4' X 7'	10-7
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			CONCRETE ENCASED DUCT BANKS	11-2
✓			DUCT REQUIREMENTS FOR PRIMARY CABLE AND CT METERING (UNDER COMMERCIAL POLICY)	11-3
			TRACER WIRE FOR EMPTY DUCTS	11-5
			BARRICADE/ BUMPER POST INSTALLATIONS	15-2
			UG ELECTRONIC MARKER LOCATIONS	15-3
✓			CLEARANCES OF UG ELECTRIC CONDUIT/CABLE FROM OTHER FACILITIES	18-304
			REQUIREMENTS FOR POURED-IN-PLACE CONCRETE PADS	19-9
			CONCRETE STEM WALL FOR SLOPING GRADES	19-9
			FIELD REPAINTING PADMOUNT CABINETS & VAULT LIDS	19-10
			SECONDARY TERMINATION (SEE DWG 4A)	
			PRIMARY TERMINATION (SEE DWG 4B)	
ATTACH COPIES OF OTHERS AS REQUIRED AND LIST HERE:				

ABBREVIATIONS

When practicable, the following standard abbreviations and symbols shall be used on all electric distribution line construction and one-line drawings. Whenever these abbreviations or symbols do not clearly define the work to be done, additional notes of explanation will be necessary for accurate understanding of the work order.

A, AMPS	Amperes
AAAC	All Aluminum Alloy Conductor (6201)
ACSR	Aluminum Conductor Steel Reinforced
AL	Aluminum (AAC, all AL conductor, or 1350 grade)
ALLEY	Alley Arm (sidearm)
AR	Crossarm
ARR	Arrester (Surge, Lightning)
ASB	Anti-Splitting Bolt
ATO	Automatic Throw-over
BAR	Buckarm
BCU	Bare Copper
BP	Box Pad
BR	Brace
BRKT	Bracket
BRL	Barrel Configuration
C	Capacitor
CA	Concrete Anchor
CATV	Cable TV
CCS	Copper Clad Steel
CLF	Current Limiting Fuse (UG)
CNR	Corner (or Shoulder) Type Pins
CP	Concrete Pad
CSP	Completely Self-Protected Transformer
CT	Current Transformer
CU	Copper
CW	Copperweld
DA	Double Arming
DBL	Double (Pins/ INS &/ or Arms)
DB	Direct Bury
DDE	Double Deadend
DE	Deadend
DHA	Double Helix Anchor
DUP	Duplex
E	Electronic Recloser
EC	Electronic Recloser in Cutout
ENC	Encased in Concrete
EX, EXIST	Existing
EXT	Extension
F	Fuse
FCI	Faulted Circuit Indicator
FE	Fused Elbow
FG	Fiberglass
FIMS	Facilities Information Management System
FO	Fiber Optic
FS	Fused Switch

G	Gas Line
GO	Gang Operated
GRD	Ground
H, HVY	Heavy, High Strength (Arms, Anchors, etc.)
HPS	High Pressure Sodium
IN	Install
INS, INSUL	Insulator, Insulated, Insulate
IS	Interrupter Switch (Fault)
J, JBOX	Junction Box
KCMIL	Thousand Circular Mils (Conductor Size)
KV	Kilovolts
KVA	Kilovoltamperes
KW	Kilowatts
LA	Line Angle
LED	Light Emitting Diode
LBS	Pounds
LBU	Load Break Unit (Cutout with Loadbreak Ears)
LF	Loop Feed
M	Meter, Meter Location
MH	Mounting Height
MO	Motor Operated
MV	Mercury Vapor, Medium Voltage
MVI	Molded Vacuum Interrupter
#	Number
N, NEUT	Neutral
NC	Normally Closed
NLBU	Non-Load Break Unit (Cutout for Wild Fire Mitigation fuses)
NO	Normally Open
NR	Non Reclose
NT	Network Transformer
OD	Open Delta Connection (Open-Delta Bank)
OH	Overhead
P, PRI	Primary
PB	Push Brace
PD	Padmount
PE	Photo Electric
PED	Pedestal (Mobile Home or Temporary Service)
PH or Ø	Phase
PT	Potential Transformer
QUAD	Quadraplex
R	Recloser

RA	Rock Anchor
RBS	Rated Breaking Strength
REG	Regulator
RF	Radial Feed
RM	Remove, Removable
ROW	Right-of-Way
RP	Replace
RR	Railroad (Tracks)
RS	Ruling Span (for Sag/Tension)
SCADA	Supervisory Control & Data Acquisition System
S, SEC	Secondary (serving >1 Meter & TYP Full Tension if OH)
SECT	Sectionalizer
SER	Service (Drop to One Meter)
SG, SGH	Span Guy, Span Guy Heavy
SGL	Single (Pins, Arms and/or INS)
SHA	Single Helix Anchor
SL	Street Light
SOL	Solid
SS	Sanitary Sewer, Storm Sewer
ST	Static (Shield Wire/ Neutral Level)
STR	Strand, Stranded
SW	Switch
SWG	Sidewalk Guy
T-OP	Tee-Op 600 Amp Separable Connectors
TEL	Telephone
TEMP	Temporary (Pedestal, Service, etc.)
TERM	Terminate, Cable Terminator Accessory
TPA	Tipping Plate Anchor
TRANS	Transmission
TRI	Triplex
TS	Traffic Signal
TSFR	Transformer
TYP	Typical
U, UBLT	Underbuilt
UG	Underground
V	Volts
VERT	Vertical Construction
VLT	Vault
VT	Voltage Transformer
W	Watts, Waterline
WO	Without
WP	Wood Pole
X	Crossing, Cross
XA	Expanding Anchor

NUMERICAL ABBREVIATONS

2= 2,400V	7= 7,200V	15= 15kV Class	35= 35kV Class
4= 4,160V	12= 12,470V	20= 19,920V	115= 115,000V
6= 6,900V	13= 13,200V or 13,800V	34= 34,500V	230= 230,000V

COMPATIBLE UNIT IDENTIFIERS (CUID)

1. Definitions:
   a. CUID (compatible unit identifier): an abbreviated description of an assembly (or a sub-assembly or single item); this is similar to the numeric spec option from the past system, but intended to be meaningful without memorizing numbers. See the list of standard abbreviations on the first page.

   b. CU (compatible unit): is a building block assembly used in various combinations to build a complete field installation.

   c. LID (location identifier): the FIMS (or job print) designation for a physical location of a pole, vault, padmount or similar piece of equipment.

   d. Bill of Material (BOM) Index: a report contained in the front of the Distribution Construction Standards Book that is sorted by CUID in alphabetical order to index the Standard Number (page number) where that assembly is detailed; this report also lists the issued stock materials required for each assembly, sometimes also listing unique minor materials needed. The CUID description is also found in the Bill of Material Index.

2. Example CUIDs and Rules:

a. An example CUID is contained between the quotation marks: "E.PD3RF-12KV-208V-150KVA".

b. This CUID is found on Distribution Construction Standard 7-6 pg 1/3 per the BOM Index.
c. The description for this CUID per the BOM Index is "Padmount transformer 3-phase radial-feed 12470GRDY/7200V to 208GRDY/120V 150kVA".

d. All Electric related CUIDs assemblies begin with "E." and individual items begin with “I.” followed by a total of up to 23 additional characters.

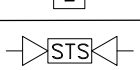
3. The Use of CUIDs on Job Prints and Their Link to the Distribution Construction Standards Book:
   a. A designer (Field Engineer) specifies intended installations at each location by selection of a basic symbol and all CUIDs to be installed there. Some items are selected by stores item number rather than as part of any assembly. The job print is the product of these selections with other explanatory notes added as needed.

   b. A construction crew reads the job print drawings with its lists of CUIDS for each LID to determine how the complete installation is to be built. Construction Standards (page numbers) detailing each CUID are found by looking up the CUID in question in the Bill of Materials Index at the front of the Distribution Construction Standards Book.

   c. Some details of construction, especially those using minor materials, are found in guides referenced by the crews without any specific CUID or job print instruction. See, for example, Distribution Construction Standard 15-1 for general system and equipment grounding guides.

   d. The crew is responsible to plan and obtain all minor material needs for each job, i.e. esp. those not normally carried as "truck stock". See "Minor Materials by Assembly Type" at the back of the Distribution Construction Standards Book.

ONELINE SYMBOLS- UNDERGROUND

F.E. JOB PRINT		F.I.M.S. MAP	
NEW INSTALLATION	EXISTING INSTALLATION	MAPPING SCHEMATIC	DESCRIPTION
			SPLICE
			CABLE TAP
	N/A		FEED THRU INSERT
	N/A	N/A	LOADBREAK ELBOW
			TEE CONNECTOR
			ELBOW IN STANDOFF POSITION (NORMAL OPEN)
			CHANGE TO STANDOFF (NORMAL OPEN)
			TERMINATION
			MAD METER
			FAULT INDICATOR (OLD STYLE)
			FAULT INDICATOR (NEW STYLE- BATTERY POWERED)
			SURGE ARRESTOR
			RADIAL TRANSFORMER
			LOOP TRANSFORMER
			NETWORK PROTECTOR
			CURRENT LIMITING FUSE
			FUSED ELBOW
			SWITCH
			FUSED SWITCH
			INTERRUPTER SWITCH
			PRIMARY METER
			CAPACITOR PAD MOUNT
N/A			EXISTING HYDRAULIC RECLOSER
N/A			EXISTING ELECTRONIC RECLOSER
N/A			EXISTING STATIC TRANSFER SWITCH
N/A			EXISTING EZ SWITCH TRANSFORMER
			SWITCH TRANSFORMER
		N/A	TEST STATION
N/A	N/A		JUNCTION BOX

ONELINE SYMBOLS- OVERHEAD

F.E. JOB PRINT		F.I.M.S. MAP	
NEW INSTALLATION	EXISTING INSTALLATION	MAPPING SCHEMATIC	DESCRIPTION
			RECLOSER
			ELECTRONIC RECLOSER
			ELECTRONIC RECLOSER IN CUTOUT
			SWITCH
			FUSE
			WILDFIRE FUSE
			PRIMARY METER
			CAPACITOR
			TERMINATION
			TRANSFORMER
			CIRCUIT CONNECTION
			CIRCUIT END
			OVERHEAD NORMAL OPEN

PHYSICAL SYMBOLS- UNDERGROUND

F.E. JOB PRINT		F.I.M.S. MAP	
NEW INSTALLATION	EXISTING INSTALLATION	MAPPING PHYSICAL	DESCRIPTION
			4X4 VAULT
			4X7 VAULT
			5X8 VAULT
			6X12 VAULT
			CUSTOM VAULT
			TRANSFORMER IN A 4X7 VAULT
			TRANSFORMER IN A 6X12 VAULT
			PAD ON 6X12 VAULT
			SINGLE DOOR PAD (TRANSFORMER/SWITCH)
			DOUBLE DOOR PAD
			CAPACITOR - DOUBLE DOOR
		N/A	SECONDARY TERMINATION
		N/A	JUNCTION BOX

PHYSICAL SYMBOLS- UNDERGROUND

F.E. JOB PRINT		F.I.M.S. MAP	
NEW INSTALLATION	EXISTING INSTALLATION	MAPPING PHYSICAL	DESCRIPTION
TS	TS	N/A	TEST STATION
F	F	N/A	FAULT INDICATOR (OLD STYLE)
F	F	N/A	FAULT INDICATOR (NEW STYLE- BATTERY POWERED)
A	A	N/A	SURGE ARRESTOR
		N/A	BARRICADE POST
		N/A	SECONDARY METER PED
			TRANSMISSION TOWER
	N/A	N/A	REMOVEABLE BREAKER
	N/A	N/A	SUBSTATION BREAKER
	N/A	N/A	GROUND
	N/A	N/A	WYE SYMBOL
FH	N/A	N/A	FIRE HYDRANT

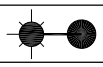
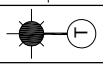
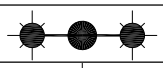
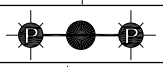
PHYSICAL SYMBOLS- OVERHEAD

NEW INSTALLATION	EXISTING INSTALLATION	MAPPING PHYSICAL	DESCRIPTION
			POLE
		N/A	DOWN GUY
		N/A	SIDEWALK GUY
		N/A	SPAN GUY
		N/A	PUSH BRACE
		N/A	OH 1PH TRANSFORMER
		N/A	OH 3PH WYE BANK
		N/A	OH 3PH DELTA BANK
		N/A	OH OPEN DELTA BANK
R	R	N/A	RECLOSER
E	E	N/A	ELECTRONIC RECLOSER
EC	EC	N/A	ELECTRONIC RECLOSER IN CUTOUT
SW	SW	N/A	SWITCH
M	M	N/A	PRIMARY METER
F	F	N/A	FUSE
WF	WF	N/A	WILDFIRE FUSE

PHYSICAL SYMBOLS- OVERHEAD

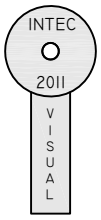
F.E. JOB PRINT		F.I.M.S. MAP	
NEW INSTALLATION	EXISTING INSTALLATION	MAPPING PHYSICAL	DESCRIPTION
		N/A	CAPACITOR
		N/A	TERMINATION
		N/A	DELTA SYMBOL
		N/A	CUSTOMER POLE
		N/A	TELEPHONE POLE
			TRANSMISSION TOWER
	N/A	N/A	REMOVEABLE BREAKER
	N/A	N/A	SUBSTATION BREAKER
	N/A	N/A	GROUND
	N/A	N/A	WYE SYMBOL
	N/A	N/A	FIRE HYDRANT

PHYSICAL SYMBOLS- STREETLIGHT

F.E. JOB PRINT		F.I.M.S. MAP		
NEW INSTALLATION	EXISTING INSTALLATION	MAPPING		DESCRIPTION
		PHYSICAL	SCHEMATIC	
				NEW STREETLIGHT ON ALUMINUM OR NEW WOOD POLE
				NEW FIBERGLASS STREETLIGHT
				NEW STREETLIGHT ON TRAFFIC POLE
N/A				EXISTING STREETLIGHT
		N/A		WALL MOUNT STREETLIGHT
		N/A	J	JUNCTION BOX
				NEW DOUBLE DAVIT STREETLIGHT
				NEW PREMIMUM STREETLIGHT
				NEW PREMIMUM DOUBLE STREETLIGHT
				NEW STREETLIGHT ON EXISTING WOOD POLE
N/A	N/A			SMALL CELL ANTENNA ON STREETLIGHT

PHYSICAL SYMBOLS- MISCELLANEOUS

F.E. JOB PRINT		F.I.M.S. MAP	
NEW INSTALLATION	EXISTING INSTALLATION	MAPPING PHYSICAL	DESCRIPTION
		N/A	NEW GUY WIRE ANCHOR



POLE VISUALLY INSPECTED IN 2011. NO BORINGS OR PRESERVATIVE CHEMICAL TREATMENTS APPLIED.

POLE INSPECTED AND TREATED WITH ULTRAFUME, CURAP 20 AND INTERNAL TREATMENT WAS INJECTED INTO THE POLE WITH PERM E8 IN 2011.

POLE INSPECTED WITHOUT A FULL DIG AND TREATMENT. POLE INSPECTION MAY INCLUDE "SOUND AND BORE", "SOUND ONLY", "SOUND AND SELECT BORE" AND "PARTIAL EXCAVATE" IN 2010

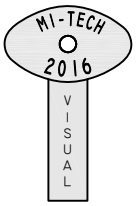
POLE INSPECTED VIA FULL 18" DIG AND TREATED WITH MITC-FUME IN 2010

POLE INSPECTED VIA FULL 18" DIG, TREATED WITH WOODFUME AND INTERNAL TREATMENT WAS INJECTED INTO THE POLE IN 2010

POLE INSPECTION INCLUDES "SOUND AND BORE" AND "PARTIAL EXCAVATION" IN 2016.

POLE INSPECTION INCLUDES "SOUND AND BORE" AND "FULL EXCAVATION" IN 2016.

POLE INSPECTION INCLUDES TREATMENT WITH G FUME.



POLE VISUALLY ONLY INSPECTED. NO BORINGS OR PRESERVATIVE CHEMICAL TREATMENTS APPLIED.

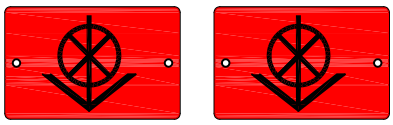
POLE INSPECTED AND INTERNAL TREATMENT WAS INJECTED INTO THE POLE.

POLE INSPECTED AND EXTERNAL TREATMENT WAS APPLIED TO THE POLE.

WOOD POLE INSPECTION AND TREATMENT TAGS

PRIORITY REJECT POLE

(RED TAG) (RED TAG)



POLES CLASSIFIED AS "PRIORITY REJECT" SHALL INDICATE A POLE WITH LESS THAN 33% REMAINING POLE STRENGTH AND SHALL BE LABELED WITH TWO RED TAGS TO DENOTE DANGER/PRIORITY THAT WILL BE SCHEDULED FOR URGENT REPLACEMENT. (THE ARROW ON THE TAG DENOTES THE DIRECTION OF THE POLE DEFECT.)

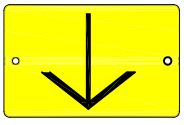
REJECT POLE

(RED TAG)

POLES CLASSIFIED AS "REJECT" SHALL INDICATE A POLE WITH MORE THAN 33% AND LESS THAN 67% REMAINING POLE STRENGTH THAT IS NON-REINFORCEABLE AND SHALL BE LABELED WITH ONE RED TAG TO DENOTE IT IS NOT URGENT AND WILL BE SCHEDULED FOR REPLACEMENT. (THE ARROW ON THE TAG DENOTES THE DIRECTION OF THE POLE DEFECT.)

REINFORCEABLE REJECT POLE

(YELLOW TAG)



POLES CLASSIFIED AS "REINFORCEABLE REJECT" SHALL INDICATE A POLE WITH LESS THAN 67% REMAINING POLE STRENGTH THAT IS REINFORCEABLE AND SHALL BE LABELED WITH ONE YELLOW TAG THAT WILL BE SCHEDULED FOR REINFORCEMENT WITH STEEL TRUSS AND BANDS. PRIMARY POLES CLASSIFIED AS "REINFORCEABLE REJECT" MUST BE ACCESSIBLE BY BUCKET TRUCK. (THE ARROW ON THE TAG DENOTES THE DIRECTION OF THE POLE DEFECT.)

WOOD POLE INSPECTION REJECT TAGS

Reject tag identification is similar for Mi-Tech, Intec & Osmose inspection process.

DISCLAIMER

"All company and product names on this sheet are used for reference and informational purposes. The rights to all such names are the property of the name owners."

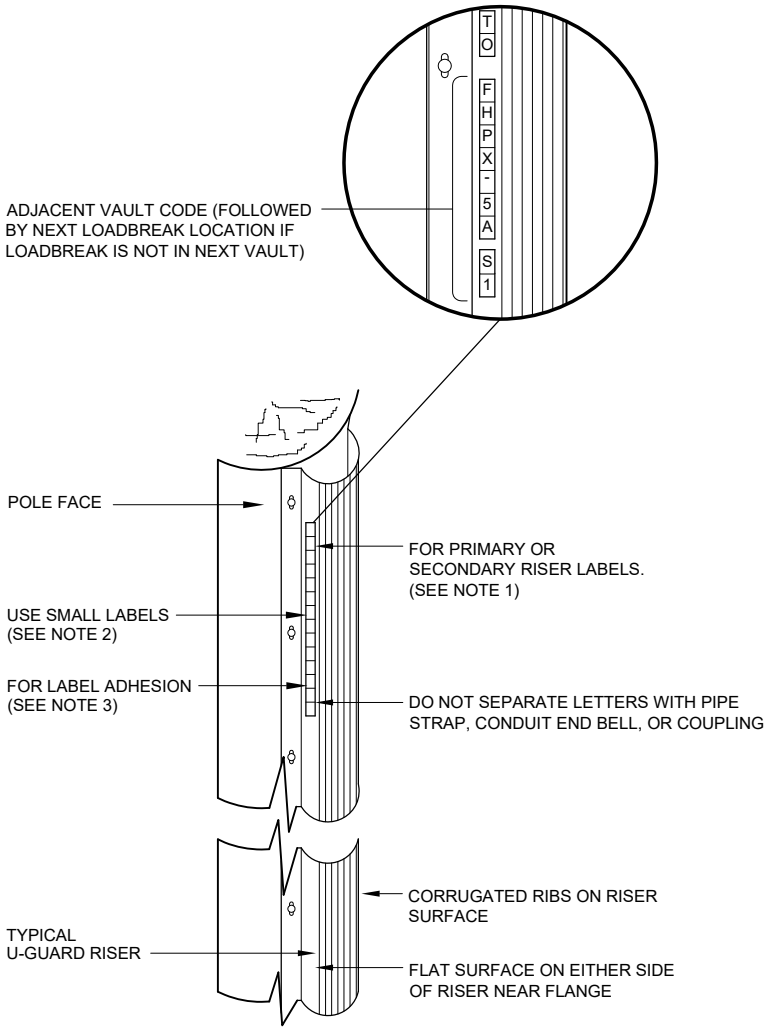
PRIMARY AND SECONDARY CABLE RISER LABELS

R INDIVIDUAL LETTER LABEL "A-Z", YELLOW ON BLACK, (ITEM #100-121-(301-326))

1 INDIVIDUAL NUMBER LABEL "0-9", YELLOW ON BLACK, (ITEM #100-125-000)

CABLE RISER LABELS

Yellow on Black letter and number labels. Size = .59" x .91"



NOTE:

Letters and numbers to be installed on conduit as to be easily read from normal approach or driving side of the pole.

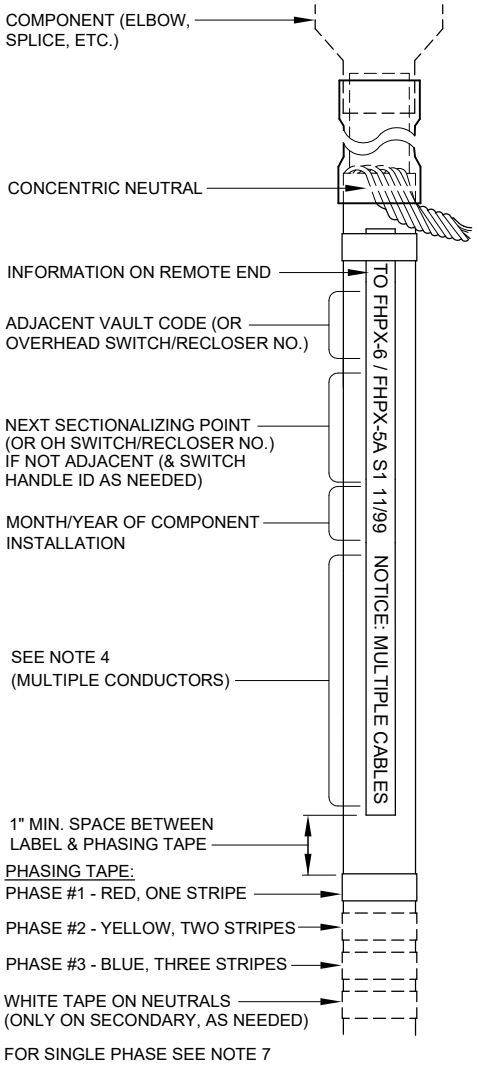
NOTES:

1. Labels on primary risers indicates vault number to which cable goes, see primary detail. Label on secondary riser indicates service address, streetlight pole number, metered service address and/or descriptive location (Handhole, J-Box, CATV, sprinkler system, 100' west or similar) of the remote cable end.

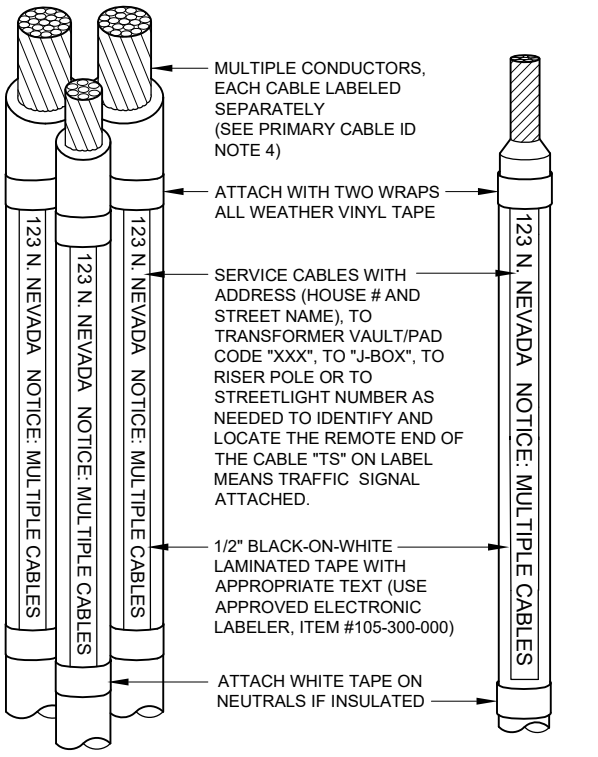
2. Letters and numbers shall be high-intensity reflective labels 0.59" x 0.91" (Letters = Item #100-121-(301-326) and Numbers = Item #100-125-000).

3. For best adhesion, attach letters on area of U-guard with no corrugated ribs, (flat area near riser flange). Place on side best seen from normal approach (driving side). Do not separate letters with pipe strap, end bell coupling or other.

CABLE LABELS & PHASING TAPE



PRIMARY CABLE IDENTIFICATION



TRIPLEX 600 VOLT UD CABLE

SINGLE WIRE

NOTE:

THIS TYPE OF LABELING IS FOUND IN J-BOXES, SL HANDHOLES, PADMOUNT TRANSFORMERS AND SUBSURFACE VAULTS; NOT IN METER SOCKETS

SECONDARY CABLE IDENTIFICATION

PRIMARY CABLE IDENTIFICATION NOTES:

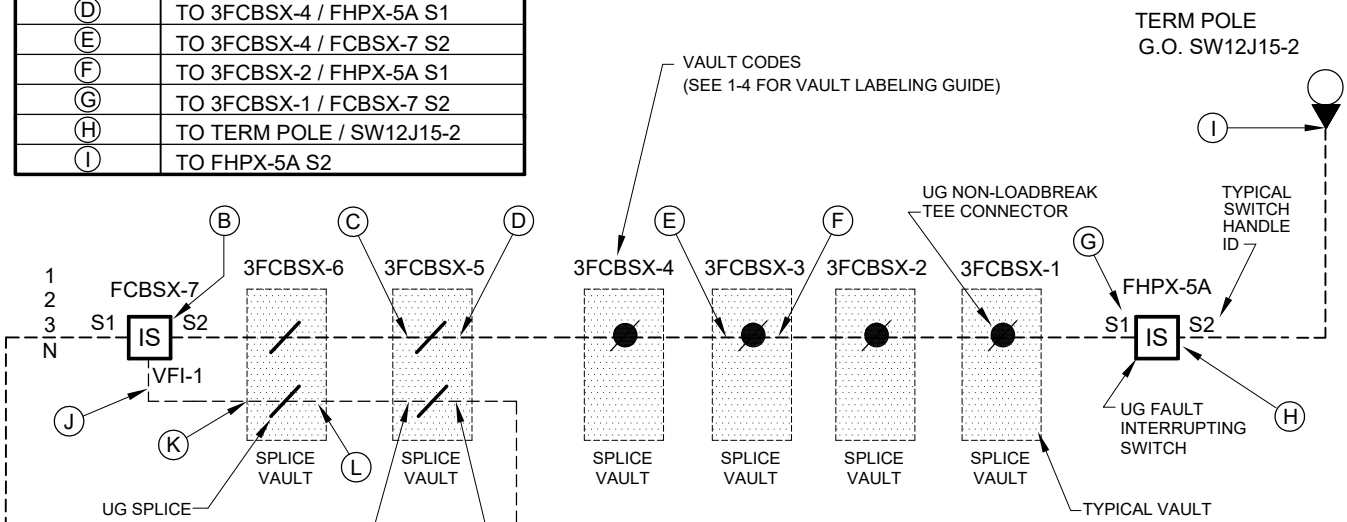
1. Sectionalizing points are defined to include: LBU's, 600 amp gang-operated switches, transformer oil switches (not network transformers- drop load with protector), 15kV or 35kV loadbreak 200 amp elbows, reclosers, fault interrupters, and line disconnect blades (anywhere a clearance tag can be placed).
2. The second vault number is not needed on the label if the cable terminates at a sectionalizing device (elbows or a switch) in the adjacent vault, pad, transformer or pole.
3. See typical examples of primary cable labels for various situations on page 3.
4. For multiple conductors per phase, additional labels shall be added marking each cable with "NOTICE: MULTIPLE CABLES". Labels shall be placed at each end and in each vault. For multiple conductors to a single service (as in parallel feeds), labels must be added marking "SET 1 OF 2", "CABLE 1 OF 2", etc.
5. A feeder from a substation to the first sectionalizing point will have the substation/breaker number instead of the vault code.
6. For direct buried cable, labels are to be applied to splices regardless of being buried.
7. For single phase primary, apply phasing tape at tap and loop tie points only.

SECONDARY CABLE IDENTIFICATION NOTES:

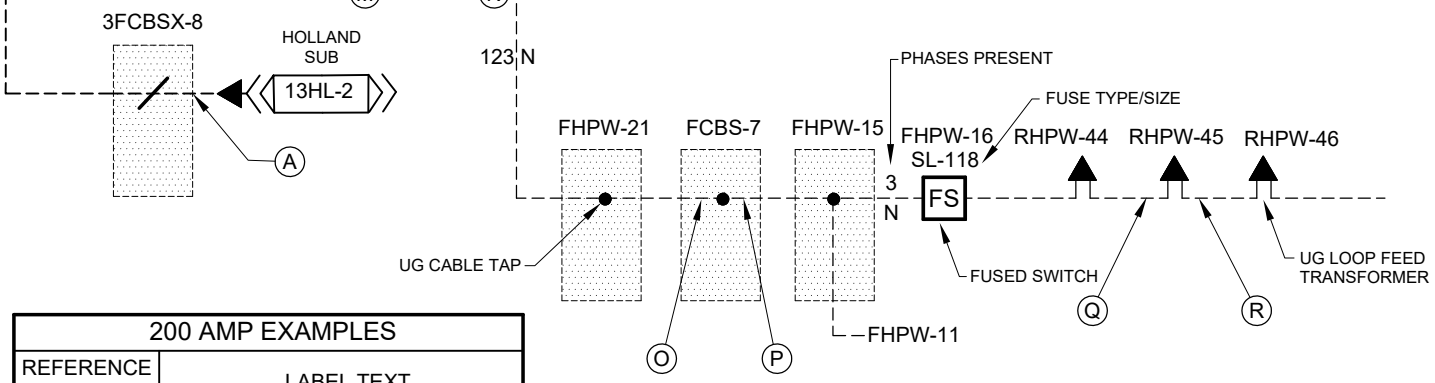
1. Identify all cables in handholes, padmount transformers and subsurface vaults indicating remote end location.
2. Service cables shall be labeled with address (house number and street name), to transformer or vault/pad code "XXX", to "J-Box", to riser pole, or to streetlight number as needed to identify and locate the remote end of the cable.
3. Attach labels to cable where they will be visible.

TYPICAL EXAMPLES LABELING 200 & 600 AMP PRIMARY CABLES

600 AMP EXAMPLES	
REFERENCE POINT	LABEL TEXT
Ⓐ	TO HL SUB / 13HL-2
Ⓑ	TO 3FCBSX-6 / FHPX-5A S1
Ⓒ	TO 3FCBSX-6 / FCBSX-7 S2
Ⓓ	TO 3FCBSX-4 / FHPX-5A S1
Ⓔ	TO 3FCBSX-4 / FCBSX-7 S2
Ⓕ	TO 3FCBSX-2 / FHPX-5A S1
Ⓖ	TO 3FCBSX-1 / FCBSX-7 S2
Ⓗ	TO TERM POLE / SW12J15-2
Ⓘ	TO FHPX-5A S2



600 AMP CIRCUIT EXAMPLE



200 AMP CIRCUIT EXAMPLE

200 AMP EXAMPLES	
REFERENCE POINT	LABEL TEXT
Ⓙ	TO 3FCBSX-6 / FHPW-21
Ⓚ	TO FCBSX-7 VFI 1 (SEE NOTE 3)
Ⓛ	TO 3FCBSX-5 / FHPW-21
Ⓜ	TO 3FCBSX-6 / FCBSX-7 VFI 1
Ⓝ	TO FHPW-21
Ⓞ	TO FHPW-21
Ⓟ	TO FHPW-15
Ⓠ	TO RHPW-44
Ⓡ	TO RHPW-46

NOTES:

1. For 35 kV, 200 amp circuits, switching is NOT to be performed using elbows. Switching on these circuits must be performed using loadbreak switches.
2. Circuits and devices shown are derived from real circuits in the Colorado Springs Utilities system, but have been modified for the purpose of the example.
3. When labeling the next loadbreak device, note that fault interrupting ways may be designated as "VFI" on some switch types and "WAY 3" or "WAY 4" on others. Make sure that the labels on the switch & cable match. Add labels (e.g. S-1, S-2, S-3....) to replacement switches as needed to keep existing cable labels accurate.

SINGLE PHASE TRANSFORMERS, PRESENT TYPES

NOTES:

1. Fuse types will vary with transformer kVA size. Refer to the applicable transformer material specification for detailed information on fusing.
2. All units in a bank to be the same type.
3. The transformer type is the last 3 digits of the item number; for example, type 3 transformer item numbers are 196-XXX-003. The middle 3 digits of this item number are kVA size with those above 750kVA represented by 8XX when XX is the kVA rating in hundreds, i.e. 810 for 1000kVA, 815 for 1500kVA, 825 for 2500kVA.
4. Beginning in 1997, taps were discontinued on 500kVA and smaller 3-phase padmount types 150/153 & 160/163; small kVA 3-phase units without taps begin with Company Number 39694.
5. New submersible type 243 is limited to 1-phase applications - **DO NOT** install type 243 in any 3-phase banks- internal secondary neutral tank grounds will create fault if banked. Use type 245 for 3-phase banks.
6. Type 3 transformers starting with Company Number 41000 no longer have taps. Older type 3 transformers had taps below rated voltage.
7. Beginning with Company Number 52034, all overhead transformers except type 9 & 26, will be equipped with an IFD (Internal Fault Detector). The red shipping lock ring must be removed upon installation. The red shipping lock should be installed anytime the transformer is moved.
8. Overhead transformer center bolt lifting eye use shall be limited to a maximum size of 50 kVA transformer or 2,000 lbs.
9. Type 170 and 173 transformers with company numbers greater than 59278 will be stainless steel for use in underground vaults. Use mild steel units in above ground applications only.
10. Any Cooper Power Systems Single Phase pole mounted transformers that will be reconfigured for three phase or "banked" applications that is internally reconfigured from the factory low voltage connection, must have a Turns Ratio Test (TTR) completed prior to energizing the transformers. (In the rare occasion, where a crew uses three transformers that do not have the secondary's paralleled and the crew opens the transformer to cut it to two wire and energizes the transformers without a TTR testing after paralleling the secondary winding, then a low voltage short circuit will occur when energized.)
11. When replacing one overhead transformer out of a 3-phase bank, it is necessary to use a two bushing transformer (H1 & H2 primary bushings) when the transformer connection is delta-delta, ungrounded wye-delta, or wye-wye with primaries connected to H2.
12. Use original type if located inside a building (where less-flammable fluid is more appropriate.) Requires change to padmount installation.
13. In 1998, the cost of replacing a 25kVA single-phase transformer using the submersible Type 223 cost about $800 more than converting to a padmont T129, however, outage time is approx. 2-1/2 to 3 hours longer. Because of its internal secondary neutral to tank ground, do not use Type 243's in any 3-phase banks - use Type 245's instead.
14. Requires change to padmount installation.

SINGLE-PHASE OVERHEAD (CONVENTIONAL, LID MOUNTED PRIMARY BUSHINGS, POLE MOUNTED BRACKETS - TANK WELDED)

TYPE 196-XXX-	PRIMARY VOLTAGE (kV)	SECONDARY VOLTAGE (V)	DESC* CODE				FUSING [1]	TAPS	ADDITIONAL COMMENTS	REPLACES TYPES
003	12.47GRDY/7.2	120/240	1	4	6		N	B/N [6]	2-BUSHING	001
007	12.47	120/240	1	4	6		N	N	USE ONLY FOR DELTA-PRIMARY	005
009	12.47GRDY/7.2	120	1	4	6		N	N	1-BUSHING AMR PROJECT	
015	19.92/34.5Y	277/480Y	1	4	6		N	S	2-BUSHING	
016	19.92/34.5Y	120/240	1	4	6		N	S	2-BUSHING	
018	12.47GRDY/7.2	240/480	1	4	6		N	N	1-BUSHING	008
022	12.47GRDY/7.2	277/480Y	1	4	6		N	N	1-BUSHING	011
026	19.92/34.5Y	120	1	4	6		N	N	1-BUSHING AMR PROJECT	
029	12.47GRDY/7.2	120/240	1	4	6		N	B	FOR USE ON 6.9KV SYSTEM	
114	12.47GRDY/7.2	120/240	3	4	6	8	I	B	TEMPORARY POWER (TYP)	

*NOTE: For Description Codes and Abbreviations (See 7-1, page 2)

SINGLE-PHASE PADMOUNT/UNDERGROUND

TYPE 196-XXX-	PRIMARY VOLTAGE (kV)	SECONDARY VOLTAGE (V)	INTER-FACE	FEED	FUSING [1]	SWITCH	TAPS	ADDITIONAL COMMENTS	REPLACES TYPES
134	34.5GRDY/19.92	240/120	ESNA	LF	B/PCL		S	ANSI I	
149	12.47GRDY/7.2	240/120	DF	LF	B/PCL		N	ANSI II	129 *
243	12.47GRDY/7.2	240/120	DF	RF	B/PCL		N	STAINLESS TANK (SEE NOTE 5)	123, 223 *
245	7.2	240/120	DF	RF	B/PCL		N	STAINLESS TANK (SEE NOTE 5)	125, 225 *
246	12.47GRDY/7.2	480/240	DF	LF	B/PCL		N	STAINLESS TANK, ANSI II, TAN	126, 226 *
249	12.47GRDY/7.2	240/120	DF	LF	B/PCL		N	STAINLESS TANK, ANSI II	229 *

*NOTE: For Description Codes and Abbreviations (See 7-1, page 2)

* **Warning** - SL fuse feeding transformer must be replaced with SX fuse - notify operations to have fuse changed as needed.

THREE PHASE TRANSFORMERS, PRESENT TYPES

SEE 7-1, PAGE 1 FOR NOTES

THREE-PHASE NETWORK/ UNDERGROUND

TYPE 196-XXX-	PRIMARY VOLTAGE (kV)	SECONDARY VOLTAGE (V)	INTER-FACE	FEED	FUSING [1]	SWITCH	TAPS	ADDITIONAL COMMENTS	REPLACES TYPES
068	13.2	480Y/277	DF	RF		DIS	S	NETWORK	
109	13.75	216Y/125	DF	RF		DIS	B	NETWORK	
170	12.47GRDY/7.2	208Y/120	DF	RF	B/PCL		N	NON-NETWORK VAULT [9]	
173	12.47GRDY/7.2	480Y/277	DF	RF	B/PCL		N	NON-NETWORK VAULT [9]	

THREE-PHASE PADMOUNT (208 & 480V SECONDARY)

TYPE 196-XXX-	PRIMARY VOLTAGE (kV)	SECONDARY VOLTAGE (V)	INTER-FACE	FEED	FUSING [1]	SWITCH	TAPS	ADDITIONAL COMMENTS	REPLACES TYPES
150*	12.47GRDY/7.2	208Y/120	DF	RF	B/PCL		S [4]	WELLS/INSERTS	130
153*	12.47GRDY/7.2	480Y/277	DF	RF	B/PCL		S [4]	WELLS/INSERTS	133
154	13.20GRDY/7.6	480Y/277	DF	RF	B/PCL		S	WELLS/INSERTS	
160*	12.47GRDY/7.2	208Y/120	DF	LF	B/PCL		S [4]	WELLS/INSERTS	
163*	12.47GRDY/7.2	480Y/277	DF	LF	B/PCL		S [4]	WELLS/INSERTS	
190	34.5GRDY/19.92	208Y/120	ESNA	LF	B/PCL/E	3I	S		140
191	34.5GRDY/19.92	480Y/277	ESNA	LF	B/PCL/E	3I	S		141

*NOTE: An "R" instead of a "1" in the TYPE designates a refurbished unit, which may have different features than shown above.

THREE-PHASE PADMOUNT/SUBSTATION (2400V SECONDARY)

TYPE 196-XXX-	PRIMARY VOLTAGE (kV)	SECONDARY VOLTAGE (V)	INTER-FACE	FEED	FUSING [1]	SWITCH	TAPS	ADDITIONAL COMMENTS	REPLACES TYPES
107	34.5	2400Y/1385	LIVE		NONE		S	SUBSTATION USE ONLY*	
175	12.47GRDY/7.2	2400Y/1385	DF	RF	B/PCL		S	LIVE FRONT SECONDARY	
176	12.47GRDY/7.2	2400Y/1385	DF	RF	B/PCL		S	INCLUDES SECONDARY METERING	
177	7.2	480Y/277	DF	RF	B/PCL		S	MANITOU HYDRO	
178	12.47GRDY/7.2	4160Y/2400	DF	RF	B/PCL		S	INCLUDES SECONDARY METERING	
179	13.2	4160Y/2400	DF	RF	B/PCL		S		
375	34.5GRDY/19.92	2400Y/1385	ESNA	LF	CCL	3I	S	LIVE 38kV FUSES**	
385	34.5	4160Y/2400	ESNA	LF	I/PCL	3I	B	WATER PUMP STATIONS***	
386	34.5	4160Y/2400	ESNA	LF	I/PCL	3I	B	WATER PUMP STATIONS	
391	34.5	480Y/277	ESNA	LF	I/PCL	3I	B	WATER PUMP STATIONS	

*NOTE: For Description Codes and Abbreviations (See 7-1, bottom of this page)

* Conventional - lid mounted primary bushings.
** Live front secondary also. Arresters on primary and secondary. With secondary CT's & PT's.
*** Spares not carried due to redundant transformer installation.

DESCRIPTION CODES

(ONLY APPLIES TO TABLES WITH DESC CODE)

1. CONVENTIONAL (NO INTERNAL PROTECTION)
2. SELF-PROTECTED (SECONDARY BREAKER ONLY)
3. COMPLETELY SELF-PROTECTED
4. LID MOUNTED PRIMARY BUSHINGS
5. POCKET BUSHINGS (PRIMARY FUSE, SECONDARY BREAKER AND ARRESTERS)
6. POLE MOUNTED BRACKETS WELDED TO TANK
7. HANGER MOUNT (ADAPTED TO POLE MOUNT PRIOR TO ISSUING)
8. ARRESTERS ON PRIMARY
9. ARRESTERS ON SECONDARY
10. WITH SECONDARY CT'S & PT'S

ABBREVIATIONS

PRIMARY INTERFACE:

- LIVE: LIVE FRONT (ANY VOLTAGE)
- DF: DEAD FRONT (12.5KV)
- RTE: RTE ELBOW (34.5KV)
- ESNA: ESNA ELBOW (34.5KV)

FEED:

- LF: LOOP FEED
- RF: RADIAL FEED
- ANSI I: HORIZONTAL PRIMARY INTERFACE
- ANSI II: DIAGONAL PRIMARY INTERFACE

APPLICATION:

- OH: OVERHEAD
- UG: UNDERGROUND (INSTALLED IN VAULT)
- PAD: PADMOUNTED
- NET: NETWORK
- SUB: SUBSTATION STYLE (POWER)

PRIMARY FUSING:

- B: BAYONET EXPULSION (FIELD REPLACEABLE)
- CCL: CLIP-MOUNTED FULL RANGE CURRENT LIMITING FUSE (LIVE FRONT SIDE COMPARTMENT)
- PCL: PARTIAL RANGE CURRENT LIMITING FUSE (NOT FIELD REPLACEABLE)
- E: EXTERNAL FULL RANGE CURRENT LIMITING FUSE (USED IN DRY-WELL FUSEHOLDERS IN HIGH VOLTAGE COMPARTMENT)
- WL: WEAK LINK
- IL: ISOLATION LINK (INTERNAL - NOT FIELD REPLACEABLE)
- I: INTERNAL (UNDER-OIL EXPULSION FUSE - REQUIRES LID REMOVAL FOR REPLACEMENT)

PRIMARY SWITCHES:

- ΔY: DELTA-WYE
- DIS: DISCONNECT
- DV: DUAL VOLTAGE
- LOOP: 4 POSITION LOOP DISCONNECT
- 3I: 3 INDEPENDENTLY OPERABLE SWITCHES FOR IN/OUT/DISCONNECT

PRIMARY TAPS:

- N: NO TAPS
- S: STRADDLE (2 - 2-1/2% ABOVE AND BELOW NORMAL RATING)
- B: BELOW (4 - 2-1/2% BELOW NORMAL RATING)

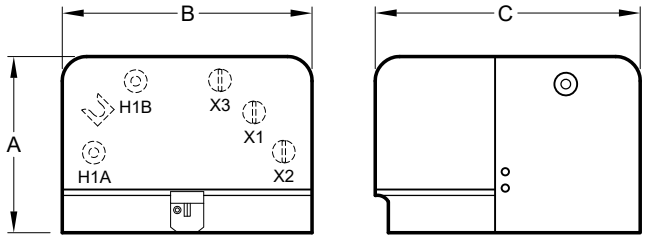
SEE 7-1, PAGE 1 FOR NOTES

TRANSFORMERS, OLD TYPES

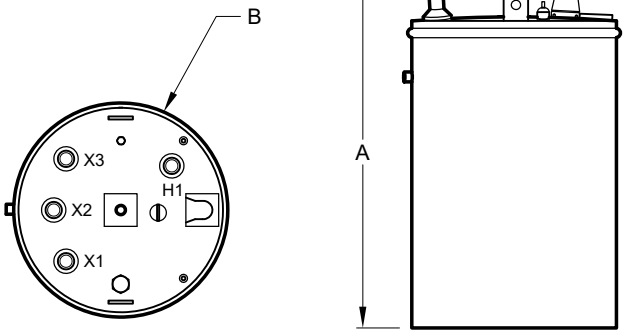
ITEM NUMBER	Ø	PRIMARY VOLTAGE (kV)	SECONDARY VOLTAGE (V)	DESC. CODE			INTER-FACE	FEED	FUSING [1]	SWITCH	TAPS	ADDITIONAL DESCRIPTION	APP.	REPLACEMENT TYPE (IF REQ'D) [11]
196-XXX-001	1	7.2/12.47Y	120/240	1	4	6					N	1 BUSHING	OH	003
196-XXX-002	1	12.47GRDY/7.2	120/240	3	4	6			I		N	SINGLE BUSHING CSP	OH	003
196-XXX-004	1	7.2/12.47Y	120/240	3	4	6			I		B	CSP	OH	003
196-XXX-005	1	12.0	120/240	1	4	6					S		OH	007
196-XXX-006	1	12.47	120/240	1	4	6					N		OH	007
196-XXX-008	1	7.2/12.47Y	240/480	1	4	6					S		OH	018
196-XXX-010	1	12.0	240/480	1	4	6					S		OH	018
196-XXX-011	1	7.2/12.47Y	277/480Y	1	4	6					B		OH	022
196-XXX-013	1	7.2/12.47Y	240/480	1	4	6					B		OH	018
196-XXX-014	1	34.5GRDY/19.92	125/250	1	4	6					S		OH	016
196-XXX-017	1	34.5GRDY/19.92	120/240		4	6			I		S	SINGLE BUSHING	OH	016
196-XXX-019	1	12.47GRDY/7.2	120/240	1					B		N	STAINLESS STEEL	UG	243 [13]
196-XXX-020	1	12.47GRDY/7.2	120/240	1	4		DF	LF	WL		N		UG	243 [13]
196-XXX-021	1	12.47GRDY/7.2	120/240	1	4		DF	LF	WL		N		UG	243 [13]
196-XXX-023	1	12.47GRDY/7.2	120/240	1	4	6	DF		WL		N		UG	243 [13]
196-XXX-024	1	12.0	120/240	1	4	6	DF		WL		N		UG	243 [13]
196-XXX-025	1	7.2/12.47Y	120/240	1	4	6					B		UG	243 [13]
196-XXX-027	1	12.47GRDY/7.2	120/240	1	4	6			WL		B		UG	243 [13]
196-XXX-030	3	12.47GRDY/7.2	208Y/120	1			DF	RF			S		PAD	150
196-XXX-033	3	12.47GRDY/7.2	480Y/277	1			DF	RF			S		PAD	153
196-XXX-034	3	12.47GRDY/7.2	216Y/125	1			DF	RF			S		PAD	150
196-XXX-035	3	0.480	208Y/120					RF					PAD	NONE
196-XXX-036	1	0.480	120/240					RF					PAD	NONE
196-XXX-037	3	7.2/12.47Y GRNDY/7.2	208Y/120	1			DF	RF		△Y	B		PAD	150
196-XXX-038	3	7.2/12.47Y GRNDY/7.2	480Y/277	1			DF	RF		△Y	B		PAD	153
196-XXX-039	1	34.5GRDY/19.92	240/120				ESNA	LF	CL		S	ANSI II	PAD	134
196-XXX-047	3	13.2	480Y/277				LIVE	RF					PAD	068
196-XXX-049	3	12.47GRDY/7.2	208Y/120				LIVE	RF			S	YY	PAD	150
196-XXX-050	3	12.47GRDY/7.2	480Y/277				LIVE	RF			S	YY	PAD	153
196-XXX-051	3	7.2/12.47Y GRNDY/7.2	208Y/120				LIVE	RF		△Y	B		PAD	150
196-XXX-052	3	7.2/12.47Y GRNDY/7.2	480Y/277				LIVE	RF		△Y	B		PAD	153
196-XXX-055	3	34.5GRDY/19.92	480Y/277				ESNA	RF	CL		S		PAD	191
196-XXX-058	1	12.47GRDY/7.2	240/120				DF	LF	CL		B	ANSI II	PAD	149
196-XXX-059	1	12.47GRDY/7.2	240/120				LIVE	LF	I	DIS	B		PAD	149
196-XXX-066	3	14.4	208Y/120				DF	RF		DIS		NETWORK	NET	109
196-XXX-069	3	13.5	208Y/120				DF	RF		DIS		NETWORK	NET	109
196-XXX-089	1	13.8	120/240	1	5	6					B		OH	003
196-XXX-090	1	12.47GRDY/7.2	120/240	3	4	6					B	SINGLE BUSHING	OH	003
196-XXX-093	1	7.2/12.47Y	120/240	2	4	6					B		OH	003
196-XXX-095	1	7.2/12.47Y	120/240	3	4	6							OH	003
196-XXX-097	1	7.2/12.47Y	120/240	2	5	7					B		OH	003
196-XXX-099	1	7.2/12.47Y	120/240	1	5	7		LF			B	"SK" 4-1/2% TAPS	OH	003
196-XXX-101	3	12.47Y	4160Y/2400	1				LF			S	AT NIXON ZDP	PAD	NONE ***
196-XXX-104	1	7.2	120/240	1	5	6					B		OH	003
196-XXX-110	3	4.16	208Y/120						CL		S	AT NIXON SUB	PAD	NONE
196-XXX-111	3	12.47GRDY/7.2	2400GRDY/ 1386				LIVE				S	LIVE FRONT SECONDARY	SUB	175 [14]
196-XXX-116	1	7.2/12.47Y	120/240	1	4		LIVE				B	LESS FLAMMABLE	OH	003 [12]
196-XXX-123	1	12.47GRDY/7.2	120/240	1	4		DF		WL/I		N	2022 UNITS HAVE FUSE	UG	243 [13]
196-XXX-125	1	7.2/12.47Y	120/240	1	4		DF		WL		B		UG	245 [13]
196-XXX-126	1	12.47GRDY/7.2	480/240				DF	LF	B/IL		N	ANSI II, TAN	PAD	246
196-XXX-127	1	12.47 GRDY/7.2 22.86GRDY/13.2	240/120				DF	LF	WL	DV	N	SECONDARY BREAKER	PAD	149
196-XXX-128	1	12.47GRDY/7.2	240/120				DF	RF	B		N	ANSI II	PAD	149
196-XXX-129	1	12.47GRDY/7.2	240/120				DF	LF	B/IL		N	ANSI II	PAD	149
196-XXX-130	3	12.47GRDY/7.2	208Y/120				DF	RF	B/PCL		S	1 PIECE BUSHING	PAD	150
196-XXX-133	3	12.47GRDY/7.2	480Y/277				DF	RF	B/PCL/WL		S	1 PIECE BUSHING	PAD	153
196-XXX-137	3	7.2/12.47GRDY/7.2	208Y/120				DF	RF	B/PCL	△Y	B		PAD	150 IF CUTOVER
196-XXX-138	3	7.2/12.47GRDY/7.2	480Y/277				DF	RF	B/PCL	△Y				153 IF CUTOVER
196-XXX-139	1	34.5GRDY/19.92	240/120				RTE	LF	B/CL		S	ANSI I	PAD	134
196-XXX-140	3	34.5GRDY/19.92	208Y/120				ESNA	LF	B/PCL/E	LOOP	S		PAD	190
196-XXX-141	3	34.5GRDY/19.92	480Y/277				ESNA	LF	B/PCL/E	LOOP	S		PAD	191
196-XXX-155	3	12470GRDY/7200	208Y/120				ESNA	LF			S		PAD	160
196-XXX-223	1	12.47GRDY/7.2	240/120				DF	RF	B/IL		N	STAINLESS TANK (SEE NOTE 5)	UG	243
196-XXX-225	1	7.2	240/120				DF	RF	B/IL		N	STAINLESS TANK (SEE NOTE 5)	UG	245
196-XXX-226	1	12.47GRDY/7.2	480/240				DF	LF	B/IL		N	STAINLESS TANK, ANSI II, TAN	PAD	246
196-XXX-229	1	12.47GRDY/7.2	240/120				DF	LF	B/IL		N	STAINLESS TANK, ANSI II	PAD	249

*NOTE: For Description Codes and Abbreviations (See 7-1, page 2)

*** Spares not carried due to redundant transformer installation.



FRONT VIEW RIGHT SIDE VIEW



TOP VIEW SIDE VIEW

SINGLE-PHASE RADIAL FEED PADMOUNT 12470GrdY/7200 - 240/120 VOLTS				
RATING (kVA)	HEIGHT (INCHES) "A"	WIDTH (INCHES) "B"	DEPTH (INCHES) "C"	WEIGHT (POUNDS)
10	24.0	32.0	32.5	508
25	24.0	32.0	32.5	660
50	24.0	32.0	32.5	860
75	24.0	32.0	35.5	1,172
100	32.0	34.0	37.5	1,426
167	32.0	36.0	44.5	1,791

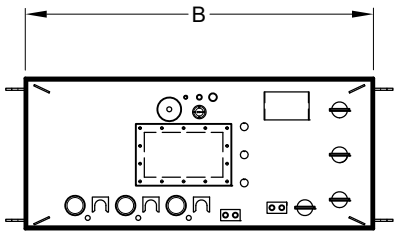
7.2kV SINGLE-PHASE PADMOUNT TRANSFORMER TYPE-249
APPROX. 2017 DESIGN WEIGHTS & DIMENSIONS

TYPE 243 SUBMERSIBLE TRANSFORMER 12470GrdY/7200 - 240Y/120 VOLTS			
RATING (kVA)	HEIGHT (INCHES) "A"	MAXIMUM TANK DIA (INCHES) "B"	WEIGHT (POUNDS)
25	29.5	23.5	509
50	34.0	23.5	696
75	35.5	27.5	993

7.2kV SUBMERSIBLE TRANSFORMER TYPE-243
APPROX. 2008 DESIGN WEIGHTS & DIMENSIONS
NOTE: X2 is internally bonded to tank

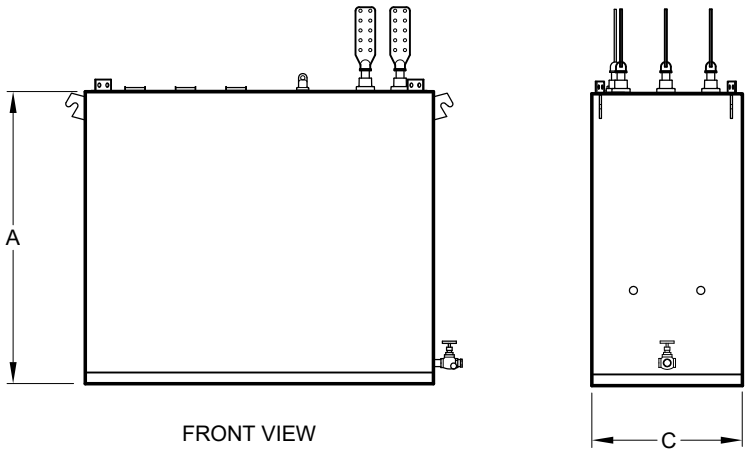
SINGLE-PHASE RADIAL FEED PADMOUNT 12470GrdY/7200 - 480/240 VOLTS				
RATING (kVA)	HEIGHT (INCHES) "A"	WIDTH (INCHES) "B"	DEPTH (INCHES) "C"	WEIGHT (POUNDS)
25	24.0	32.0	33.5	746
50	24.0	32.0	33.5	884

7.2kV SINGLE-PHASE PADMOUNT
TRANSFORMER TYPE-246
APPROX. 2017 DESIGN WEIGHTS & DIMENSIONS



TOP VIEW

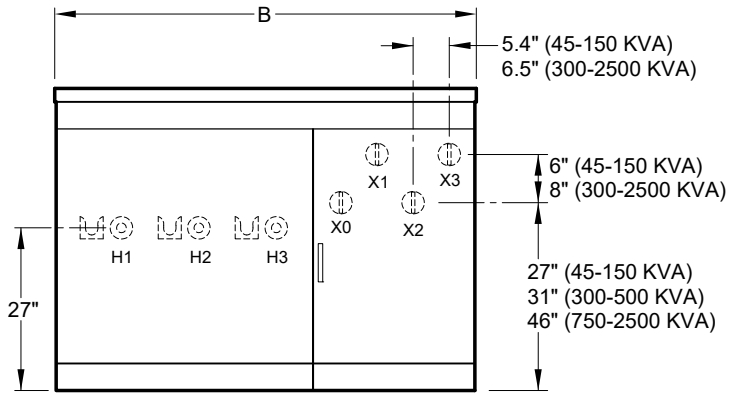
TYPE 170 & 173 THREE-PHASE RADIAL FEED UNDERGROUND COMMERCIAL TRANSFORMER 12470GrdY/7200 - 208Y/120 VOLTS (TYPE 170) 12470GrdY/7200 - 480Y/277 VOLTS (TYPE 173)				
RATING (kVA)	HEIGHT (INCHES) "A"	WIDTH (INCHES) "B"	DEPTH (INCHES) "C"	WEIGHT (POUNDS)
75	52.0	62.0	30.5	1,683
150	52.0	62.0	30.5	3,259
300	56.0	62.0	30.5	3,211
500	56.0	62.0	30.5	4,917
750	64.0	70.0	32.5	9,500
1000	52.2	70.0	30.6	9,252



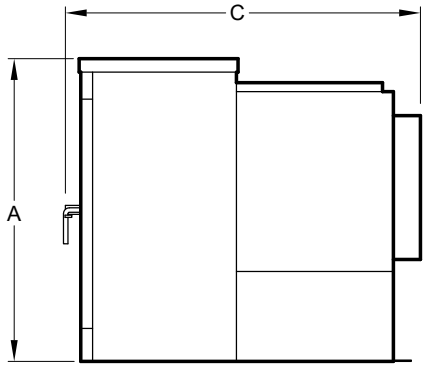
FRONT VIEW RIGHT SIDE VIEW

12.47kV THREE-PHASE UNDERGROUND COMMERCIAL TRANSFORMER TYPES 170/173
APPROX. 2017 DESIGN WEIGHTS & DIMENSIONS

12.47kV THREE-PHASE PADMOUNT TRANSFORMER TYPES 150/153
APPROX. 2017 DESIGN WEIGHTS & DIMENSIONS



FRONT VIEW

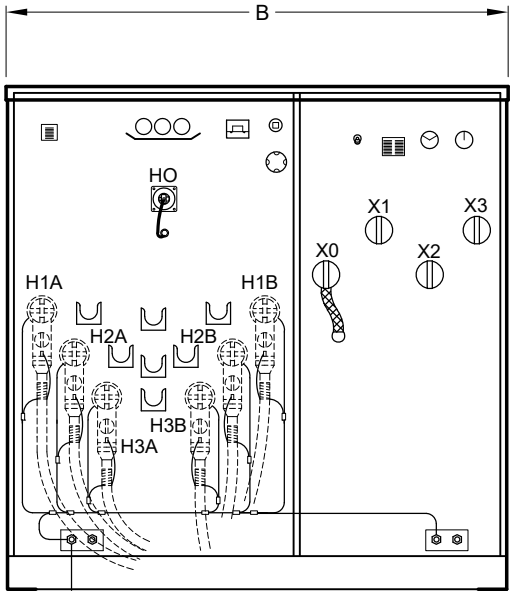


RIGHT VIEW

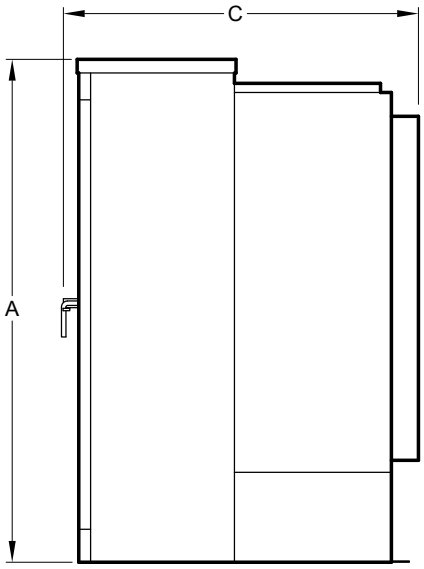
THREE-PHASE RADIAL FEED PADMOUNT 12470GrdY/7200 - 208Y/120 VOLTS				
RATING (kVA)	HEIGHT (INCHES) "A"	WIDTH (INCHES) "B"	DEPTH (INCHES) "C"	WEIGHT (POUNDS)
45	52.3	70.5	46.2	1,993
75	52.3	70.5	48.2	2,264
150	52.3	70.5	50.2	3,632
300	54.5	70.5	50.2	3,737
500	54.5	70.5	54.2	6,785
750	68.4	70.5	57.2	8,265
1000	72.8	70.5	67.2	10,254

THREE-PHASE RADIAL FEED PADMOUNT 12470GrdY/7200 - 480Y/277 VOLTS				
RATING (kVA)	HEIGHT (INCHES) "A"	WIDTH (INCHES) "B"	DEPTH (INCHES) "C"	WEIGHT (POUNDS)
75	52.3	70.5	51.2	2,718
150	52.4	70.5	51.2	3,101
300	54.5	70.5	50.2	3,432
500	72.4	70.5	62.2	10,408
750	68.4	70.5	58.2	8,196
1000	68.4	70.5	60.2	8,768
1500	68.4	70.5	62.2	12,216
2000	70.5	70.5	62.2	12,906
2500	76.8	70.5	70.2	16,527

12.47kV THREE-PHASE PADMOUNT TRANSFORMER TYPES 160/163
APPROX. 2017 DESIGN WEIGHTS & DIMENSIONS



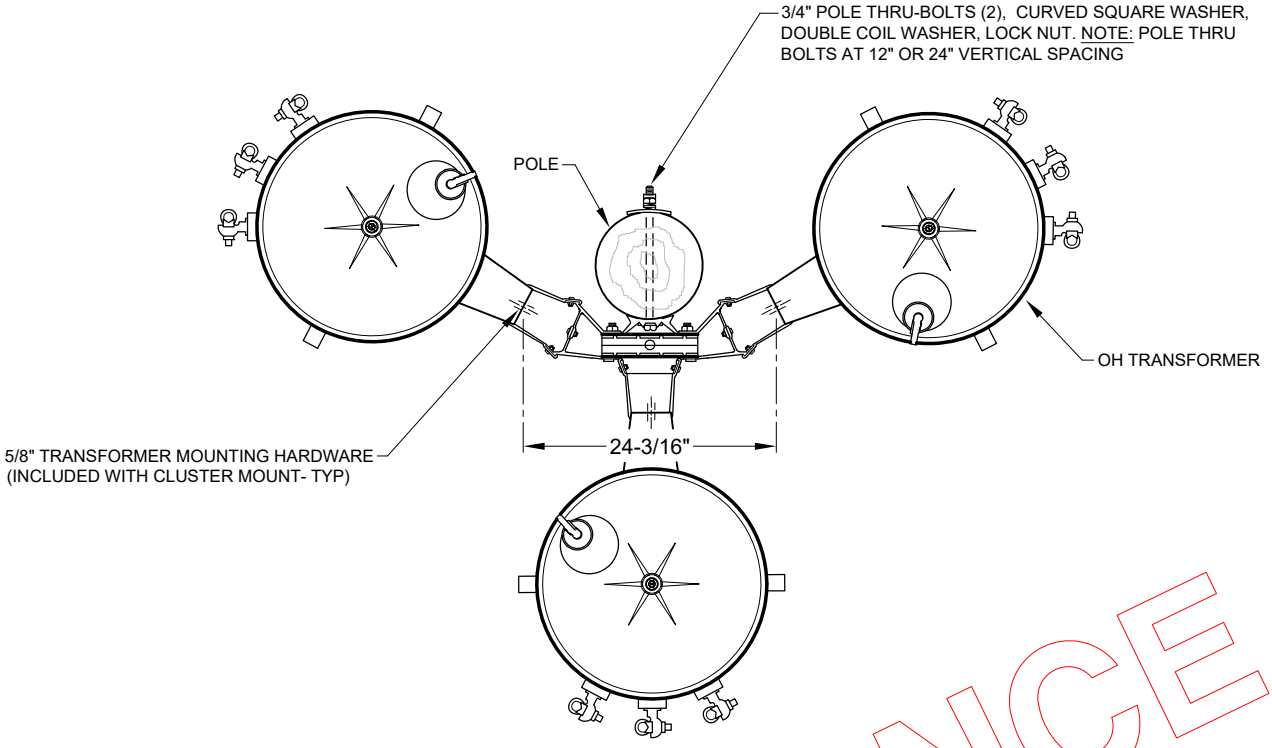
FRONT VIEW



RIGHT VIEW

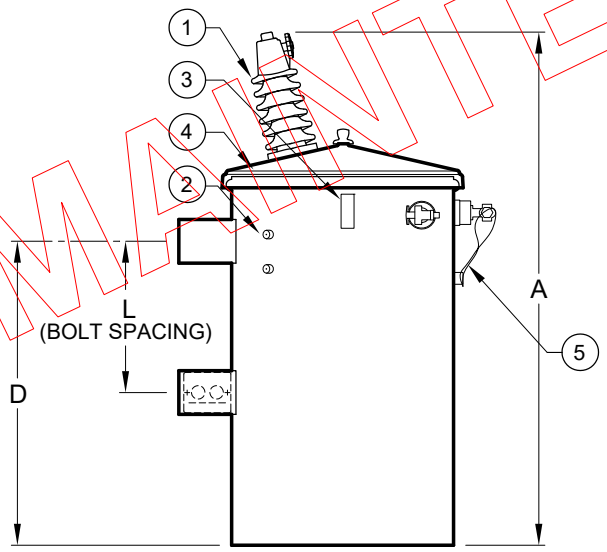
THREE-PHASE RADIAL FEED PADMOUNT 12470GrdY/7200 - 208Y/120 VOLTS				
RATING (kVA)	HEIGHT (INCHES) "A"	WIDTH (INCHES) "B"	DEPTH (INCHES) "C"	WEIGHT (POUNDS)
45	50.5	70.5	46.2	2,050
75	56.3	66.5	49.2	2,811
150	56.3	66.5	51.2	3,600
300	54.5	70.5	50.2	4,075
500	60.4	70.5	56.2	6,330
750	68.4	70.5	56.2	9,435
1000	72.8	70.5	68.2	10,545

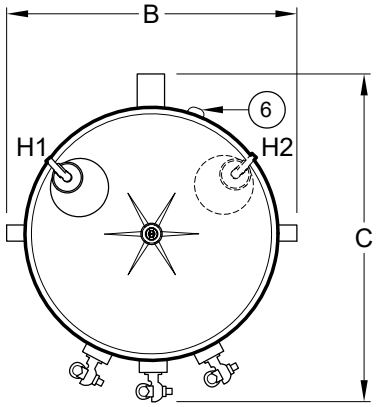
THREE-PHASE RADIAL FEED PADMOUNT 12470GrdY/7200 - 480Y/277 VOLTS				
RATING (kVA)	HEIGHT (INCHES) "A"	WIDTH (INCHES) "B"	DEPTH (INCHES) "C"	WEIGHT (POUNDS)
75	56.3	66.5	50.2	2,846
150	56.3	66.5	53.2	3,676
300	60.4	70.5	54.2	5,123
500	50.5	70.5	54.2	5,240
750	68.4	70.5	58.2	8,648
1000	66.5	70.5	54.2	8,067
1500	76.4	70.5	62.2	12,551
2000	76.8	70.5	66.2	14,055
2500	76.8	70.5	70.2	16,557



TRANSFORMER CLUSTER MOUNT

For 3-50 kVA transformer lugs with 12" vertical spacing and 1000 lbs per phase position (Aluminum Brand), use Item # 150-100-100 (steel models rated 2000 lbs per position). For 3-167 kVA transformer lugs at 12" or 24" vertical spacing and 2000 lbs per phase position, use Item # 150-100-200.





X3 X2 X1 FOR 7200V
X1 X2 X3 FOR ≥12KV

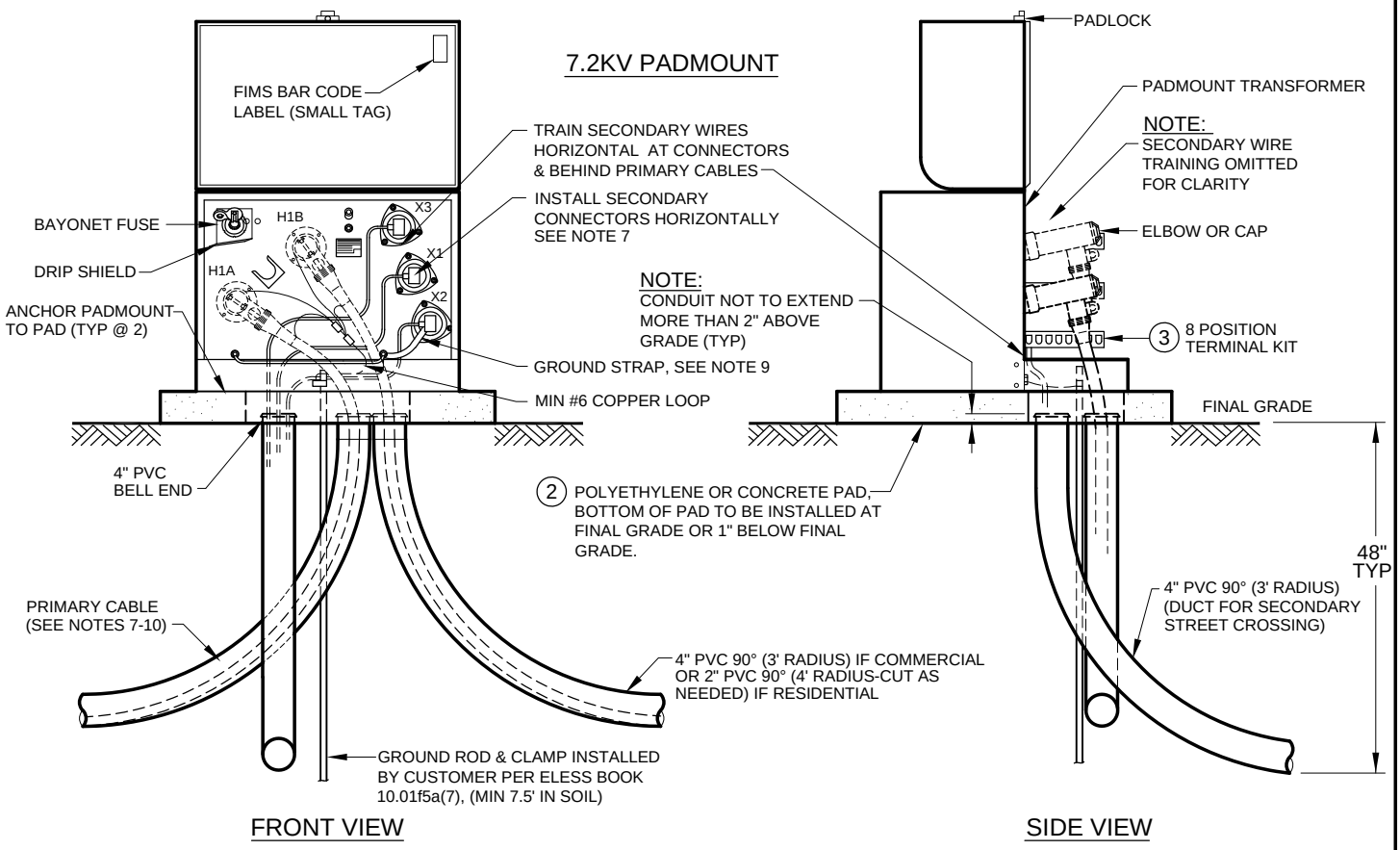
ITEM	STANDARD FEATURES
1	Wheel-type HV terminals
2	Arrester mounting bosses
3	Lifting lugs
4	Epoxy insulated (15kV avg.), self-venting
	& resealing cover (w/o PRV)
5	LV neutral ground strap
6	Tank ground pad

7.2kV TYPE - 1, 3
APPROXIMATE DESIGN WEIGHTS AND DIMENSIONS AS OF 2022

kVA SIZING	DIMENSIONS (IN INCHES) A	B	C	D	L	APPROX. WEIGHT
1	34	14	17	8.5	-	105
15	34	20	24	20	11.25	258
25	36	20	24	21	11.25	326
50	36	25	29	21	11.25	610
75	50	25	34	33	23.25	848
100	54	27	36	37	23.25	1,091
167	54	36	37	37	23.25	1,501

Install and maintain overhead transformers within 5 degrees of level.

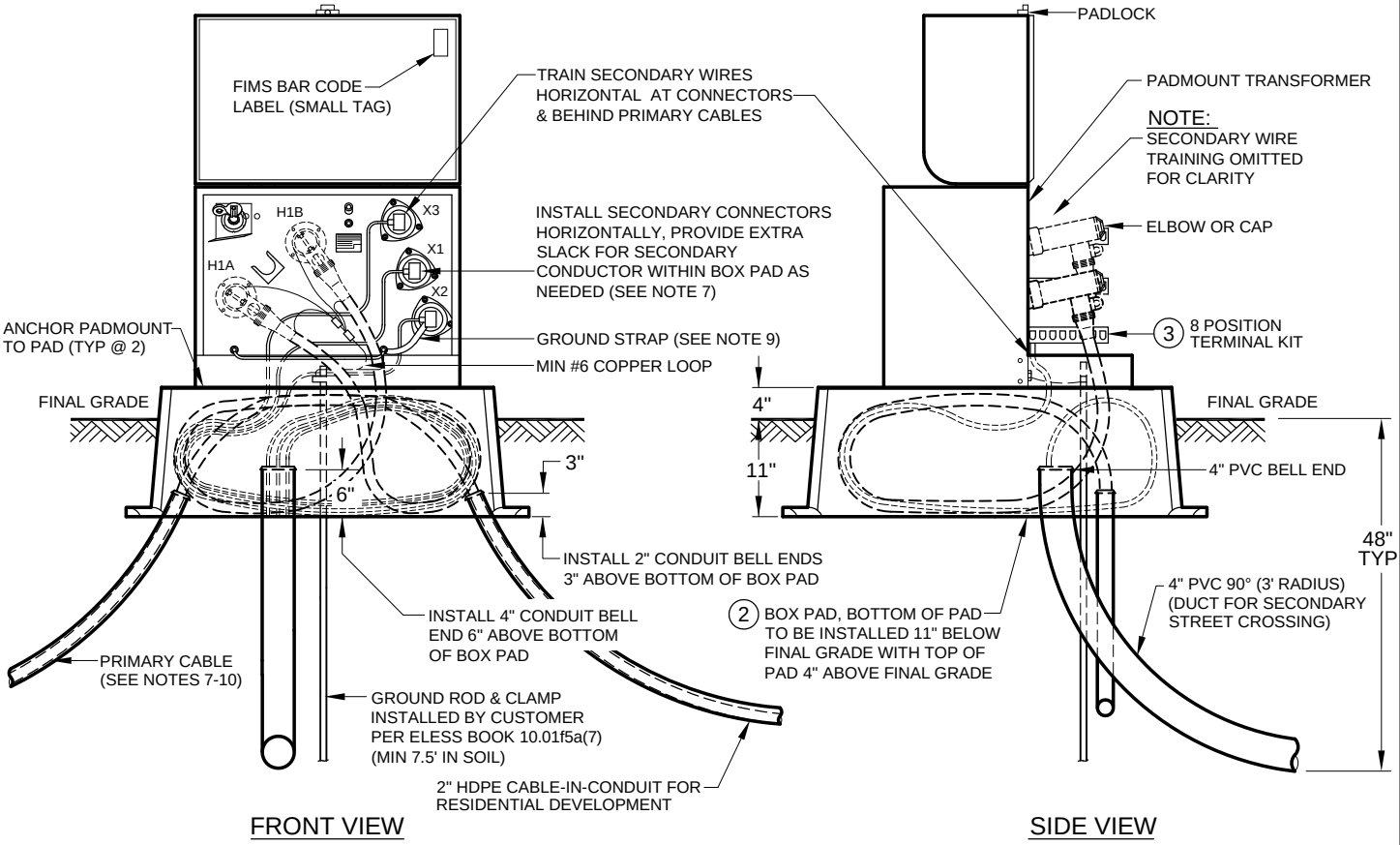
Colorado Springs Utilities
It's how we're all connected



NOTES (7.2 and 19.92 KV 1-PHASE PADMOUNTS):

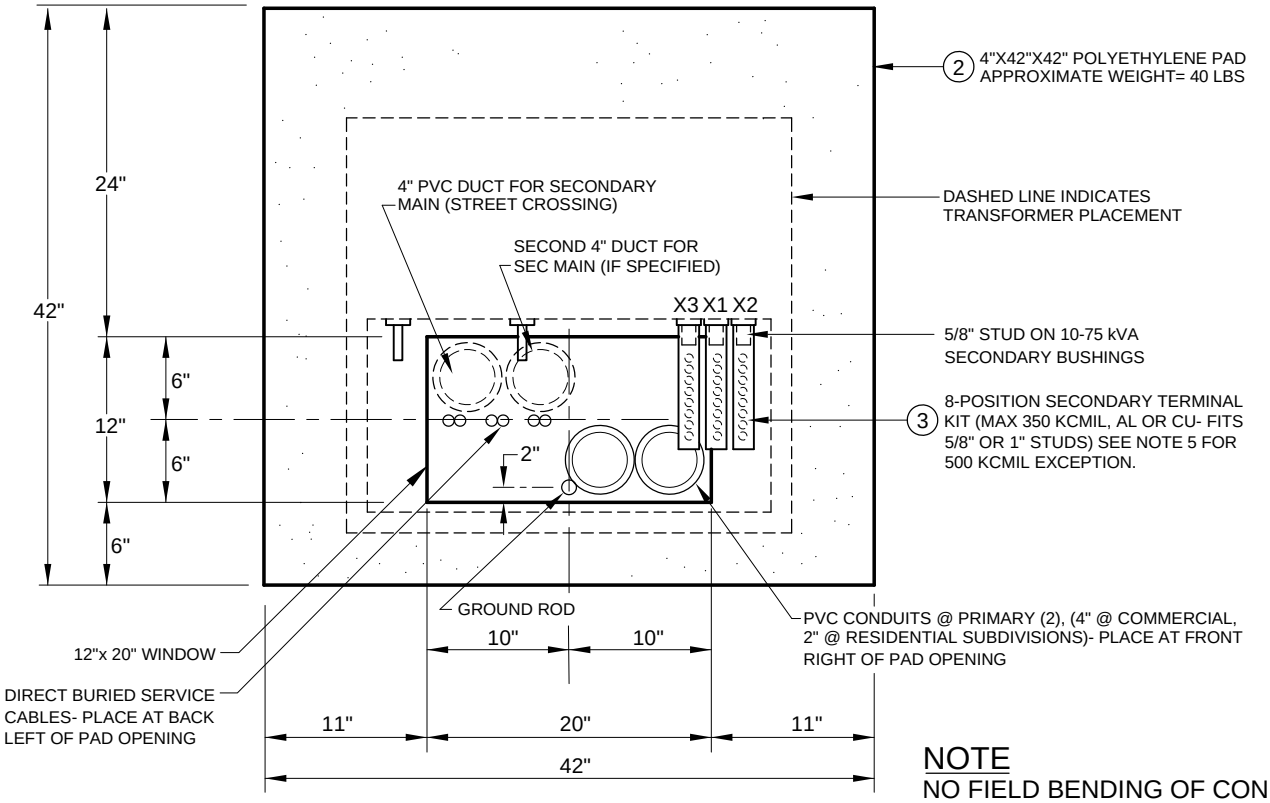
1. All loop-feed type transformers shall have second duct 90° bend installed even when initially radially fed. Stub and cap second duct a minimum of 2' beyond edge of pad and place 8" UG marker above end for future location.
2. For temporary radial installation without ground rod and with direct buried primary: padmount must be installed within 4' of the tap vault and bonded to vault grounding electrode by cable concentrics.
3. Refer to Page 3 for leveling pad (with collar when needed). See EDCS 18-302 for clear work area around the transformer.
4. Install primary and secondary ducts as shown in the appropriate Figure (1,2, or 3). Install ground rod near center of pad opening.
5. Maximum secondary conductor size shall be 350 kcmil AL or CU. 500 kcmil AL or CU conductors may be used with approved equipment adapter (Burndy AYP500) and shall be suitably insulated at 600V with shrink tubing. All burrs must be filed smooth on crimped connectors. No more than four 500 kcmil conductors may be installed per transformer secondary connector/ bar.
6. Secondary cable progression into the 6 or 8-position terminals shall be from tank to front with the largest size cables first (routed sequentially from the right side ducts as numbered in Figure 2 to the corresponding terminal position number or from the back as numbered in Figure 3 for 19.92kV units).
7. Leave slack in secondary and primary cables to permit removal and replacement for maintenance. In 7.2kV padmounts, install secondary connectors horizontally to facilitate removal of secondary during maintenance.
8. When terminating single phase transformers, cable using conduit on the left side shall be terminated to the H1A bushing. Cable using conduit on the right side shall be terminated to H1B bushing to prevent crossing of primary cables.
9. CAUTION: Ground strap on neutral bushing shall remain connected to tank in all cases; tank will be energized to primary voltage if primary neutral tank ground is disconnected.
10. Leave sufficient slack on concentric neutrals to allow removal of elbows without disconnecting neutrals.
11. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!
12. It is the customer's responsibility to seal the customer's secondary ducts from water entering the customer's equipment or building that originate from a Colorado Springs Utilities' transformer or vault.
13. Remove all exterior lifting eyes/bolts, secure with padlock, anchor to pad.

7.2KV RESIDENTIAL BOX PAD



NOTES:

1. See page 1 notes for drawing notes.
2. Duct placement in Box Pad has similar pad opening (21"x12") as the Polymer Pad. See drawing on page 3 for duct placement "7.2KV: DUCT PLACEMENT IN POLYMER PAD (10-75 KVA)".
3. Duct ends should point toward the box pad window opening for future wire pulling.

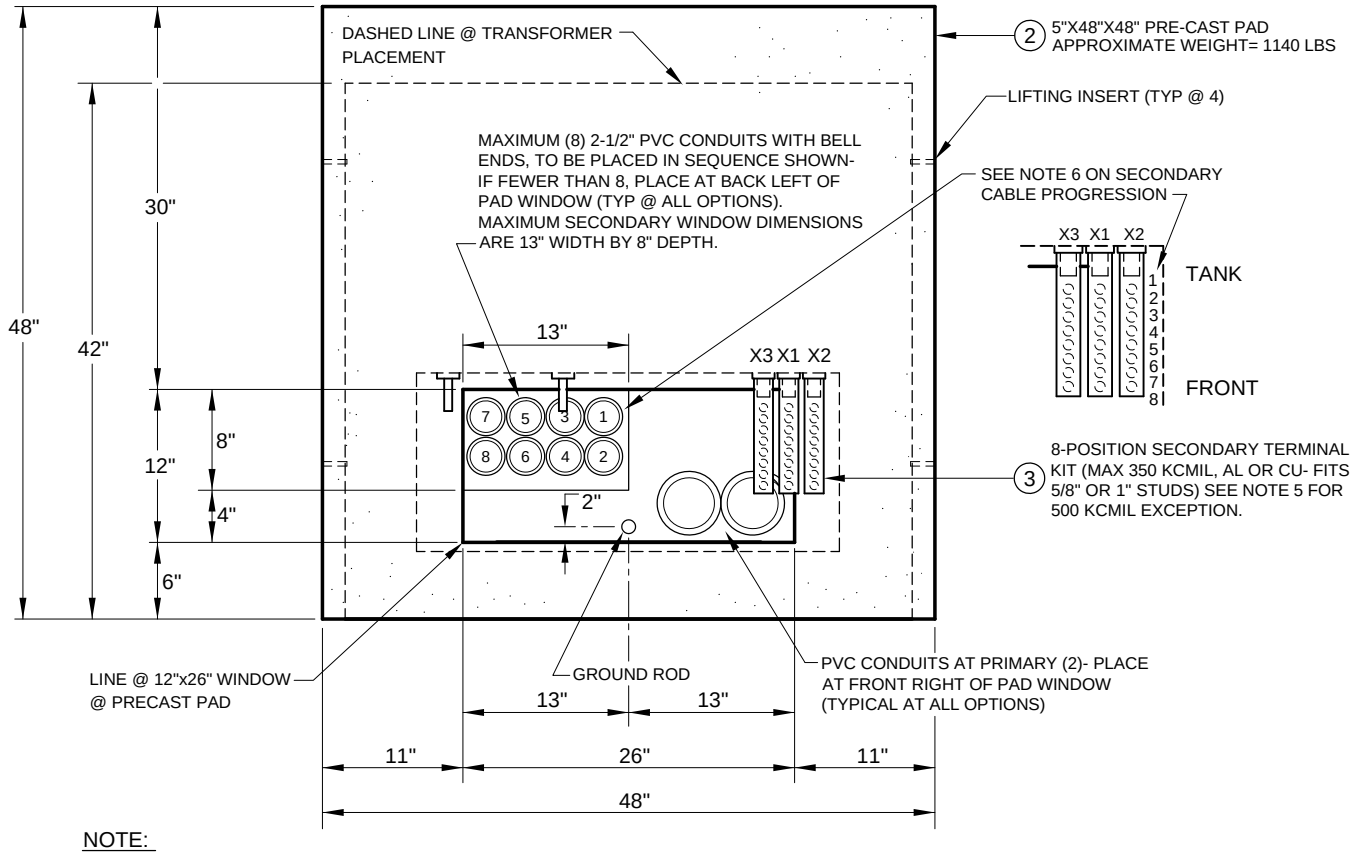


7.2KV: DUCT PLACEMENT IN POLYMER PAD (10-75 KVA)

FIGURE 1

NOTE

NO FIELD BENDING OF CONDUIT IS ALLOWED, ONLY FACTORY BENDS ARE ACCEPTABLE.

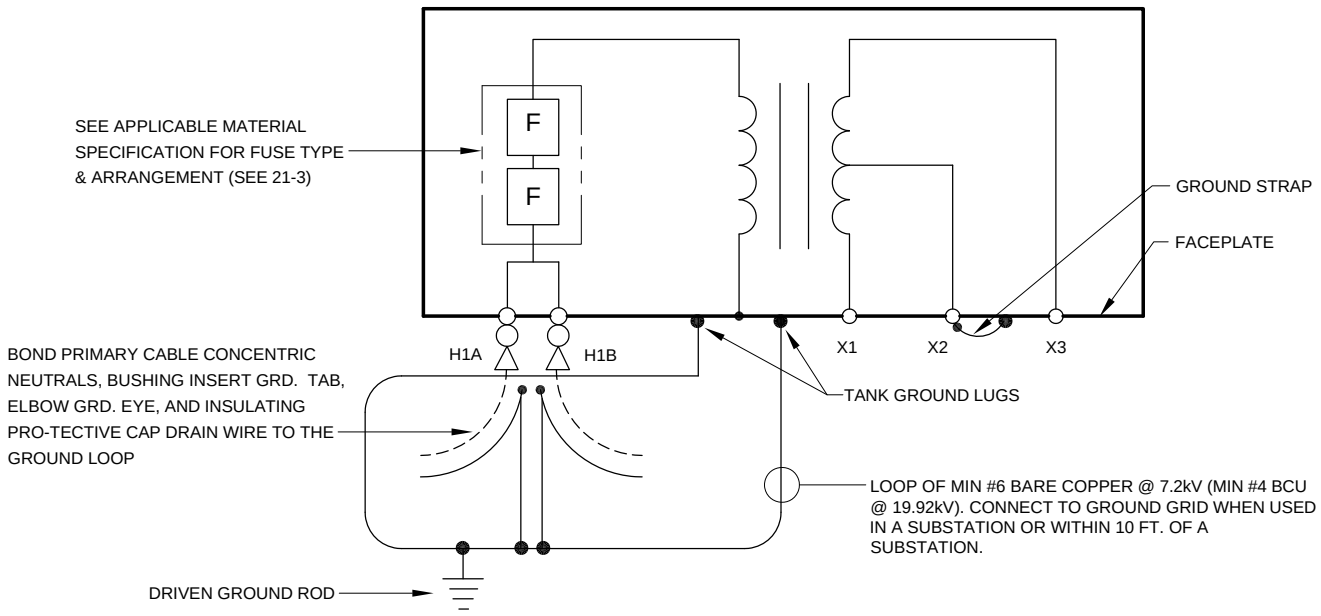


NOTE:
TRANSFORMER TO BE BOLTED TO TOP OF PAD.

7.2KV: DUCT PLACEMENT IN CONCRETE PAD

FIGURE 2

ONE LINE SCHEMATIC DIAGRAM 7.2 & 19.92KV PADMOUNTS



PADMOUNT LEVELING GUIDE

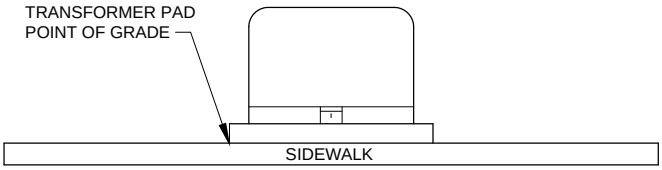


FIGURE A

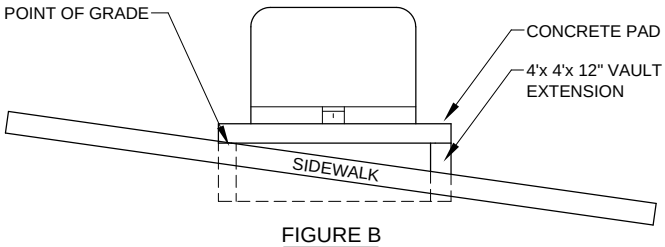


FIGURE B

NOTES:

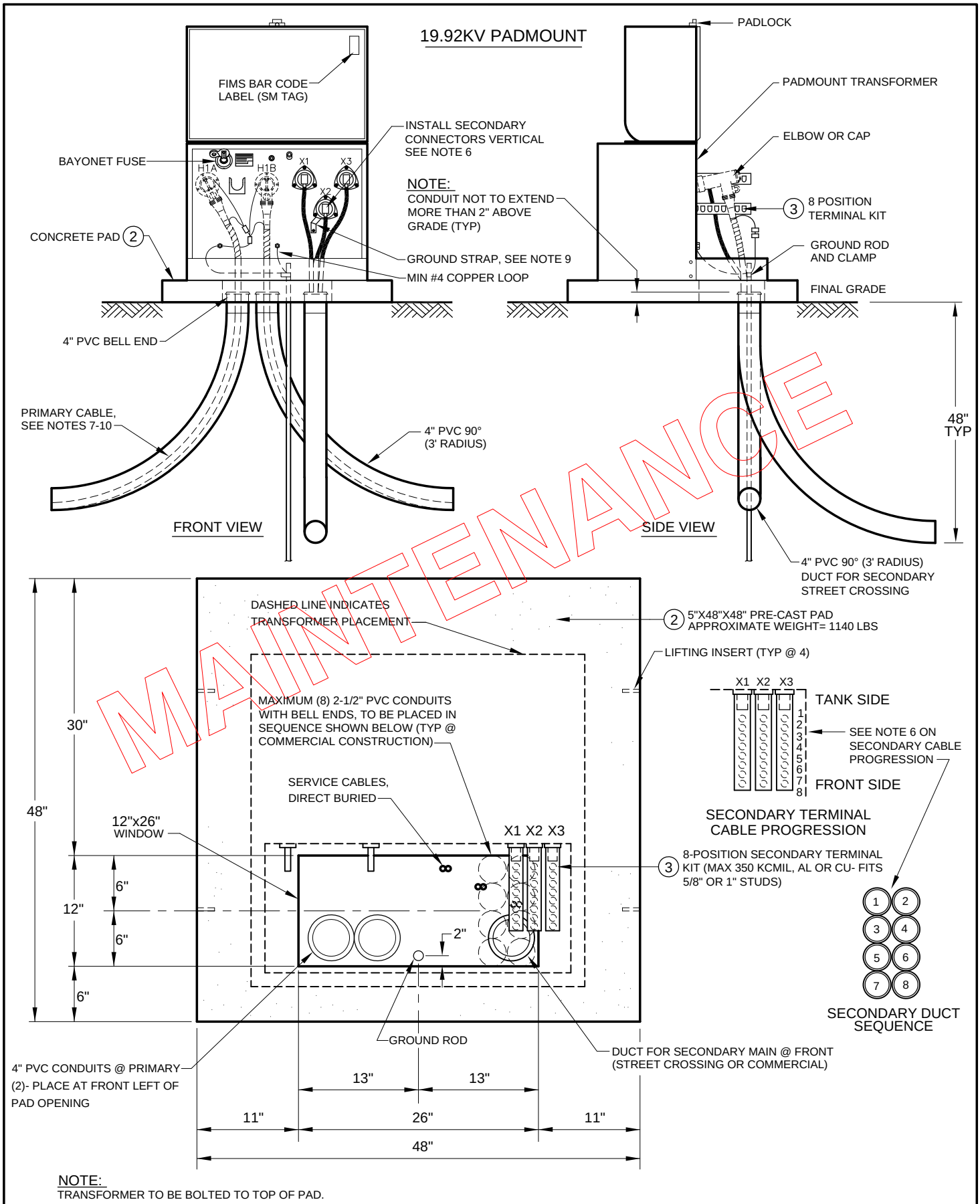
A. Transformer pad shall be installed on level and compacted earth if terrain slope is 5% or less in any direction.

B. If terrain slope is greater than 5%, a 4'x 4'x 12" vault extension (CUID "VLT4X4-EXT12") shall be installed level in all directions from point of grade (see Figure B).

C. Vault extension shall be filled with earth and compacted to provide a solid base for the transformer pad.

D. For installation uniformity, 5% grade is interpreted to be 5/8" vertical rise or fall per each foot (12") of horizontal run.

E. Field Engineer to specify precast pads on all commercial installations, regardless of the transformer size and on residential installations greater than 75 kVA. Residential site conditions may require the use of precast pads on sizes that normally call of a polymer pad on installations that require a larger pad window opening.



NOTE:
TRANSFORMER TO BE BOLTED TO TOP OF PAD.

19.92 KV DUCT PLACEMENT (IN CONCRETE PAD - ALL KVA SIZES)

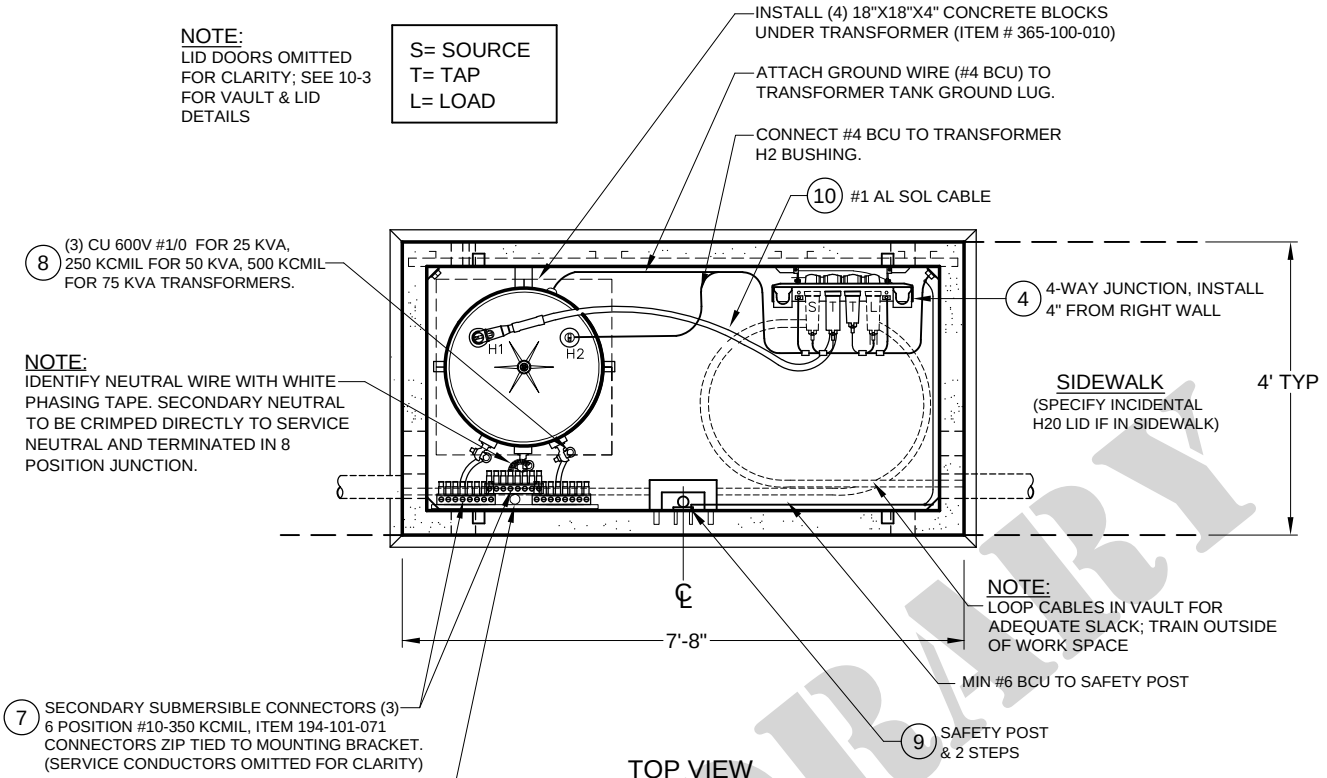
FIGURE 3

SINGLE PHASE (MODIFIED OH TRANSFORMER) UNDERGROUND TRANSFORMER

NOTE: THESE 1-PHASE TRANSFORMER OPTIONS ARE ONLY A TEMPORARY APPLICATION AND WILL BE EVALUATED FOR CONTINUED USE AT THAT TIME BASED ON SUPPLY CHAIN CONDITIONS.

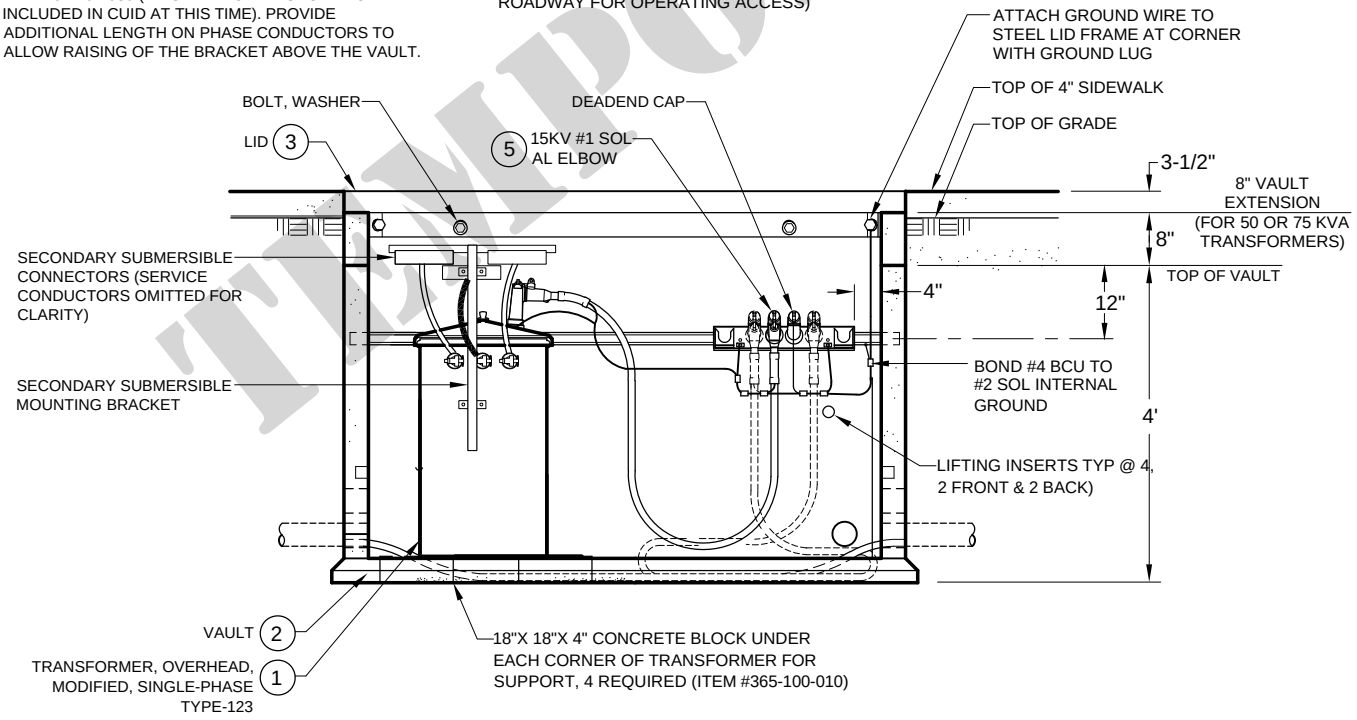
NOTE:
LID DOORS OMITTED FOR CLARITY; SEE 10-3 FOR VAULT & LID DETAILS

S= SOURCE
T= TAP
L= LOAD



TOP VIEW

(FRONT TYPICALLY TOWARD SIDEWALK, IF PRESENT, OR TOWARD AN ADEQUATE SPACE AWAY FROM THE ROADWAY FOR OPERATING ACCESS)



SIDE VIEW

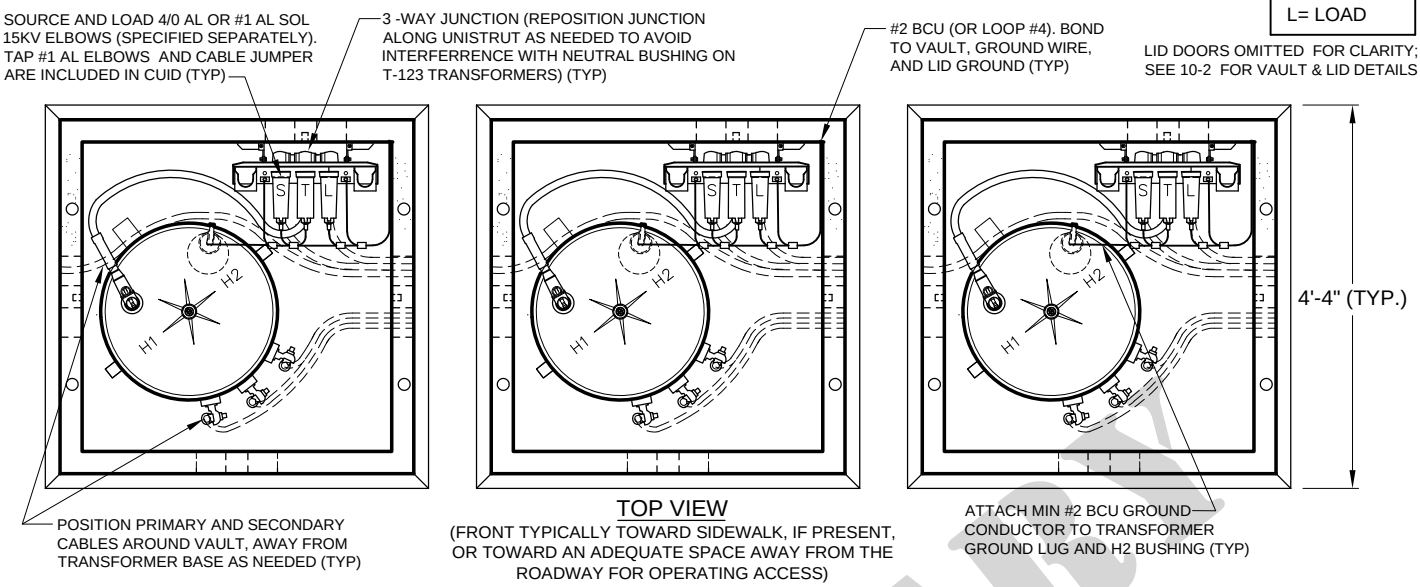
NOTES:
1) SEE NOTES 1, 2, 3, AND 5 IN SECTION 7-5, PAGE 2.
2) THESE 1-PHASE TRANSFORMER OPTIONS ARE ONLY A TEMPORARY APPLICATION AND WILL BE EVALUATED FOR CONTINUED USE AT THAT TIME BASED ON SUPPLY CHAIN CONDITIONS.
3) THIS TYPE-123 TRANSFORMER REQUIRES A MCLF FOR UPSTREAM PROTECTION (EXCEPT FOR AREAS WITH LESS THAN 3500A FAULT CURRENT)

CUIDS
E.UG1-7KV-240V-25KVA-TEMP
E.UG1-7KV-240V-50KVA-TEMP
(NO CUID FOR 75KVA UNLESS REQUESTED)

THREE PHASE T-123 (120/208V) AND T-122 (277/480V) (MODIFIED T-003 AND T-022 OH TRANSFORMERS) TRANSFORMERS IN 4X4 VAULTS (45, 75, OR 150 KVA ONLY)

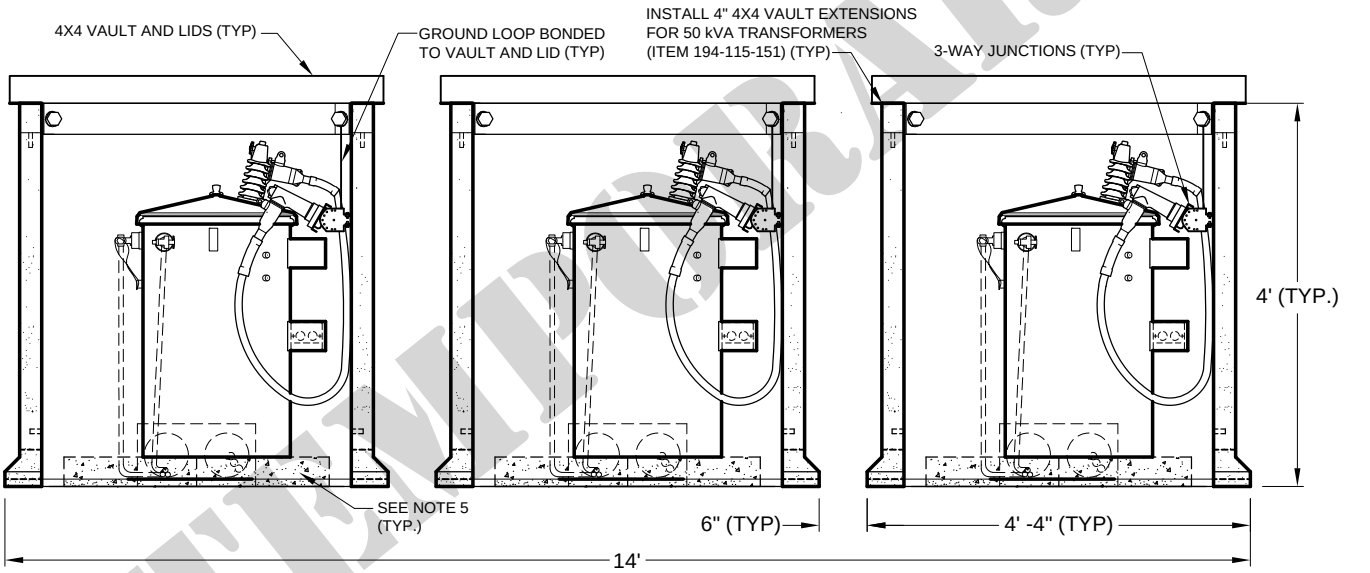
NOTE: THESE 3-PHASE TRANSFORMER OPTIONS ARE ONLY A TEMPORARY APPLICATION AND WILL BE EVALUATED FOR CONTINUED USE AT THAT TIME BASED ON SUPPLY CHAIN CONDITIONS.

S= SOURCE
T= TAP
L= LOAD



TOP VIEW

(FRONT TYPICALLY TOWARD SIDEWALK, IF PRESENT, OR TOWARD AN ADEQUATE SPACE AWAY FROM THE ROADWAY FOR OPERATING ACCESS)



SIDE VIEW

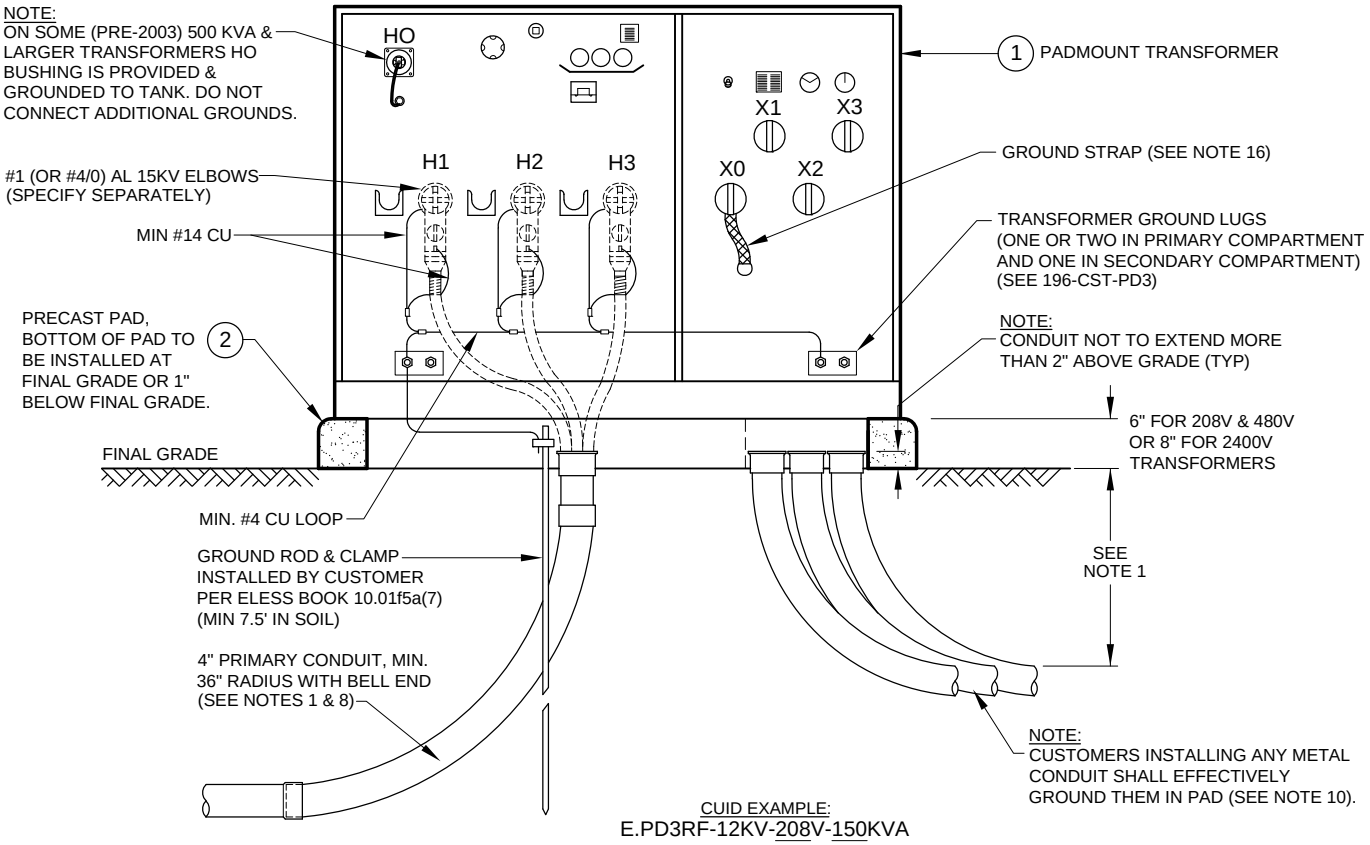
NOTE:
PRIMARY, SECONDARY CONDUCTORS AND CONDUIT INLET DASHED FOR CLARITY

1. Secondary conductor by customer.
2. For Wye connected primary (12470 volt system), Identify neutral cable with white phasing tape.
3. See transformer connection diagrams 7-11, page 1 for 208V or page 2 for 480V for connections.
4. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!
5. Install transformer on 18" X 18" X 4" blocks (4 typ) (365-100-010).
6. Leave sufficient slack on concentric neutrals to allow removal of elbows from bushing without disconnecting neutrals.
7. Select the proper lid for the installation type (see 10-2, page 1).
8. Current limiting fuses (X-LIMITER, SL, SX, or MCLF) are required for upstream protection where the fault current exceeds 3500 amps.
9. Only one secondary conductor per phase is allowed in the transformer vaults for 45 kVA and 75 kVA 3-phase transformer sizes. More than one conductor per phase is allowed in the transformer vaults for 150 kVA 3-phase transformer size (Example: parallel 350 kcmil CU conductors into a customer owned secondary 3-way junction with a single 350 kcmil CU conductor per phase to each of the three 50 kVA transformers). Only copper conductor is allowed within the vaults. Maximum conductor size is: 350 kcmil CU for 75 & 150 kVA transformers with 120/208V secondary or 150 kVA transformer with 277/480V secondary, 4/0 AWG CU for 45 kVA transformer with 120/208V secondary or 45 & 75 kVA transformers with 277/480V secondary.

CUIDS

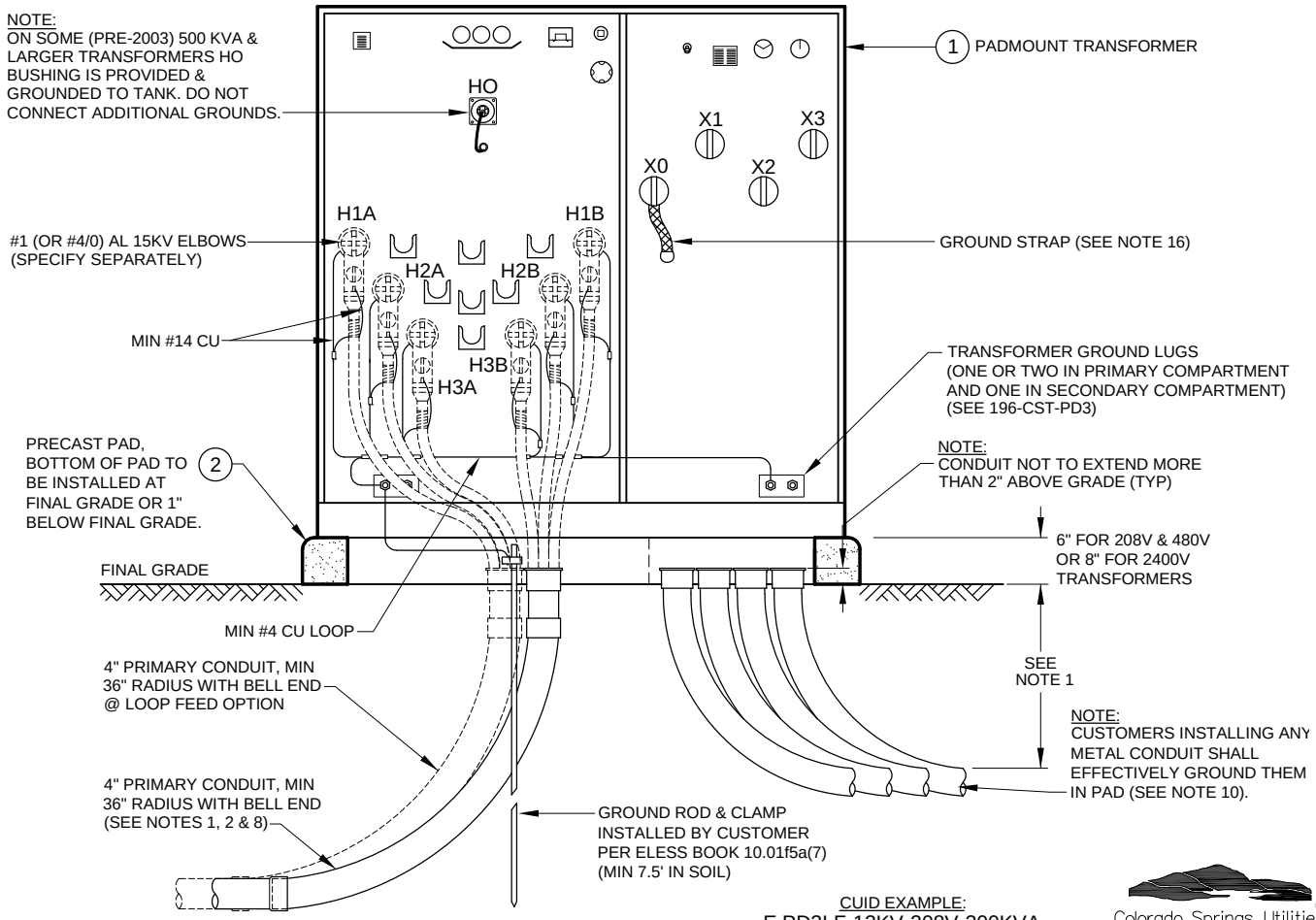
E.UG3-12KV-208V-45KVA
E.UG3-12KV-208V-75KVA
E.UG3-12KV-208V-150KVA
E.UG3-12KV-480V-75KVA
E.UG3-12KV-480V-150KVA

RADIAL FEED OPTION



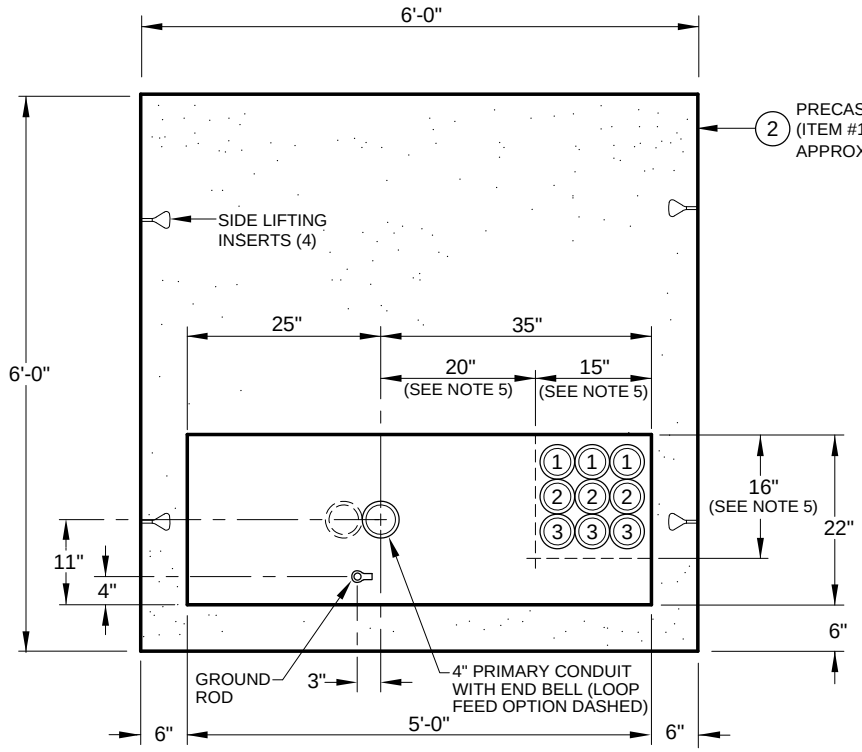
CUID EXAMPLE:
E.PD3RF-12KV-208V-150KVA

LOOP FEED OPTION

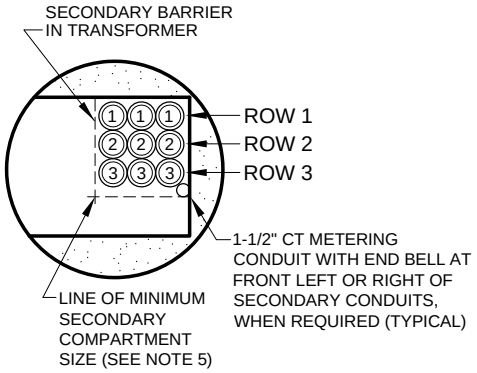


CUID EXAMPLE:
E.PD3LF-12KV-208V-300KVA

PAD AND CONDUIT DETAILS

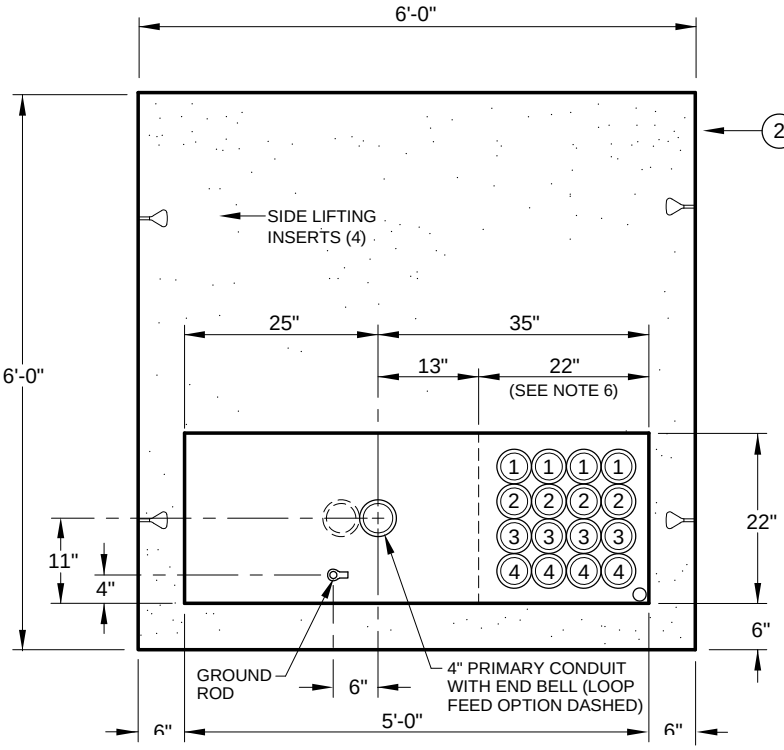


45-150 kVA TRANSFORMER PAD
(SEE NOTE 5)

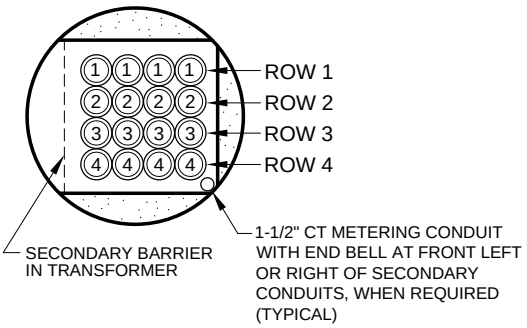


SECONDARY CONDUIT DETAIL
DETAIL SHOWN IS BASED ON MAXIMUM
(9) 3-1/2" DUCTS WITH BELL ENDS (SEE NOTE 3)

NOTE
NO FIELD BENDING OF CONDUIT IS ALLOWED, ONLY FACTORY BENDS ARE ACCEPTABLE.

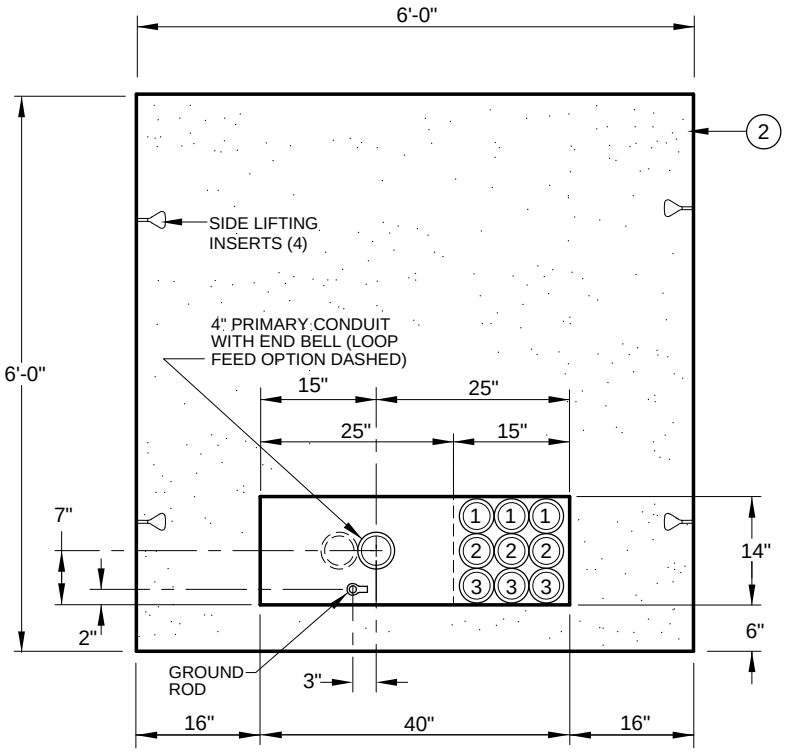


300-2500 kVA TRANSFORMER PAD
(SEE NOTE 6 & 18)

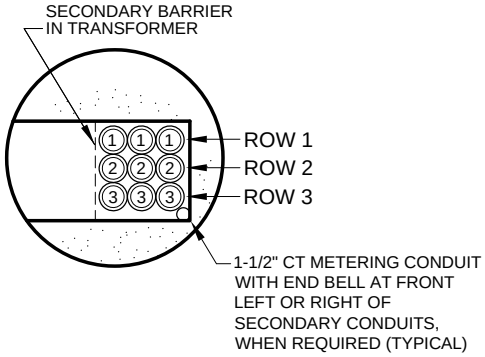


SECONDARY CONDUIT DETAIL
DETAIL SHOWN IS BASED ON MAXIMUM
(16) 3-1/2" DUCTS WITH BELL ENDS (SEE NOTE 3)

PAD AND CONDUIT DETAILS



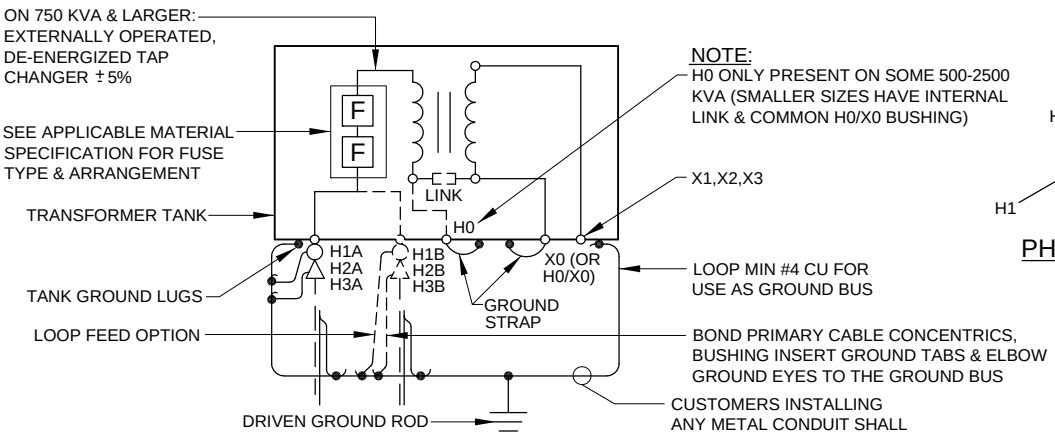
45-500 kVA REFURBISHED TRANSFORMER PAD



SECONDARY CONDUIT DETAIL
DETAIL SHOWN IS BASED ON MAXIMUM
(9) 3-1/2" DUCTS WITH BELL ENDS (SEE NOTE 3)

NOTE

NO FIELD BENDING OF CONDUIT IS ALLOWED, ONLY FACTORY BENDS ARE ACCEPTABLE.



ONE LINE SCHEMATIC

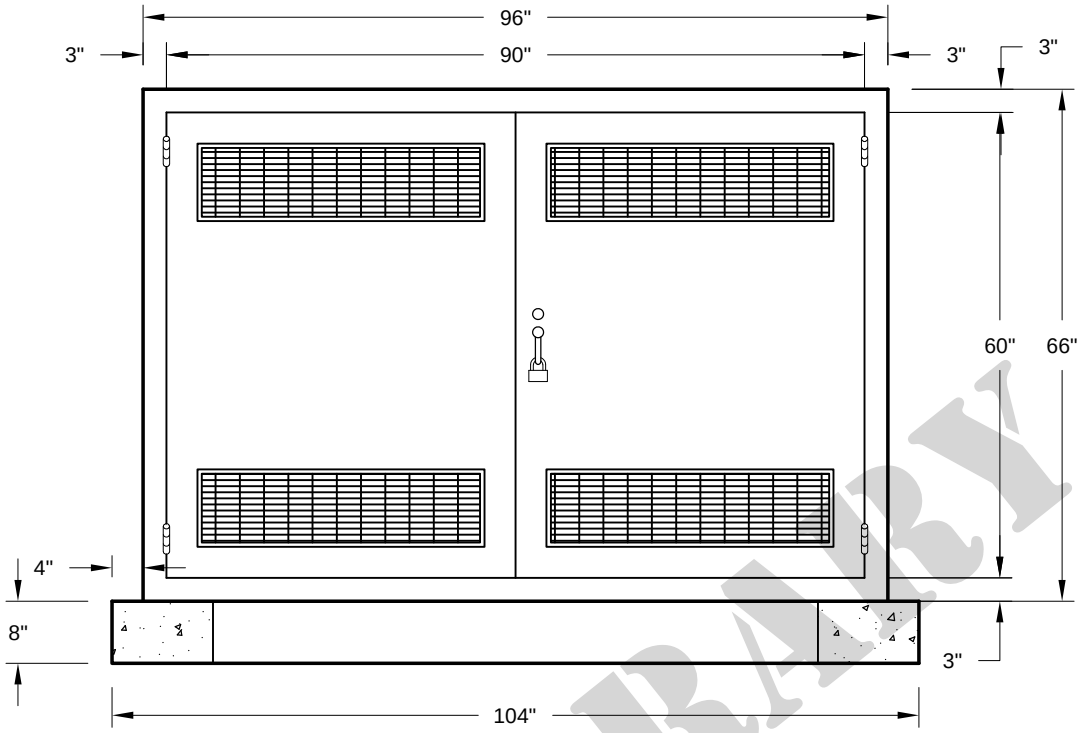
PHASOR DIAGRAM

NOTES:

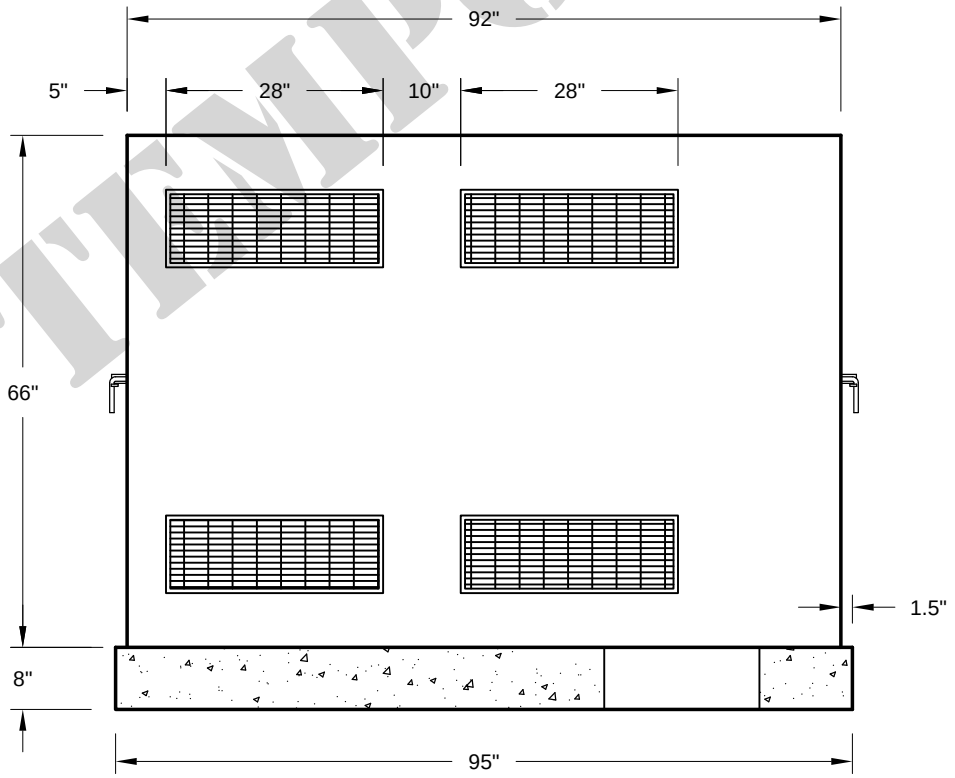
1. All conduits shall be installed by the customer to Colorado Springs Utilities specifications. Refer to EDCS 11-3 for specifications on primary conduit, and EDCS 11-1 for primary/secondary conduit depths, trench backfilling and compaction, and pad compaction requirements.
2. For radial feed installation of a loop-type transformer, both primary conduits shall be installed. If one is not used, it shall be stubbed and capped at least 2' out from the front edge of the pad with an 8" UG marker installed above the end.
3. Placement of multiple secondary conduits shall be by rows from back to front, example: row 1 first, then row 2, etc. Fill back row first prior to starting the next row forward, filling front row last or used for future use.
4. Do not pour concrete in the conduit window opening unless an older style transformer is issued (see note 6). Pea gravel may routinely be used as a filler if needed.
5. For 45-150 kVA transformers, frame 9 secondary conduits maximum (3 rows of 3 conduits). Each row to fit within 15" maximum width from right side of window opening, and within 16" maximum depth from back side of window opening. The distance from the secondary compartment to the center of the primary conduit shall be 22" maximum, 10" minimum. This framing arrangement works with both current and older style transformer secondary compartment dimensions. See page 2.
6. For 300-2500 kVA older style transformers, frame 16 secondary conduits maximum (4 rows of 4 conduits). Each row to fit within 22" maximum width from right side of window opening, and within 22" maximum depth from back side window opening. This framing arrangement works with current style transformer secondary compartment dimensions. See page 2.
7. If an older style transformer is issued and it does not completely cover the window opening, form and fill the exposed area of window and under cabinet with concrete. This keeps energized equipment from being accessible from the outside, maintains cabinet security and supports the cabinet.
8. All vertical primary conduit bends shall have a minimum 36" radius. For primary 4" conduit runs with three (maximum allowed) 90° bends and/or a length of 300' and longer, the vertical conduit bend into the transformer pad shall be Fiberglass or GRC material. Otherwise, primary 4" conduit runs with two or less 90° bends and a length of less than 300', the vertical conduit bend into the transformer pad may be PVC material. (See ELESS book, Appendix C, Table 3 for 4" 90°, 36" radius fiberglass elbow material requirements).
9. Field Engineer to specify EDCS 19-9 for pads poured-in-place when access with precast pad is not available.
10. NESC-314B: Conductive-material ducts and riser guards that enclose electric supply lines, or are exposed to contact with open supply conductors, shall be effectively grounded.
11. When terminating three phase loop feed transformers, cables using conduit on the left side shall be terminated to the HxA bushings. Cables using conduit on the right side shall be terminated to HxB bushings to prevent crossing of primary cables.
12. All secondary conductors shall be installed and terminated by customer to Colorado Springs Utilities EDCS 7-15.
13. Leave slack in secondary and primary cables to permit transformer removal and replacement for maintenance, train primary cables to permit parking elbows.
14. Leave sufficient slack on concentric neutrals to allow removing elbows without disconnecting neutrals.
15. Ground loop in all cases shall be installed in front of primary cables.
16. CAUTION: Ground strap on neutral bushing shall remain connected to tank in all cases (except for XO bushing in special cases, such as 2400V motor loads), tank will be energized to primary voltage if primary neutral tank grounds are disconnected and one open primary phase exists on the source side of the transformer without H0 bushings.
17. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!
18. For secondary voltage over 480V, refer to manufacturer's drawings to determine suitable pad size, see also pads in 7-7.
19. It is the customer's responsibility to seal the customer's secondary ducts from water entering the customer's equipment or building that originate from a Colorado Springs Utilities' transformer or vault.
20. No conduit field bends are allowed, only factory conduit bends are acceptable.
21. Remove all exterior lifting eyes/bolts, secure with padlock, anchor to pad.

THREE PHASE (MODIFIED OH TRANSFORMER) PADMOUNTED TRANSFORMER

NOTE: THESE TRANSFORMER OPTIONS ARE ONLY A TEMPORARY APPLICATION AND WILL BE EVALUATED FOR CONTINUED USE AT THAT TIME BASED ON SUPPLY CHAIN CONDITIONS.



EXTERNAL FRONT AND BACK VIEW



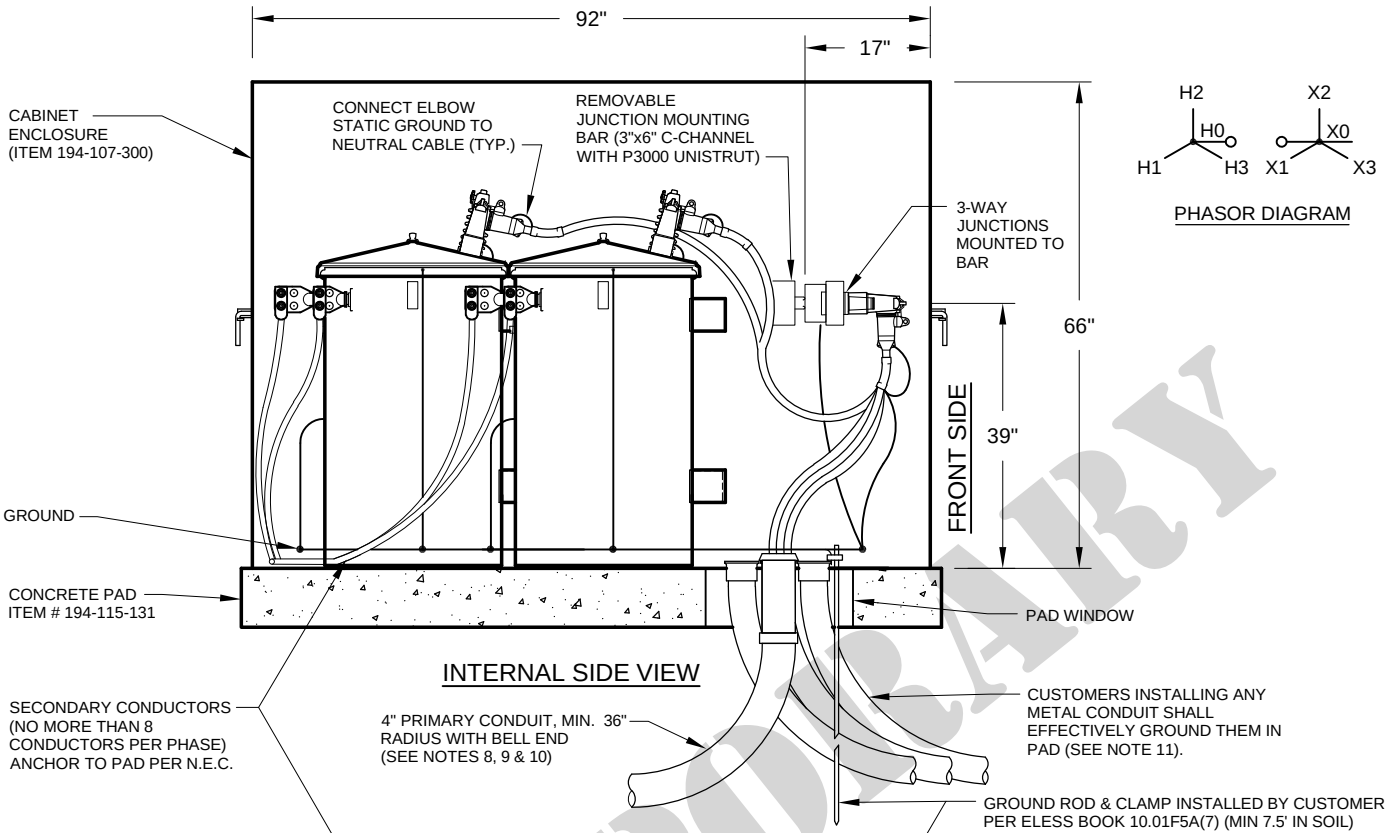
EXTERNAL SIDE VIEW

CUIDS

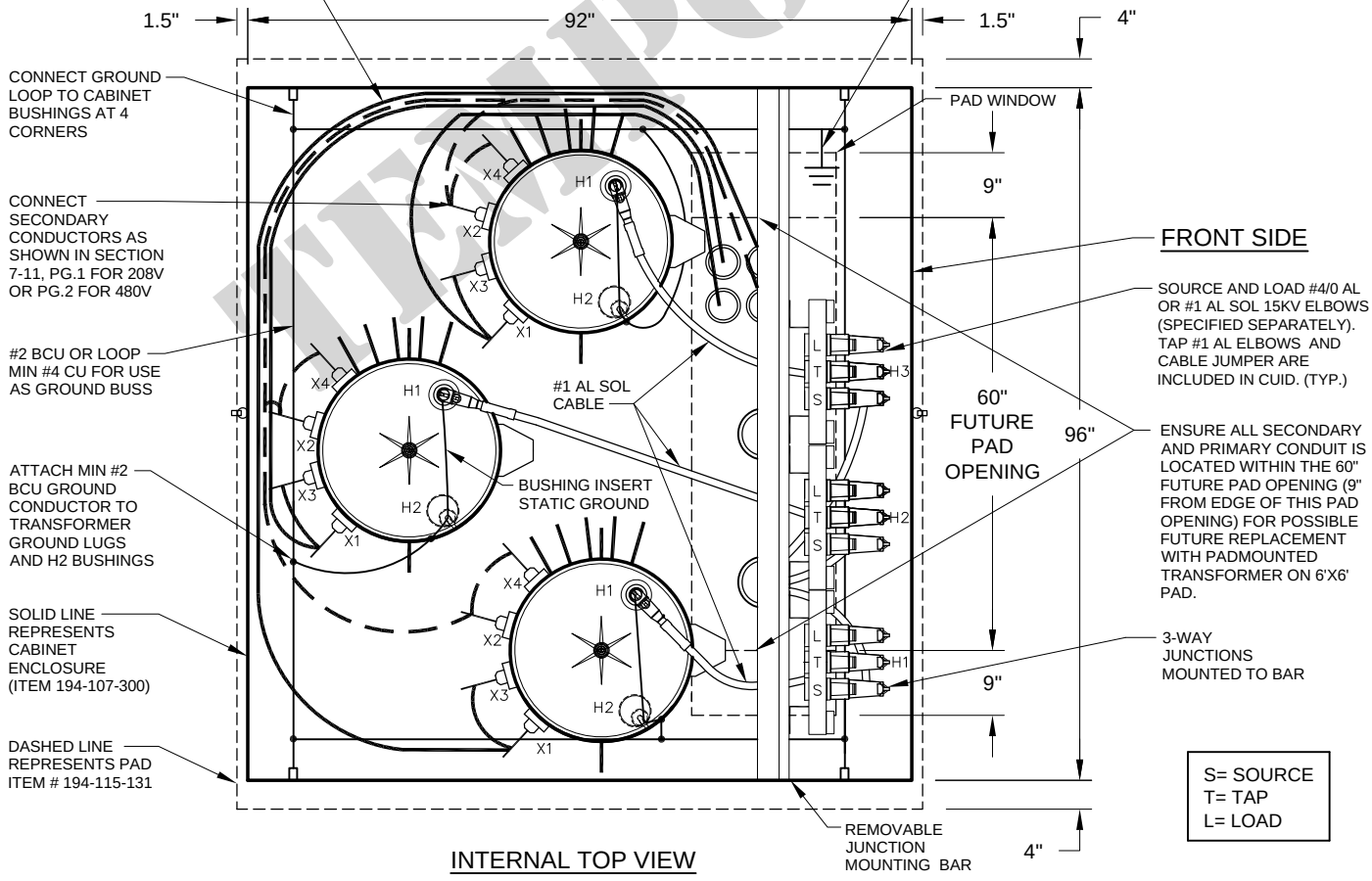
E.PD3-12KV-208V-225KVA
E.PD3-12KV-208V-300KVA
E.PD3-12KV-208V-500KVA
E.PD3-12KV-480V-225KVA
E.PD3-12KV-480V-300KVA
E.PD3-12KV-480V-500KVA

THREE PHASE (MODIFIED OH TRANSFORMER) PADMOUNTED TRANSFORMER

NOTE: THESE TRANSFORMER OPTIONS ARE ONLY A TEMPORARY APPLICATION AND WILL BE EVALUATED FOR CONTINUED USE AT THAT TIME BASED ON SUPPLY CHAIN CONDITIONS.



PHASOR DIAGRAM



THREE PHASE (MODIFIED OH TRANSFORMER) PADMOUNTED TRANSFORMER

NOTE: THESE TRANSFORMER OPTIONS ARE ONLY A TEMPORARY APPLICATION AND WILL BE EVALUATED FOR CONTINUED USE AT THAT TIME BASED ON SUPPLY CHAIN CONDITIONS.

NOTES:

1. Secondary conductor by customer.
2. For wye connected primary (12470 volt system), identify neutral cable with white phasing tape.
3. See transformer connection diagrams 7-11, page 1 for 208v or page 2 for 480v for connections.
4. NESC rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!
5. Leave sufficient slack on concentric neutrals to allow removal of elbows from bushing without disconnecting neutrals.
6. Current limiting fuses (X-Limiter, SL, SX, or MCLF) are required for upstream protection where the fault current exceeds 3500 amps.
7. All conduits shall be installed by the customer to Colorado Springs Utilities specifications. Refer to EDCS 11-3 for specifications on primary conduit, and EDCS 11-1 for primary/secondary conduit depths, trench backfilling and compaction, and pad compaction requirements.
8. For radial feed of a future loop feed transformer installation, both primary conduits shall be installed. If one is not used, it shall be stubbed and capped at least 2' out from the front edge of the pad with an 8" UG marker installed above the end.
9. All vertical primary conduit bends shall have a minimum 36" radius. For primary 4" conduit runs with three (maximum allowed) 90° bends and/or a length of 300' and longer, the vertical conduit bend into the transformer pad shall be Fiberglass or GRC material. Otherwise, primary 4" conduit runs with two or less 90° bends and a length of less than 300', the vertical conduit bend into the transformer pad may be PVC material. (See ELESS book, Appendix C, Table 3 for 4" 90°, 36" radius fiberglass elbow material requirements).
10. NESC-314B: Conductive-material ducts and riser guards that enclose electric supply lines, or are exposed to contact with open supply conductors, shall be effectively grounded.
11. No conduit field bends are allowed, only factory conduit bends are acceptable.

TRANSFORMER SECONDARY SPADE CONNECTIONS

1. All compression or mechanical connectors shall be listed for use on AL and CU.
2. All secondary connections to padmount transformers shall be made with plated 1/2" medium carbon steel bolts, heat treated, quenched and tempered equal to ASTM A-325 or SAE grade 5.
3. Nuts shall be plated 1/2" heavy semi-finished hexagon, conforming to ANSI B-18.2.2, threads to be unified course series (UNC), class 2B.
4. Flat washers shall be plated steel, a plain standard WIDE series with min. O.D. of 1-5/8", conforming to ANSI B-27.2. SAE or narrow series washers shall NOT be used.
5. Spring-type (Belleville) disc washers shall be as follows: O.D. = 1-5/8", thickness = 0.140", normal load to flat = 3000 lbs. min., torque to flat. Bolts shall be tightened until an increase in torque is felt, in this manner no torque wrench is required and spring (Belleville) washer will be flattened.
6. Hardware shall be assembled as shown in Figures 1 & 2, with the sequence of connections starting from the back first as shown in Figure 3.
7. All hardware shall be lubricated with a suitable joint compound before tightening.
8. Back-up wrenches shall be used to tighten all hardware, bolts shall be tightened sufficiently to flatten spring washer and left in that position.
9. All multi-cable socket blocks or multi-hole connectors shall meet ANSI C119.4 Class A requirements and have NEMA spacing using 1/2" bolts as shown in Figure 3. Connectors shall have two spade holes per position and be listed as transformer type. 1/2" bolts must be used for all available connector spade holes. Junction box connectors are not allowed. No secondary transformer spade holes shall be covered by overlapping of customer's/contractor's lug connector(s). If overlapping does occur then the customer's/contractor's lugs holes will have to be drilled to a 1/2" hole by the customer/contractor to conform to the bolt specs in this section.
10. Bus bar extension (when required on retrofits) shall be in the vertical position only, using four bolt NEMA spacing. Bus bar material to be tin plated aluminum or copper.
11. Solid bus bar or bus way (when used) shall have a flexible expansion coupling between the bus and the transformer spade with the bus supports as required by the NESC to carry all weight of the bus.
12. Transformer spades and cantilever support assemblies shall NOT be drilled or altered, (defacing of spade or supports will result in refusal by Utilities inspector until spade/supports are replaced on a time and material cost and proper connections are made).
13. All connections shall be inspected by Colorado Springs Utilities Inspectors before energizing.

TABLE 1

TRANSFORMER TYPE	TRANSFORMER SIZE (KVA)	NUMBER OF POSITIONS ON SECONDARY SPADE CONNECTOR					
		2	3	5	6	8	9
150, 160 & 190	45-150		X				
	300			X			
	500				X		
	750					X	
	1000						X
153, 163 & 191	75-500		X				
	750			X			
	1000				X		
	1500					X	
	2000-2500						X
175, 176, 375 & 376	1000-2500	X					
177	750			X			
391	150		X				

REPLACEMENT SECONDARY TRANSFORMER SPADES	
ITEM NUMBER	NUMBER OF HOLES
194-101-141	8
194-101-142	10
194-101-143	12
194-101-145	16
194-101-147	20

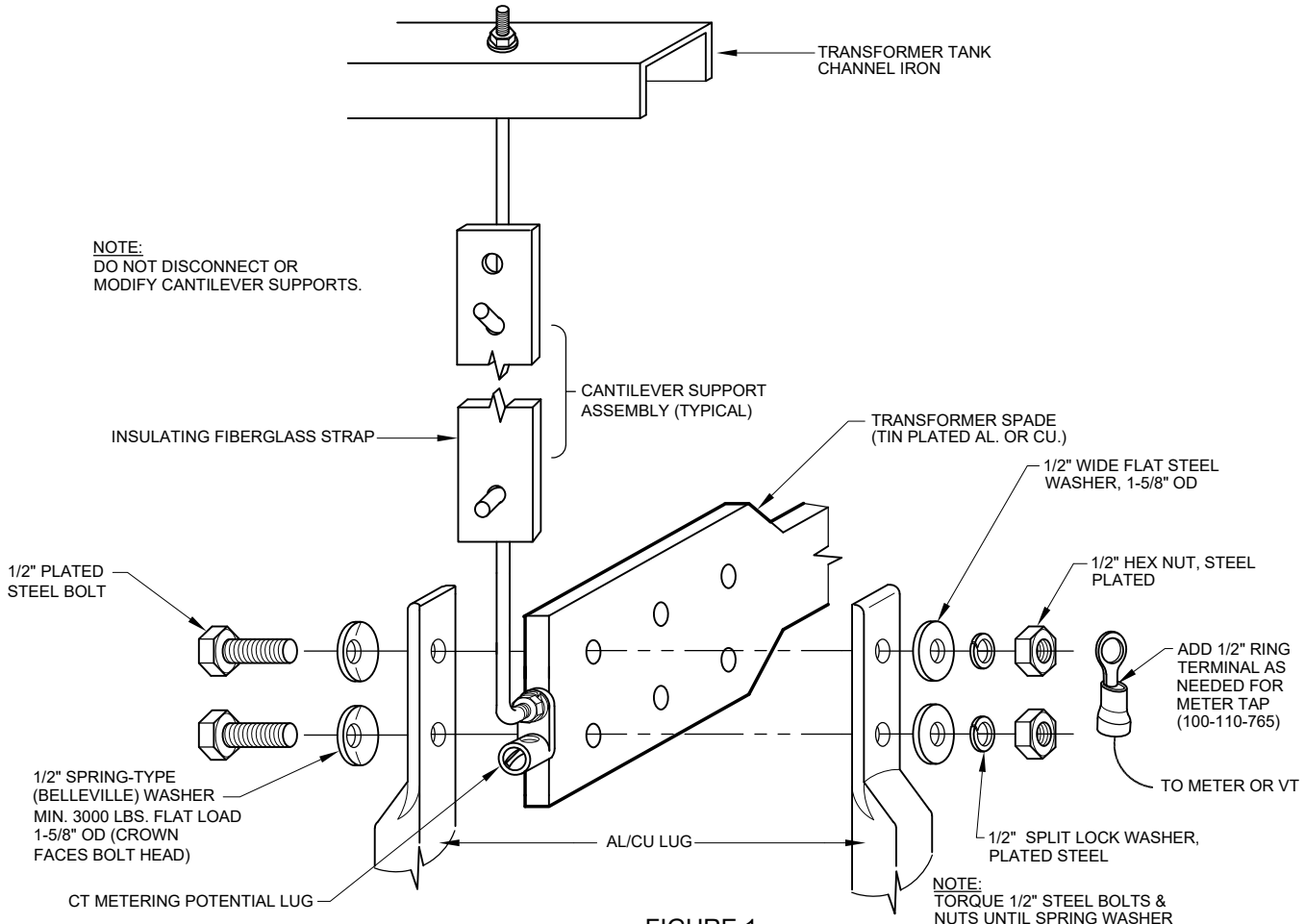


FIGURE 1
HARDWARE ASSEMBLY & TYPICAL CANTILEVER SUPPORT

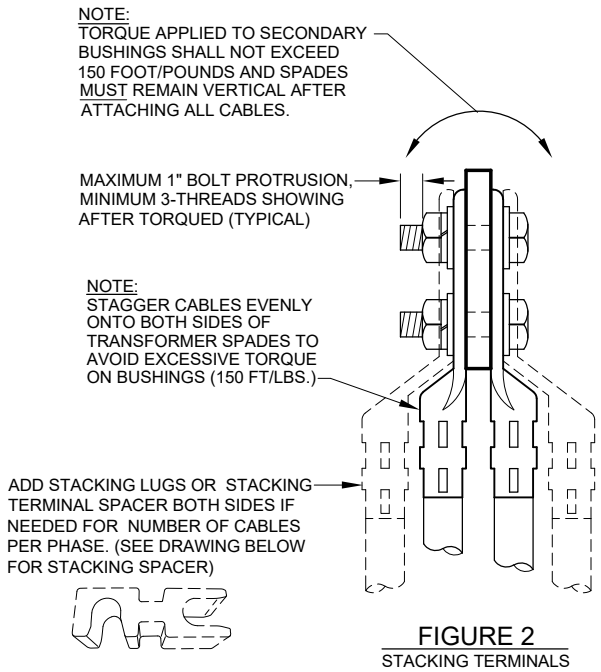


FIGURE 2
STACKING TERMINALS

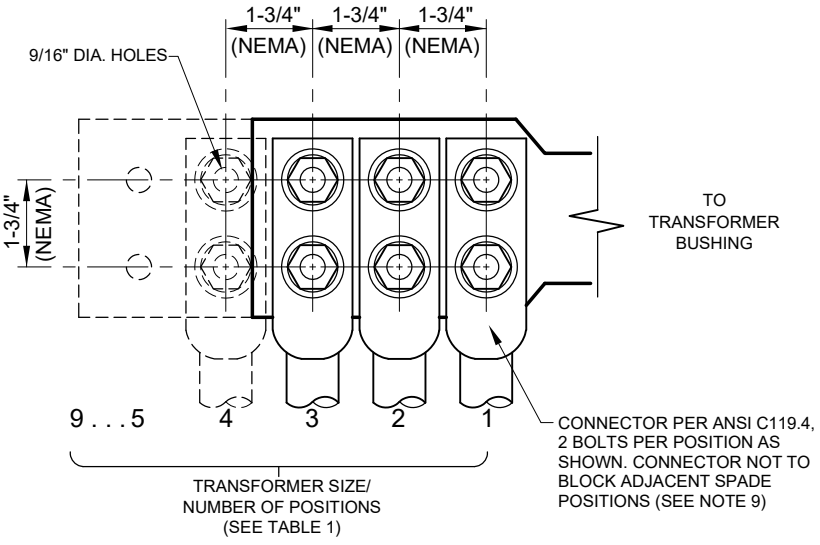


FIGURE 3
SPADE BOLT PATTERN & SEQUENCE OF SECONDARY CABLE CONNECTIONS

NOTE:
IF 2" CLEARANCE BETWEEN OUTSIDE LUGS AND CABINET OR OTHER PHASES CANNOT BE MAINTAINED, INSULATE WITH LISTED ELECTRICAL TAPE AND PROVIDE AT LEAST 1" CLEARANCE MINIMUM (VERIFY THIS CLEARANCE DIMENSION WITH QC PRIOR TO INSTALLATION).

Colorado Springs Utilities
Specification for Indoor Transformer Vaults

1. SCOPE:

Pad-mounted transformers, located outside, away from any structures, and on the customer's property, is the standard for all commercial installations. In some cases, where it has been determined that an outdoor location is not available, a vault installation may be utilized. This must be approved for use by Utilities Field Engineering, based on no reasonable locations available outside of the building. Colorado Springs Utilities will provide top-feed transformers with less-flammable oil for these cases.

This General Specification is to be used as a definition of Company policy concerning the installation of transformer vaults within customer premises. This shall be understood to be minimum requirements. Any deviation from this specification must be approved in writing by Colorado Springs Utilities. Utilities will not provide electrical service to the customer until the vault is completed in accordance with this specification.

The customer shall provide an electrical vault at ground level, with external access, inside of the building that meets the requirements of this document and all applicable state and local code requirements. The customer is responsible for installing and maintaining any items such as sprinklers, smoke alarms, etc. that may be required by local authorities. All alternate vault locations must be approved in writing by Utilities.

The installation must meet all applicable state and local code requirements The Vault shall be built in accordance with Article 450 part III, and Articles 230-250, and other applicable sections of the most current edition of the National Electric Code (NEC). This shall be considered the minimum requirements. Where conflicts occur between this document and the NEC the more stringent requirement shall apply.

After the vault is completed and accepted by Utilities, no work shall be done on, in or through the vault without the permission of Utilities. This includes all future customer services, and vault modifications. **Maintenance of the vault once complete will be the responsibility of the building owner.**

2. STANDARD SERVICE VOLTAGE:

A. For available voltage levels, see the Electric Line Extension Service Standards, 3.02.

3. SIZE OF VAULT

The size of the vault is determined by the building's load and the number of transformers. The vault drawings on pages 9 & 10 show Utilities requirements for vault space based upon one or two transformers. Minimum inside vault dimensions are shown in the drawings to allow necessary maintenance, switching and cable pulling. This area is to be kept clear of any materials or debris. The ceiling height shall be a minimum of 10 feet.

4. BUILDING MATERIALS FOR VAULT

A. The support walls, floor, and ceiling shall have a minimum 3 hour fire rating, (class A) and be constructed as follows.
    1. Reinforced concrete – 6” thick minimum, (preferred construction)
    2. Reinforced concrete – filled block – 8” thick minimum

B. The floor shall be designed to support the weight of the transformer and other associated equipment that is installed. Each transformer bay should be able to support the minimum weight of 12,000 lbs. for each 1,000 kVA transformer.

C. The vault shall have a 4 inch tall concrete curb around the perimeter of the vault, with a removable curb section at the main doorway that spans the entire doorway and that is sealed for oil containment per NEC 450.43B. The removable curb shall be bolted to the floor (see drawings for curb placement). The vault floor shall be flat and on the same plane as the adjacent sidewalk or driveway to assist removal of the transformer by rolling.

D. The floor and curb shall be sealed with Dayton Superior Corporation DAY-CHEM AGGRE-GLOSS (J-25) or equivalent. The space between the removable curb, floor and permanent curb shall be filled with a silicone base caulk and sealed with the afore mentioned sealant to prevent oil penetration.

E. The customer shall provide rolling and jacking equipment for the installation and removal of the transformer. The rolling equipment shall be TECHIMPEXUSA model number SFT-16 and the jacking equipment shall be (2) TECHIMPEXUSA model number Z-5 or equivalents. (2) 4” X 4” X 40” long steel channels shall be provided to set the transformer on and capable of supporting the load at 4 points, up to 6,ooo lbs. at each point.

5. VAULT VENTILIATION

The ventilation system for the vault shall be unique and will be reviewed and approved by Utilities. There shall be no tie into the building system (no exceptions) for both intake and exhaust. These intake and exhaust openings shall not be located near any adjacent ventilation systems. The ventilation system can be either Gravity Flow or Forced Air.

A. The air spacing or opening between each louver shall measure a maximum distance of 4 inches. The louvers shall be thermostatically controlled and the electrical feed to the louvers shall come from a separate grid vault. **Thermostatically controlled louvers are required on both gravity flow and forced air venting.** A screen or wire mesh, which covers the vault-side of the entire louvered section(s), is required to prevent birds or other animals from entering the vault. This layout and others which are designed to freely circulate a sufficient amount of air throughout the vault and around the electrical equipment will be acceptable.

B. Gravity Flow – The net free area (opening area minus the area of the louvers and, or grating) shall be no less then (3) square inches per KVA capacity installed in the vault. The ventilation openings shall in conformance with Article 450-45 of the NEC. Final ventilation locations to be verified by the Utilities engineer.

C. Forced Air – Forced air ventilation will required additional vault space for the duct and blower motor. The customer shall provide Colorado Springs Utilities with the complete specification for the ventilation system. The customer shall install the ventilation system. The blower shall be thermostatically controlled.

    Requirements: For forced air, the ventilation system shall be capable of providing five (5) cubic feet per minute per KVA of capacity installed in the vault. Air flow shall be directed to the

transformers so that air will flow through and around the radiators of the transformer tank.

6. ELECTRICAL

A. Grounding: The rebar superstructure in the floor and the rebar superstructure in all of the vault walls surrounding the transformers shall be bonded together. Each corner (4) of the transformer vault shall have a grounding connection point bonded to the rebar superstructure in the walls. The grounding connection point shall consist of a significant piece of 2/0 stranded bare copper wire bonded to the rebar superstructure to allow a sufficient length of said 2/0 stranded copper wire to be routed on the floor, under ramps, to the transformer(s). The connection for 1/2" rebar shall be made with Burndy Compression Connector (YGHP29C2), the connection for 5/8" rebar shall be made with Burndy Compression Connector (YGHP34C26). The connections shall be made with Burndy type Y-35 Hypress hand-operated hydraulic tool. No other method for attaching 2/0 stranded bare copper will be accepted. **All rebar and grounding connection points shall be inspected by Utilities Quality Control Inspectors before any concrete is poured. Any failure to comply with this specification will mean the removal of all concrete for inspection purposes.**

B. The secondary conductors and connections shall be installed and owned by the customer. These shall be routed above the transformer as shown in the drawings. The transformer will be an Underground Commercial (UCT), Type 170/173. The cables entering the room shall be in conduit and the conduit sealed in the oil containment area. All cables shall be sealed inside the conduit to prevent the entrance of gas into the vault. See Appendix F; drawings 7-15 for connection requirements. No single service entrance shall exceed a 4000 ampere rating, per transformer.

C. Conduit and Cables

1. The customer shall provide all conduit runs needed by Utilities conductors within the building. Any conduit run(s) encased in concrete shall have a minimum of 2" cover. In all cases conduit runs should be as near straight as possible, and free of excessive bends. Utilities shall designate the location of all conduit entrances prior to construction. The customer will provide all primary services conduit from outside the building to the transformer vault, entering up through the floor into the room. Duct openings shall be installed at least 6 inches above the floor and sealed as stated above.

2. Utilities will provide and own the primary conductors.

D. Lighting of transformer vaults shall be provided and owned by the customer. Fixtures may be installed by a contractor before Utilities occupies the vault space. Lighting shall be 48" LED light strips that are ceiling or wall mounted. Utilities will designate the final placement of all lighting, before installation in the vault. Lighting shall not be positioned directly over the transformers. All wiring must conform to the current edition of the NEC and the "Electric Line Extension & Service Standards" (ELESS). The transformer vault shall have, at a minimum one, 120 volt convenience outlet.

E. The metering for the building shall conform to chapter 5 of the ELESS. All metering shall be located outside of the transformer vault. The customer shall have prior approval from the Utilities Meter Shop and Field Engineering Departments for any job requiring instrument transformers and any fabrication of such equipment. All such drawings for the specified equipment shall be provided to both Utilities Meter Shop and Field Engineering Departments for approval prior to fabrication of the metering equipment.

F. Smoke alarms shall be installed and owned by the customer per NFPA standards.

7. VAULT ACCESS

A. Provisions must be made for employees authorized by Utilities to access the vault. All passageways and openings shall be made so that the vault equipment (including transformers) can be replaced during future maintenance. **The main doorways to the street shall be a minimum 8 feet tall and 6 feet wide, the doors shall be Class "A" fire rated. If two doors with a center post are used in each opening, the center post must be removable**. The doors shall open out of the vault and all double doors must be capable of latching at the top, bottom, and middle. The hinges on these doors should have a set screw to prevent hinge pins and doors from being lifted out. These doors shall not open into or near any of the building's air supply/ventilation systems. Doors shall be labeled and include Fire Exit hardware as required by NEC 110.31. All access doors to the vault shall have electrical warning labels installed. Two access locations are required, on opposite ends of the vault. The customer shall provide all door lock sets to be keyed alike to Schlage B660P.

B. (2) lockable boxes shall be provided by the customer and attached next to the vault doors. One box shall contain a labeled key for fire emergency access with a Colorado Springs Fire Department designated lock. The other box shall be made available for a Utilities padlock. The boxes shall be ordered from Colorado Springs Fire Department.

C. Each vault door shall have an electrical warning label attached to it. Utilities item number 100-130-455 is approved and shall be used for this purpose.

8. ACCEPTANCE CRITERIA

The vault shall be energized only after an inspection by Utilities. The following items must be completed before such inspection (and the subsequent vault energizing) occurs:

1. Fireproofing of steel beams within the vault must be completed.
2. Ventilation system shall be installed and operable.
3. Vault floor, curb and 4" removable curb shall be sealed as required to prevent transformer oil from penetrating the vault floor.
4. Customer service entrance conduit shall be installed and sealed where the bus goes through the vault wall to the customer's switch gear room.
5. Permanent fire doors, smoke detectors, and locks shall be installed and operational.
6. Removable curb furnished per spec.
7. **Utilities does not allow any foreign objects to enter the transformer vault. Surface-mounted rigid electrical conduit and outlet boxes are allowed provided they are approved by the local authorities.**

9. CUSTOMER AGREEMENT

A statement shall be signed and returned to Utilities agreeing to build the vault according to these vault specifications. An additional statement shall be signed and returned to Utilities designating the vault as a Utilities facility with a copy of the statement sent to the Pikes Peak Regional Building Department Electrical Inspector. The only authorized signer is the building owner.

The following statement must be signed by the owner and one copy of the specification returned to:

Colorado Springs Utilities Representative
Energy Services Field Engineering
Colorado Springs Utilities
1521 Hancock Expressway
Colorado Springs, CO 80947-1821

The preceding vault specifications meet with our approval.

_____Owner
_____Date

The undersigned hereby authorizes the use of the transformer vault located in:

Customer Name _____
Address _____
City, State, & Zip Code _____

The vault is designated as a Colorado Springs Utilities facility.

Signed (Field Engineering Supervisor)_____

Date _____

Cc: Pikes Peak Regional Building Department, Chief Electrical Inspector

Acceptance Check List

1. Rebar superstructure and grounding connection points. Pass □ Fail □

Comments: _____
_____

Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

2. Primary and Secondary conduit feeds. Pass □ Fail □

Comments: _____
_____

Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

3. Ventilation system installed and working at required CFM. Pass □ Fail □

Comments: _____
_____

Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

4. Permanent fire doors, smoke detectors, and locks installed & operational. Pass □ Fail □

Comments: _____
_____

Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

5. Customer service entrance ducts installed & sealed where the bus goes through the vault floor to the customer's switch gear rooms. Pass □ Fail □

Comments: _____
_ _____

Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

6. Secondary services tested for proper connections before being energized. Pass □ Fail □

Comments: _____
_____

Utilities Inspector: _____ Owner/ Project Manager_____ Date ____

7. Removable curb installed with accessible bolts and sealed for oil penetration. Pass ☐ Fail ☐

Comments: _____
_____

Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

8. Vault floor and curbing sealed. Pass ☐ Fail ☐

Comments: _____
_____

Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

9. Fireproofing completed. Pass ☐ Fail ☐

Comments: _____
_____

Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

10. No foreign piping in vault. Pass ☐ Fail ☐

Comments: _____
_____

Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

11. All required lock boxes installed Pass ☐ Fail ☐

Comments: _____
_____

Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

12. Jacks and rollers placed in vault. Pass ☐ Fail ☐

Comments: _____
_____

Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

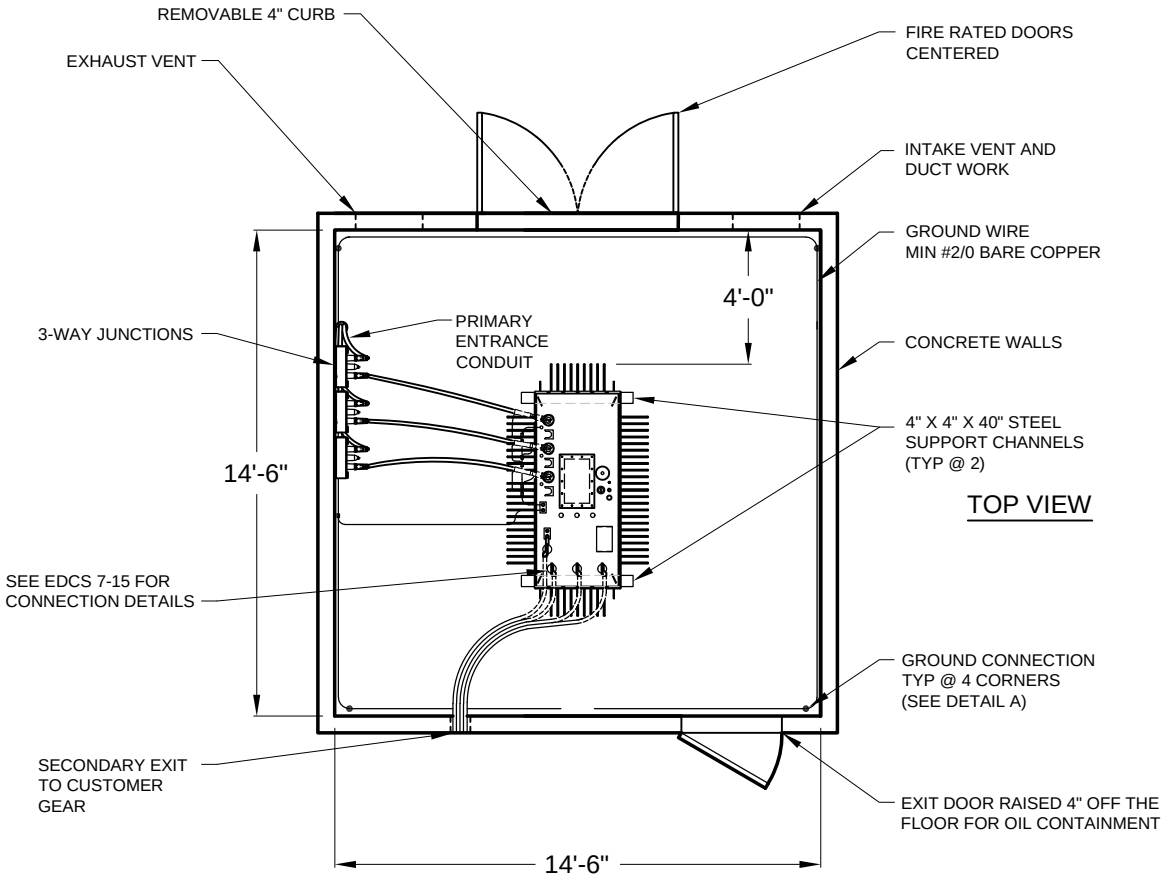
	Pass	Fail
13. Finished vault inspected.	□	□

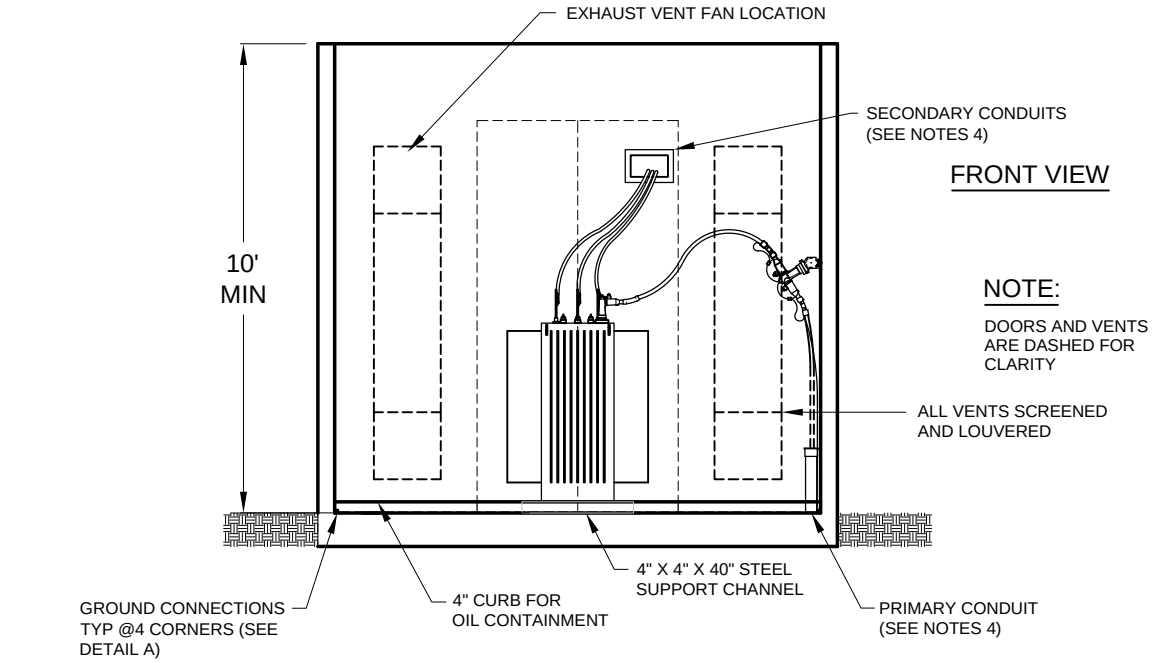
Comments: _____

_____

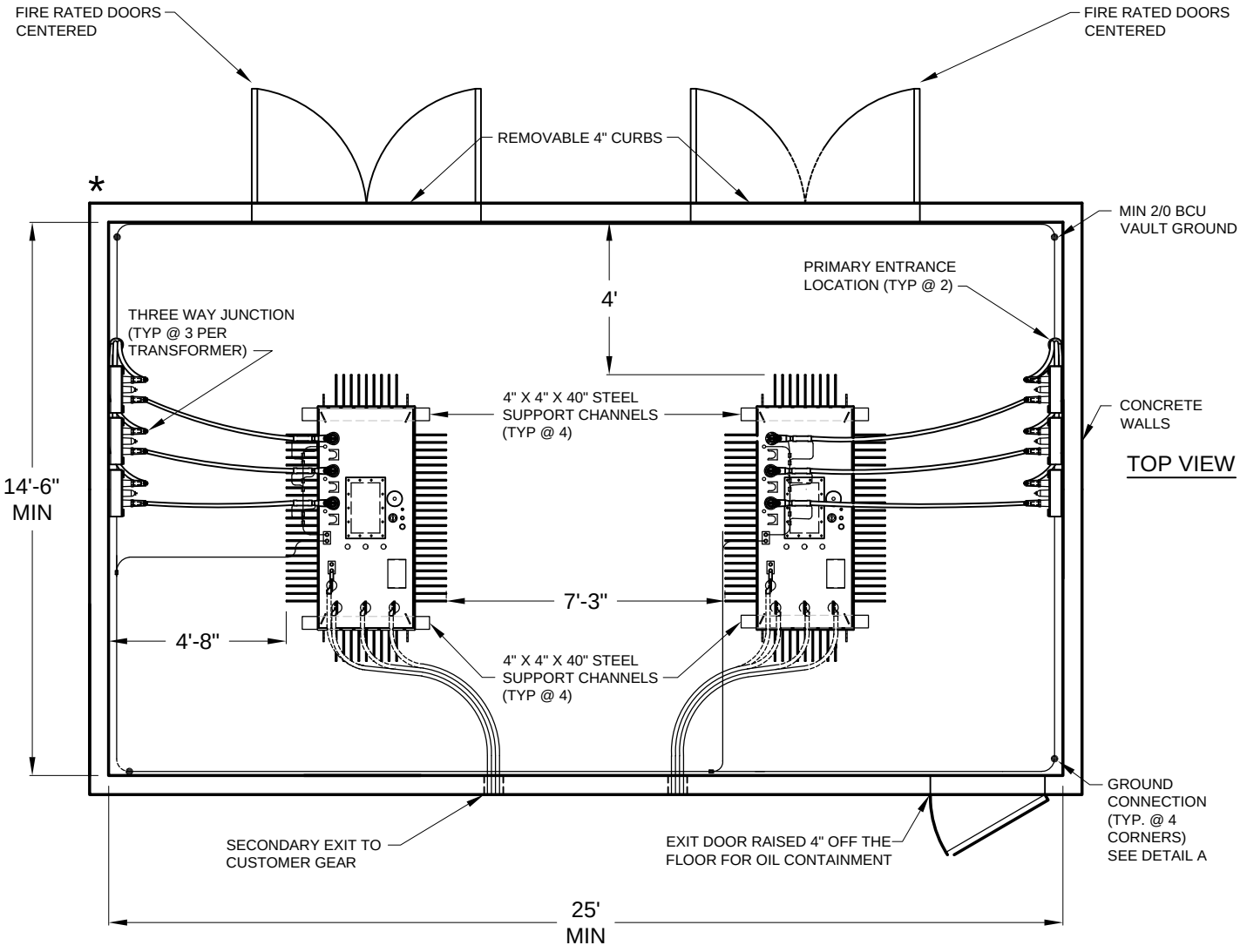
Utilities Inspector: _____ Owner/ Project Manager_____ Date _____

GROUND LEVEL TRANSFORMER VAULT



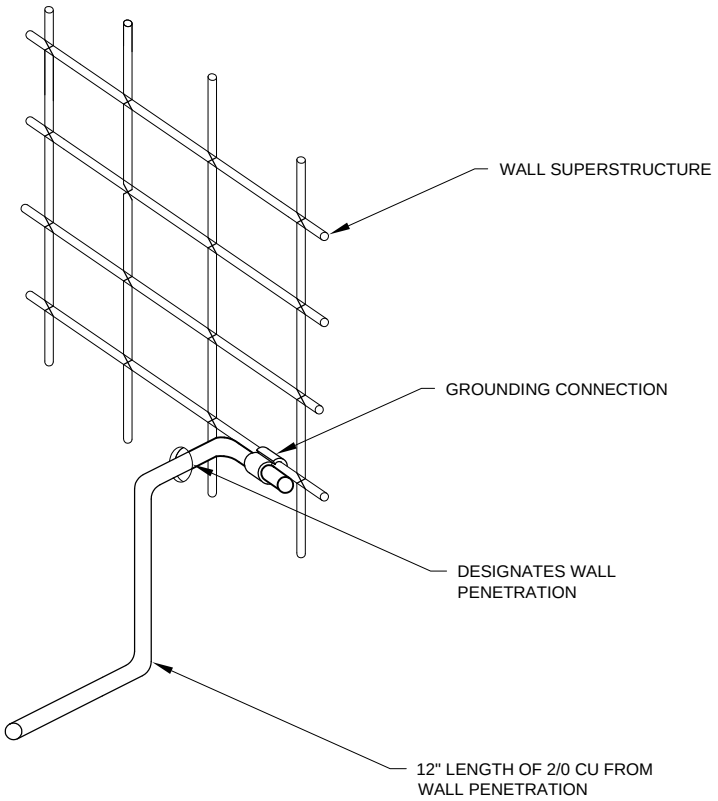


2 UNIT GROUND LEVEL TRANSFORMER VAULT



* SEE PAGE 2 FOR VENTILATION LOCATIONS AND DETAILS.

GROUND LEVEL TRANSFORMER VAULT



DETAIL A

NOTES:

1. Route primary cables along the wall to 3-ways and then to the transformers.
2. See Detail A for grounding connection.
3. For multiple transformer configurations add an additional 12' room width and additional double doors for each additional transformer.
4. The primary conduits enter the vault below the 3-ways that feed the transformer. The secondary conduits that feed the customer gear, are typically located on the rear wall. The final location of the primary and secondary conduits shall be determined before construction. Conduit size is determined by size and number of cables.
5. Ceiling height shall be a minimum of 10 feet and doors shall be a minimum of 8 feet tall.

Colorado Springs Utilities
Specification for Transformers in Alcoves

1. SCOPE:

Pad-mounted transformers, located outside, away from any structures, and on the customer's property, is the standard for all commercial installations. In some cases, where the commercial building is built to the lot line and space for an indoor transformer vault is not available, an alcove shall be provided by the building owner to house the transformers necessary to power the building. This must be approved for use by Utilities Field Engineering, based on no reasonable locations available inside of the building. Colorado Springs Utilities will provide pad-mounted transformers.

This General Specification is to be used as a definition of Company policy concerning the installation of a transformer within an alcove on the customer premises. This shall be understood to be minimum requirements. Any deviation from this specification must be approved in writing by Colorado Springs Utilities. Utilities will not provide electrical service to the customer until the alcove is completed in accordance with this specification.

The customer shall provide an electrical alcove at ground level, with external access, that meets the requirements of this document and all applicable state and local code requirements. The customer is responsible for installing and maintaining any items that may be required by local authorities. All alcove locations must be approved in writing by Utilities.

The installation must meet all applicable state and local code requirements The alcove shall be built in accordance with Article 450 part III, and Articles 230-250, of the most current edition of the National Electric Code (NEC). This shall be considered the minimum requirements. Where conflicts occur between this document and the NEC the more stringent requirement shall apply.

After the alcove is completed and accepted by Utilities, no work shall be done on, in or through the alcove without the permission of Utilities. This includes all future customer services, and alcove modifications. **Maintenance of the alcove once complete will be the responsibility of the building owner.**

2. STANDARD SERVICE VOLTAGE:

A. For available voltage levels, see the Electric Line Extension Service Standards, 3.02.

3. SIZE OF ALCOVE

The size of the alcove is determined by the building's load and the number of transformers. See Drawings 1, 2 and 3 to show Utilities requirements for alcove space based upon one or two transformers. Minimum inside alcove dimensions are shown in the drawings to allow necessary maintenance, switching and cable pulling. This area is to be kept clear of any materials or debris. The ceiling height shall be a minimum of 30 feet above the tallest transformer to allow placement/removal of the transformer by boom crane.

4. BUILDING MATERIALS FOR ALCOVE

A. The alcove walls and ceiling shall have a minimum 3 hour fire rating, (class A) and be constructed as follows.
   1. Reinforced concrete – 6” thick minimum, (preferred construction)
   2. Reinforced concrete – filled block – 8” thick minimum
   3. Meets the barrier requirements of ELESS 18-301.

B. The floor shall be located at street level, flush with the sidewalk and designed to support the weight of the transformer and other associated equipment that is installed. Each transformer location should be able to support the minimum weight of 12,000 lbs. for each 1,000 kVA transformer.

5. ELECTRICAL

A. Grounding

1. See Drawing 1 for ground rod position and routing of ground wires. Minimum #4 copper wire to be used for ground loop.

B. Conduit and Cables

1. All conduits shall stub up through the street-level floor into the transformer cabinet and be installed by the customer to Colorado Springs Utilities specifications. Refer to EDCS Chapter 11 for specifications for primary/secondary conduit depths, trench backfilling and compaction, and pad compaction requirements. Also see EDCS Section 7-6 for conduit and transformer installations
2. Conduit run(s) encased in concrete shall have a minimum of 2” cover. In all cases conduit runs should be as near straight as possible, and free of excessive bends. Utilities shall designate the location of all conduit entrances prior to construction. Utilities will provide all primary services conduit from outside the building to the transformer alcove, entering up through the floor into the transformer(s).
3. Placement of multiple secondary conduits shall be by rows from back to front, example: row 1 first, then row 2, etc. Fill back row first prior to starting the next row forward, filling front row last or used for future use.
4. For 300-2500 kVA older style transformers, frame 16 secondary conduits maximum (4 rows of 4 conduits). Each row to fit within 22" maximum width from right side of window opening, and within 22" maximum depth from back side window opening. This framing arrangement works with current style transformer secondary compartment dimensions (see page 4).
5. All vertical primary conduit bends shall have a minimum 36" radius. For primary 4" conduit runs with three (maximum allowed) 90° bends and/or a length of 300' and longer, the vertical conduit bend into the transformer pad shall be Fiberglass or GRC material. Otherwise, primary 4" conduit runs with two or less 90° bends and a length of less than 300', the vertical conduit bend into the transformer pad may be PVC material. (See ELESS book, Appendix C, Table 3 for 4" 90°, 36" radius fiberglass elbow material requirements).
6. NESC-314B: Conductive-material ducts and riser guards that enclose electric supply lines, or are exposed to contact with supply conductors, shall be effectively grounded.
7. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!
8. It is the customer's responsibility to seal the customer's secondary ducts from water entering the customer's equipment or building that originate from a Colorado Springs Utilities' transformer.

C. Metering

1. The metering for the building shall conform to chapter 5 of the ELESS. The customer shall have prior approval from the Utilities Meter Shop and Field Engineering Departments for any job requiring instrument transformers and any fabrication of such equipment. All such drawings for the specified equipment shall be provided to both Utilities Meter Shop and Field Engineering Departments for approval prior to fabrication of the metering equipment.

6. CUSTOMER AGREEMENT

A statement shall be signed and returned to Utilities agreeing to build the alcove according to these specifications. An additional statement shall be signed and returned to Utilities designating the alcove as a Utilities facility with a copy of the statement sent to the Pikes Peak Regional Building Department Electrical Inspector. The only authorized signer is the building owner.

The following statement must be signed by the owner and one copy of the specification returned to:

Colorado Springs Utilities Representative
Energy Services Field Engineering
Colorado Springs Utilities
1521 Hancock Expressway
Colorado Springs, CO 80947-1821

The preceding alcove specifications meet with our approval.

_____Owner
_____Date

The undersigned hereby authorizes the use of the transformer alcove located in:

Customer Name _____
Address _____
City, State, & Zip Code _____

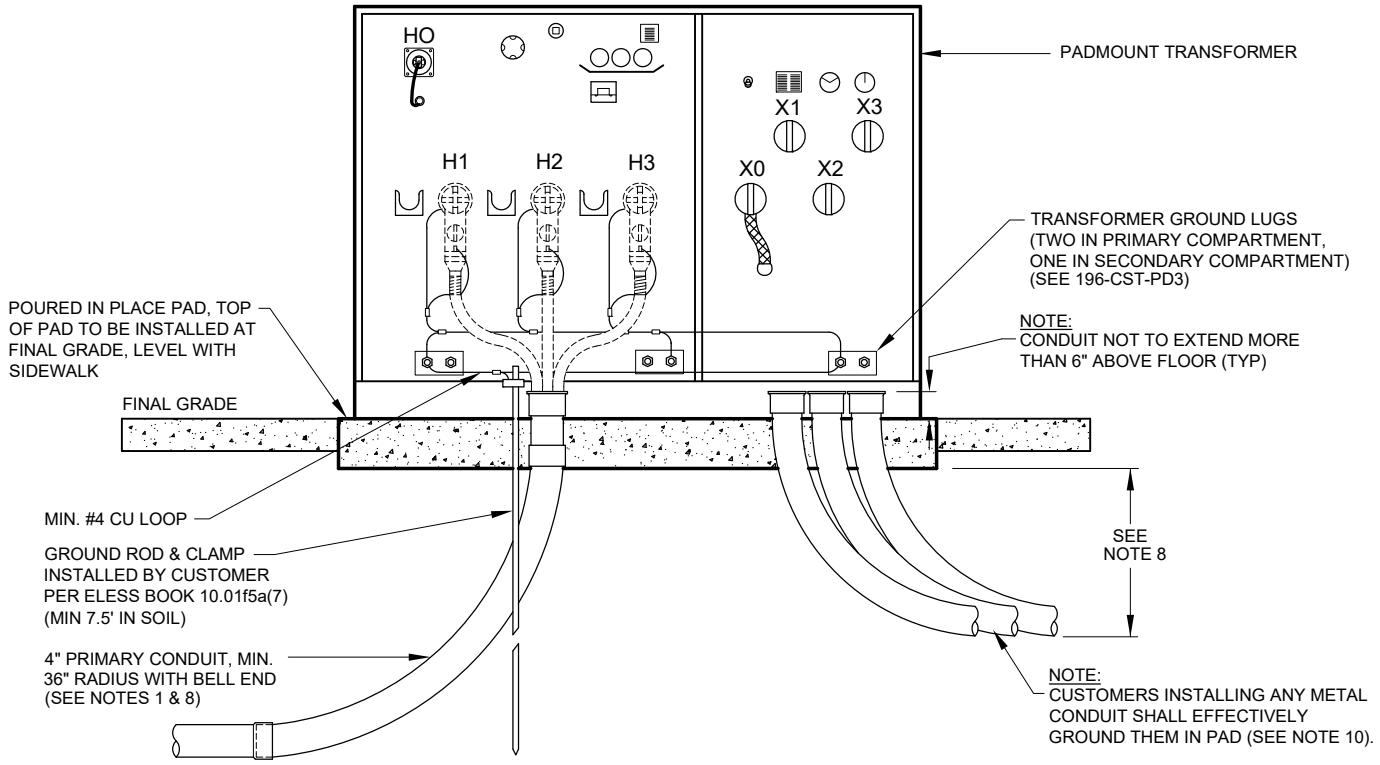
The alcove is designated as a Colorado Springs Utilities facility.

Signed (Field Engineering Supervisor)_____

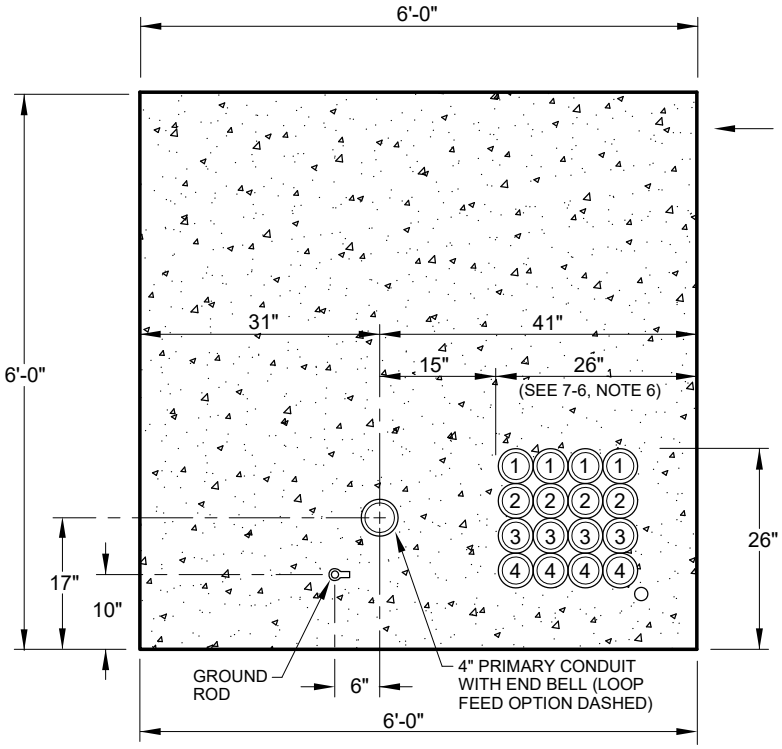
Date _____

Cc: Pikes Peak Regional Building Department, Chief Electrical Inspector

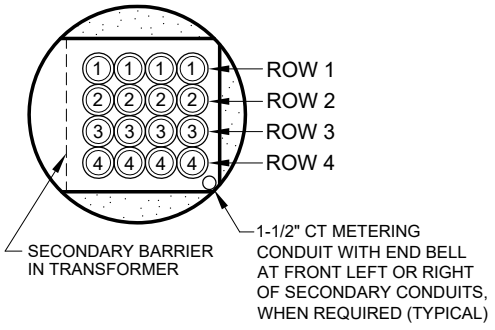
DRAWING 1



PAD AND CONDUIT DETAILS
DRAWING 2

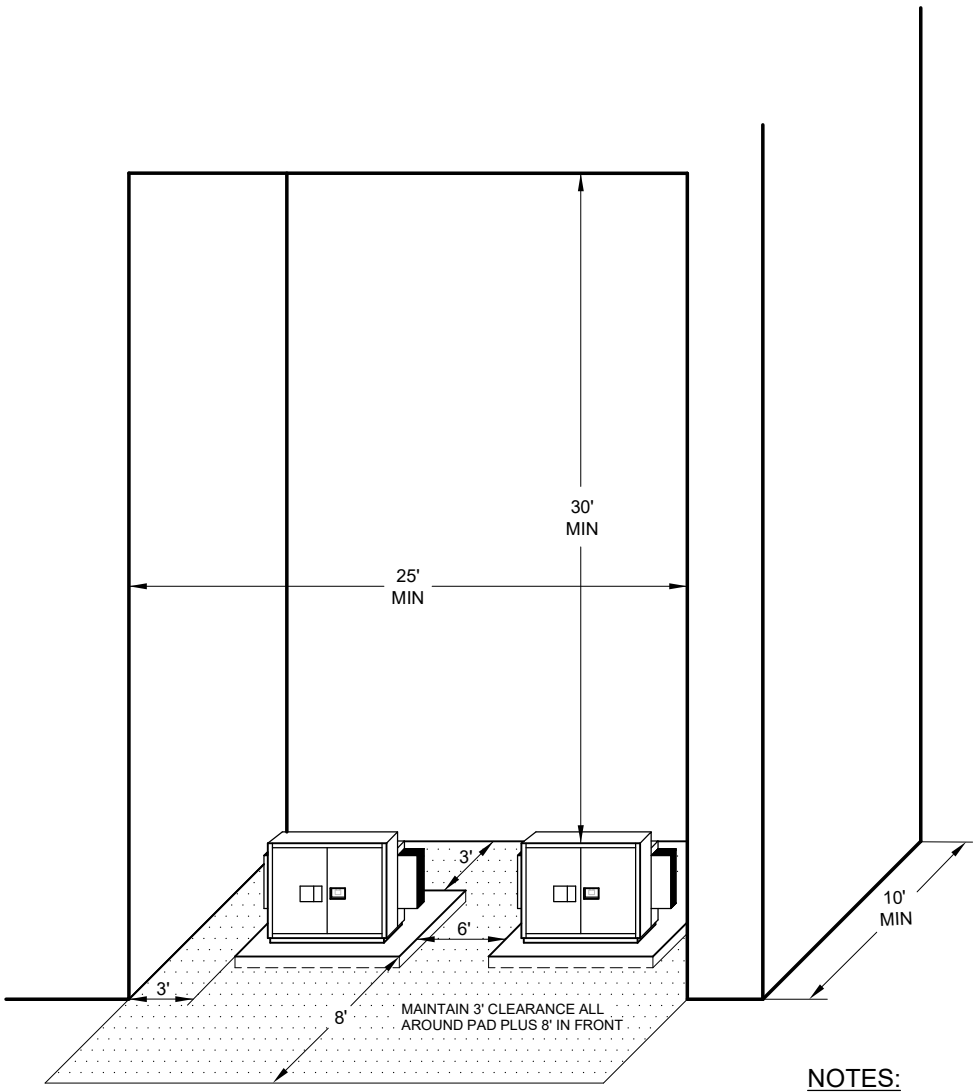


300-2500 kVA TRANSFORMER PAD



SECONDARY CONDUIT DETAIL
DETAIL SHOWN IS BASED ON MAXIMUM
(16) 3-1/2" DUCTS WITH BELL ENDS (SEE 7-6,NOTE 3)

ALCOVE INSTALLED TRANSFORMERS



NOTES:

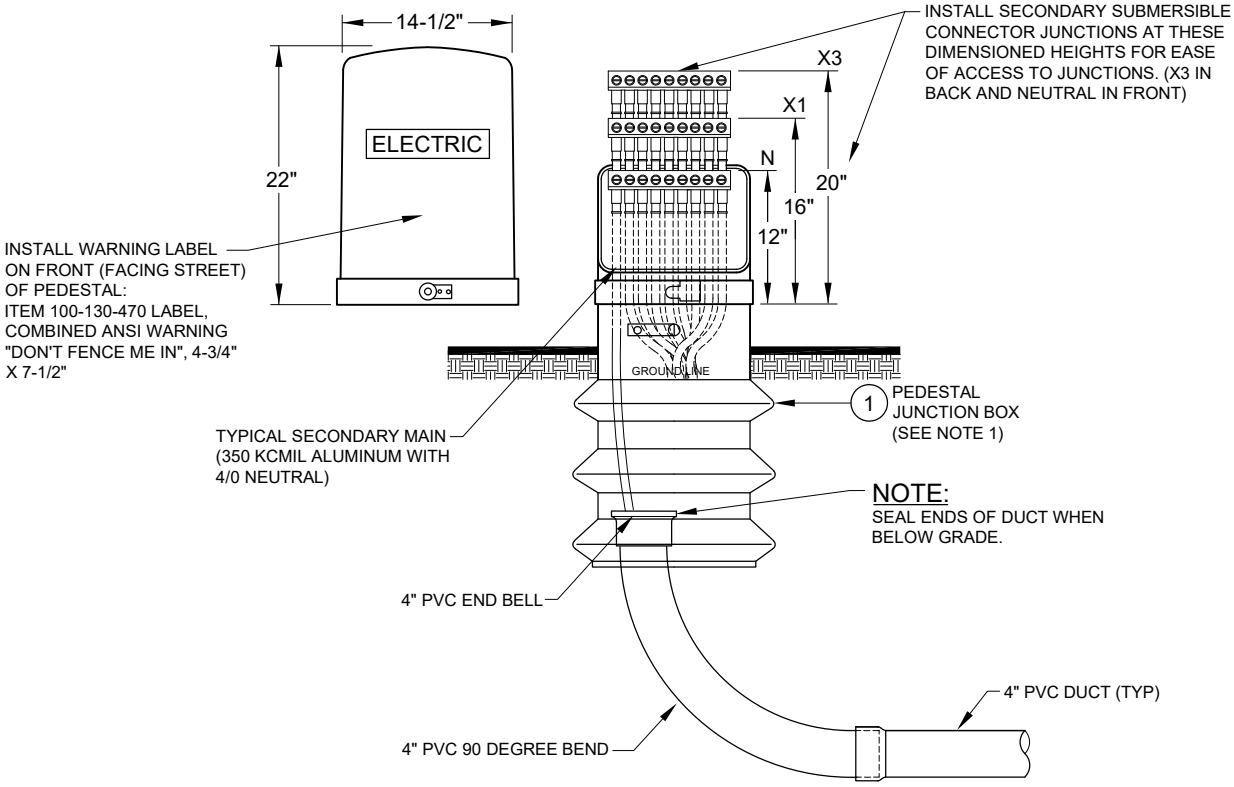
WALLS AND CEILING MAY NOT EXIST, I.E., CORNERS OF BUILDING OR NO OVERHANGING STRUCTURE

DRAWING 3

NOTES:

1. 3 ft. shall be maintained around all transformers and 6 ft. between transformers.
2. The alcove ceiling shall be a minimum height of 30 ft. above the tallest transformer, to facilitate setting the transformers with a boom truck.
3. 8 ft. of clear working space shall be in front of each transformer.
4. If a curb and sidewalk are in front of transformers, the distance between the curb and transformer shall not be greater than 8 ft.
5. 26 ft. by 30 ft. of roadway from the curb face, in front of the transformers shall be maintained to set up a boom truck, to install and remove transformers.
6. The depth of the alcove shall be a minimum of 10 ft.
7. The top of the transformer pad shall be at final grade, flush with the sidewalk. See Drawing 1 & 2 for pad details, dimensions and conduit placement.
8. See EDCS 7-6 for conduit and transformer installation.

PEDESTAL JUNCTION BOX INSTALLATION

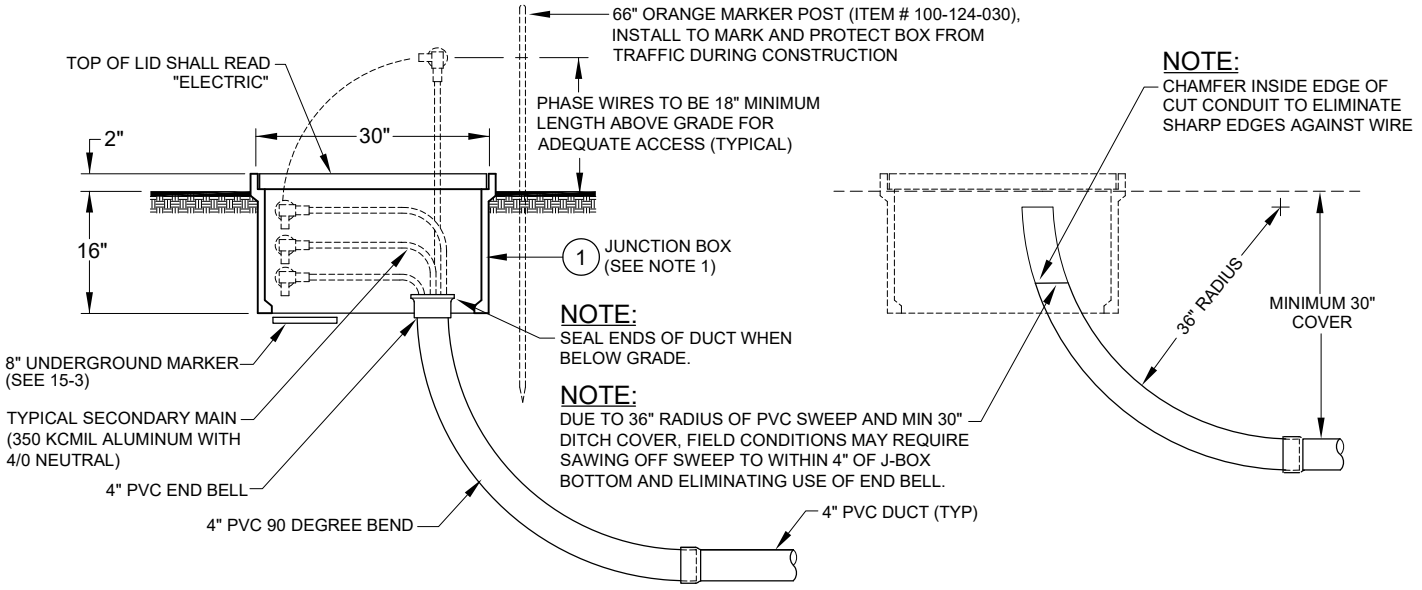


PEDESTAL JUNCTION BOX				
DESCRIPTION	ITEM NO.	BOX WGT	LID WGT	TOTAL WGT
JBOX, PEDESTAL, ELECTRIC, 9"W X 14"L X 22"H	194-115-127	12 LBS	10 LBS	22 LBS

NOTE:

1. Pedestal junction box cannot be installed in locations subject to incidental vehicular traffic to include driveways, alleys, parking lots, and roadway shoulder applications, use submersible junction box for these locations.
2. These may not be appropriate for new construction, or in front lot locations. Contact Colorado Springs Utilities Standards for approved use in these locations.

SUBMERSIBLE JUNCTION BOX INSTALLATION



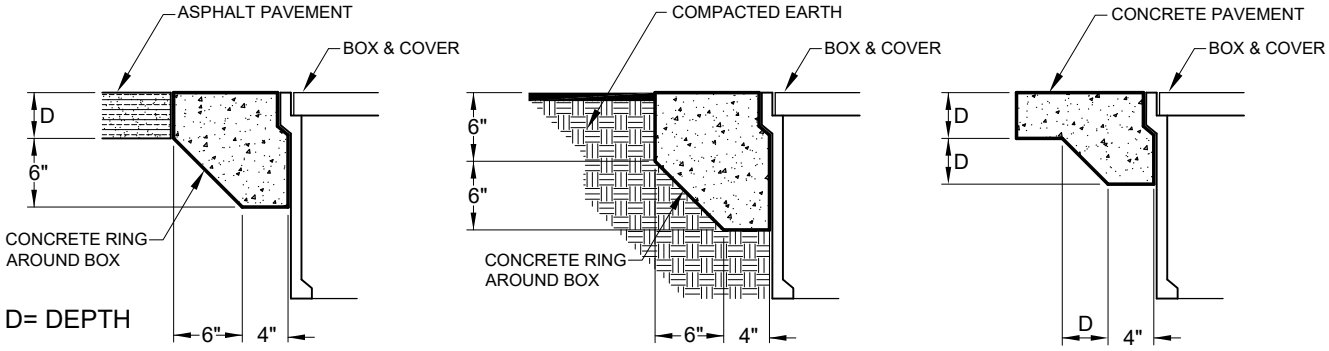
JUNCTION BOX WITH "ELECTRIC" COVER				
DESCRIPTION	ITEM NO.	BOX WGT	LID WGT	TOTAL WGT
JBOX, SECONDARY, SUBSURFACE, 17"x 30"x 18"	194-115-113	58 LBS	50 LBS	108 LBS
JBOX, SECONDARY, SUBSURFACE, 13"x 24"x 18"	194-115-126	45 LBS	25 LBS	70 LBS

REPLACEMENT "ELECTRIC" JUNCTION BOX COVERS	
DESCRIPTION	ITEM NO.
COVER, REPLACEMENT, 13" X 24", PENCELL	194-115-136
COVER, REPLACEMENT, 13" X 24" X 1"	194-115-137
COVER, REPLACEMENT, 17" X 30" X 1"	194-115-138
COVER, REPLACEMENT, HEAVY DUTY, 17" X 30" X 2"	194-115-180
COVER, REPLACEMENT, HEAVY DUTY, 13" X 24" X 2"	194-115-181

REPLACEMENT JUNCTION BOX BOLTS, NUT & NUT RETAINER	
DESCRIPTION	ITEM NO.
BOLT, REPLACEMENT, COIL-THREADED, 1/2-6 X 3-1/2"	194-115-182
NUT, REPLACEMENT, COIL-THREADED, 1/2-6	194-115-183
BOLT, REPLACEMENT, PENTA-HEAD 3/8"-16 X 2-1/2"	194-115-184
BOLT, REPLACEMENT, PENTA-HEAD 3/8"-16 X 3-1/2"	194-115-129
RETAINER, PUSH NUT, BOLT, REPLACEMENT, COVER	194-115-185
RETAINER CLIP, PUSH NUT, BOLT, REPLACEMENT, COVER	194-115-135

NOTE:
Junction box has Tier-15 loading for off-street/incidental (unintentional) traffic locations only, e.g. sidewalks, residential driveways, parking lots, road shoulder etc., not in roadways or alleyways.

JUNCTION BOX REINFORCEMENT OPTIONS FOR NON-PREFERRED INSTALLATIONS

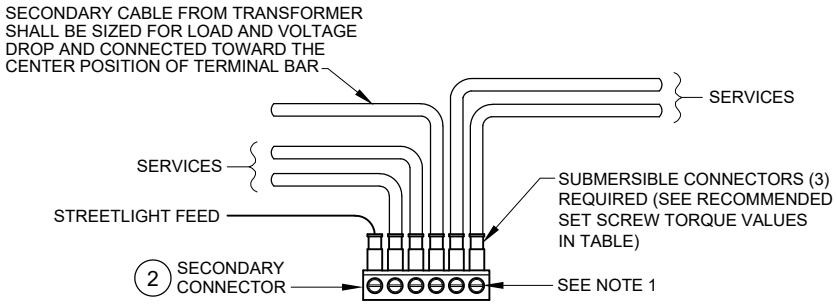


ASPHALT PAVEMENTS | COMPACTED EARTH | CONCRETE PAVEMENTS

NOTES:
1. Non-preferred installation locations include driveways, alleys, parking lots, and off roadway applications where subject to occasional non-deliberate heavy vehicles.
2. Concrete encasement to be 3,000 psi min.
3. Concrete encasement ring dimensions to be equal to design pavement depth.
4. Pavement and subgrade to be as shown on engineering plans.

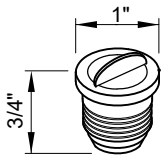
CUID EXAMPLE:
E.JBOX-6

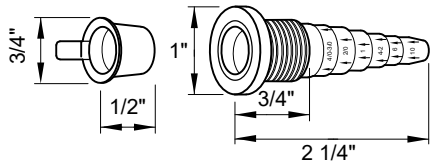
SINGLE PHASE UG SECONDARY CONNECTORS



DESCRIPTION	ITEM NO.
TERMINAL, SECONDARY, SUBMERSIBLE, 3 POSITION, #10-500 KCMIL	194-101-074
TERMINAL, SECONDARY, GEL CAP, 3 POSITION, #14-2/0 KCMIL	195-850-875
TERMINAL, SECONDARY, 3 POSITION, 2 SIDED, #6-250 KCMIL	195-850-870
TERMINAL, SECONDARY, SUBMERSIBLE, 6 POSITION, #10-350 KCMIL	194-101-071
TERMINAL, SECONDARY, SUBMERSIBLE, 9 POSITION, #10-350 KCMIL	194-101-070
TERMINAL, SECONDARY, SUBMERSIBLE, 8 POSITION, #10-500 KCMIL	194-101-073
TERMINAL, SECONDARY, SUBMERSIBLE, 4 POSITION, #10-350 KCMIL	195-850-860

RECOMMENDED TORQUE VALUES FOR SOCKET SET SCREWS	
CONNECTOR SIZE AWG-KCMIL	RECOMMENDED TORQUE FOOT-LBS
#8, #6, #4	8
#2, #1	12
#1/0, #2/0	16
#3/0, #4/0	20
250	25
350	30
500	38





PORT END CAP

DESCRIPTION	ITEM NO.
PORT CAP, SUBMERSIBLE CONNECTOR, 1" x 3/4"	100-106-967

PORT WIRE CAP

DESCRIPTION	ITEM NO.
PORT WIRE CAP, SUBMERSIBLE CONNECTOR, 1" x 2-1/4"	100-106-968

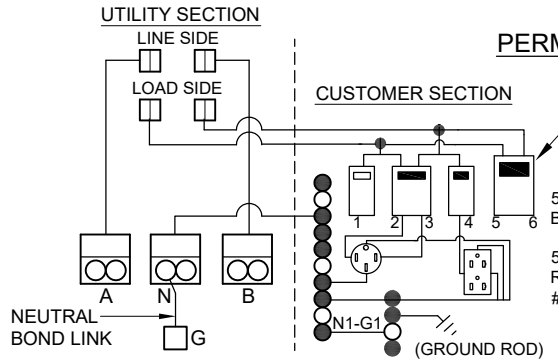
SINGLE PHASE UG SECONDARY
CONNECTOR REPLACEMENT PARTS

NOTES:

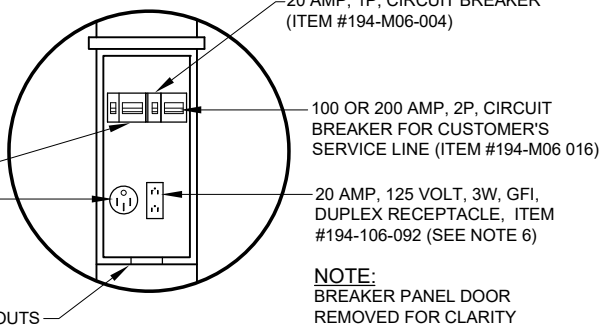
1. Reminder: To prevent entrance of moisture or water, follow manufacturer's instructions. Replace set screw plugs and conductor sleeve to provide moisture and temperature resistance.

2. See 6-27 for labeling of secondary services.

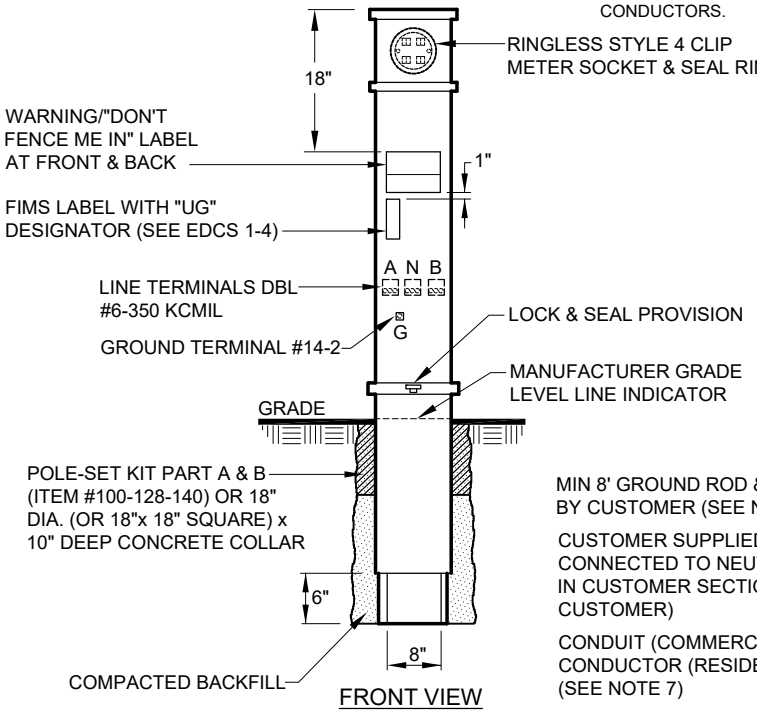
PERMANENT METER PEDESTAL



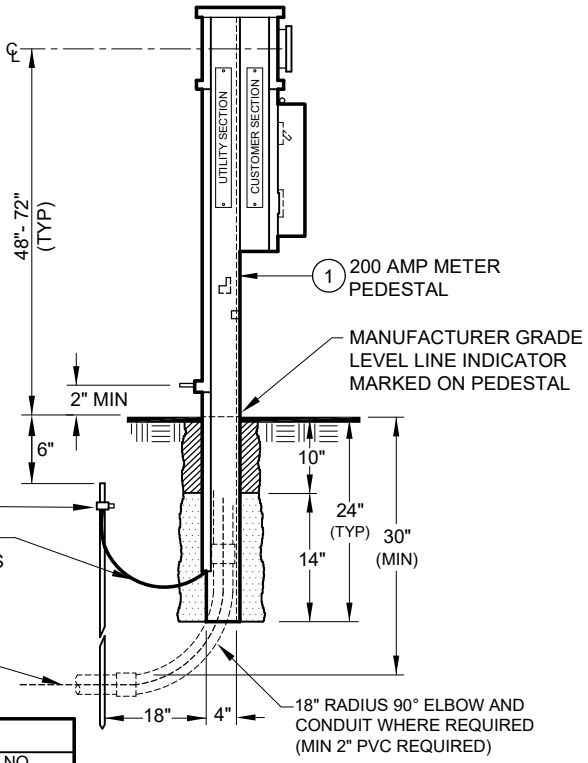
ONE-LINE WIRING DIAGRAM



NOTE:
BREAKER PANEL DOOR REMOVED FOR CLARITY



FRONT VIEW



RIGHT SIDE VIEW

UTILITIES WAREHOUSE STOCKED REPLACEMENT PARTS	
DESCRIPTION	ITEM NO.
BREAKER, 100 AMP 2P	194-M06-016
BREAKER, 50 AMP 2P	194-M06-007
BREAKER, 20 AMP 1P	194-M06-004
RECEPTACLE, 125/250 VOLT 4W 50 A	194-106-125
RECEPTACLE, 125 VOLT, 3W 20 A GFI	194-106-092
SIGN, "DON'T FENCE ME IN"	100-130-471
HASP, REPLACEMENT, RINGLESS METER SOCKET SEAL	194-113-398
TAB, REPLACEMENT, RINGLESS METER SOCKET SEAL	194-113-399

CUID EXAMPLE:
E.PED

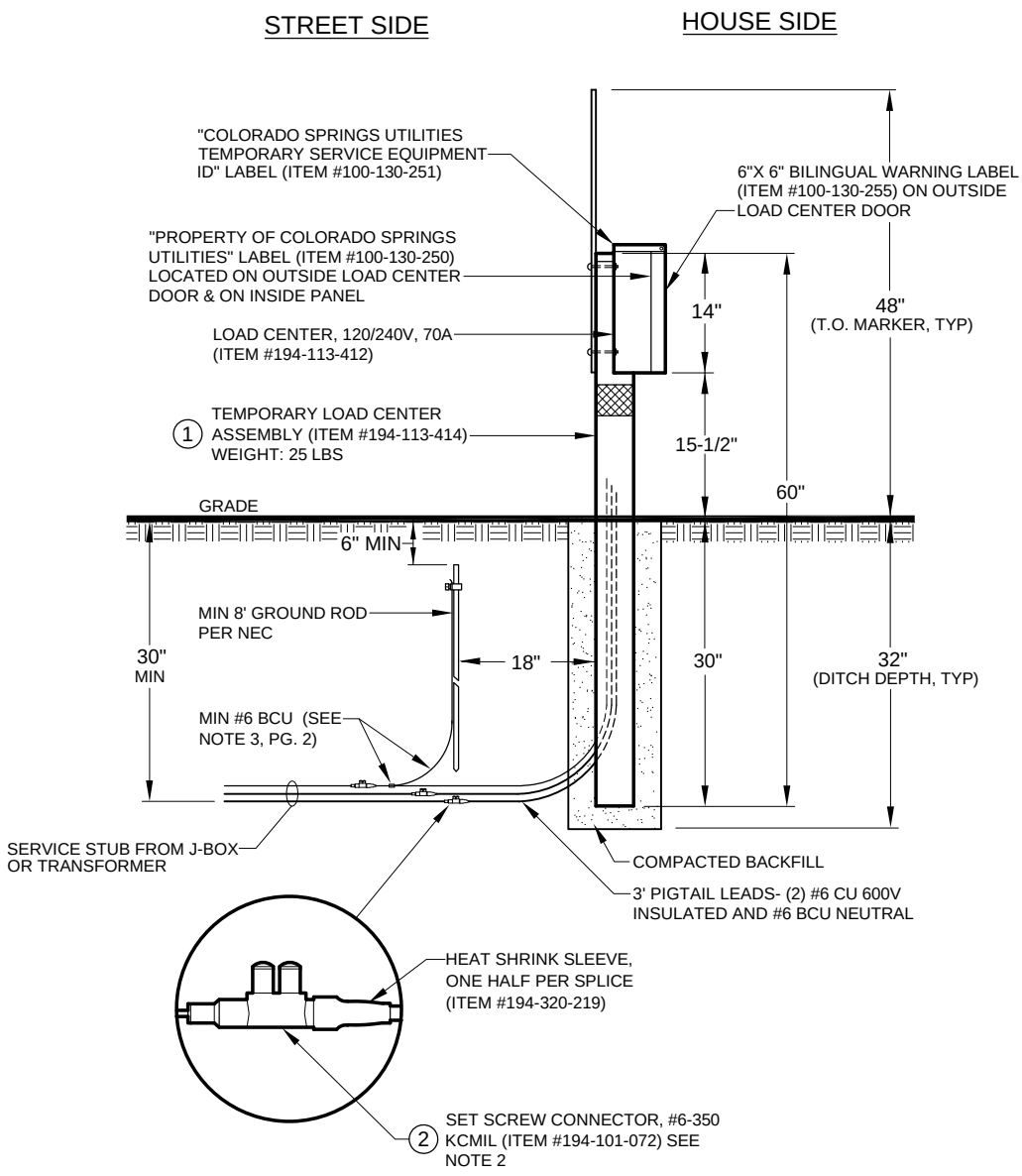
NOTES:

1. The pedestal (Item #194-113-406) must be placed outside of the service trench to ensure a solid footing. The earth must be thoroughly compacted around the pedestal to prevent tilting. Any tilting of more than 5 degrees will be straightened at the customer's expense.
2. To provide customer with better service, workmen must have access to both sides of the meter pedestal. Therefore, a 3'x 3' clear working and standing area shall be maintained in front and back of the meter pedestal.
3. A 48"- 50" typical height from top of finished grade to the centerline of the meter socket shall be maintained on all pedestals, (or buried to manufacturer provided grade level line indicator). The buried depth of the base shall be 24" typical below final grade. The bottom end of the utility termination cover shall extend 2" minimum above final grade.
4. A min 8' copper-clad bonded ground rod shall be driven below the ground line and within 18" of the side of the pedestal in a location that will avoid all conductors. The neutral will be bonded to the ground rod with a min #6 bare copper wire size as required by Regional Building Department (see Electric Line Extension & Service Standards Book, Drawing-9).
5. The customer's service line must not overlay the utility cable at any point.
6. Where customer load is hard-wired, receptacles are optional.
7. For trench information, refer to Electric Line Extension & Service Standards Book 7.02 (residential) or 10.1f (commercial).
8. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!

50 AMP TEMPORARY SERVICE POWER PEDESTAL-SINGLE FAMILY RESIDENTIAL

(PREFERRED ASSEMBLY)

(This assembly is for use on easement & R.O.W. only- not for use on private property)



REPAIR PARTS	
DESCRIPTION	ITEM NO.
240V 50A 2P GFCI BREAKER	194-M06-017
120V 20A 1P BREAKER	194-M06-005
120V GFCI DUPLEX RECEPTACLE	194-106-092
240V 50A RECEPTACLE	194-106-125
HASP, REPLACEMENT, LOAD CENTER	194-113-397

SPLICE REPLACEMENT PARTS	
DESCRIPTION	ITEM NO.
WIRE SEAL & CAP	100-106-968
HEX SCREW CAP	100-106-967

ALL NON-CURRENT CARRYING METALLIC PARTS TO BE BONDED TO NEUTRAL AND EFFECTIVELY GROUNDED.

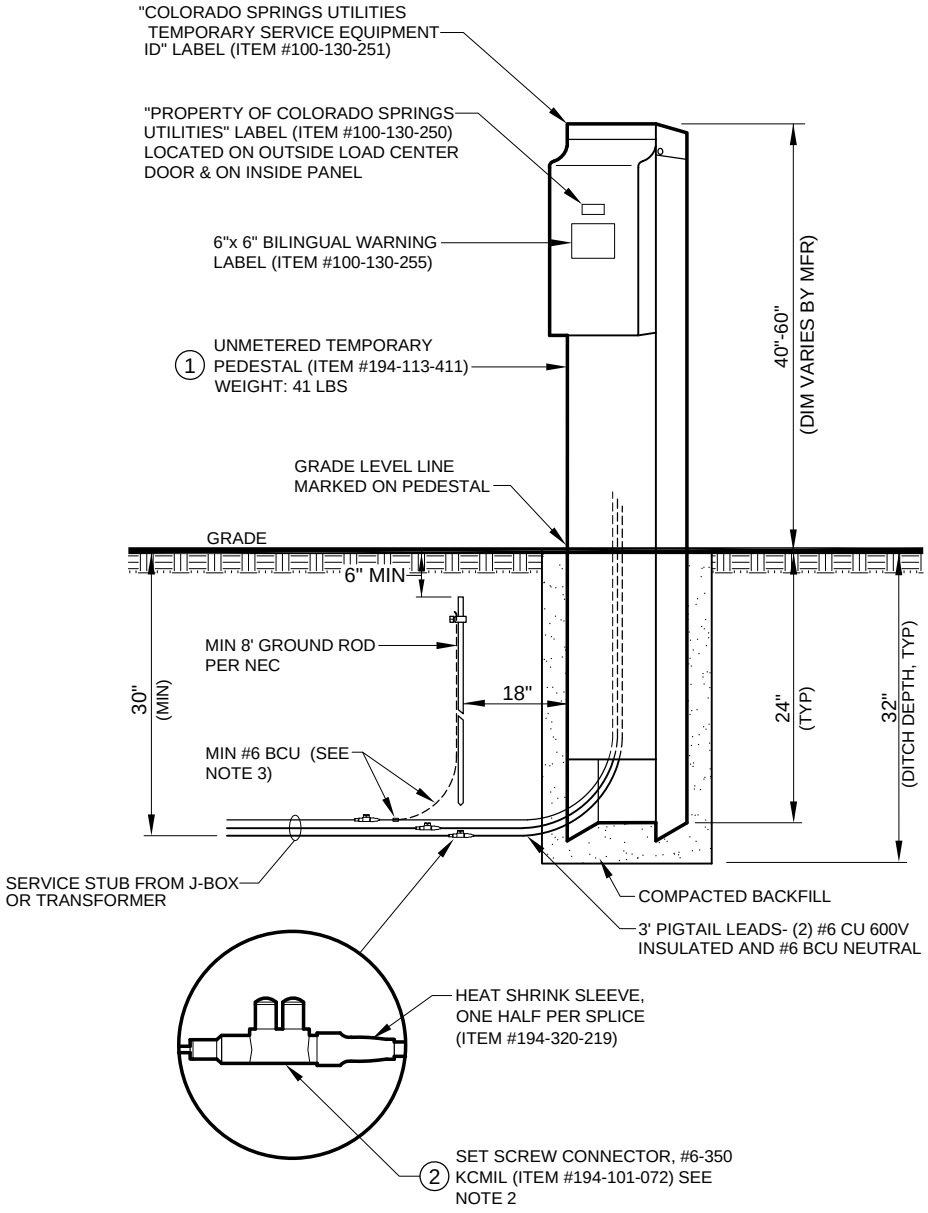
CUID EXAMPLE:

E.TEMP-PREF

50 AMP TEMPORARY SERVICE POWER PEDESTAL-SINGLE FAMILY RESIDENTIAL

(ALTERNATE ASSEMBLY)

(This assembly is for use on easement R.O.W. or private property)



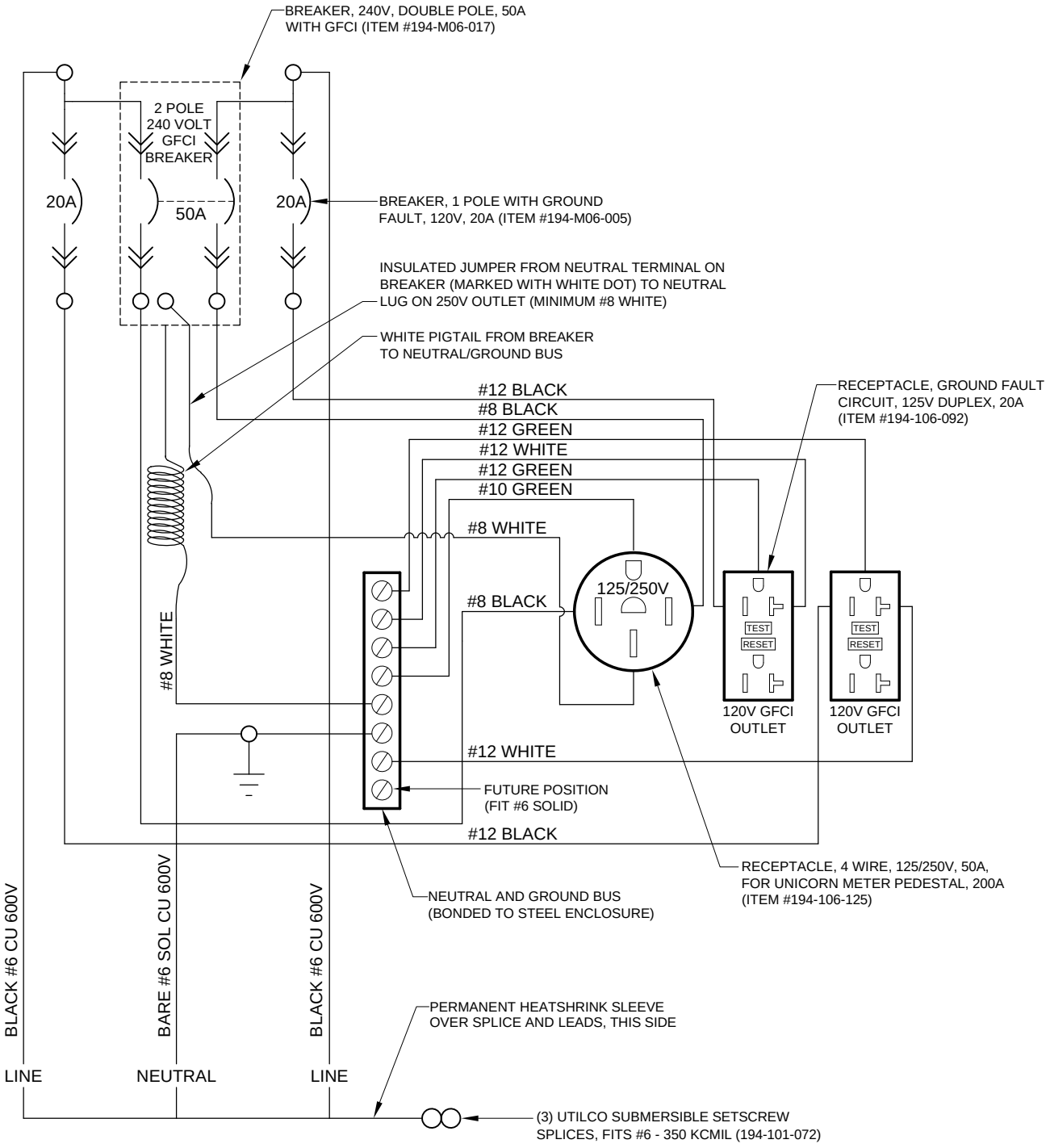
NOTES:

1. Install Temporary Service Pedestal or Temporary load Center Assembly at end of each service stub during initial construction.
2. Utilco connectors shall be torqued to 8 ft-lbs for #6 CU and sealed on pigtail sides with one half of heat shrink sleeve (Item #194-320-219) as shown in detail. When permanent service is installed, remove temporary service equipment with splices remaining connected to pigtails. Use only compression sleeves and heat shrink tubing when splicing permanent service to stub.
3. Connect 6'-10' min #6 BCU ground rod wire to pedestal #6 Bare CU neutral using a compression connector.
4. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!

CUID EXAMPLE:

E.TEMP-ALT

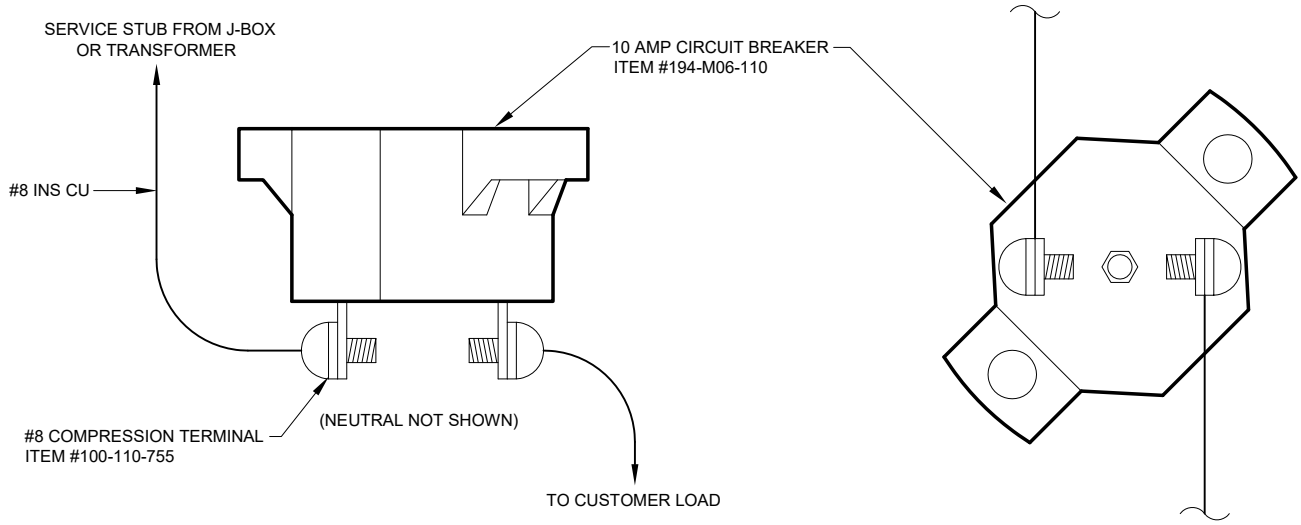
TEMPORARY SERVICE PEDESTAL WIRING SCHEMATIC



NOTE:

1. If enclosure is conductive (steel) an external grounding nut shall be welded to the side of service pedestal, 6" above grade line.

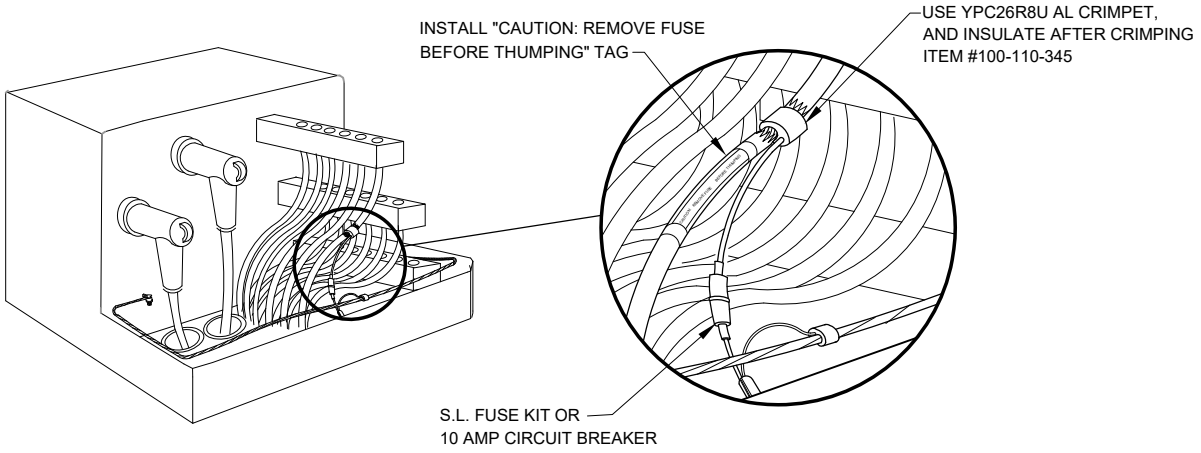
UNMETERED 120V 900W SERVICES



NOTES:

1. For underground installations, locate the circuit breaker inside the J-box or padmounted transformer and insulate with splicing tape (Item number 100-136-030 or 100-136-070) over glass tape (Item number 100-136-090).
2. For overhead installations, locate the circuit breaker at the transformer and insulate with mastic (Item number 100-136-010) over glass tape (Item number 100-136-090).
3. Do not bury circuit breaker after taping - leave it exposed to air for cooling.

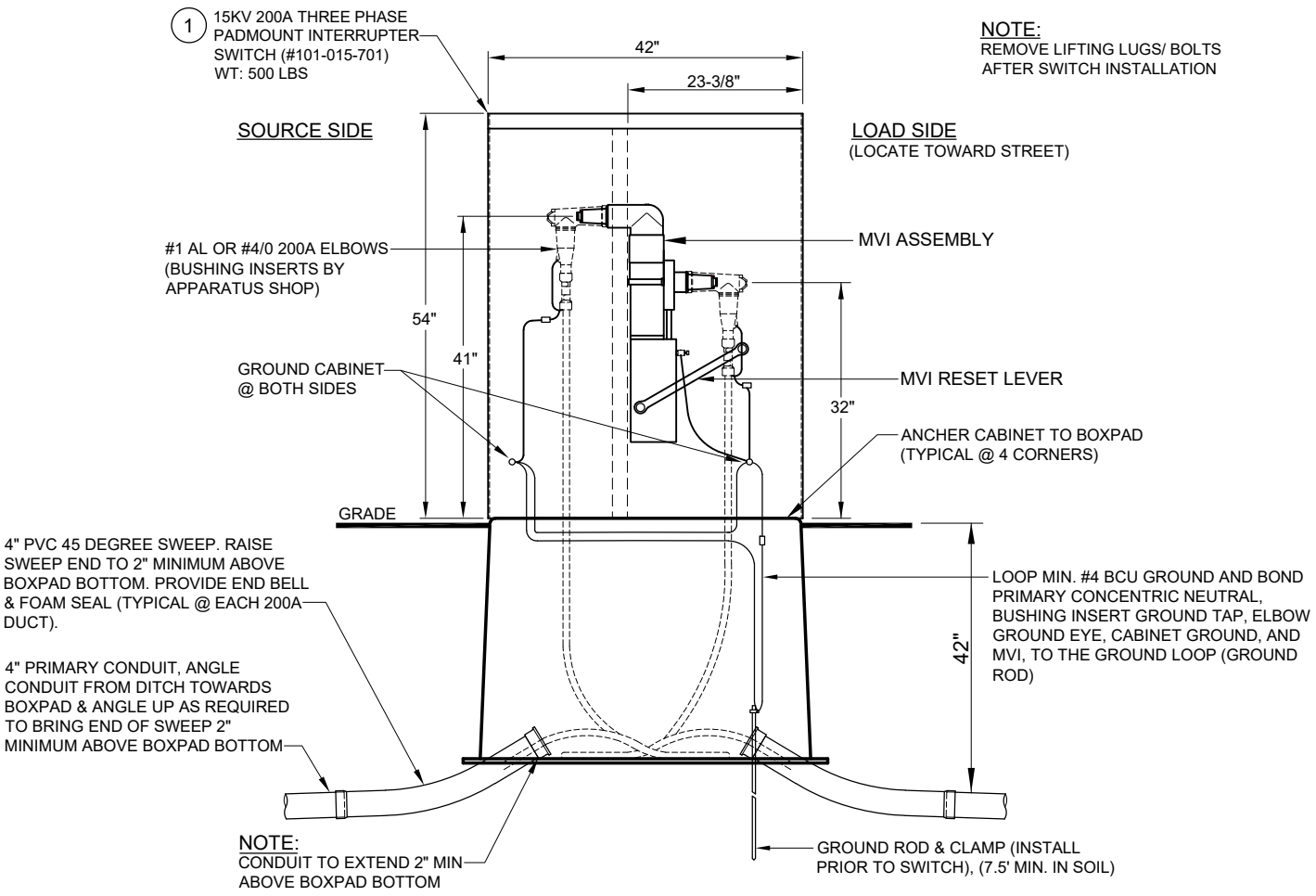
STREETLIGHT AND UNMETERED LOAD TAP IN EXISTING PADMOUNT TRANSFORMER OR J-BOX



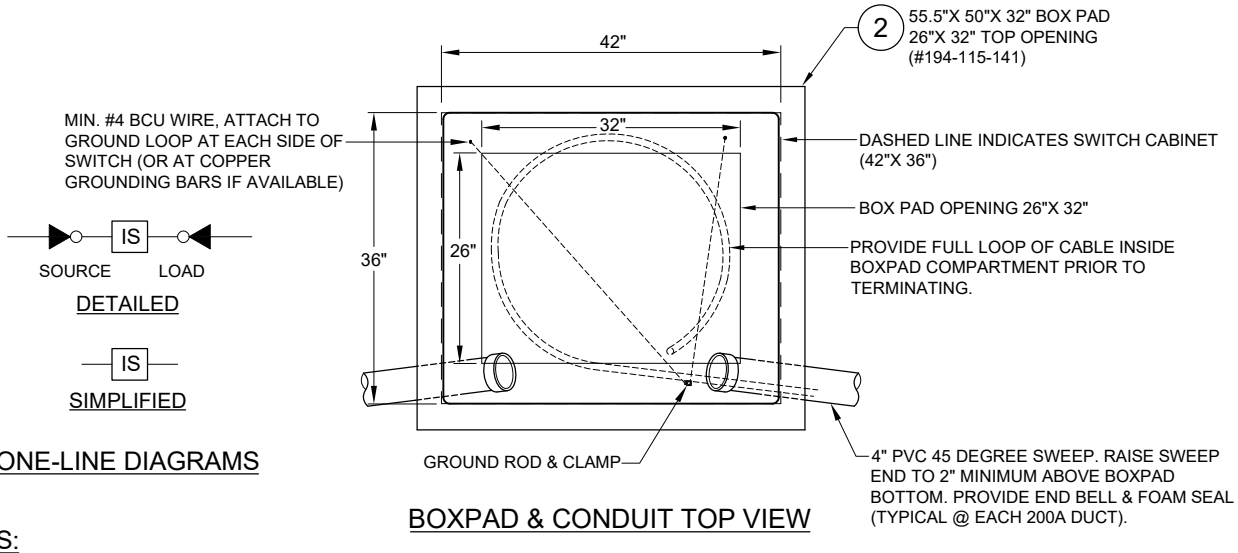
DESCRIPTION	ITEM NO.
8 AMP MIDGET FUSE	100-118-308
10 AMP MIDGET FUSE	100-118-310
15 AMP MIDGET FUSE	100-118-315
20 AMP MIDGET FUSE	100-118-320
30 AMP MIDGET FUSE	100-118-330
CLIP FUSE GRIPPER	✓195-102-300
CONNECTOR FUSED #10AWG	✓195-103-005

✓ - Denotes minor material items for all non-100 series items treated as such.

BOXPAD MOUNTED SWITCH



BOXPAD & CONDUIT SIDE VIEW



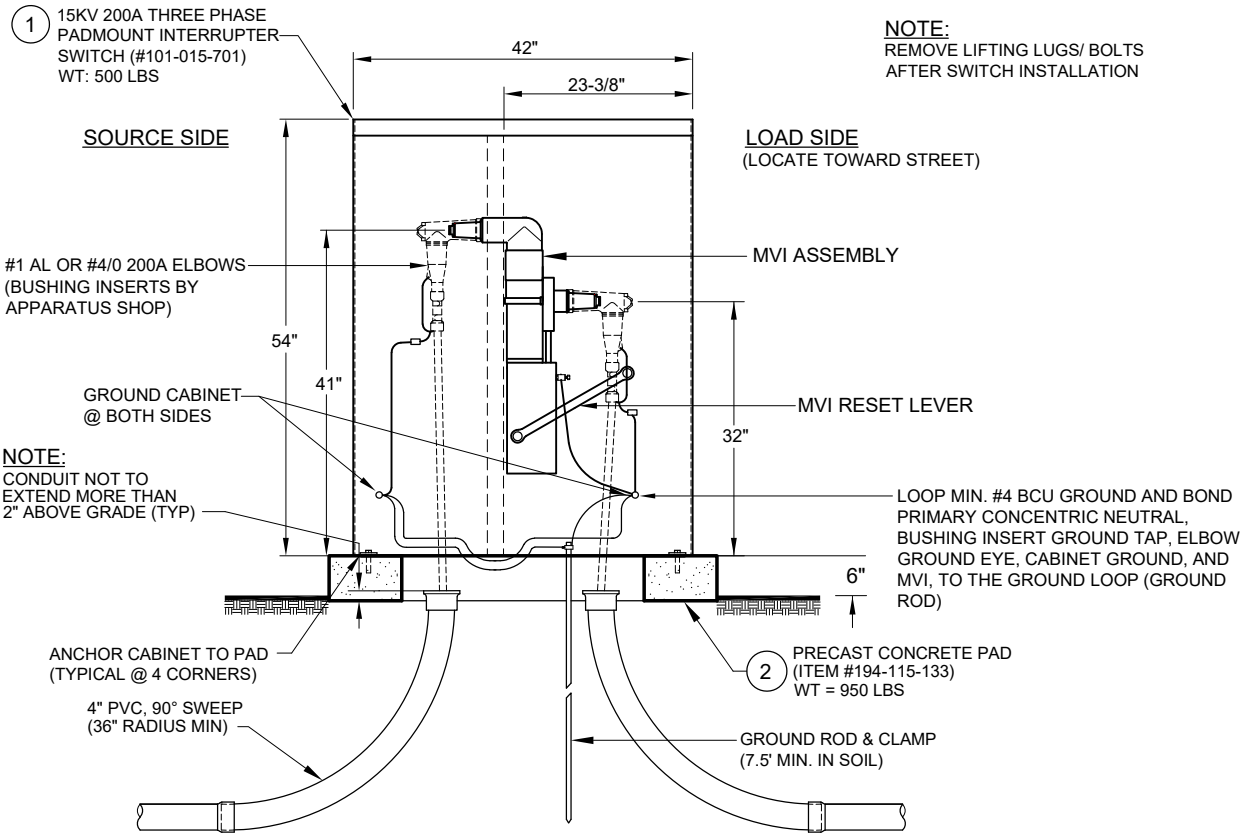
ONE-LINE DIAGRAMS

BOXPAD & CONDUIT TOP VIEW

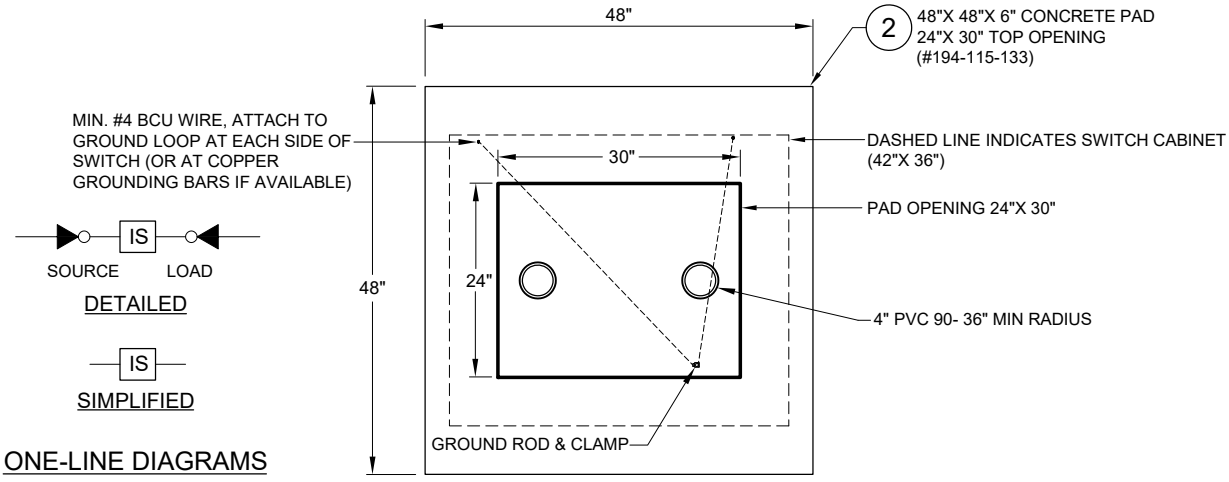
NOTES:

1. Specify 15 KV, #1 AL cable & elbows for use with continuous current rating up to 120 amps.
2. Specify 15 KV, #4/0 AL cable & elbows for use with continuous current rating up to 200 amps.
3. Remove all exterior lifting eyes/bolts, secure with padlock, anchor to pad.
4. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!
5. Not to be used to protect transformers without "internal current-limiting fuses" (i.e. type 129s).

PAD MOUNTED SWITCH



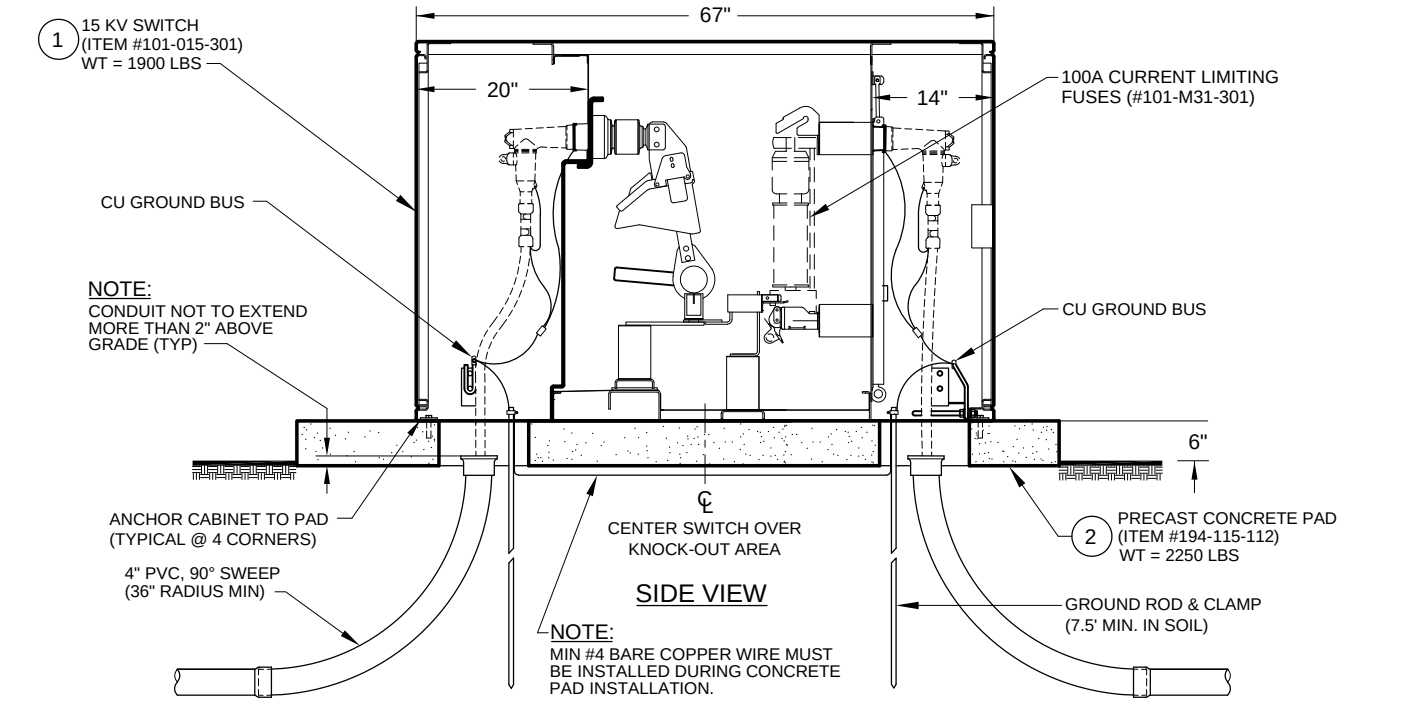
PAD & CONDUIT SIDE VIEW

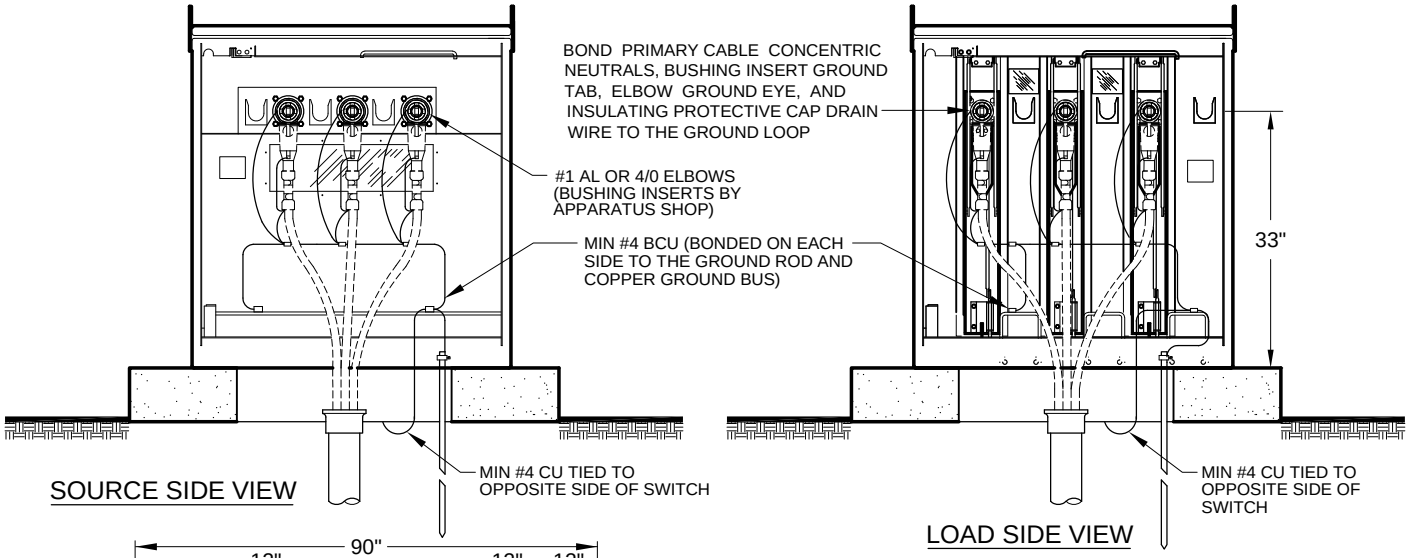


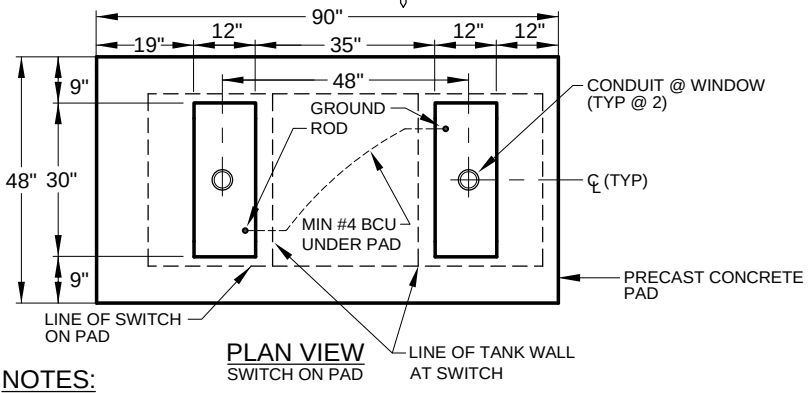
PAD & CONDUIT TOP VIEW

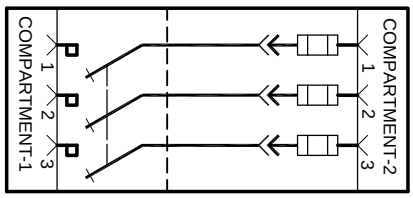
NOTES:

1. Specify 15 KV, #1 AL cable & elbows for use with continuous current rating up to 120 amps.
2. Specify 15 KV, #4/0 AL cable & elbows for use with continuous current rating up to 200 amps.
3. Remove all exterior lifting eyes/bolts, secure with padlock, anchor to pad.
4. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!
5. Not to be used to protect transformers without "internal current-limiting fuses" (i.e. type 129s).









CONNECTION DIAGRAM

NOTES:

1. Specify 15 KV, #1 AL cable & elbows for use with fuse load current rating up to 120 amps.
2. Specify 15 KV, #4/0 AL cable & elbows for use with fuse load current rating over 120 amps.
3. Specify faulted circuit indicators: typical locations are at the 1/4, 1/2 & 3/4 points of the circuit as well as two each at branch points. For more information on FCI placement see the Distribution Planning Guide.
4. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!
5. Remove lifting lugs/ bolts after switch installation.

CUID EXAMPLE:
E.FS-3PH-15KV-200A-AIR

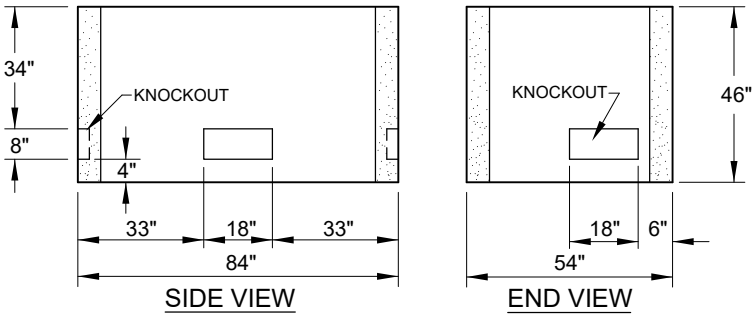
ELECTRIC DISTRIBUTION CONSTRUCTION STANDARDS

Colorado Springs Utilities
It's how we're all connected

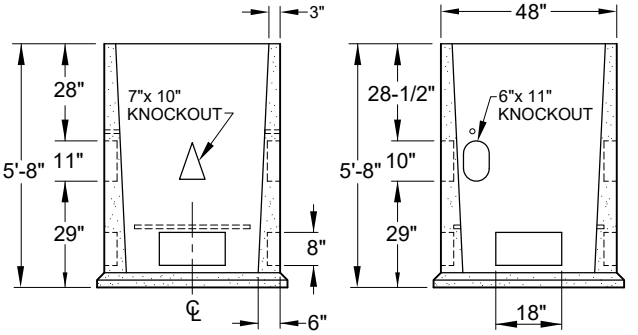
APPROVED AS OF: 11-18-2022	PD FUSED SWITCH 15KV 3-PHASE AIR-INSULATED	9-24	PG. 1/1

T02–01626

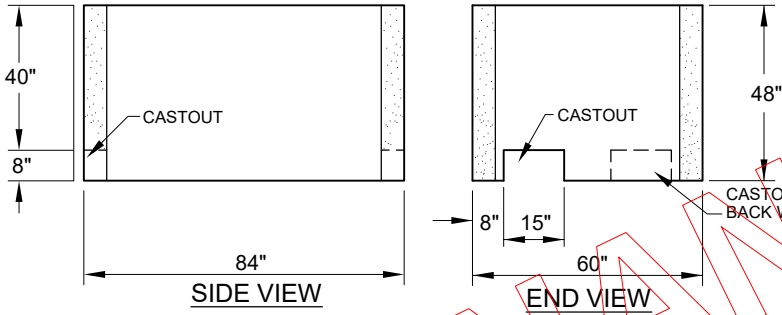
OLD VAULTS, VARIOUS SIZES
(Vaults are shown for dimensional purposes only)



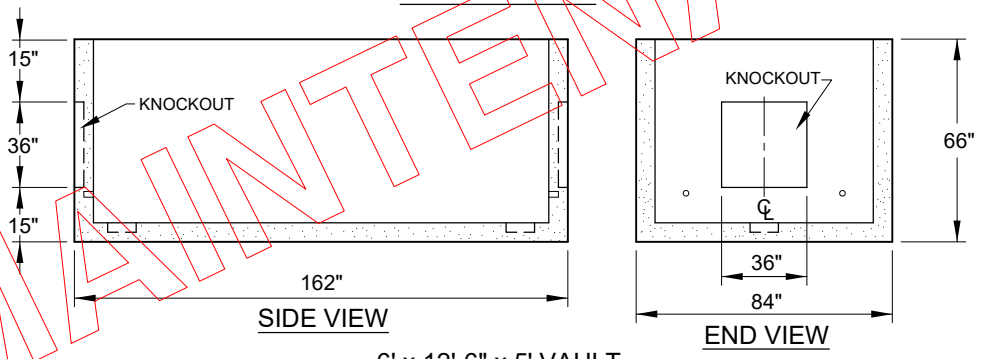
4'-6' x 7' x 3'-10" VAULT



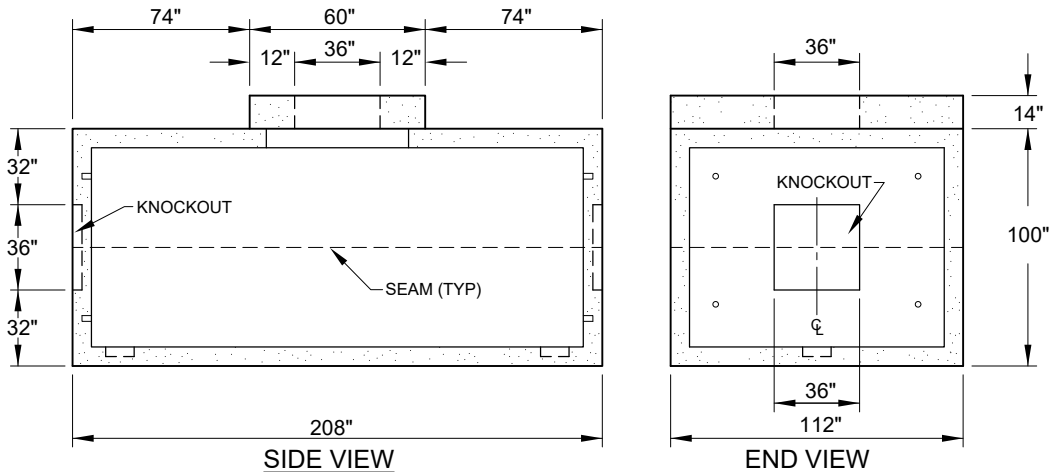
4' X 4' X 5'-8" VAULT



4' x 6' x 4' VAULT



6' x 12'-6" x 5' VAULT

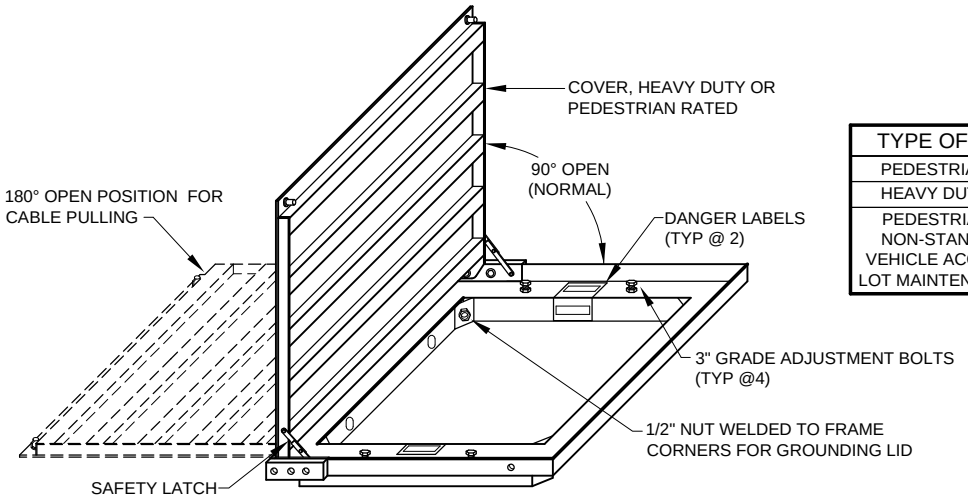


8' x 16' x 7' VAULT

NOTE:

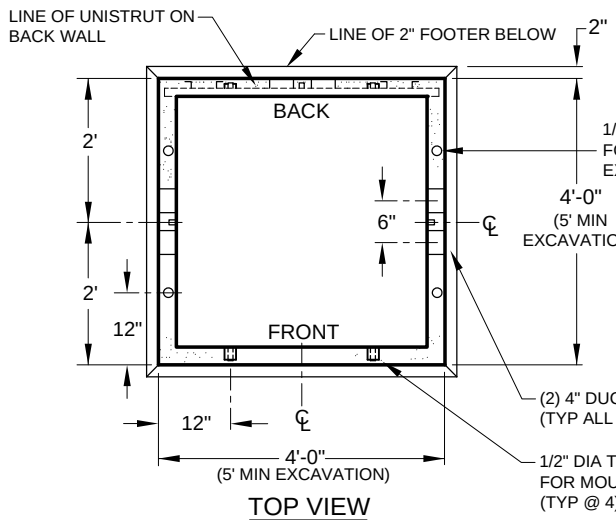
1. These vaults are no longer available in stock, but may be present in the Springs Utilities system. These drawings are for dimensional purposes in reference to knock out locations.

4' WIDE X 4' LONG X 4' HIGH
VAULT ASSEMBLY



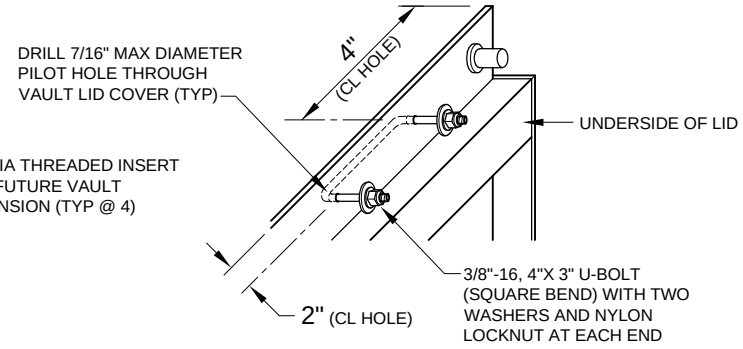
TYPE OF COVER	ITEM NO.	APPROX. WT.
PEDESTRIAN RATED	194-115-124	230 LBS
HEAVY DUTY RATED	194-115-123	280 LBS
PEDESTRIAN RATED NON-STANDARD (NO VEHICLE ACCESS, REAR LOT MAINTENANCE ONLY)	194-115-170	100 LBS

NOTE:
LOCATE HANDLE ON TYPICAL OPERATOR SIDE OF VAULT LID



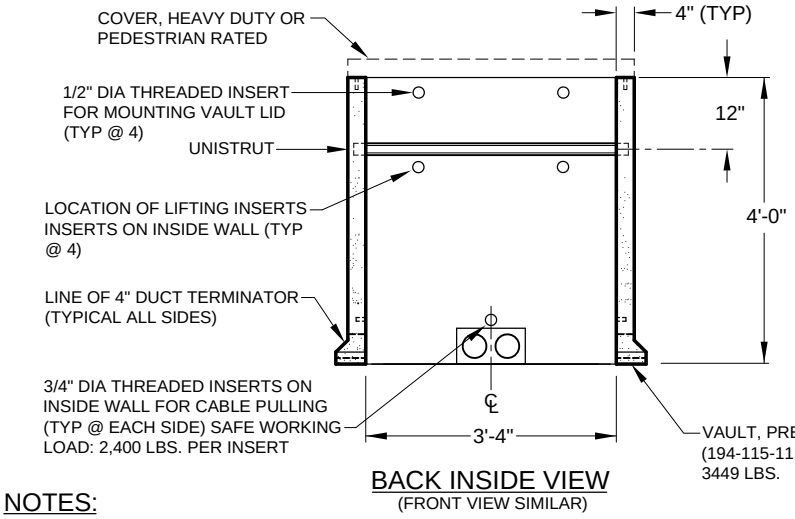
TOP VIEW

(FRONT TYPICALLY TOWARD SIDEWALK, IF PRESENT, OR TOWARD AN ADEQUATE SPACE AWAY FROM THE ROADWAY FOR OPERATING ACCESS)

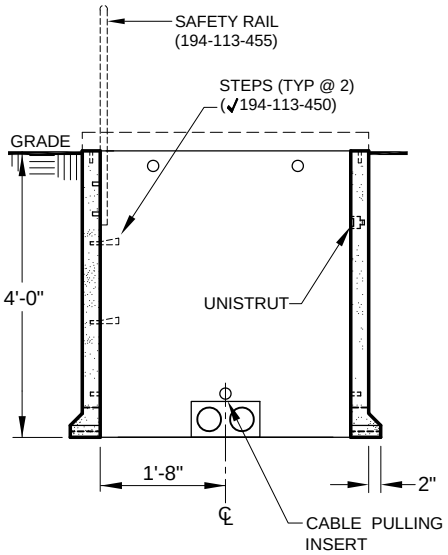


FIELD RETROFIT HANDLE

(FOR USE ON EXISTING MADRUGA HEAVY DUTY 4X4 AND 4X7 VAULT LIDS FOUND IN FIELD THAT ARE NOT INSTALLED WITHIN A SIDEWALK WITH BROKEN TORSION BAR)



BACK INSIDE VIEW
(FRONT VIEW SIMILAR)



LEFT INSIDE VIEW
(RIGHT INSIDE VIEW SIMILAR)

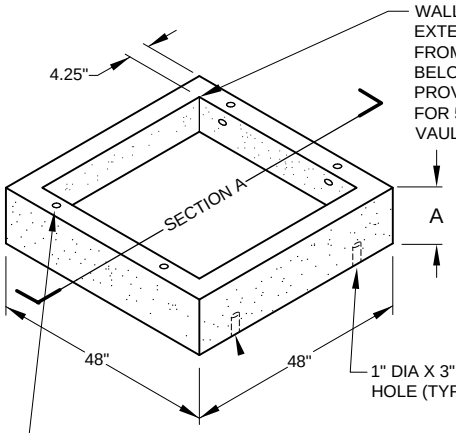
NOTES:

1. Refer to Electric Distribution Construction Standard 10-1 for installation notes.
2. For typical (behind curb, non-sidewalk) installations, install pedestrian (or heavy duty) rated cover 3-1/2" above grade.
3. For typical sidewalk installations, install pedestrian (or heavy duty) rated cover flush to top of proposed sidewalk. Adequately compact soil around lid perimeter to avoid future settling of sidewalk.
4. Vault lids should be installed to limit the likelihood of tripping by pedestrians

✓ Denotes minor material items for all non-100 series items treated as such.

CUID EXAMPLE:
E.VLT4X4-X

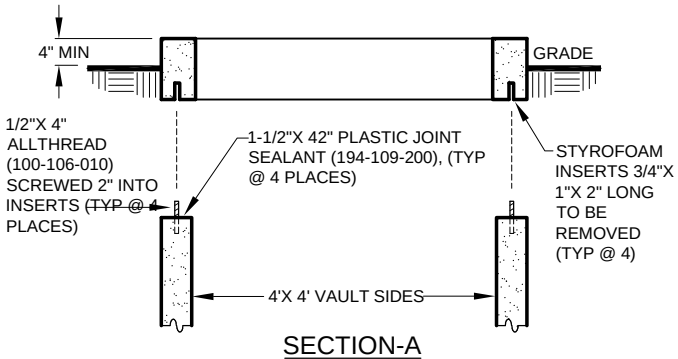
CONCRETE 4' X 4' VAULT EXTENSION



WALL THICKNESS FOR THE 8", 12" & 18" EXTENSIONS WILL BE 4.25" FOR 5" FROM TOP OF EXTENSION, THEN 4.5" BELOW THE 5" MARK. THIS WILL PROVIDE A 39.5" INTERIOR OPENING FOR 5" FROM TOP OF EXTENSION FOR VAULT LID INSTALLATION.

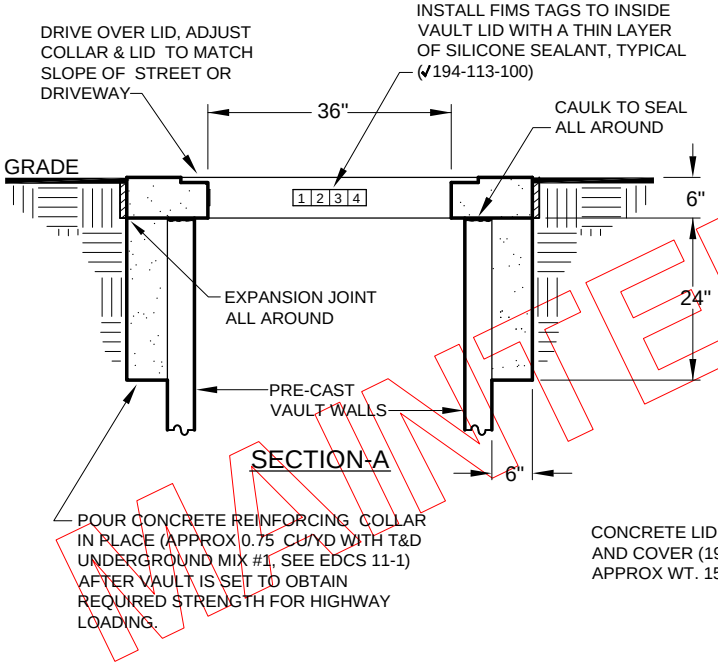
1" DIA X 3" ARBOR HOLE (TYP @ 4)

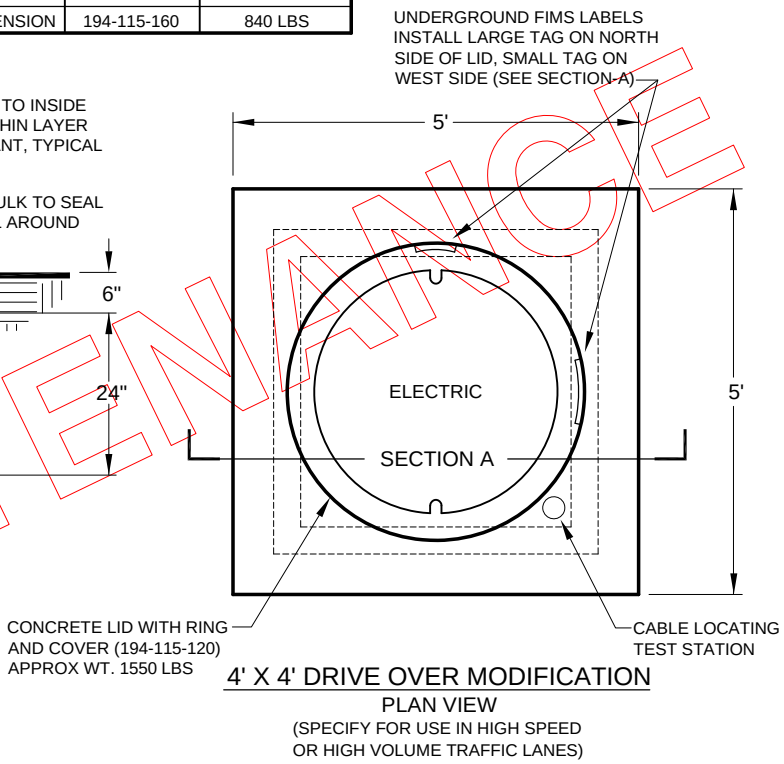
ALL VAULT AND VAULT EXTENSIONS SHALL BE LIFTED BY THE INSIDE LIFTING ANCHORS ONLY, THE ONLY EXCEPTION IS THAT 4'X4' EXTENSIONS SHALL BE LIFTED BY THE TOP INSERTS.



SECTION-A

A	ITEM NO.	APPROX. WT.
4" VAULT EXTENSION	194-115-151	250 LBS
8" VAULT EXTENSION	194-115-152	500 LBS
12" VAULT EXTENSION	194-115-156	750 LBS
18" VAULT EXTENSION	194-115-160	840 LBS





4' X 4' DRIVE OVER MODIFICATION

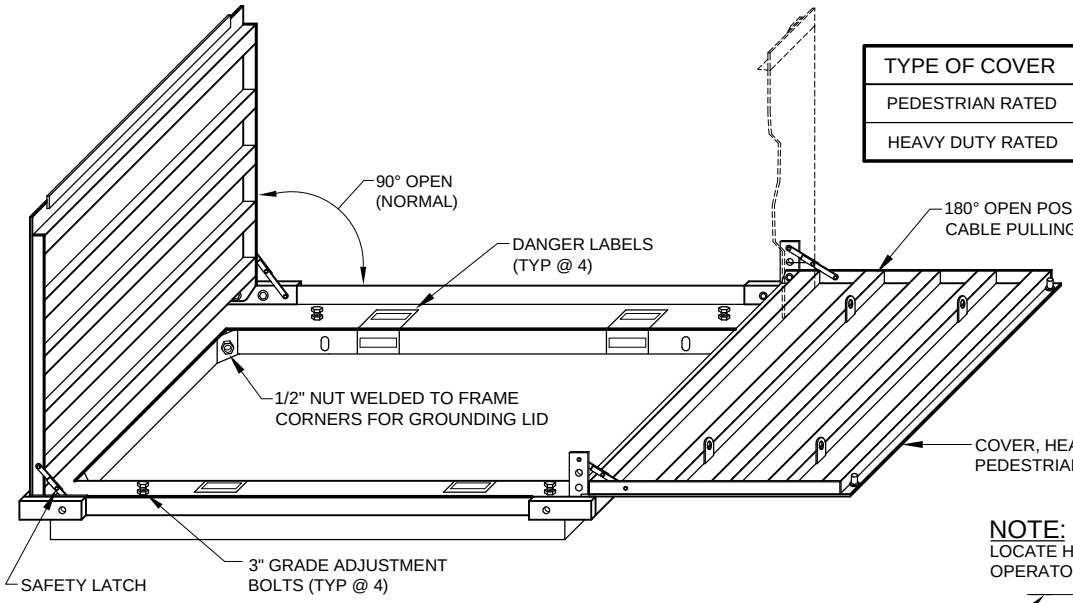
PLAN VIEW

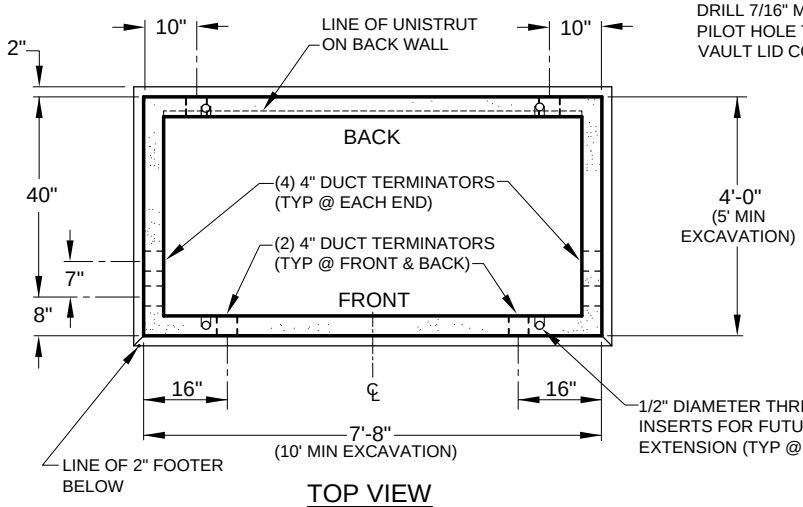
(SPECIFY FOR USE IN HIGH SPEED OR HIGH VOLUME TRAFFIC LANES)

4. The heavy duty rated cover (heavy duty lid has an incidental H20 rating of 16,000 lbs. dual wheel load without allowance for impact) is for off-street/incidental (unintentional) traffic locations only, e.g. sidewalks, residential driveways, parking lots, road shoulder etc., not in roadways or alleyways. The 6X12 vault (194-115-106) with ring and manhole cover (194-115-115) are recommended where vehicular traffic is expected (see EDCS 10-4). The pedestrian rated cover is designed for pedestrian loading only (300 lbs. per sq. ft.). For existing covers in the distribution system, if no markings on the cover state otherwise, assume it is pedestrian rated only.
5. Use foam sealer between vault cover (+/- 3") and concrete vault when raising vault cover to meet grade, typical for sealing new or existing covers.
6. Cable locating test station: remove one stainless steel nut from stainless steel bolt, loop #6 copper wire around bolt. Apply silicone sealant around nut area on exterior side of test station for waterproofing. Install jam nut and tighten with proper tools. Bond #6 wire to system neutral with proper compression crimp. This will provide Central Locating with an above-ground attachment for locating underground primary cables.
7. Plug all lifting inserts with duct seal to keep their integrity at final installation.
8. Replace any uneven or rocking manhole covers with gasketed manhole cover (194-115-188).

4' WIDE X 7-8" LONG X 4' HIGH VAULT ASSEMBLY

TYPE OF COVER	ITEM NO.	APPROX. WT.
PEDESTRIAN RATED	194-115-119	450 LBS.
HEAVY DUTY RATED	194-115-118	480 LBS.

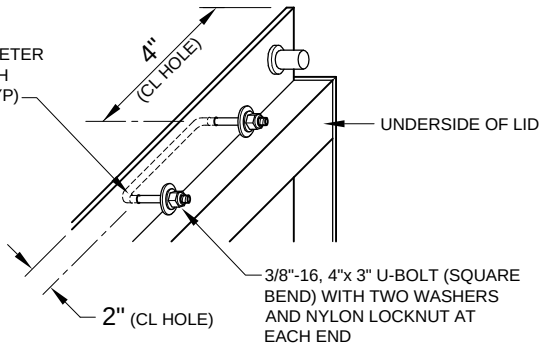




TOP VIEW

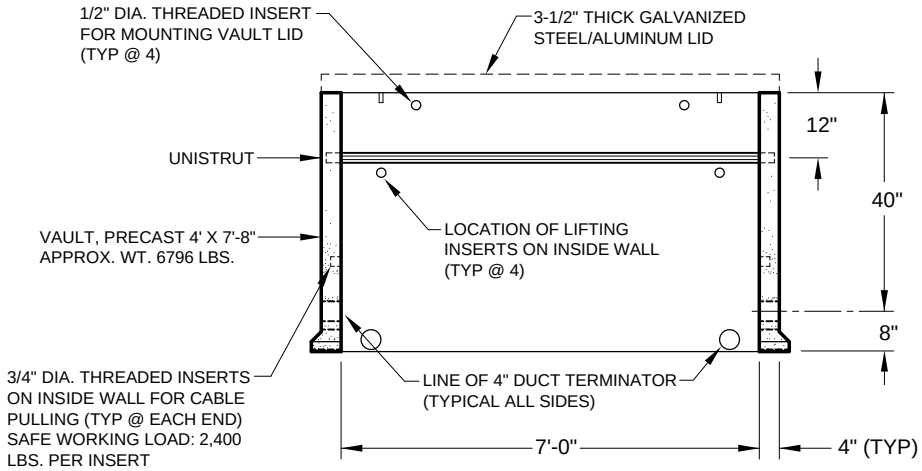
(FRONT TYPICALLY TOWARD SIDEWALK, IF PRESENT, OR TOWARD AN ADEQUATE SPACE AWAY FROM THE ROADWAY FOR OPERATING ACCESS)

NOTE:
LOCATE HANDLE ON TYPICAL OPERATOR SIDE OF VAULT LID



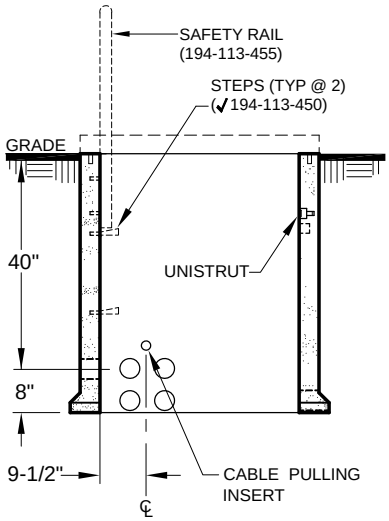
FIELD RETROFIT HANDLE

(FOR USE ON EXISTING MADRUGA HEAVY DUTY 4X4 AND 4X7 VAULT LIDS FOUND IN FIELD THAT ARE NOT INSTALLED WITHIN A SIDEWALK WITH BROKEN TORSION BAR)



BACK INSIDE VIEW

(FRONT VIEW SIMILAR)



LEFT INSIDE VIEW

(RIGHT VIEW SIMILAR)

✓ Denotes minor material items for all non-100 series items treated as such.

CUID EXAMPLE:
E.VLT4X7-X

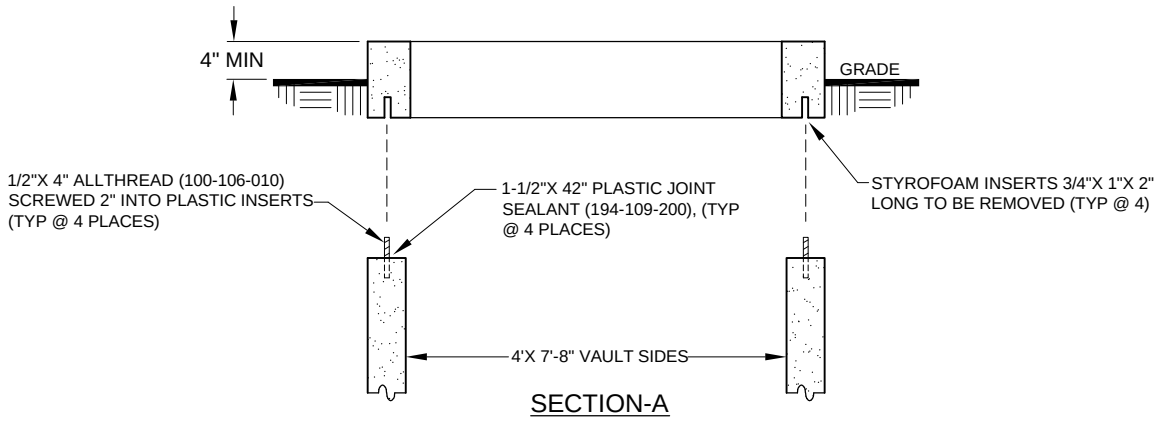
ELECTRIC DISTRIBUTION CONSTRUCTION STANDARDS

Colorado Springs Utilities
It's how we're all connected

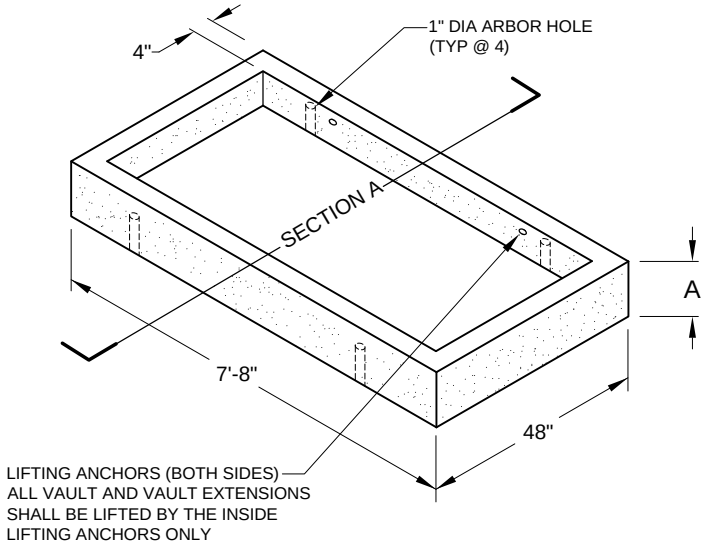
APPROVED AS OF:		
10-2-2023	4'X7'-8" VAULT, COVERS, & EXTENSIONS	10-3 PG. 1/2

T02–01626

CONCRETE 4'X 7'-8" VAULT EXTENSION



SECTION-A



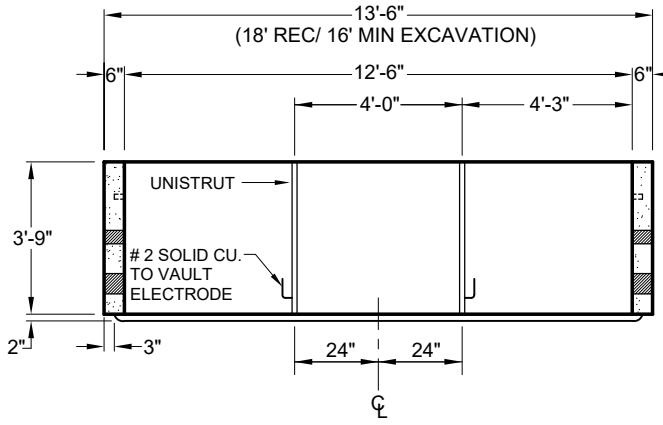
A	ITEM NO.	APPROX. WT.
8" VAULT EXTENSION	194-115-165	720 LBS
12" VAULT EXTENSION	194-115-166	1080 LBS
18" VAULT EXTENSION	194-115-167	1620 LBS

NOTES:

1. Refer to Electric Distribution Construction Standard 10-1 for installation notes.
2. For typical (behind curb, non-sidewalk) installations, install pedestrian (or heavy duty) rated cover 3-1/2" above grade.
3. For typical sidewalk installations, install pedestrian (or heavy duty) rated cover flush to top of proposed sidewalk. Adequately compact soil around lid perimeter to avoid future settling of sidewalk.
4. The heavy duty rated cover (heavy duty lid has an incidental H20 rating of 16,000 lbs. dual wheel load without allowance for impact) is for off-street/incidental (unintentional) traffic locations only, e.g. sidewalks, residential driveways, parking lots, road shoulder etc., not in roadways or alleyways. The 6X12 vault (194-115-106) with ring and manhole cover (194-115-115) are recommended where vehicular traffic is expected (see EDCS 10-4). The pedestrian rated cover is designed for pedestrian loading only (300 lbs. per sq. ft.). For existing covers in the distribution system, if no markings on the cover state otherwise, assume it is pedestrian rated only.
5. Use foam sealer between vault cover (+/- 3") and concrete vault when raising vault cover to meet grade, typical for sealing new or existing covers.
6. Plug all lifting inserts with duct seal to keep their integrity at final installation.
7. Use 3/8" dia. x 4" thick pea gravel inside vault for drainage in muddy or poor soil conditions (one ton will cover approximately 2-1/2 vaults).
8. Vault lids should be installed to limit the likelihood of tripping by pedestrians.

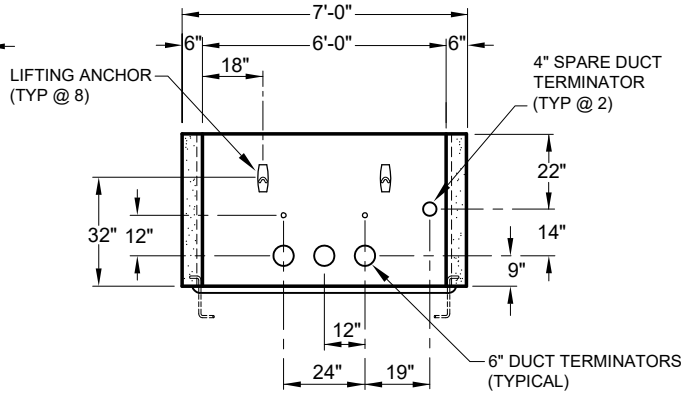
6' WIDE x 12'-6" LONG x 7' HIGH VAULT

(ITEM #194-115-106)



SIDE ELEVATION-TOP HALF

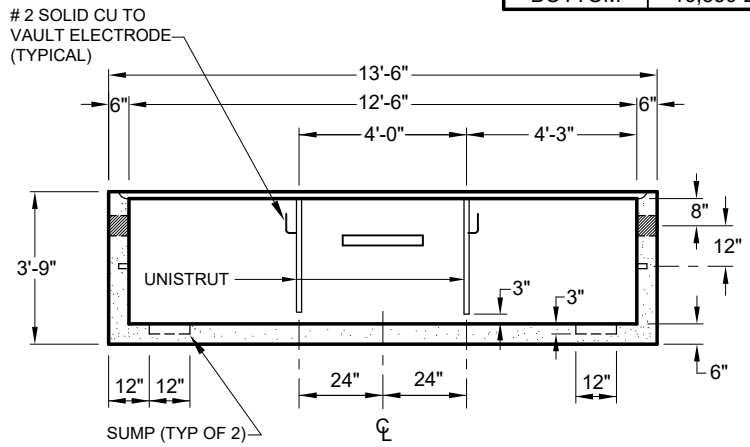
(OPPOSITE SIDE SIMILAR)



END ELEVATION-TOP HALF

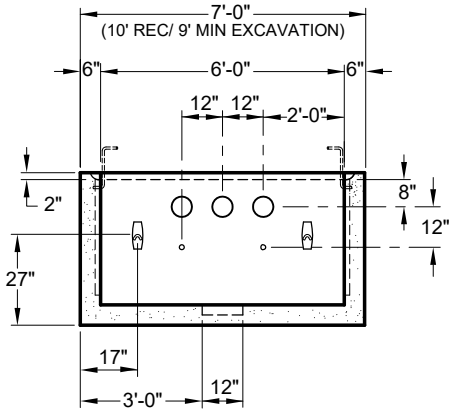
(OPPOSITE SIDE SIMILAR)

VAULT HALF	APPROX WT
TOP	10,800 LBS
BOTTOM	16,350 LBS



SIDE ELEVATION-BOTTOM HALF

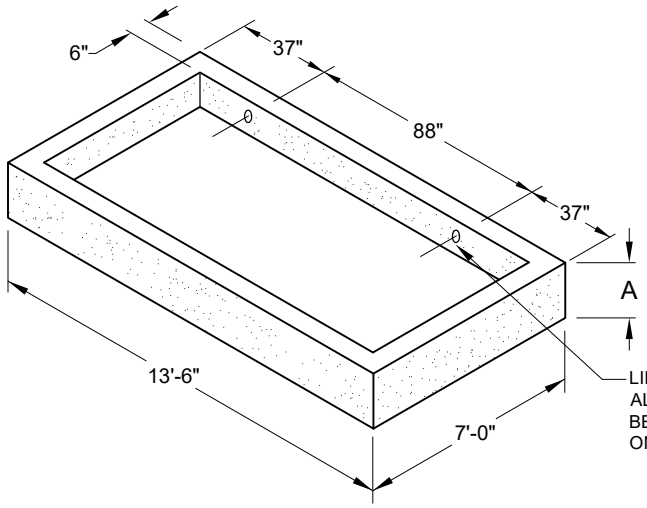
(OPPOSITE SIDE SIMILAR)



END ELEVATION-BOTTOM HALF

(OPPOSITE SIDE SIMILAR)

CONCRETE 6'x 12'-6" VAULT EXTENSION



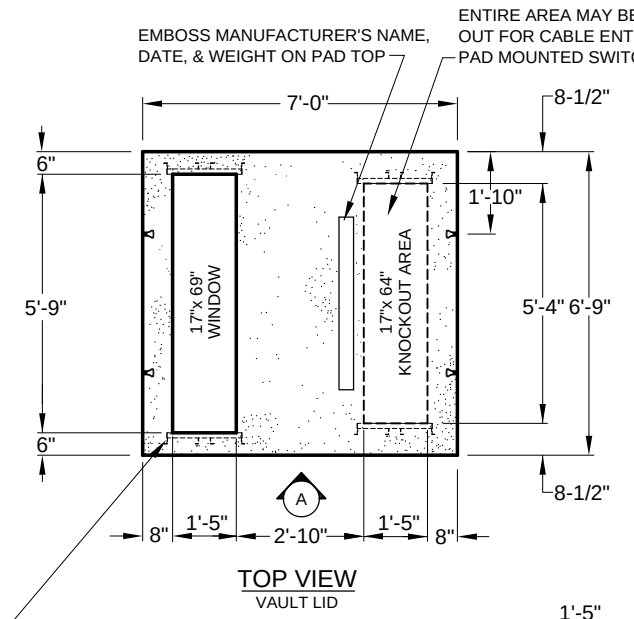
A	ITEM NO.	APPROX. WT.
1.5' VAULT EXTENSION	194-115-161	4,333 LBS
2.5' VAULT EXTENSION	194-115-162	7,222 LBS
3' VAULT EXTENSION	194-115-163	8,667 LBS
3.5' VAULT EXTENSION	194-115-164	10,111 LBS

NOTE:

1. Refer to EDCS 10-1 for installation notes and grounding details between vault halves.
2. The 6x12 vault (Item #194-115-106) with ring and manhole cover (Item #194-115-115) are recommended where high-speed, or heavy traffic is expected.

(PREFERRED)
COVER, VAULT, 10" x 84" x 81", WITH WINDOW AND KNOCKOUT (ITEM #194-115-103)

APPROX WEIGHT= 4856 LBS



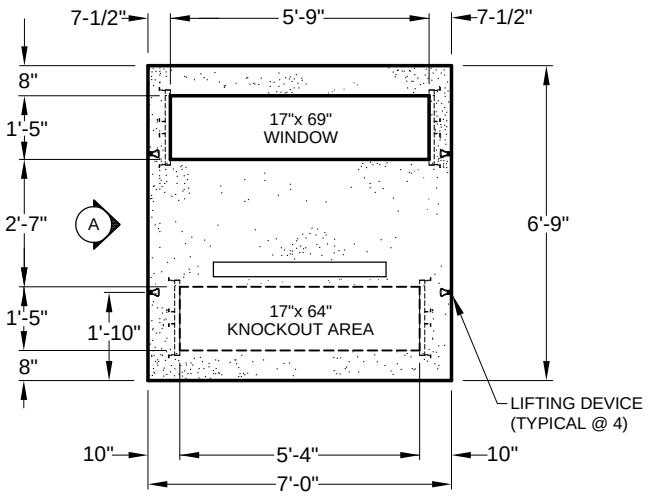
TOP VIEW
VAULT LID

LINE OF UNISTRUT @ EACH END OF WINDOW & KNOCKOUT USED TO ATTACH CABLE SUPPORT BRACKET (TYPICAL)

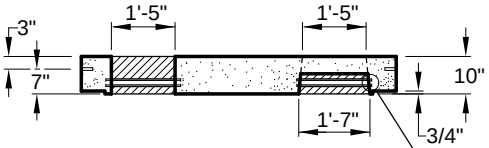
(NON-PREFERRED)
COVER, SUBSTATION VAULT, 10" x 81" x 84", WITH WINDOW AND KNOCKOUT (ITEM #194-115-105)

APPROX WEIGHT= 4856 LBS

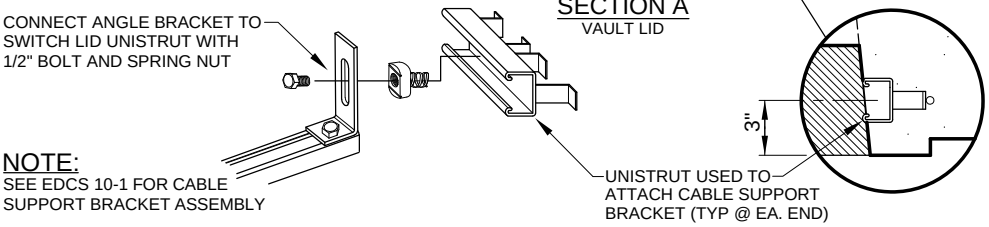
(USE ONLY WHEN NECESSARY TO PROVIDE ACCESS TO CABLE COMPARTMENT)



TOP VIEW
VAULT LID

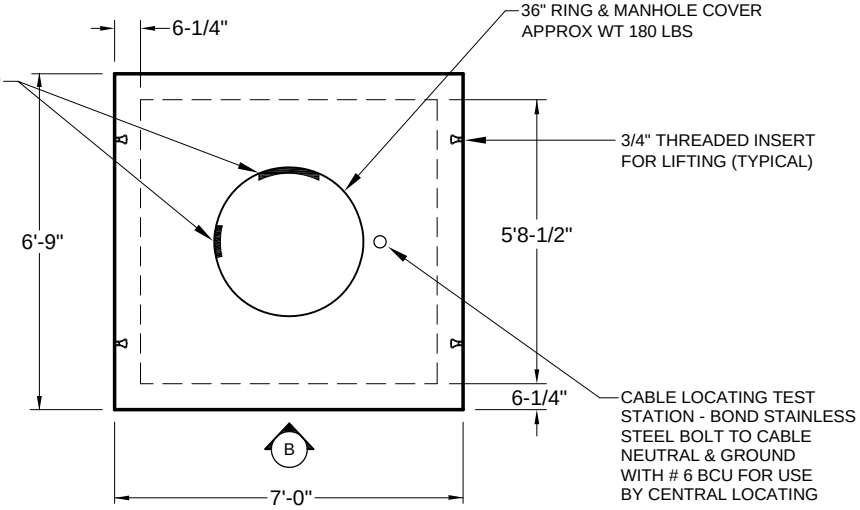


SECTION A
VAULT LID



NOTE:
SEE EDCS 10-1 FOR CABLE SUPPORT BRACKET ASSEMBLY

"UG" FIMS LABELS, INSTALL LARGE TAG ON NORTH SIDE OF LID AND SMALL TAG ON WEST SIDE (SEE SECTION-A)



TOP VIEW

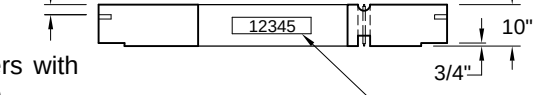
ITEM NUMBER	INSIDE RING DIAMETER	MANHOLE COVER DIAMETER	RISE
194-115-190	36"	37-3/8"	1-1/2"
194-115-191	36"	37-3/8"	2"
194-115-192	35-1/2"	38-1/2"	2"

MANHOLE RING EXTENSIONS
Used to raise manhole covers to grade

COVER, VAULT, 10" x 81" x 84",
RING & COVER, (ITEM # 194-115-115)

APPROX WEIGHT= 5780 LBS

NOTE: USE ITEM # 194-115-132 FOR COVER, VAULT, 8" x 81" x 84",THAT IS A CUSTOM 8" THICK LID FOR USE IN REPLACING EXISTING 8" THICK LIDS ONLY.



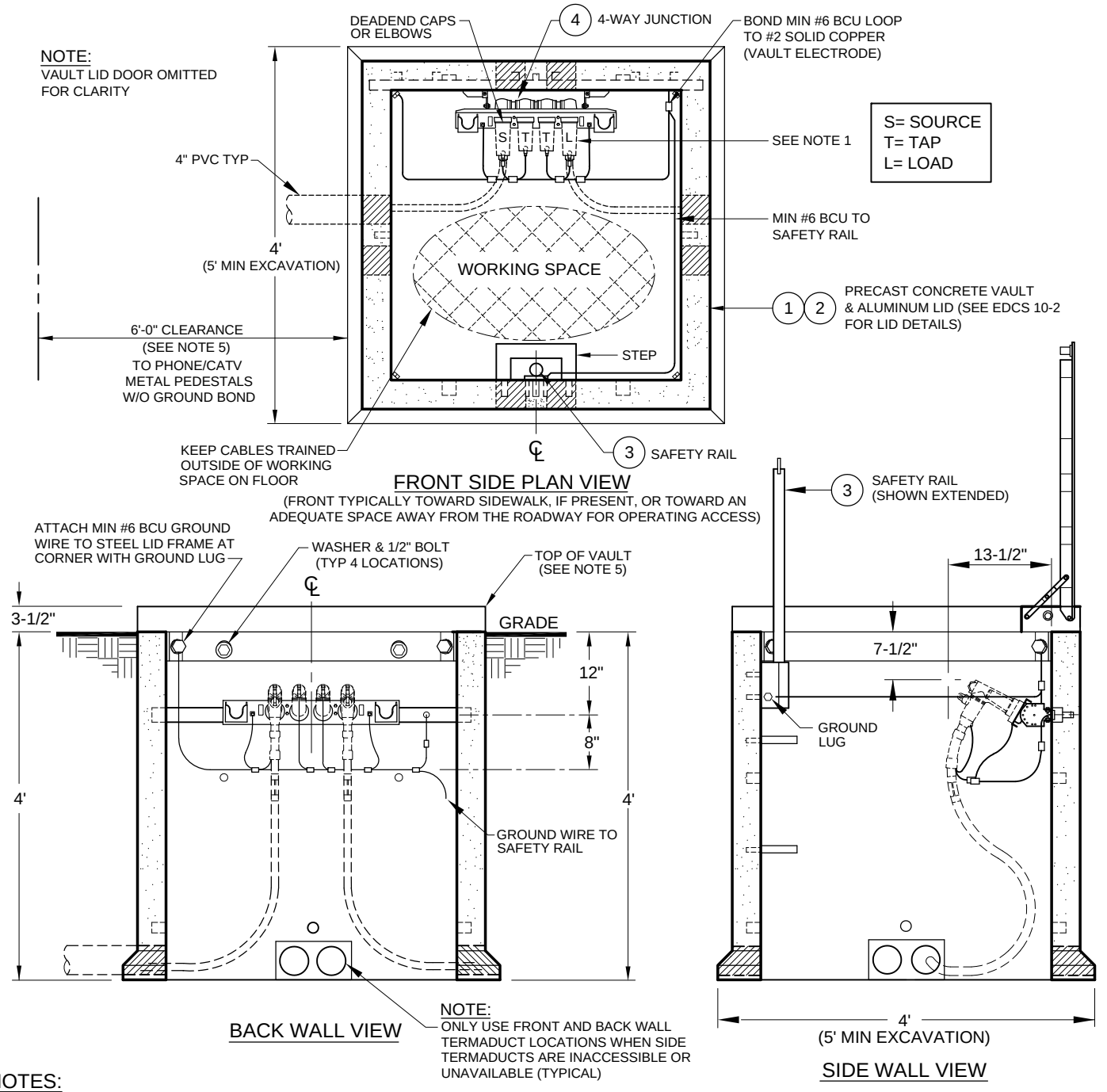
SECTION B
VAULT LID

INSTALL "UG" FIMS LABELS TO INSIDE OF VAULT LID WITH THIN LAYER OF SILICONE SEALANT, TYPICAL (ITEM ✓194-113-100)

NOTES:
1. Replace any uneven or rocking manhole covers with gasketed manhole cover (Item #194-115-188).
2. Replace broken manhole covers with Item #194-115-189.
3. Vault lids should be installed to limit the likelihood of tripping by pedestrians

4X4 VAULT INSTALLATION

(PREFERRED INSTALLATION)



FRONT SIDE PLAN VIEW

(FRONT TYPICALLY TOWARD SIDEWALK, IF PRESENT, OR TOWARD AN ADEQUATE SPACE AWAY FROM THE ROADWAY FOR OPERATING ACCESS)

BACK WALL VIEW

NOTE:
ONLY USE FRONT AND BACK WALL TERMADUCT LOCATIONS WHEN SIDE TERMADUCTS ARE INACCESSIBLE OR UNAVAILABLE (TYPICAL)

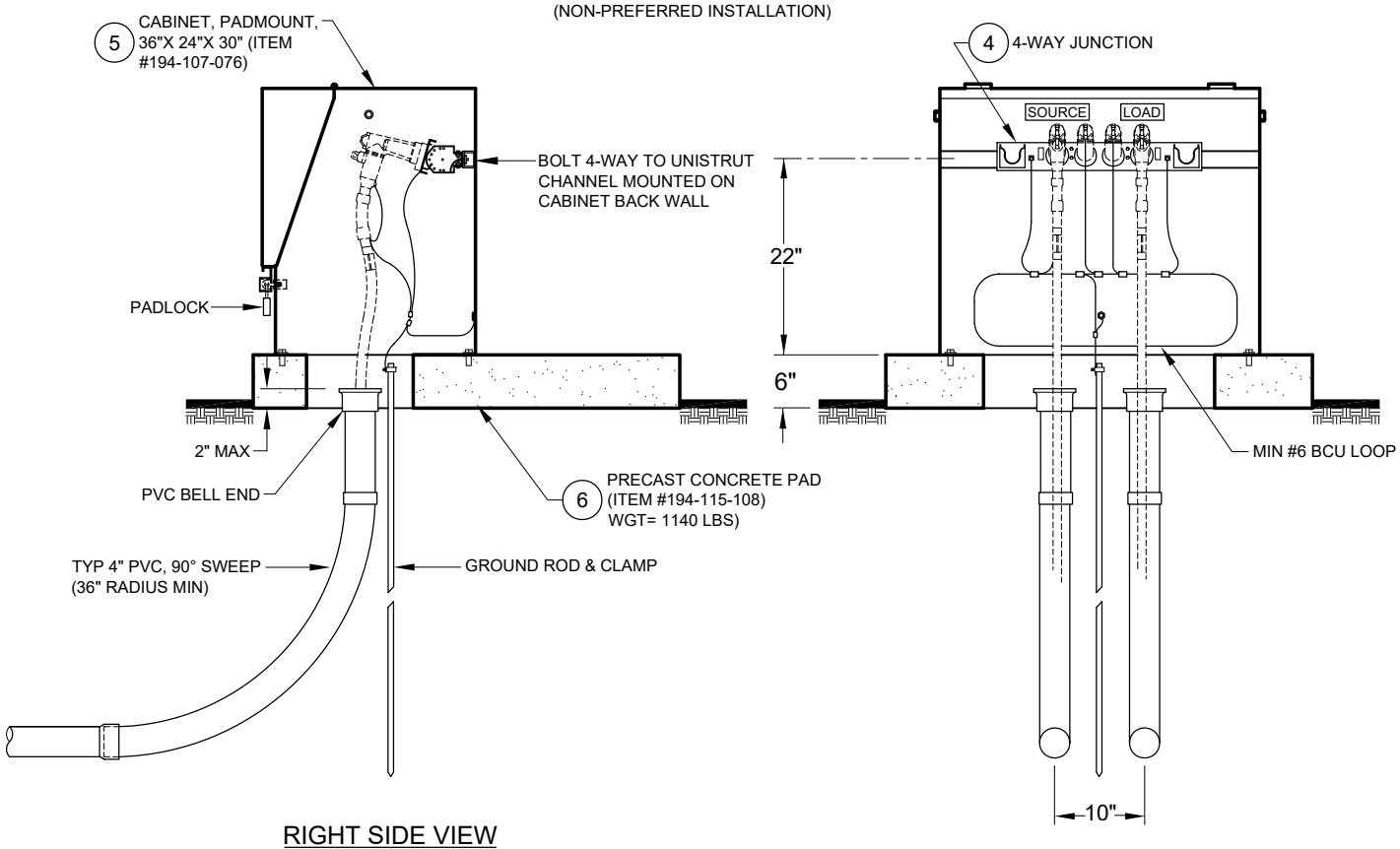
SIDE WALL VIEW

NOTES:

1. All sources and loads will be terminated as shown. These will be indicated on job construction prints. Source, Tap, Tap, Load is the preferred termination configuration. In congested 4x7 (3 phase) vaults, this sequence can be rearranged as necessary to keep cables from crossing each other, as long as Source & Load are not located in the center two bushings.
2. Use foam sealer (Item #100-106-965) between vault lid (± 3") and concrete vault when raising vault lid to meet grade, typical for sealing new or existing lids.
3. Use 3/8" dia. pea gravel, 4" thick inside vault for drainage in muddy or poor soil conditions (one ton will cover approximately 6 vaults).
4. Specify a pedestrian or heavy duty rated cover for flush mount applications (pedestrian lid is for pedestrian traffic only, heavy duty lid for off-street/incidental (unintentional) traffic locations only, e.g. sidewalks, residential driveways, parking lots, road shoulder etc., not in roadways or alleyways). See EDCS 10-2 for application limits and details for flush mounting in sidewalks.
5. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!

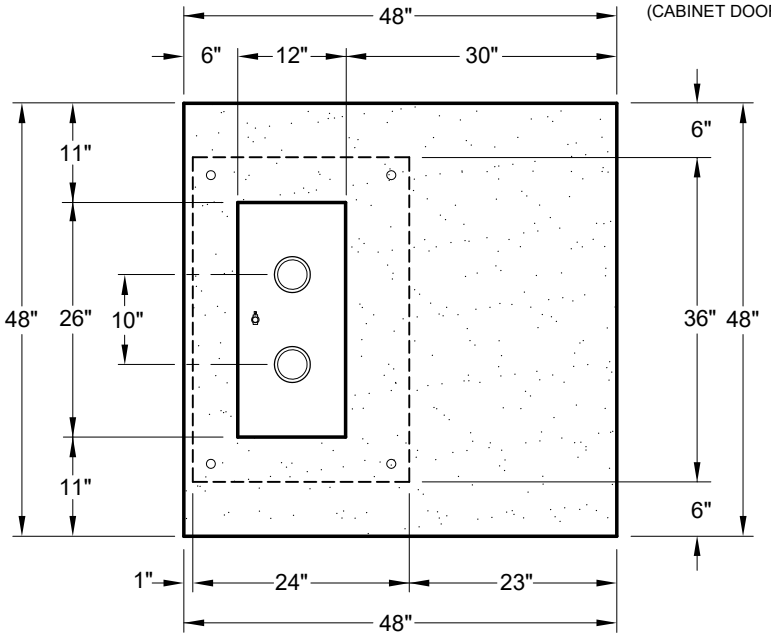
CUID EXAMPLE:
E.VLT4X4&H20-1PH-4WAY

PADMOUNT INSTALLATION
(NON-PREFERRED INSTALLATION)



RIGHT SIDE VIEW

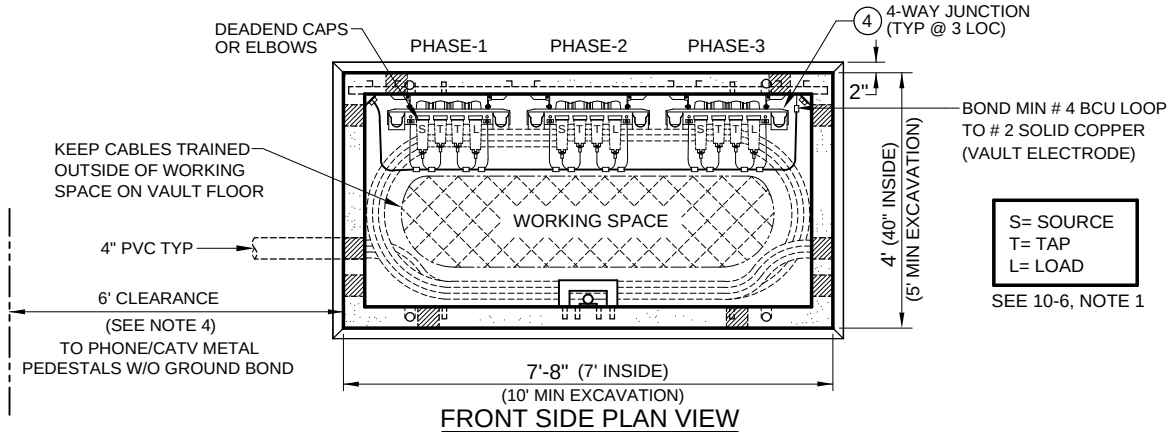
FRONT VIEW
(CABINET DOOR REMOVED FOR CLARITY)



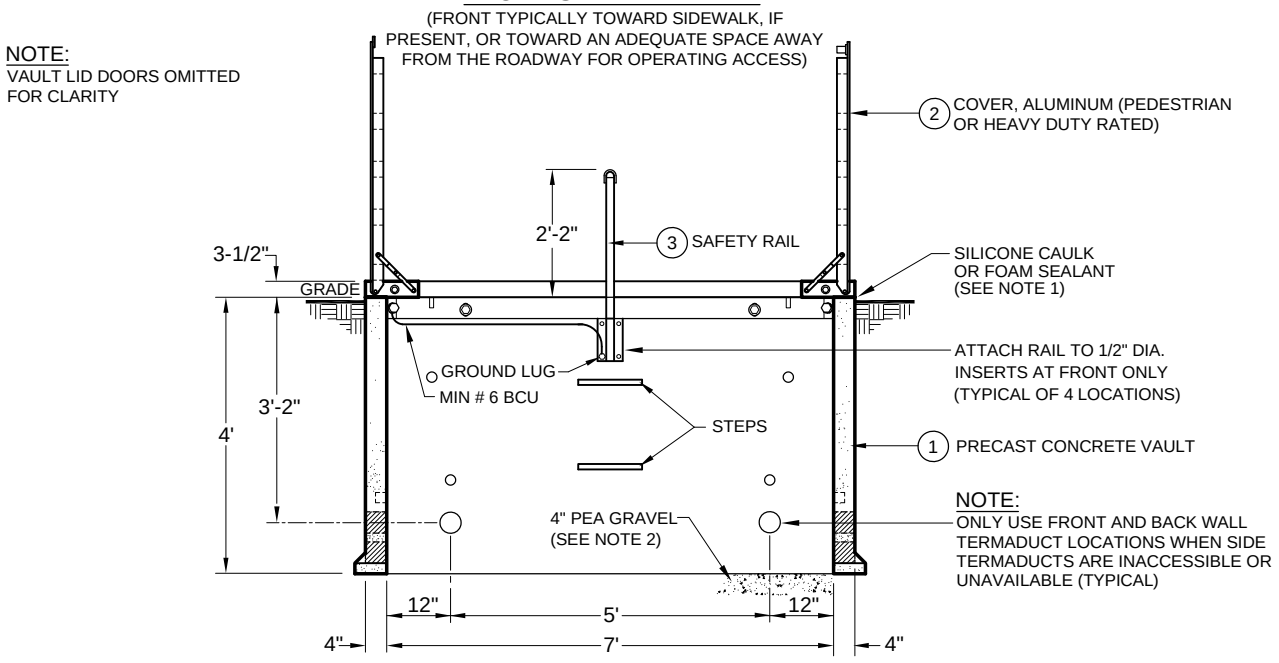
NOTES:

1. Bond primary cable concentric neutrals, bushing insert ground tab & elbow ground to the ground loop.
2. Cabinet to be bolted to pad at 4 locations (see drawing).
3. All sources and loads will be terminated as shown. These will be indicated on job construction prints. Source, Tap, Tap, Load is the preferred termination configuration. In congested 4x7 (3 phase) vaults, this sequence can be rearranged as necessary to keep cables from crossing each other, as long as Source & Load are not located in the center two bushings.
4. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!
5. Remove lifting lugs/ bolts after installation.

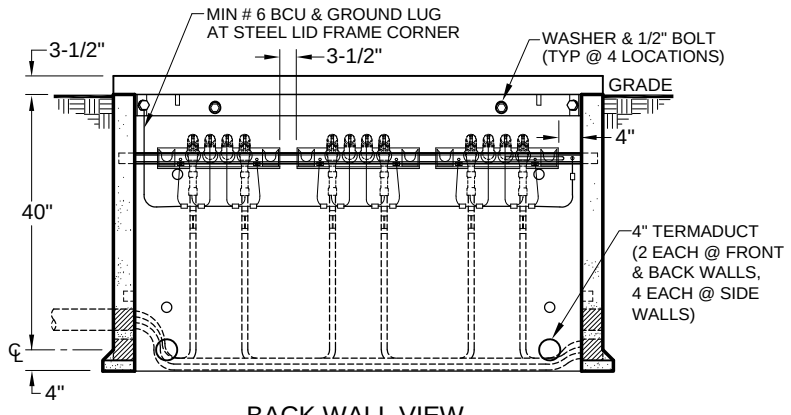
CUID EXAMPLE:
E.PD-1PH-4WAY



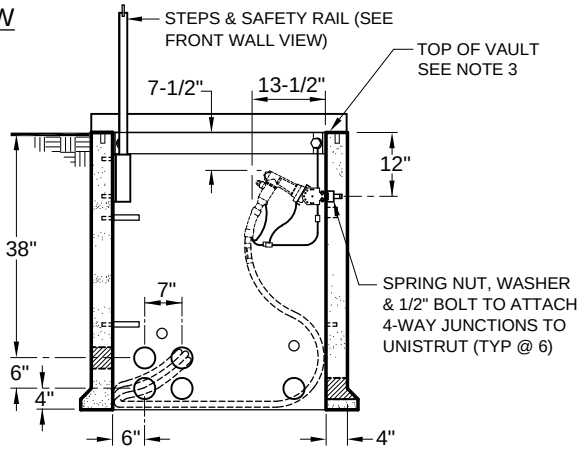
FRONT SIDE PLAN VIEW



FRONT WALL VIEW



BACK WALL VIEW



SIDE WALL VIEW

NOTES:

1. Use foam sealer (Item #100-106-965) between vault lid and concrete vault when raising lid (+/- 3") to meet grade, typical for sealing new or existing lids.
2. Use 3/8" dia. pea gravel, 4" thick inside vault for drainage in muddy or poor soil conditions (one ton will cover approximately 2-1/2 vaults).
3. Specify a pedestrian or heavy duty rated cover for flush mount applications (pedestrian lid is for pedestrian traffic only, heavy duty lid for off-street/incidental (unintentional) traffic locations only, e.g. sidewalks, residential driveways, parking lots, road shoulder etc., not in roadways or alleyways). See EDCS 10-3 for flush mounting in sidewalks.
4. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!

CUID EXAMPLE:
E.VLT4X7&H20-3PH-4WAY

Colorado Springs Utilities
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ELECTRIC DISTRIBUTION CONSTRUCTION STANDARDS

APPROVED AS OF: 8-17-2023	15KV 200-AMP 3-PHASE VAULT 4X7	10-7	PG. 1/1

T02–01626

TRENCHING GUIDE

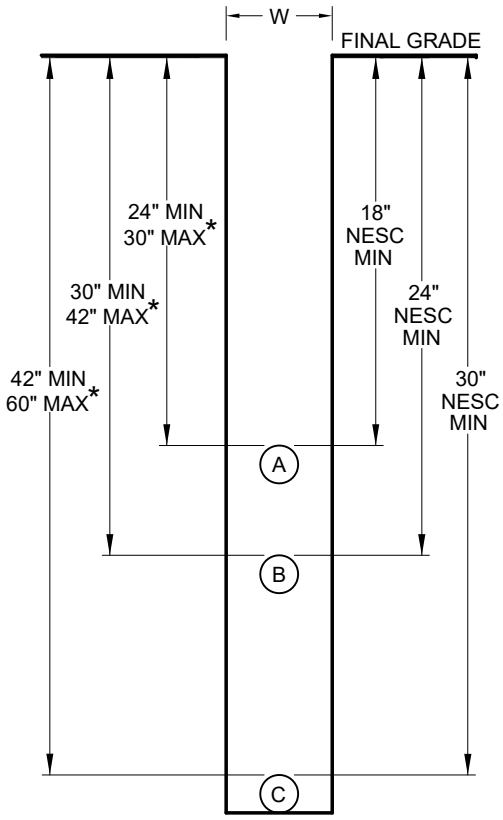


FIGURE- A
TYPICAL TRENCH DEPTHS

NESC MINIMUM COVER ABOVE TOP OF CABLES (OR DIRECT BURIED DUCT- COLORADO SPRINGS UTILITIES STANDARD) PER NESC RULE 352D2 (WITHOUT SUPPLEMENTAL PROTECTION- SEE NOTE 2, REQUIRES WRITTEN AUTHORIZATION FROM A COLORADO SPRINGS UTILITIES ELECTRIC DEPARTMENT REPRESENTATIVE).

NESC MINIMUM COVER IS 24" → 30" TYP (COLORADO SPRINGS UTILITIES ADOPTED A LARGER MINIMUM COVER FOR ALL VOLTAGES TO ACCOUNT FOR POTENTIAL GRADE CHANGES).

NOTE:
SEE NOTES 6 & 7 FOR DEPTH INSPECTION REQUIREMENTS

*COLORADO SPRINGS UTILITIES ELECTRIC REQUIRED STANDARD MINIMUM CONDUIT/ CABLE COVER

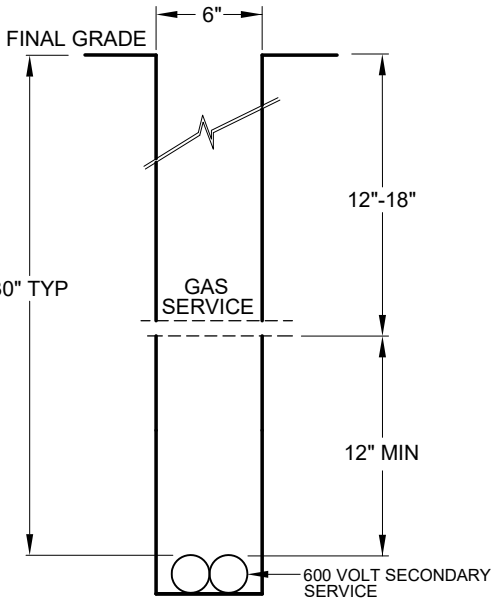


FIGURE- B
TYPICAL TRENCH CROSSING DEPTHS

CABLE/ CIRCUIT TYPE	TYPICAL TRENCH WIDTH		MAXIMUM VOLTAGE
A	STREETLIGHT FEEDS	6"	MAX. 150 VOLTS PHASE TO GROUND
B	SECONDARY	6"	0-600 VOLTS PHASE-TO-PHASE
C	PRIMARY	24"	601-50,000 VOLTS PHASE-TO-PHASE

TRANSITION COUPLINGS PROVIDED BY COLORADO SPRINGS UTILITIES	
SIZE AND TYPE	ITEM NUMBER
2" E-LOK	✓ 194-214-218
4" E-LOK	✓ 194-214-220
6" E-LOK	✓ 194-214-230
2" FLEX, 2-CLAMP	✓ 194-214-407
4" FLEX, 2-CLAMP	✓ 194-214-408
6" FLEX, 2-CLAMP	✓ 194-214-410

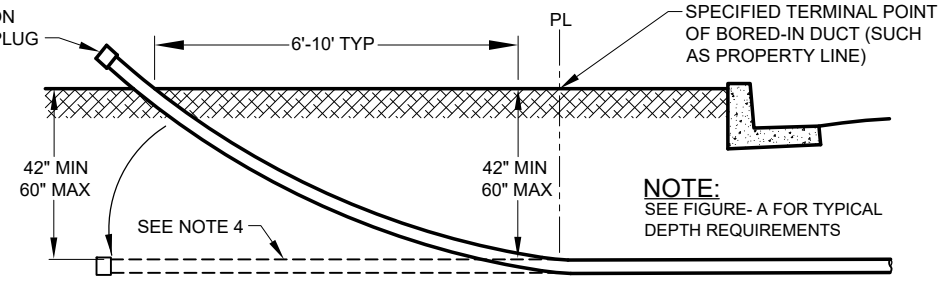


FIGURE- C
BORED-IN STUB CONFIGURATION

NOTES:

1. Trench width to be a minimum of 3" on each side of conduit or conductor, to provide for proper compaction (see table above).
2. Duct shall have a 3" minimum concrete envelope when Utilities minimum cover depths are not achieved. Ducts shall also be installed with plastic base spacers to maintain a consistent 3" of concrete below duct. See Electric Distribution Construction Standard (EDCS) 11-2 & 11-3.
3. See EDCS 18-304 for clearances required by NESC from UG electric conduit/cable to other UG facilities (communication, water, sewer, foundations, sub-structures, etc).
4. Colorado Springs Utilities requires an E-LOK type transition coupling at plugged end of bore, to be relocated to nearest 42" depth of stub (typically within 6'-10') and used for attachment of contractor supplied pipe. Contractor has the option of picking up bored pipe at 42" depth or digging parallel and lowering end of stub if direction of contractor's ditch allows.
5. Colorado Springs Utilities acknowledges difficulties in blowing and pulling wire in ducts of dissimilar inside diameters, and accepts this responsibility if contractor supplied pipe meets Electric Distribution Construction Standard 11-3 and is installed properly.
6. If required depth of trench or bored-in conduit cannot be met by Utilities contractor, new proposed depth must be approved in advance by Utilities inspector. Inspector must be notified a minimum of three days in advance of bore start time. Inspector may require utility or other locate documentation to verify existing infrastructure depths. Potholing may be required at any time, at the discretion of the Utilities inspector, to prove any bore depth. Conduit will be required for any installation that exceeds Utilities minimum or maximum depth as shown in Figure A. See also ELESS 8.06 and 10.01h for service inspection responsibilities.
7. Utilities contractor to submit bore log to Utilities inspector within 7 days of completion of bore installation.

✓ - Denotes minor material items for all non-100 series items treated as such.

TRENCH BACKFILL AND COMPACTION GUIDE:

1. Before any backfilling operations are started, make an inspection of all trenches.

2. If soil materials in the bottom of a trench might cause unequal settlement, the unsatisfactory materials shall be removed and backfilled with selected materials.

3. Check for cable placement, conduit integrity, concrete encasement of conduit when required, adequate bedding/cover over direct buried cables, proper minimum depth, pole and pad risers, cable entrance to and from vaults and pads, secondary pull boxes and service stubs marked with electronic markers to determine that the work has been done in accordance with construction standards and job print specifications.

4. NESC Rule 352A requires the following:
   a. The bottom of the trench receiving direct-buried cable should be relatively smooth, undisturbed earth; well tamped earth; or sand. When excavation is in rock or rocky soils, the cable should be laid on a protective layer of well-tamped backfill. Backfill should be free of materials that may damage the cable. Backfill should be adequately compacted. Machine compaction should not be used within 150mm (6 inches) of the cable.
   b. For cable installed in a duct, the bottom of the trench should be in undisturbed, tamped, or relatively smooth earth. Where the excavation is in rock, the duct should be laid on a protective layer of clean tamped backfill. All backfill should be free of materials that may damage the duct.

5. The first twelve inches of backfill shall be free from stones, rock, or other material that might damage the cable or conduit. Selected backfill shall contain no soil material larger than 1/2" in diameter.

6. Final backfill shall be done in equal increments the length and girth of the trench line.

7. When suitable, as determined by soils test, use native material compacted in accordance with the following:
   a. For cohesive soils, compact to 95% maximum Standard Proctor dry density (ASTM D698) at ±2% of optimum moisture content.
   b. For cohesiveless soils, compact to 95% maximum Modified Proctor dry density (ASTM D1557) at +/-2% of optimum moisture content (or 100% maximum Standard Proctor dry density (ASTM D698) at ±2% of optimum moisture content). Prior to and during compaction, materials shall have a moisture content as required to obtain the specified density. Thickness of horizontal layers after compacting shall not be more than 9 inches.
   c. Thickness of horizontal layers after compacting shall not be more than 6 inches. For highly expansive soils (swell potential is greater than 2.00% under 200 psf surcharge pressure), contact City Engineering.
   d. If native soils are not suitable for trench backfill and compaction (heavy clay or expansive soil, rock-filled, etc.), use flowable fill, T&D Underground mix #3, installed as specified on page 5 or Class 5 or 6 base course or similar graded material compacted to the test values specified above (see gradation specifications on page 6).

   NOTE: Utility Inspectors routinely obtain compaction results from test labs using the Modified Proctor method and as a practical approach based on historical values or maximum density for native soils in the vicinity (not site specific) when native backfill is employed. When deemed necessary by the test lab and Utility Inspector, the site specific maximum density may need to be verified by test. Any independent contractor tests should be done using the same (Modified Proctor) test method for compaction of results or else the limits for the Standard Proctor method shall be referenced. **Backfill & compaction of all trenches shall meet the requirements of the City of Colorado Springs City Engineering Standard Specifications and all other applicable State, Federal, or railroad requirements.**

8. The density tests shall be performed at various depths in the trench to ensure that the required compaction is obtained throughout. For trenches less than 30" in depth, compaction tests shall be taken at the surface and within 18" above the top of conduit or cable. For trenches greater than 30" in depth, density tests shall be taken within 18" of the top of the conduit or cable and at 24" vertical intervals to the top of the trench with the final test at the surface.

9. The frequency of density tests shall be a minimum of 250 linear feet of mainline trench and at each service installed. The number of density tests may be increased if directed by the Utility Inspector. If flowable fill is installed as specified on page 5, compaction and density tests are not required.

10. All trench lines shall be restored to the original grade. Any excess soil shall be piled on top of the trench and shall be well compacted. The top surface of the trench backfill shall be relatively smooth. The premises should be left in clean condition and all rock and debris shall be removed from the site. Pavement or walk cuts shall be repaved with material identical to the original surfaces in accordance with Standard Specifications of the Department of Public Works, the El Paso County ordinances, or Colorado State Highway Department as appropriate.

11. Flowable fill, T&D Underground Mix #3 on page 5 is required as backfill for all trenches less than one foot in width in public right-of-ways under the jurisdiction of the Colorado Springs Department of Public Works.

FOUNDATION COMPACTION SPECIFICATION FOR PADMOUNTED EQUIPMENT

1. Colorado Springs Utilities recommends experienced personnel who understand the importance of moisture for compacting soils and the characteristics of expansive soils.

2. Before any backfilling or compaction operations are started, inspect all conduit spacings and riser heights. Make sure they meet the construction standard specified for the equipment to be installed.

3. All pads pre-cast or poured on site shall project a minimum of 4" above grade.

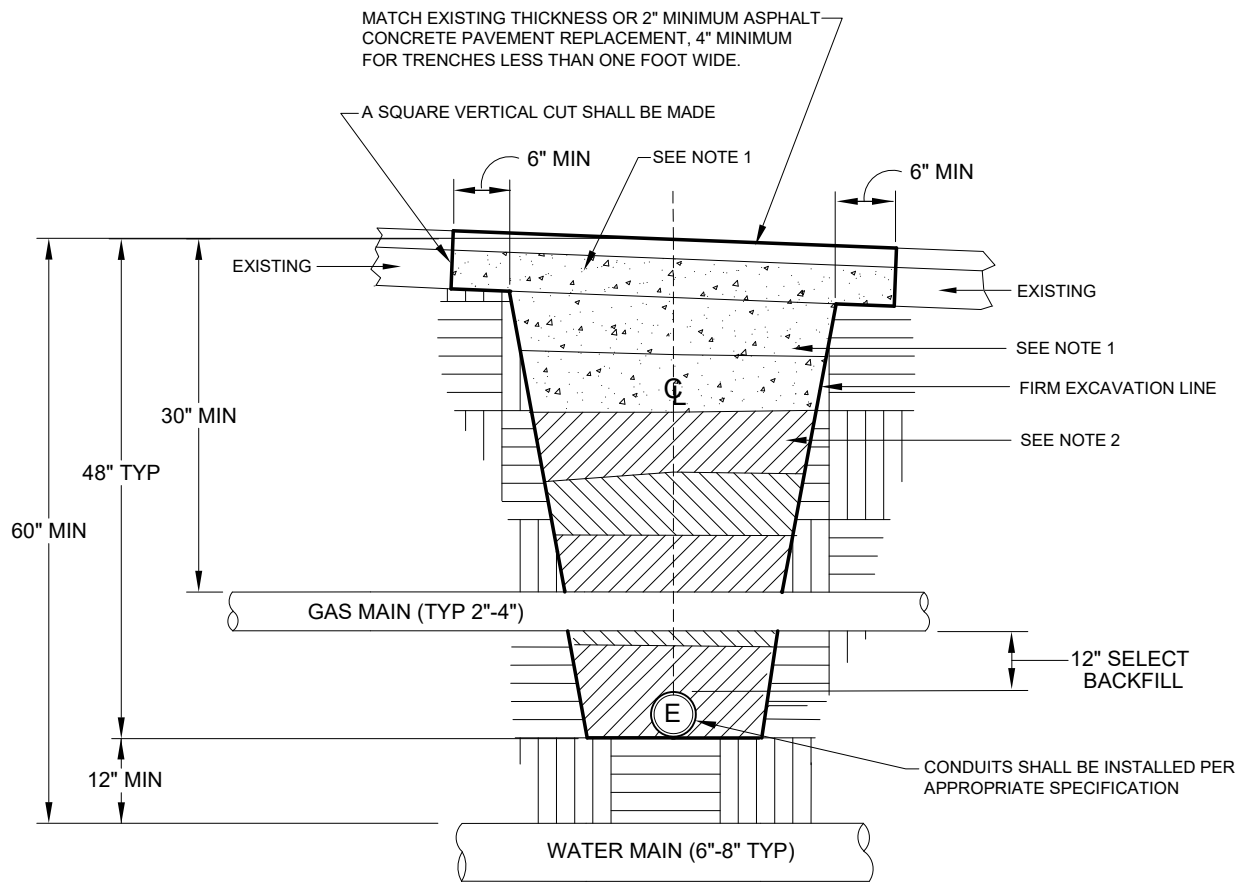
4. Excavate a minimum of twelve inches beyond perimeter of pad and a minimum of 36" deep.

5. The first twelve inches of backfill shall be free from stones, rock, or other material that might damage the cable or conduit. Selected backfill shall contain no soil material larger than 1/2" in diameter.

6. When suitable, as determined by soils test, use native material compacted in accordance with the following:
   a. For cohesive soils, compact to 87% maximum Modified Proctor dry density at ± 2% of optimum moisture content (or 92% maximum Standard Proctor dry density at ±2% of optimum moisture content).
   b. For cohesionless soils, compact to 85% maximum Modified Proctor dry density at -5% to +3% of optimum moisture content (or 90% maximum Standard Proctor dry density at -5% to +3% of optimum moisture content). Prior to and during compaction, materials shall have a moisture content as required to obtain the specified density. Thickness of horizontal layers after compacting shall not be more than 9".
   c. For expansive soils, remove and replace with CDOT Class 5 or 6 soil and compact per 6b above (see gradation specifications on page 6).

7. After successful completion of the above steps, call the Colorado Springs Utilities Inspector who will arrange for compaction tests. This shall be done and approved before a concrete pad will be poured or a precast pad installed.

8. All equipment pads supporting Colorado Springs Utilities equipment shall have compaction tests and records kept by the Colorado Springs Utilities Inspector.



PAVEMENT REPLACEMENT AND BACKFILL DETAIL

STREET CROSSING NOTES:

1. All work to be in conformance with City of Colorado Springs Public Works specifications (https://coloradosprings.gov/public-works/page/standard-specifications-manual). Refer to other authority if using state highway or county roads.

2. When suitable, use native material compacted as specified on page 2. If native soils are not suitable, install flowable fill, Colorado Springs T&D Mix #3 as specified on page 5.

3. Flowable fill is required for street crossing trenches one foot or less in width.

4. Utilize the boring crew/contractor when appropriate for recently repaved streets, etc.

UTILITIES CONCRETE MIXES

ELECTRIC T&D UNDERGROUND

MIX #1	MIX #2	MIX #3
DUCT ENCASEMENT CONCRETE	ALL POURED-IN-PLACE EQUIPMENT PADS (WHERE ADEQUATE SUPPORT STRENGTH IS NEEDED)	FLOWABLE FILL MIX
SLUMP: 6" MAXIMUM AGGREGATE: 3/4" MINIMUM STRENGTH: 2000 PSI MAXIMUM WATER/CEMENT: 0.85 LBS/LB MINIMUM CEMENT/YD: 453 LBS/YD TYPE II CEMENT	SLUMP: 6" MAXIMUM AGGREGATE: 3/4" MINIMUM STRENGTH: 2000 PSI MAXIMUM WATER/CEMENT: 0.85 LBS/LB MINIMUM CEMENT/YD: 453 LBS/YD TYPE II CEMENT MAXIMUM AIR ENTRAINMENT: 6% +/- 0.5%	FOR FLOWABLE FILL SPECIFICATION: REFERENCE COLORADO SPRINGS "CITY STANDARD SPECIFICATIONS MANUAL" SECTION 206 "COMPACTION OF UTILITY TRENCHES" OR CDOT "SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" SECTION 206 "EXCAVATION AND BACKFILL FOR STRUCTURES".

NOTE:
ANY CONCRETE MIX CONTAINING FLY ASH OR ADDITIVES, MUST BE APPROVED BY UTILITIES ENGINEERING STANDARDS.

CONCRETE MIX ESTIMATOR
FOR CONCRETE ENCASED DUCT BANKS

6" DUCT BANK STRUCTURE	MINIMUM TRENCH WIDTH	REQUIRED CONCRETE HEIGHT	TYPICAL BUCKET WIDTH *	CONCRETE QUANTITY (CUBIC YARDS)								
				TRENCH LENGTH								
				LINEAL FOOT	50'	100'	150'	200'	250'	300'	350'	400'
2 CONDUITS	21-1/4"	12"	18" (20"- 22")	0.0532	2.66	5.32	7.98	10.64	13.30	15.96	18.62	21.28
			24" (26"- 28")	0.0719	3.60	7.19	10.79	14.38	17.98	21.57	25.17	28.76
4 CONDUITS	21-1/4"	21"	18" (20"- 22")	0.0898	4.49	8.98	13.47	17.96	22.45	26.94	31.43	35.92
			24" (26"- 28")	0.1220	6.10	12.20	18.30	24.40	30.50	36.60	42.70	48.80
6 CONDUITS	29-7/8"	21"	30" (32"- 34")	0.1400	7.00	14.0	21.0	28.0	35.0	42.0	49.0	56.0

* ADD 2"- 4" FOR ACTUAL BUCKET TRENCH WIDTH

QUANTITY BASED ON MAXIMUM BUCKET TRENCH WIDTH (SEE NOTE 2)

FLOWABLE FILL MIX ESTIMATOR
FOR FILLING TRENCH ABOVE CONCRETE ENCASED DUCT BANKS

6" DUCT BANK STRUCTURE	MINIMUM TRENCH WIDTH	REQUIRED CONCRETE HEIGHT	TYPICAL BUCKET WIDTH *	FLOWABLE FILL QUANTITY (CUBIC YARDS)								
				TRENCH LENGTH								
				LINEAL FOOT	50'	100'	150'	200'	250'	300'	350'	400'
2 OR 4 CONDUITS	21-1/4"	36"	18" (20"- 22")	0.204	10.20	20.40	30.60	40.80	51.0	61.20	71.40	81.60
			24" (26"- 28")	0.260	13.0	26.0	39.0	52.0	65.0	78.0	91.0	104.0
6 CONDUITS	29-7/8"	36"	30" (32"- 34")	0.315	15.75	31.50	47.25	63.0	78.75	94.50	110.25	126.0

* ADD 2"- 4" FOR ACTUAL BUCKET TRENCH WIDTH

QUANTITY BASED ON MAXIMUM BUCKET TRENCH WIDTH (SEE NOTE 3)

CONCRETE NOTES:

1. The Concrete Mix and Flowable Fill Mix Estimator charts are based on typical Utilities concrete encased trench configurations. Flowable fill (Mix #3) is commonly used to backfill trenches when native soil is unsuitable, or for quick trench closure (see EDCS 11-2).
2. The formula for estimating cubic yards of Concrete Mix: CU. YD.= $\frac{L' \times [(W' \times H') - (N \times 0.196)]}{27}$ (where "N" = number of 6" ducts)
3. The formula for estimating cubic yards of Flowable Fill is: CU. YD.= $\frac{L' \times W' \times H'}{27}$

FLOWABLE FILL INSTALLATION GUIDE:

Flowable fill for utility trench restoration is to be used only as an alternative when native soil is not suitable for backfill. It will set up and provide compaction for quick trench closure. It shall be installed as follows:

1. As the cement truck begins pouring fill mix into the trench, the crew shall start vibrating the mix immediately.
2. To achieve proper hydration of the flowable fill mix, vibrators shall be used in all cases. The use of vibrators is extremely important as it removes excess water from the mix. If vibrators are not used, the flowable fill will not hydrate properly. For proper installation, the use of one vibrator minimum is required for each concrete truck pouring concrete into a trench.
3. All concrete encased ducts using "T&D Underground Mix #1" shall be allowed sufficient time to set up before the flowable fill mix is installed. This is to avoid any intermixing of the two different types of concrete. See chart for estimating flowable fill quantity when used to cover concrete encased duct banks.
4. The normal set-up time for the flowable fill mix to withstand traffic is approximately one hour after installation. Depending upon soil conditions, weather, and temperature, this time may vary. The mix will completely set up in 28 days, when properly hydrated. The set-up time required to resume normal traffic shall be determined by the Colorado Springs Utilities LCS/Inspector on the job site.

AGGREGATE BASE COURSE MATERIALS

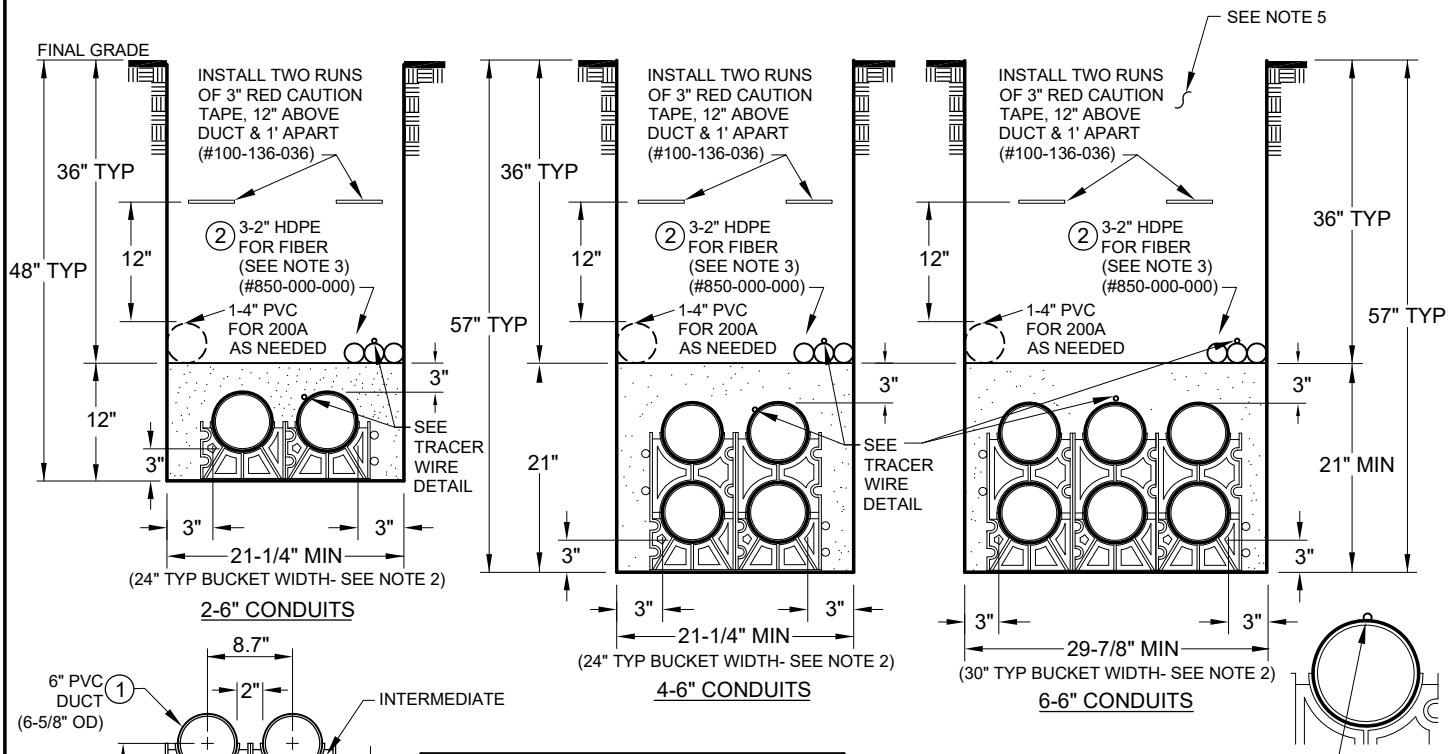
(USE AS DRIVING SURFACE OR PAD SITE
REPLACEMENT OF HEAVY CLAY OR EXPANSIVE SOILS)

GRADATION SPECIFICATIONS
(MASS PERCENT PASSING SQUARE MESH SIEVES)

U.S. STANDARD SIEVE SIZE	COLORADO STATE AGGREGATE BASE COURSE CLASS 6	COLORADO STATE AGGREGATE BASE COURSE CLASS 5
1-1/2"	-	100
1"	-	95-100
3/4"	100	-
1/2"	-	-
3/8"	-	-
NO. 4	30-65	30-70
NO. 200	3-12	3-15

COMPACTION NOTE:
FOR COMPACTION REQUIREMENTS, SEE NOTE 7 OF "TRENCH BACKFILL & COMPACTION GUIDE" (EDCS 11-1-2), OR NOTE 6 OF "FOUNDATION COMPACTION SPECIFICATION FOR PADMOUNTED EQUIPMENT" (EDCS 11-1-3).

CONCRETE ENCASED DUCT BANKS



SPACERS		
SIZE	TYPE	ITEM NUMBER
6"	BASE	✓194-212-106
6"	INTERMEDIATE	✓194-212-206

✓- Denotes minor material items for all non-100 series items treated as such.

For 3-wide duct structures, #12 copper clad steel (CCS) tracer wire (Electric Item #190-605-660) (Fiber Item #190-605-680) shall be taped to top of center duct. For 2 ducts, wire may be taped to inner side of either duct. Tracer wire must be bonded to system ground at each vault or pad location (also see EDCS 11-5 for Street Crossings).

TRACER WIRE DETAIL

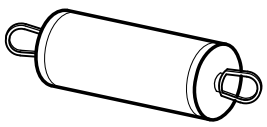
NOTES:

1. Install spacers every 5'. Base spacer and/or intermediate spacers and conduits shall be tied together using line pull polyolefin (Item #194-110-120). Survey stakes shall be used at every base spacer as a tie down to prevent ducts from floating.
2. Concrete encased duct is to have a minimum of 3" concrete envelope above and below, and 3" on each side. Dimensions of trench width shall be maintained as shown to keep concrete envelope volume within specification. Any trenches exceeding this limit shall be formed on one side (at contractor's expense) to minimize cost of encasement and excess trench width shall be backfilled at contractor's expense, including all material, labor and equipment costs. Bottom of trench shall be uniform, compact and free of debris.
3. Install 3-2" HDPE orange conduits for fiber communication cables on top of 3" concrete envelope. Route fiber conduits around outside of electric vaults, on the property side of the vaults. Install communication hand holes near vaults as shown on the next page. Do not use encased ducts for communications. Do not introduce fiber conduits into any electric vaults. See EDCS 11-5 for Fiber Tracer Wire.
4. Concrete used for duct encasement shall be "T&D Underground Mix #1" as specified in EDCS 11-1. Concrete shall be properly vibrated when installed to assure complete flow under, around, and between all ducts and to eliminate any air pockets.
5. After concrete has taken firm set, refer to EDCS 11-1 for final backfill and compaction guide using native soil or compaction sand. Backfill of trenches in existing paved streets shall be native soil whenever economical (mechanically compacted per EDCS 11-1, page 2) or if native soil is unsuitable, "T&D Underground Mix #3" as specified in EDCS 11-1, page 5 after concrete encasement has set up. This is a flowable fill that will set up and provide compaction for quick trench closure.
6. NESC Rule 352D requires a minimum of 30" cover above primary cables (601 volts to 50kV); see NESC rules for shallower burial depth requirements. In streets of the city of Colorado Springs, City Code Section 3.3.212 titled "Depth of Structures" requires written permission from the Department of Public Works prior to installation of any structure (except manholes, vaults, and such) at a vertical depth of less than 24" below the established flow line of the nearest gutter (or surface of the nearest outermost edge of the traveled portion of the street).
7. Encasement should be used for 1) 600 amp mainlines, 15kV and 35kV; 2) multiple-duct banks (vertically stacked); 3) installations that require flowable fill or 4) in cases where minimum cover is not met (see EDCS 11-1).
8. Joint trench with fiber must not use the same color scheme as Utilities' standard color for elecric, gas, water and wastewater conduit or pipe to avoid confusion for installation and maintenance of trench. Utilities' electric and gas standard colors to avoid are grey, black with red stripes and yellow. Reference Utilities water and wastewater standards for approved colors.

CUID EXAMPLE:
E.DUCT-BANK-(4)-6"PVC-ENC

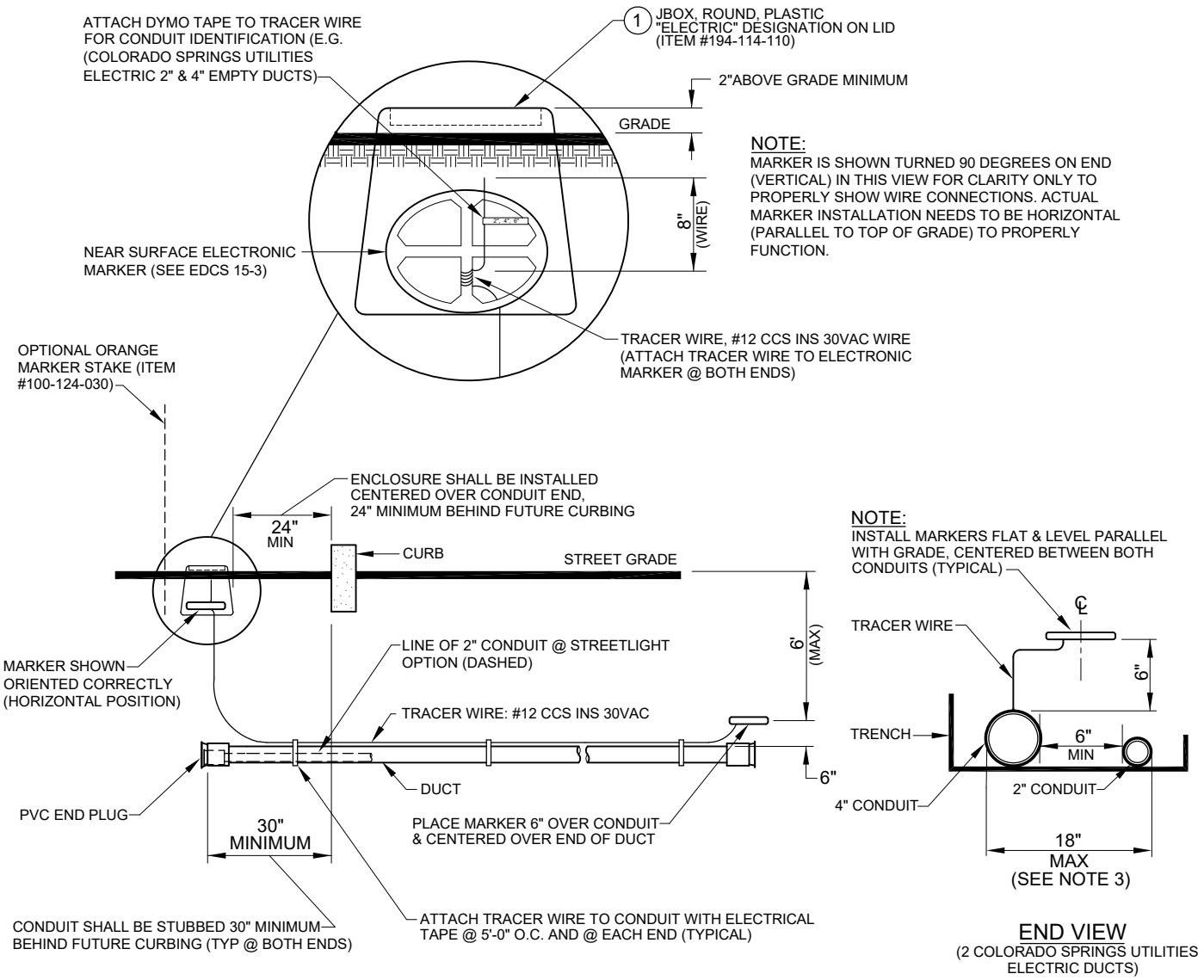
1. The intent of this specification is to establish the guidelines on materials acceptable for underground primary installations as governed by the commercial/industrial policy of Colorado Springs Utilities. It shall also be a guide for Colorado Springs Utilities Inspectors in determining conformance to specifications. The size of duct for primary cable run (2", 4" or 6") shall be specified by Colorado Springs Utilities Field Engineer on the job print.
2. All approved direct buried plastic ducts used for commercial/industrial installations for primary cable runs shall have a minimum cover of 42" of compacted backfill over the top of the ducts and a minimum of 3" from side of ducts to trench walls. Street crossings shall comply with Electric Distribution Construction Standard 11-1. Vertical measurement shall meet or exceed the requirements both at the time of installation and subsequent thereto. A minimum of 3" of concrete encasement shall be used when adequate depth cannot be achieved. Authorization from the Utility Inspector is required before any installation with less than a minimum cover of 42" of compacted backfill is installed.
3. All plastic utility duct for underground installations shall conform to either National Electrical Manufacturers Association (NEMA) Standards for Electric Duct or American Society for Testing & Materials (ASTM) specifications and be installed per NEMA/ASTM guidelines. The following types of conduits are acceptable for Electric Raceways when installed as noted:
   - 3.1 EPC-40-PVC Electrical plastic conduit, schedule 40 of iron pipe dimensions, in conformance with NEMA publication number TC-2, current edition and rated for 90°C cables. These are suitable for direct burial without concrete encasement.
   - 3.2 PVC Plastic utilities duct for underground installation in conformance with NEMA publication number TC6 (or TC8: extra strength PVC duct) current edition and rated for 90°C:
     - 3.2.1 EB (Type 1) Encased burial duct is designed for use in underground concrete encased applications and shall be installed accordingly.
     - 3.2.2 DB (Type II) Direct burial duct, which has a heavier wall than EB, is designed for underground direct burial use. It may, however, be concrete encased as required.
   - 3.3 Smooth wall PVC conduit and fittings for underground installation in conformance with ASTM F512 latest edition and rated for 90°C cables: types EB-20 or EB-35 shall be concrete encased; types DB-60 or DB-120 may be direct buried or encased as required.
   - 3.4 All conduits, 90 degree bends and fittings shall be rated for 90°C cable without exception.
4. Fittings, couplings, and bends shall be of the type designed for the duct being used. For NEMA TC-2 duct, refer to NEMA TC-3, and for NEMA TC-6 (or TC-8) duct, refer to NEMA TC-9 for appropriate fittings. ASTM F512 also covers fittings; for conduits specified per ASTM F512.
5. Refer to PVC duct manufacturer recommendations for solvent cement to be used on their product. Caution shall be taken to insure that fittings and duct are compatible. For installation below 32°F, proper PVC cement shall be specified.
6. All work and materials will be inspected and approved by Colorado Springs Utilities as the commercial/industrial policy indicates.
7. All ducts of conductive material, such as GRC, which enclose electric supply lines, shall be effectively grounded in accordance with NESC rules. Grounding bushings shall be installed on all exposed GRC conduits above grade.
8. All rigid steel sweeps and 90 degree bends shall comply to ANSI standard C80.1 latest edition.
9. All galvanized conduit, 90 degree bends or long radius sweeps that are direct buried shall be coated with tar or taped with suitable material for corrosion protection.
10. All horizontal 90 degree bends in primary conduit runs shall be 48" long-radius Fiberglass (Fiberglass is only allowed if installed within a concrete encasement) or GRC (See ELESS book, Appendix C, Table 3 for 90°, 48" Long Radius fiberglass elbow material requirements).
11. All vertical primary riser conduits shall be installed with bushings or bell ends to avoid cable abrasion against sharp conduit edges. Conduit risers into padmount equipment shall project 2" above grade or as shown in the specified construction standard.
12. All vertical primary conduit runs shall have a minimum 36” radius. For primary 4" (3-phase) conduit runs with three 90° bends and/or a length of 300' and longer, the vertical conduit bend into padmounted equipment shall be Fiberglass or GRC material. Otherwise, 4" (3-phase) conduit runs with two or less 90° bends and a length of less than 300', the vertical conduit bend into padmounted equipment may be PVC material. All primary 4" (1-phase) vertical conduit bends into the transformer pad may be PVC material (GRC conduit is not allowed for 1-phase installations). At a termination riser pole, vertical 4" (3-phase) conduit bends shall be Fiberglass or GRC and vertical 2" (1-phase) conduit bends shall be Fiberglass or PVC material (GRC conduit is not allowed for 1-phase installations). (See ELESS book, Appendix C, Table 3 for 90°,
13. 36" radius fiberglass elbow material requirements).
14. Install a CSU Fiber Optic Conduit in all commercial trenches.
15. No conduit field bends are allowed, only factory conduit bends are acceptable.
    After trench is backfilled and compacted, primary cable ducts shall be clean internally and proven to be free of obstructions by passing a mandrel of the following minimum outside diameter and length:

4" duct = 3.56" OD, 6" long mandrel
6" duct = 5.69" OD, 11-1/2" long mandrel



Colorado Springs Utilities
It's how we're all connected

ELECTRIC CONDUIT



SIDE VIEW
TYPICAL INSTALLATION

END VIEW
(2 COLORADO SPRINGS UTILITIES ELECTRIC DUCTS)

ITEM ID	COLOR	UTILITY	INSTALLATION	TENSILE STRENGTH	LENGTH
190-605-655	RED	ELECTRIC	DIRECT BURIED	250LBS	500FT
190-605-660	RED	ELECTRIC	DIRECT BURIED	250LBS	2500FT
190-605-665	RED	ELECTRIC	BORING	1100LBS	500FT
190-605-670	RED	ELECTRIC	BORING	1100LBS	2500FT
190-605-675	ORANGE	FIBER	DIRECT BURIED	250LBS	500FT
190-605-680	ORANGE	FIBER	DIRECT BURIED	250LBS	2500FT
190-605-685	ORANGE	FIBER	BORING	1100LBS	500FT
190-605-691	ORANGE	FIBER	BORING	1100LBS	2500FT

COPPER-CLAD, #12, TRACER WIRE

Used to locate empty electric or fiber-optic ducts.

CUID EXAMPLES:
E. JBOX-TRACER-WIRE
E. TRACER-WIRE

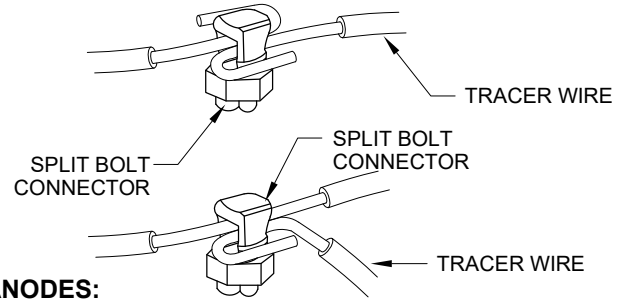
NOTES:

1. Tracer wire, electronic markers, and j-box shall be installed for locating empty street crossings, conduit stubs, or street light stubs.
2. String wire the entire length of street crossing, or conduit stub. Leave approximately 5-7 feet of slack on one end for attaching to electronic marker in j-box. Train 8" of this tail above electronic marker at inside of j-box. Wrap tracer wire(s) around electronic marker spoke as shown in detail above. Attach tracer wire to marker at opposite end of conduit in the same manner. Attach tracer wire to conduit with electrical tape at each end and every 5 feet. This is required to maintain alignment with the conduit. Install j-box a minimum 24" behind future curbing, and 2" above grade. Provide conduit size on dymo tape and attach to end of tracer wire at enclosure for future identification as shown in detail above.
3. If two Colorado Springs Utilities electric conduits are both installed in the same trench within 18" maximum separation (to outside), only one tracer wire is required. Attach tracer wire to largest OD conduit per note 2. Place marker 6" above and centered between conduits. Identify both conduits on dymo label. Provide 6" minimum separation between conduits to ensure good compaction (see End View detail above). For separation greater than 18" to outside of conduits, install tracer wire on each duct and label individually.
4. Plastic j-box and electronic markers shall be removed for re-use after cable has been installed. Tracer wire can be abandoned at this time.
5. Repair splices of #12 CCS tracer wire may be made with connector (Item #100-112-100) insulated with mastic, wrapped with electrical tape.

FIBER CONDUIT

GENERAL:

1. Fiber conduit must be installed with a tracer wire on the center-most duct which is used as a means of locating the conduit while it is underground.
2. Open trench applications will use a #12, high-strength, copper-clad steel, wire with a orange, HDPE jacket (Item 190-605-680). See Table on page 1.
3. Directional boring applications will use a #12, extra high-strength, copper-clad steel, wire with a orange, HDPE jacket (Item 190-605-691). See Table on page 1.
4. The ends of tracer wire are to be wrapped first with a 3/4" rubber splicing tape (100-136-070) and then 3/4" electrical tape (100-136-100) for protection.
5. Tracer wire should not be wrapped around the duct.
6. In trench applications, the tracer wire is to be placed on top of the center duct only and is to be taped to the duct in at least 3 locations and not to exceed 10 feet apart between tapes.

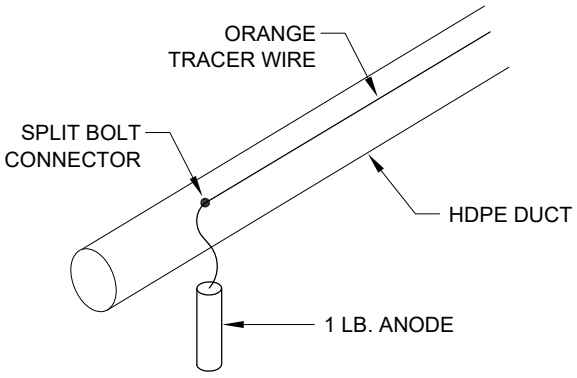


ANODES:

1. For long runs of duct, a 1 lb. anode will be attached to the tracer wire every 1000 ft.
2. To protect the tracer wire used to assist in PE pipe locating, a 1lb. anode (201-000-001) should be connected to the end of the tracer wire for all new dead end conduit runs. The new anode will be attached to the tracer wire with a split-bolt connector (212-000-009). The connector is to be wrapped first with a 3/4" rubber splicing tape (100-136-070) and then 3/4" electrical tape (100-136-100) for protection.
3. The installation or removal of a tracer wire anode must be noted in the permanent field record.
4. The appropriate clearances between anodes and steel pipes or other structures must be maintained.
5. This is similar to the Gas Design and Engineering Manual for tracer wire installation.

SPLICING:

1. Tracer wire should be as continuous as possible. Where splicing is necessary, the only approved method is to use a split bolt connector (212-000-009).
2. Once installed, the connectors should first be wrapped with a 3/4" rubber splicing tape (100-136-070) and then 3/4" electrical tape (100-136-100) for protection.



ITEM NUMBER	CSU TYPE	FORM DESIGNATION	NAMEPLATE VOLTAGE (VOLTS)	CURRENT CLASS	# OF WIRES	TEST CURRENT (AMPS)	PHASE	SELF-CONTAINED	TRANSFORMER RATED (CL20)	NAMEPLATE COLOR BOTTOM LABEL/ ABOVE LCD	NOTES
											FOCUS AXRe
102-303-000	1	1S	120	100	2	15	SINGLE	Y		NA / NA	AMI, RESIDENTIAL, kWh, Dmd, TOU, LP
102-303-013	5	2S	240	200	3	30	SINGLE	Y		NA / NA	AMI, RESIDENTIAL, kWh, Dmd, TOU, LP
102-303-015	5E	2SE	240	320	3	50	SINGLE	Y		GREEN / NA	AMI, RESIDENTIAL, kWh, Dmd, TOU, LP
102-303-017	52	3S	240	20	2	2.5	SINGLE		Y	RED / NA	AMI, RESIDENTIAL, CT RATED, kWh, Dmd, TOU, LP, NEUTRAL TERM @ 9 O'CLOCK,
102-303-018	55	3S	120	20	2	2.5	SINGLE		Y	NA / NA	AMI, CAPACITOR BANK, kWh, Dmd, TOU, LP, NEUTRAL TERM @ 9 O'CLOCK,
											FOCUS AXRe-SD (SERVICE DISCONNECT)
102-303-040	1D	1S	120	100	2	15	SINGLE	Y		NA / NA	AMI, RESIDENTIAL, kWh, Dmd, TOU, LP
102-303-045	5D	2S	240	200	3	30	SINGLE	Y		NA / NA	AMI, RESIDENTIAL, kWh, Dmd, TOU, LP
102-303-056	5N	2S	240	200	3	30	SINGLE	Y		NA / BLUE	AMI, NET METER, kWh, Dmd, TOU, LP
102-303-057	5ED	2SE	240	320	3	50	SINGLE	Y		GREEN / NA	AMI, RESIDENTIAL, kWh, Dmd, TOU, LP
102-303-063	5EN	2SE	240	320	3	50	SINGLE	Y		GREEN / BLUE	AMI, NET METER, kWh, Dmd, TOU, LP
102-303-064	10D	12S	120	200	3	30	SINGLE	Y		NA / NA	AMI, RESIDENTIAL, kWh, Dmd, TOU, LP NEUTRAL TERM @ 9 O'CLOCK,
102-303-066	10N	12S	120	200	3	30	SINGLE	Y		NA / BLUE	AMI, NET METER, kWh, Dmd, TOU, LP NEUTRAL TERM @ 9 O'CLOCK,
											E650 S4X
102-303-067	52M	3S	120-480	20	2	2.5	SINGLE		Y	RED / NA	AMI, INDUSTRIAL, kWh, Dmd, TOU, LP, Reactive, NEUTRAL TERM @ 9 O'CLOCK,
102-303-068	60M	45S	120-480	20	3	2.5	SINGLE		Y	RED / NA	AMI, INDUSTRIAL, kWh, Dmd, TOU, LP, Reactive
102-303-069	72M	9S	120-480	20	4	2.5	POLY		Y	RED / NA	AMI, INDUSTRIAL, kWh, Dmd, TOU, LP, Reactive
102-303-072	11M	12S	120-480	200	3	30	POLY	Y		NA / NA	AMI, INDUSTRIAL, kWh, Dmd, TOU, LP, Reactive, NEUTRAL TERM @ 9 O'CLOCK,
102-303-096	22M	16S	120-480	200	4	30	POLY	Y		NA / NA	AMI, INDUSTRIAL, kWh, Dmd, TOU, LP, Reactive
											FOCUS AL OPT-OUT METER (NO RADIO)
102-303-020	1	1S	120	100	2	15	SINGLE	Y		NA / NA	OPT-OUT METER (NO RADIO)
102-303-021	5	2S	240	200	3	30	SINGLE	Y		NA / NA	OPT-OUT METER (NO RADIO)
102-303-022	10	12S	120	200	3	30	SINGLE	Y		NA / NA	OPT-OUT METER (NO RADIO)
											MV-90 METERS
102-301-001	1C	1S	120	100	2	15	SINGLE	Y		WHITE	MV-90 METER WITH METRUM CELL MODULE
102-301-041	22C	16S	120-480	200	4	30	POLY	Y		WHITE	MV-90 METER WITH METRUM CELL MODULE
102-301-070	3C	2S	120-480	200	3	30	SINGLE	Y		WHITE	MV-90 METER WITH METRUM CELL MODULE
102-301-073	11C	12S	120-480	200	3	30	POLY	Y		WHITE	MV-90 METER WITH METRUM CELL MODULE
102-301-098	72C	9S	120-480	20	4	2.5	POLY		Y	RED	MV-90 METER WITH METRUM CELL MODULE
102-301-131	60C	45S	120-480	20	3	2.5	POLY		Y	RED	MV-90 METER WITH METRUM CELL MODULE
											FOCUS AL, 2-WAY AMR METER
102-301-004	1	1S	120	100	2	15	SINGLE	Y		NA / NA	AMR METER, 2-WAY
102-301-061	5	2S	240	200	3	30	SINGLE	Y		NA / NA	AMR METER, 2-WAY
102-301-012	10	12S	120	200	3	30	SINGLE	Y		NA / NA	AMR METER, 2-WAY

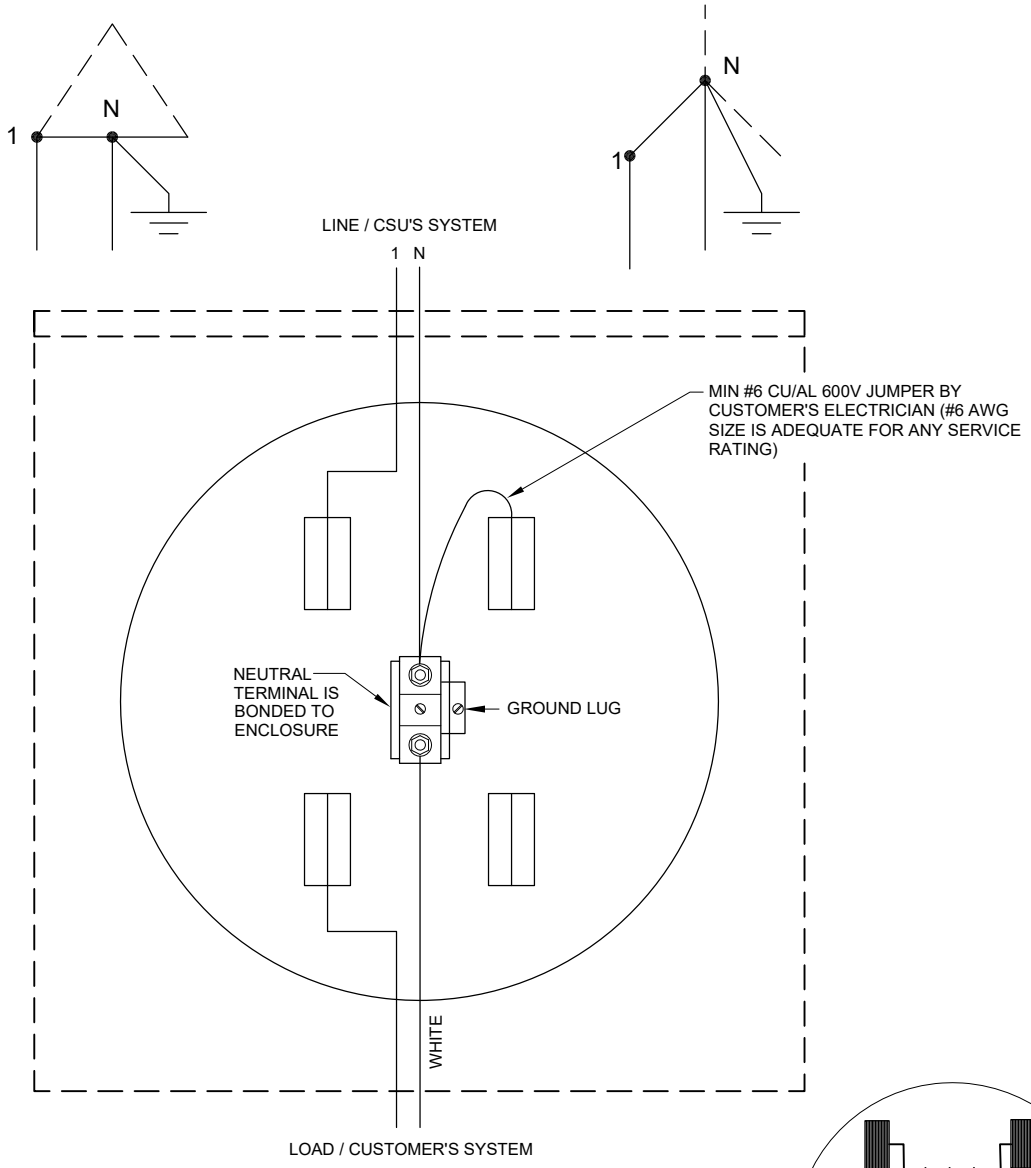
Colorado Springs Utilities Type Abbreviations:

C- MV-90 Meter
D- Internal Disconnect Capability
E- CL320
M- Multi-Function Register (TOU & kW/kVA/PF) & Extended Memory
N- Net Metering Capability

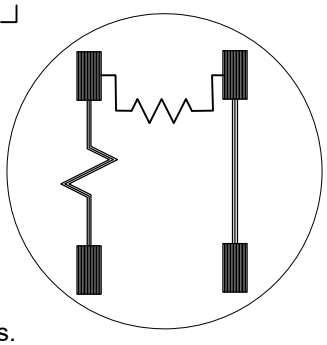
ITEM NUMBER	COLORADO SPRINGS UTILITIES TYPE	FORM DESIGNATION	NAMEPLATE VOLTAGE (VOLTS)	TEST CURRENT (AMPS)	PHASE	SELF-CONTAINED	TRANSFORMER RATED (CL20)	NAMEPLATE COLOR	NOTES
102-301-000	1	1S	120	15	SINGLE	Y		WHITE	AMR METER
102-301-069	3M	2S	VARIABLE	30	SINGLE	Y		WHITE	AMR METER
102-301-065	5	2S	240	30	SINGLE	Y		WHITE	AMR METER
102-301-067	5D	2S	240	30	SINGLE	Y		YELLOW	AMR DISCONNECT METER
102-301-066	5E	2S	240	50	SINGLE	Y		GREEN	CLASS 320 AMP (CL320) AMR METER
102-301-064	5EN	2S	240	50	SINGLE	Y		BLUE/ GREEN DOT	CLASS 320 AMP (CL320) AMR NET METER
102-301-063	5L	2S	240	30	SINGLE	Y		WHITE	AMR METER WITH LOAD PROFILE CAPABILITY
102-301-068	5N	2S	240	30	SINGLE	Y		BLUE	AMR NET METER
102-301-062	5DN	2S	240	30	SINGLE	Y		BLUE	AMR NET METER W/ DISCONNECT
102-301-015	10	12S	120	30	SINGLE	Y		WHITE	AMR NETWORK METER
102-301-016	10D	12S	120	30	SINGLE	Y		YELLOW	AMR NETWORK DISCONNECT METER
102-301-014	10L	12S	120	30	SINGLE	Y		WHITE	AMR METER WITH LOAD PROFILE CAPABILITY
102-301-017	10N	12S	120	30	SINGLE	Y		BLUE	AMR NETWORK NET METER
102-301-013	10DN	12S	120	30	SINGLE	Y		BLUE	AMR NETWORK NET METER W/ DISCONNECT
102-301-072	11	12S	VARIABLE	30	POLY	Y		WHITE	AMR NETWORK METER
102-301-018	11M	12S	VARIABLE	30	POLY	Y		WHITE	AMR NETWORK METER
102-301-040	22	16S	VARIABLE	30	POLY	Y		WHITE	AMR METER
102-301-045	22M	16S	VARIABLE	30	POLY	Y		WHITE	AMR METER
102-301-055	52	3S	240	2.5	POLY		Y	RED	AMR METER
102-301-056	52M	3S	240	2.5	POLY		Y	RED	AMR METER
102-301-057	55	3S	120	2.5	SINGLE	Y		WHITE	CAPACITOR BANK MONITOR METER
102-301-135	60	45S	VARIABLE	2.5	POLY		Y	RED	AMR METER
102-301-130	60M	45S	VARIABLE	2.5	POLY		Y	RED	AMR METER
102-301-096	72	9S	VARIABLE	2.5	POLY		Y	RED	AMR METER
102-301-097	72M	9S	VARIABLE	2.5	POLY		Y	RED	AMR METER

Colorado Springs Utilities Type Abbreviations:

C- MV-90 Meter
D- Internal Disconnect Capability
E- CL320
M- Multi-Function Register (TOU & kW/kVA/PF) & Extended Memory
N- Net Metering Capability
L- AX meter with Load Profile Capability



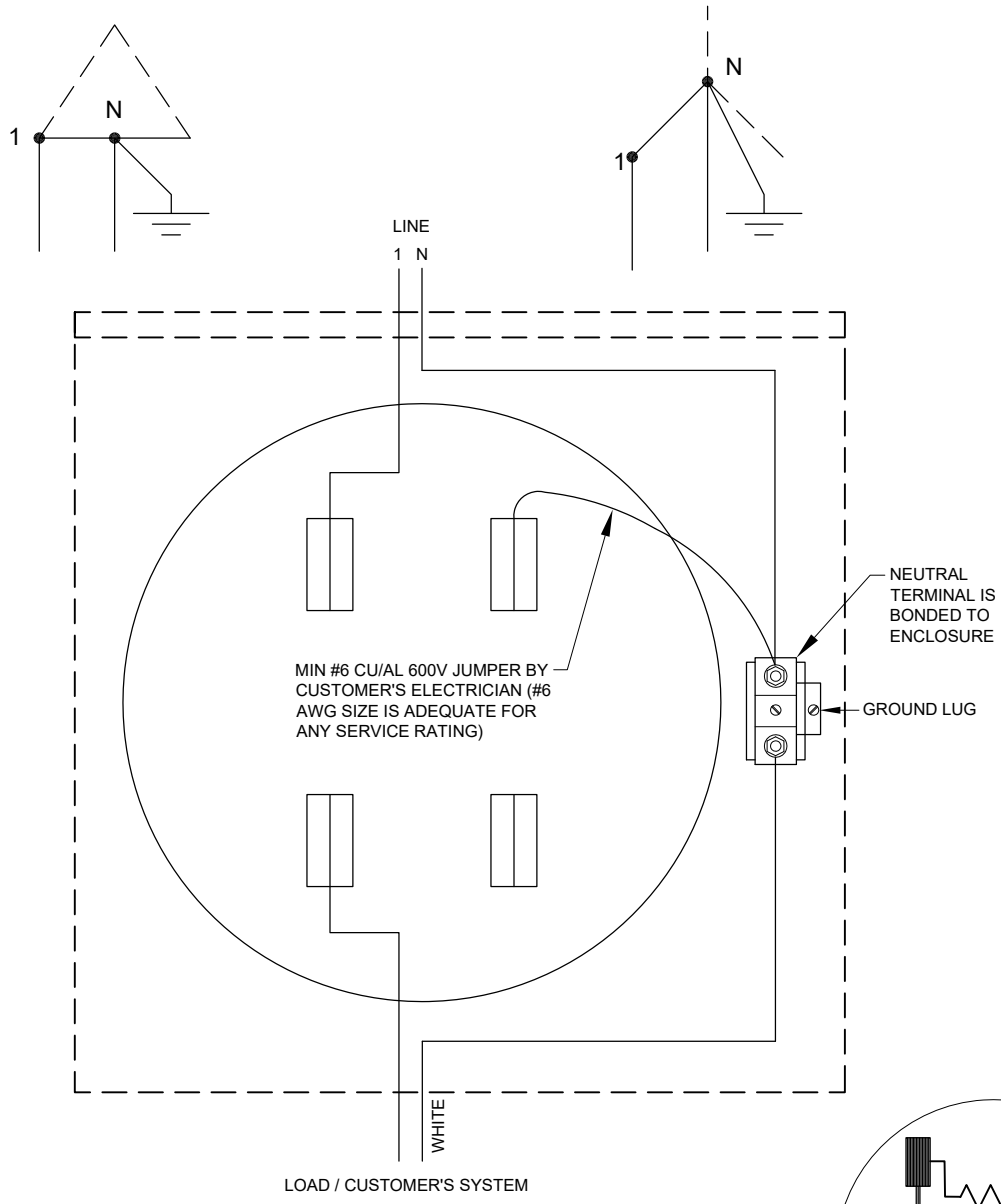
SINGLE PHASE, 2 WIRE, 120 VOLT



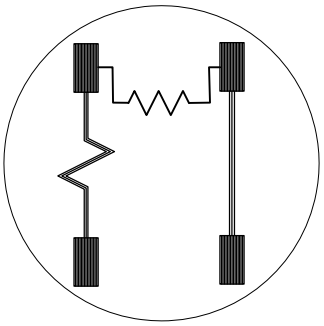
INTERNAL
METER CONNECTIONS

NOTES:

1. See Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for typical secondary grounding requirements.
2. Wire Size Range:
   - 2.1 100 amp socket: Lugs suitable for #6 - #2/0 stranded CU/AL conductors.
   - 2.2 200 amp socket: Lugs suitable for #2 - 350 kcmil CU/AL conductors.
   - 2.3 Ground Lug: Capable of accepting up to #2 solid CU/AL conductor.
3. Approximate Dimensions:
   - 3.1 100 amp socket: 3-5/16"(D) x 8"(W) x 11-1/2"(H).
   - 3.2 200 amp socket: 4-3/8"(D) x 11"(W) x 15-1/2"(H).
4. Knockouts: Three on bottom and one each on both sides and back; knockouts are concentric type with maximum diameter of 2" for 100 amp sockets and 2-1/2" for 200 amp sockets.
5. If the meter socket is fed from an upstream (supply side) breaker or disconnect, where the neutral is already bonded to the grounding electrode system, do not connect the neutral ground lug (NEC 250).
6. EEI form type 1S, CSU type 1, 1C.



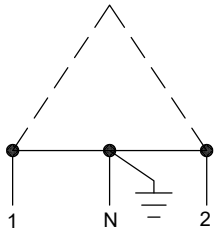
SINGLE PHASE, 2 WIRE, 120 VOLT
(100 Amp Traffic and Signal Pedestal)

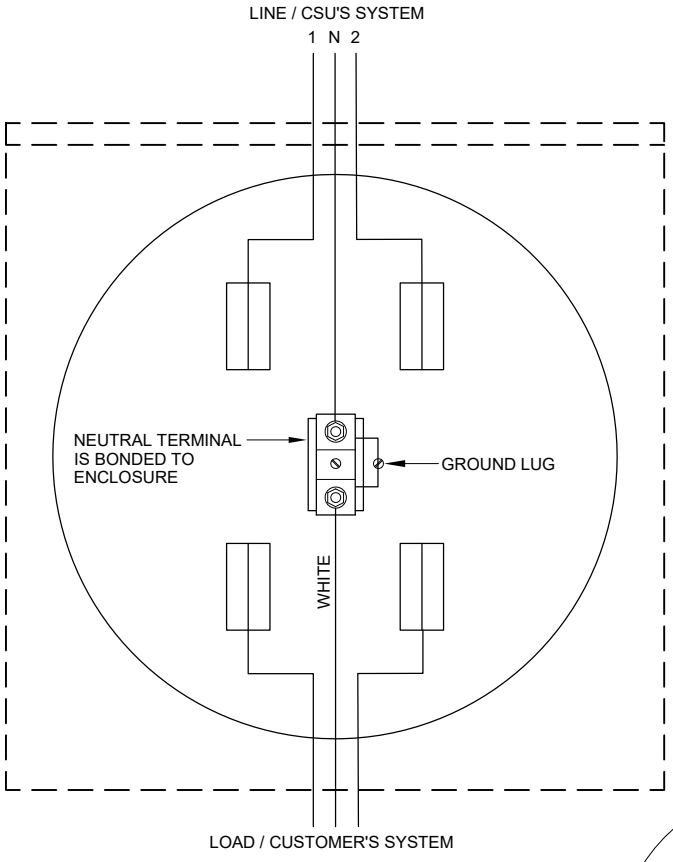


INTERNAL
METER CONNECTIONS

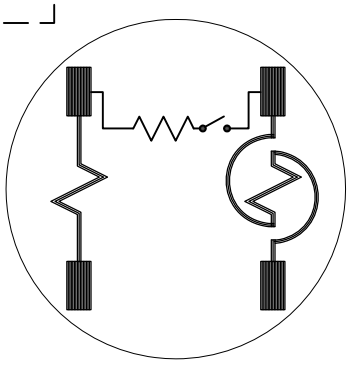
NOTES:

1. See Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for typical secondary grounding requirements.
2. Wire Size Range:
   - 2.1 100 amp socket: Lugs suitable for #6 - #2/0 stranded CU/AL conductors.
   - 2.2 Ground Lug: Capable of accepting up to #2 solid CU/AL conductor.
3. If the meter socket is fed from an upstream (supply side) breaker or disconnect, where the neutral is already bonded to the grounding electrode system, do not connect the neutral ground lug (NEC 250).
4. EEI form type 1S, CSU type 1.





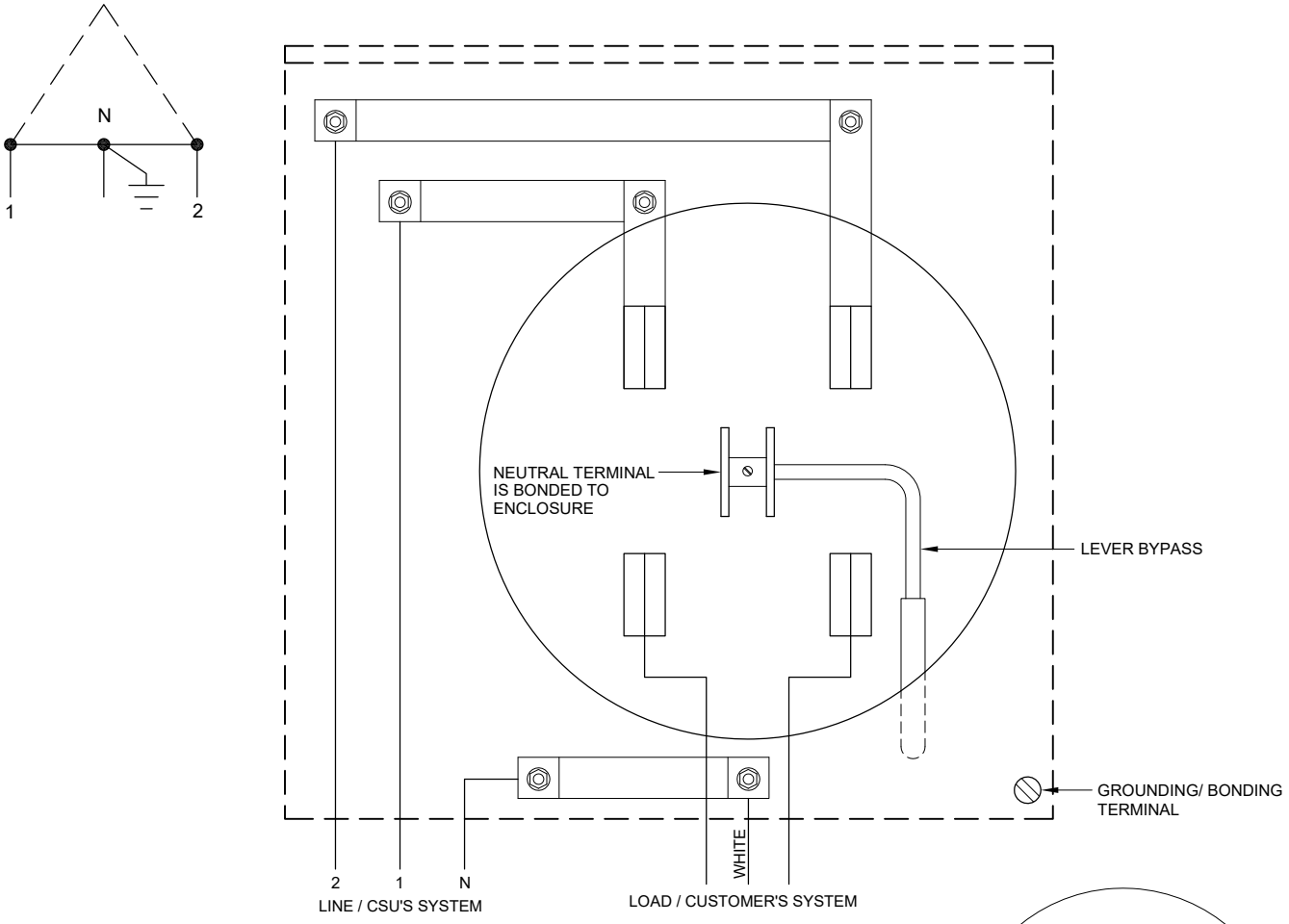
SINGLE PHASE, 3 WIRE, 240 VOLT



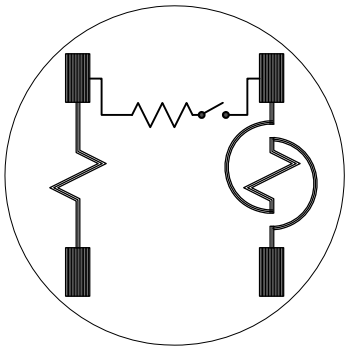
INTERNAL
METER CONNECTIONS

NOTES:

1. See Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for typical secondary grounding requirements.
2. Wire Size Range:
   - 2.1 100 amp socket: Lugs suitable for #6 - #2/0 stranded CU/AL conductors.
   - 2.2 200 amp socket: Lugs suitable for #2 - 350 kcmil CU/AL conductors.
   - 2.3 Ground Lug: Capable of accepting up to #2 solid CU/AL conductor.
3. Approximate Dimensions:
   - 3.1 100 amp socket: 3-5/16"(D) x 8"(W) x 11-1/2"(H).
   - 3.2 200 amp socket: 4-3/8"(D) x 11"(W) x 15-1/2"(H).
4. Knockouts: Three on bottom and one each on both sides and back; knockouts are concentric type with maximum diameter of 2" for 100 amp sockets and 2-1/2" for 200 amp sockets.
5. If the meter socket is fed from an upstream (supply side) breaker or disconnect, where the neutral is already bonded to the grounding electrode system, do not connect the neutral ground lug (NEC 250).
6. EEI form type 2S, CSU types 3C, 3M, 5, 5D, 5L, 5N.



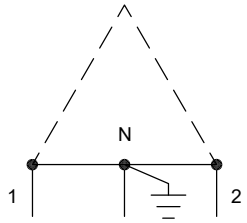
SINGLE PHASE, 3 WIRE, 240 VOLT (320 AMP)



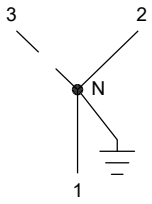
INTERNAL
METER CONNECTIONS

NOTES:

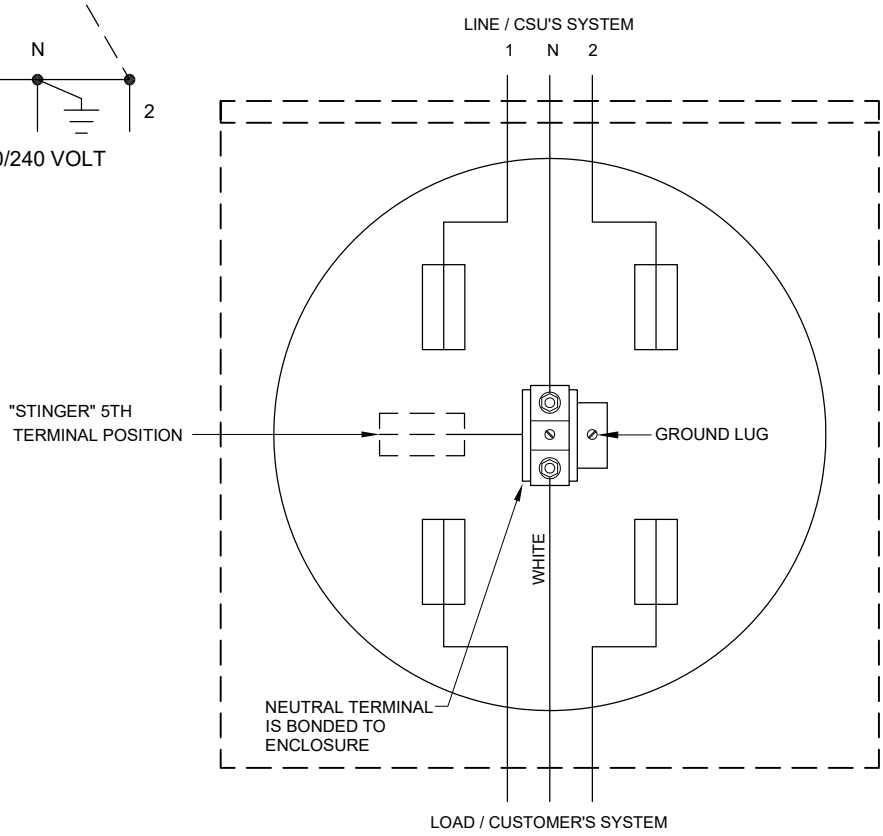
1. See Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for typical secondary grounding requirements.
2. Wire Size Range:
   - 2.1 Lugs suitable for #2 - 600 kcmil CU/AL conductors.
   - 2.2 Ground Lug: Capable of accepting up to #1/0 CU/AL conductor.
3. Approximate Dimensions:
   - 3.1 320 amp socket (OH): 4-3/8"(D) x 10-1/2"(W) x 26"(L)
   - 3.2 320 amp offset socket (UG): 6"(D) x 17"(W) x 30"(L)
4. Knockouts: Three on bottom and one each on both sides and back; knockouts are concentric type with a maximum diameter of 3-1/2".
5. To accommodate the 4" riser, a 3" to 4" adapter will be required to transition to the meter socket.
6. If the meter socket is fed from an upstream (supply side) breaker or disconnect, where the neutral is already bonded to the grounding electrode system, do not connect the neutral ground lug (NEC 250).
7. EEI form type 2S, 2SE, CSU types 5E, 5EN.



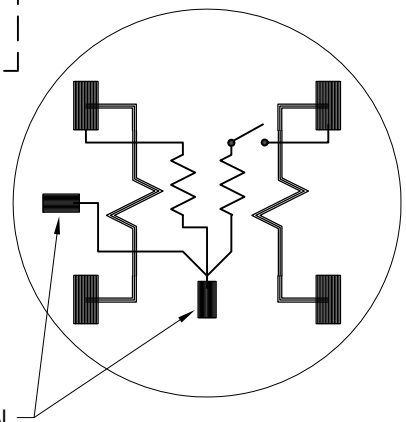
120/240 VOLT



120/208 VOLT, NETWORK
(SEE NOTE 7)



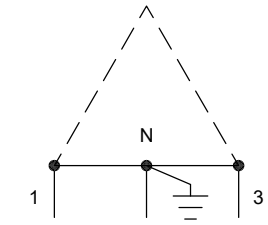
120/208 VOLT, 3 WIRE, NETWORK



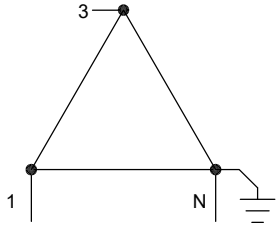
INTERNAL
METER CONNECTIONS

NOTES:

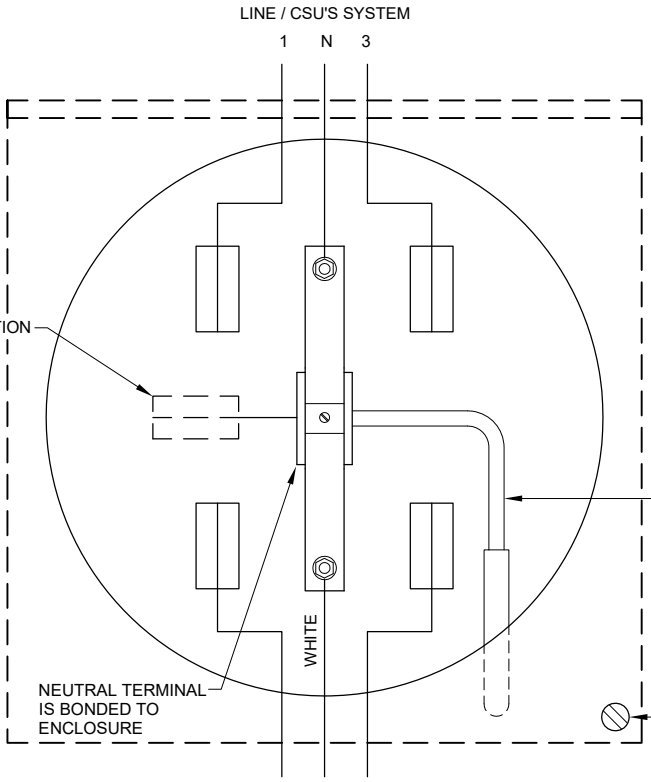
1. See Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for typical secondary grounding requirements.
2. A fifth terminal (stinger) in the 9 o'clock position is required for 120/208 volt service.
3. Wire Size Range:
   - 3.1 100 amp socket: Lugs suitable for #6 - #2/0 stranded CU/AL conductors.
   - 3.2 200 amp socket: Lugs suitable for #2 - 350 kcmil CU/AL conductors.
   - 3.3 Ground Lug: Capable of accepting up to #2 solid CU/AL conductor.
4. Approximate Dimensions:
   - 4.1 100 amp socket: 3-5/16"(D) x 8"(W) x 11-1/2"(H).
   - 4.2 200 amp socket: 4-3/8"(D) x 11"(W) x 15-1/2"(H).
5. Knockouts: Three on bottom and one each on both sides and back; knockouts are concentric type with a maximum diameter of 2" for 100 amp sockets and 2-1/2" for 200 amp sockets.
6. If the meter socket is fed from an upstream (supply side) breaker or disconnect, where the neutral is already bonded to the grounding electrode system, do not connect the neutral ground lug (NEC 250).
7. EEI form type 12S, CSU types 10, 10D, 10L, 10N.

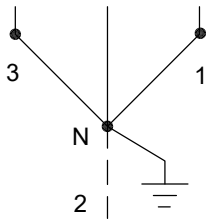


120/240 VOLT
240/480 VOLT (SEE NOTE 7)



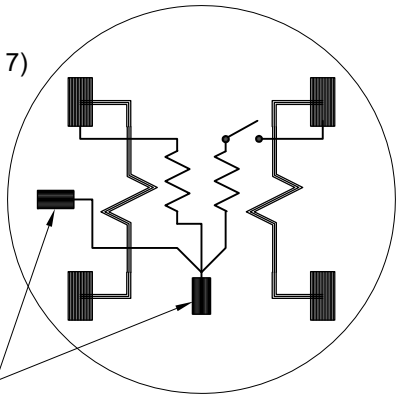
(SEE NOTE 8)





120/208 VOLT, NETWORK

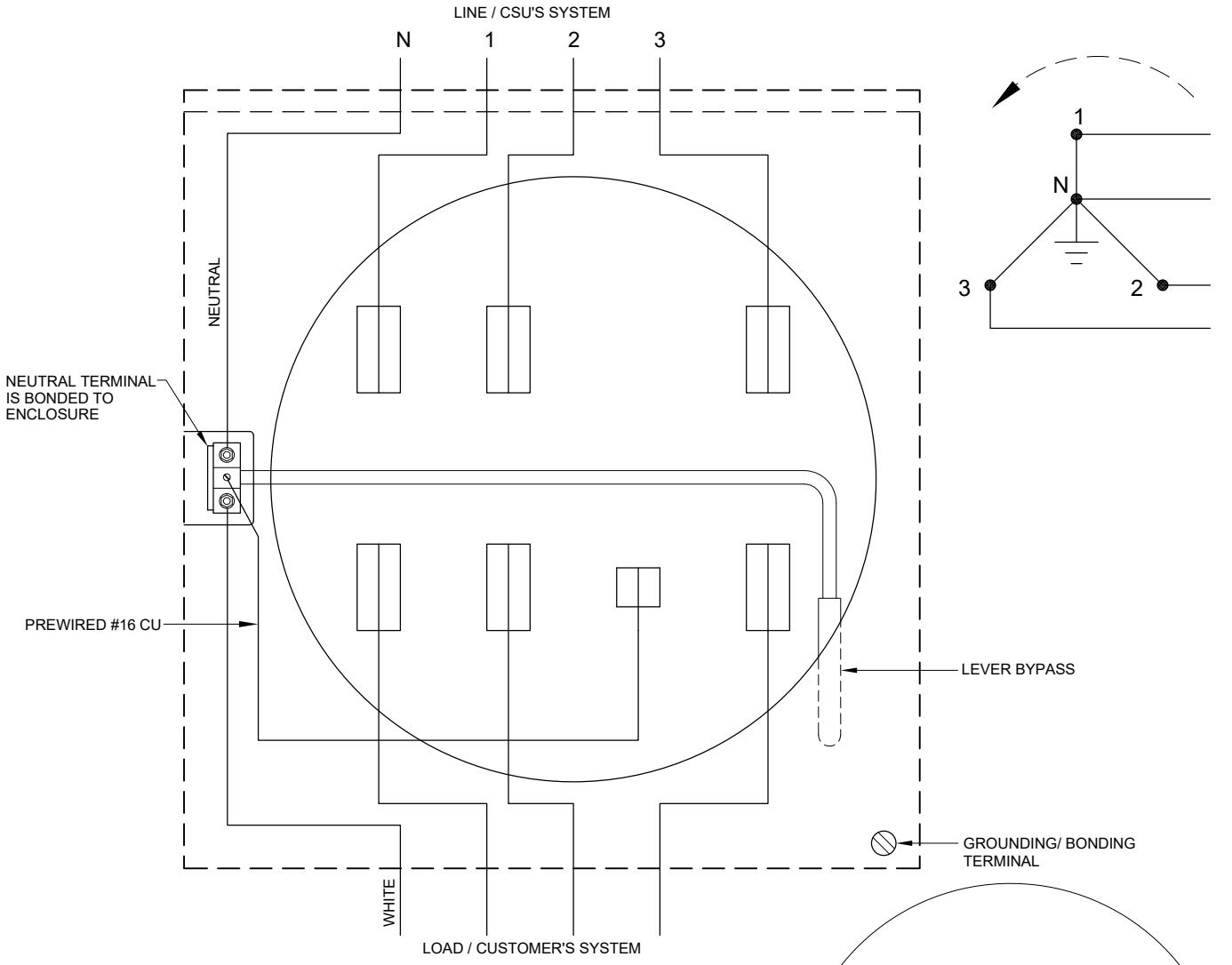
120/208 VOLT, 3 WIRE, NETWORK
SINGLE PHASE, 3 WIRE, 120/240 VOLT
SINGLE PHASE, 3 WIRE, 240/480 VOLT (SEE NOTE 7)
THREE PHASE, 3 WIRE, DELTA (SEE NOTE 8)
277/480 VOLT, 3 WIRE, NETWORK



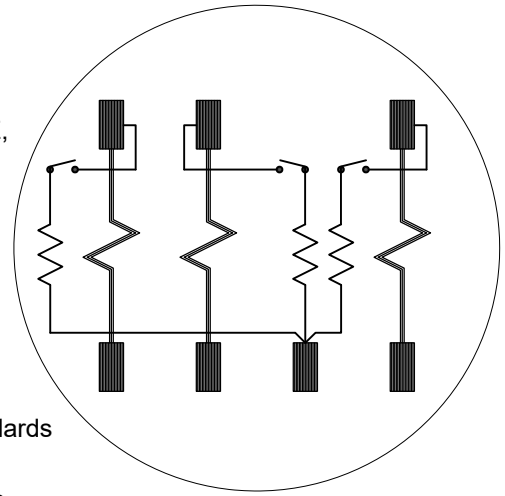
INTERNAL
METER CONNECTIONS

NOTES:

1. See Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for typical secondary grounding requirements.
2. A fifth terminal (stinger) in the 9 o'clock position is required for 120/208 volt service.
3. Wire Size Range: Lugs suitable for #2 - 350 kcmil CU/AL conductors.
   3.1 Ground Lug: Capable of accepting up to #2 solid CU/AL conductor.
4. Approximate Dimensions: 5"(D) x 13"(W) x 19"(H).
5. Knockouts: Three on bottom and one each on both sides and back; knockouts are concentric type with a maximum diameter of 3".
6. Single phase, 3 wire, 240/480 volt wye connection is for limited use.
7. Two phase, 3 wire, 277/480 volt wye connection is for limited use.
8. Corner grounded Delta services for maintenance reference only; voltage is not available for new installations.
9. If the meter socket is fed from an upstream (supply side) breaker or disconnect, where the neutral is already bonded to the grounding electrode system, do not connect the neutral ground lug (NEC 250).
10. EEI form type 12S, CSU types 11, 11M.



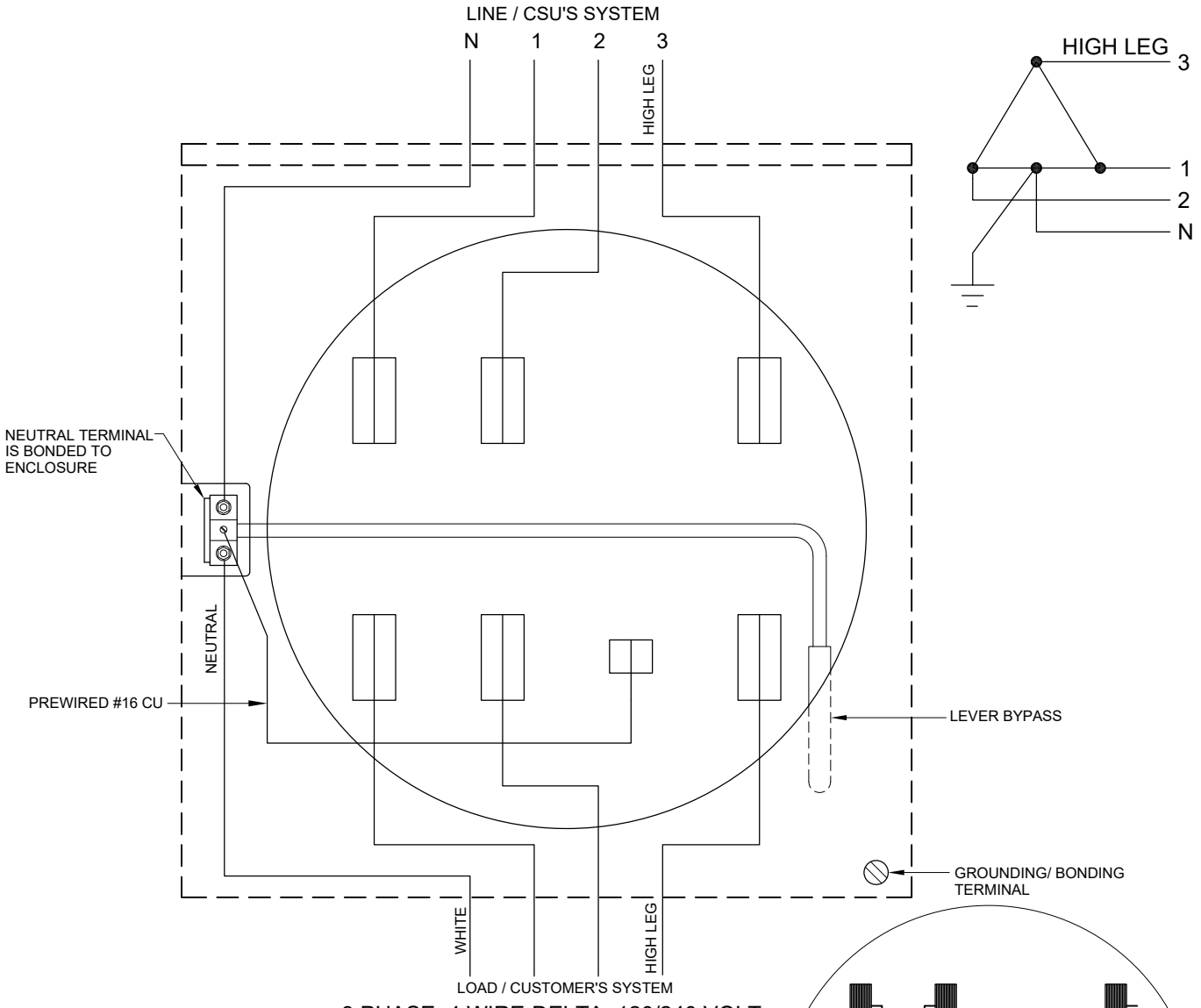
3 PHASE, 4 WIRE, 120/208V & 277/480V WYE,
120/240/208V DELTA SERVICE.



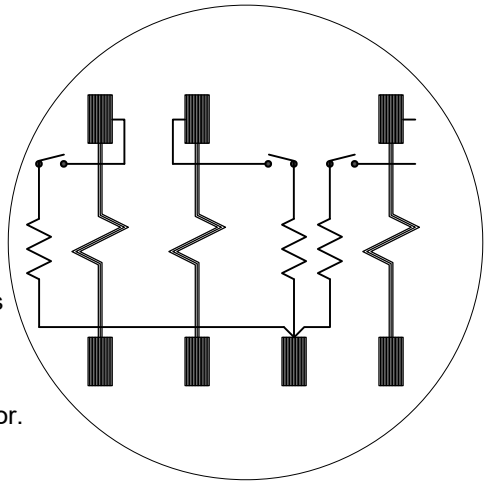
INTERNAL
METER CONNECTIONS

NOTES:

1. See Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for typical secondary grounding requirements.
2. Wire Size Range: Lugs suitable for #2 - 350 kcmil CU/AL conductors.
   2.1 Ground Lug: Capable of accepting up to #2 solid CU/AL conductor.
3. Approximate Dimensions: 5"(D) x 13"(W) x 19"(H).
4. Knockouts: Three on bottom and one each on both sides and back; knockouts are concentric type with a maximum diameter of 3".
5. If the meter socket is fed from an upstream (supply side) breaker or disconnect, where the neutral is already bonded to the grounding electrode system, do not connect the neutral ground lug (NEC 250).
6. EEI form type: 16S, CSU type 22, 22C, 22M.



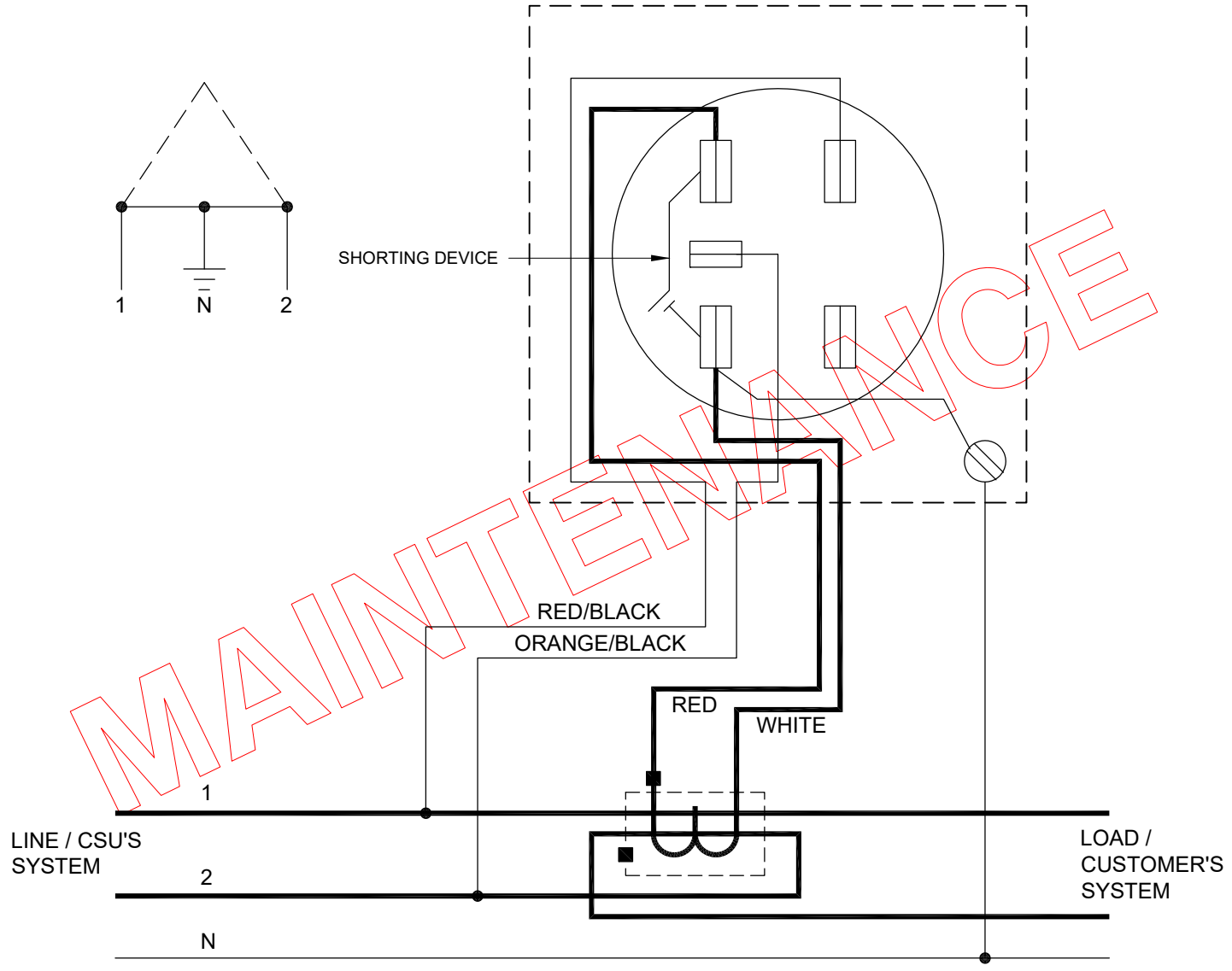
3 PHASE, 4 WIRE-DELTA, 120/240 VOLT



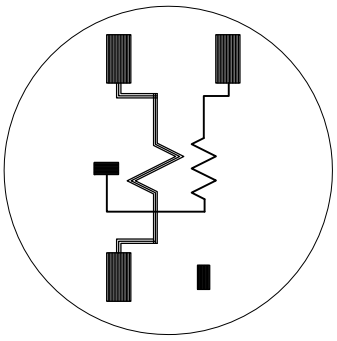
INTERNAL METER CONNECTIONS

NOTES:

1. See Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for typical secondary grounding requirements.
2. Wire Size Range: Lugs suitable for #2 - 350 kcmil CU/AL conductors.
   2.1 Ground Lug: Capable of accepting up to #2 solid CU/AL conductor.
3. Approximate Dimensions: 5"(D) x 13"(W) x 19"(H).
4. Knockouts: Three on bottom and one each on both sides and back; knockouts are concentric type with a maximum diameter of 3".
5. "High Leg" conductor of delta must be marked at weatherhead and connected to the right-side terminal as shown.
6. If the meter socket is fed from an upstream (supply side) breaker or disconnect, where the neutral is already bonded to the grounding electrode system, do not connect the neutral ground lug (NEC 250).
7. EEI form type: 16S, CSU types 22, 22C, 22M.



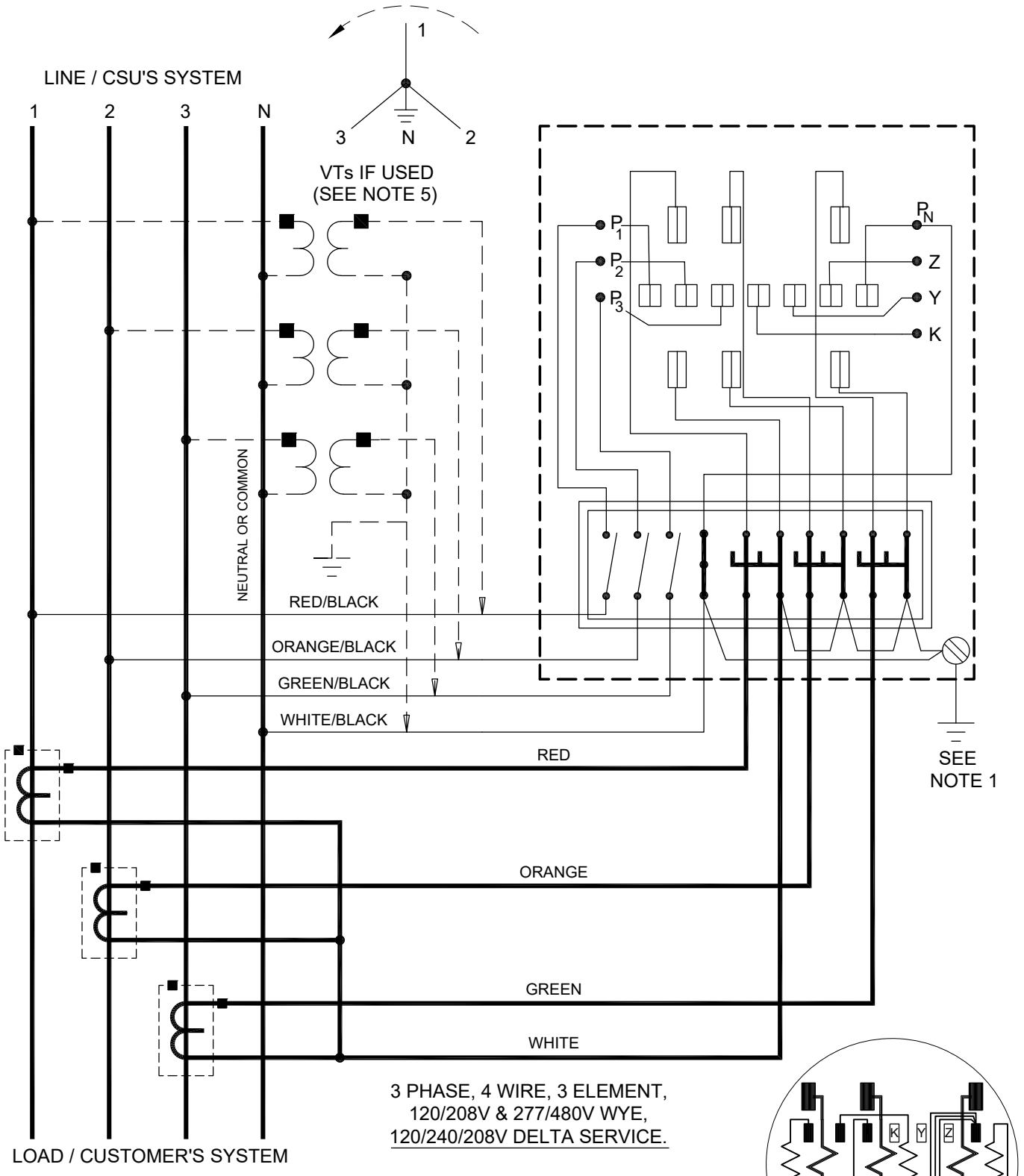
SINGLE PHASE, 3 WIRE CIRCUITS



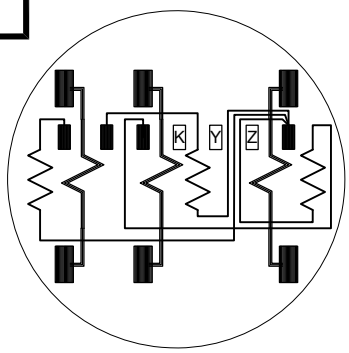
INTERNAL METER CONNECTIONS

NOTES:

1. See Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for secondary grounding requirements.
2. 120/240 volt using 2 wire meter, 3 wire C.T. secondary metering only.
3. EEI form type 3S, CSU type 52, 52M.



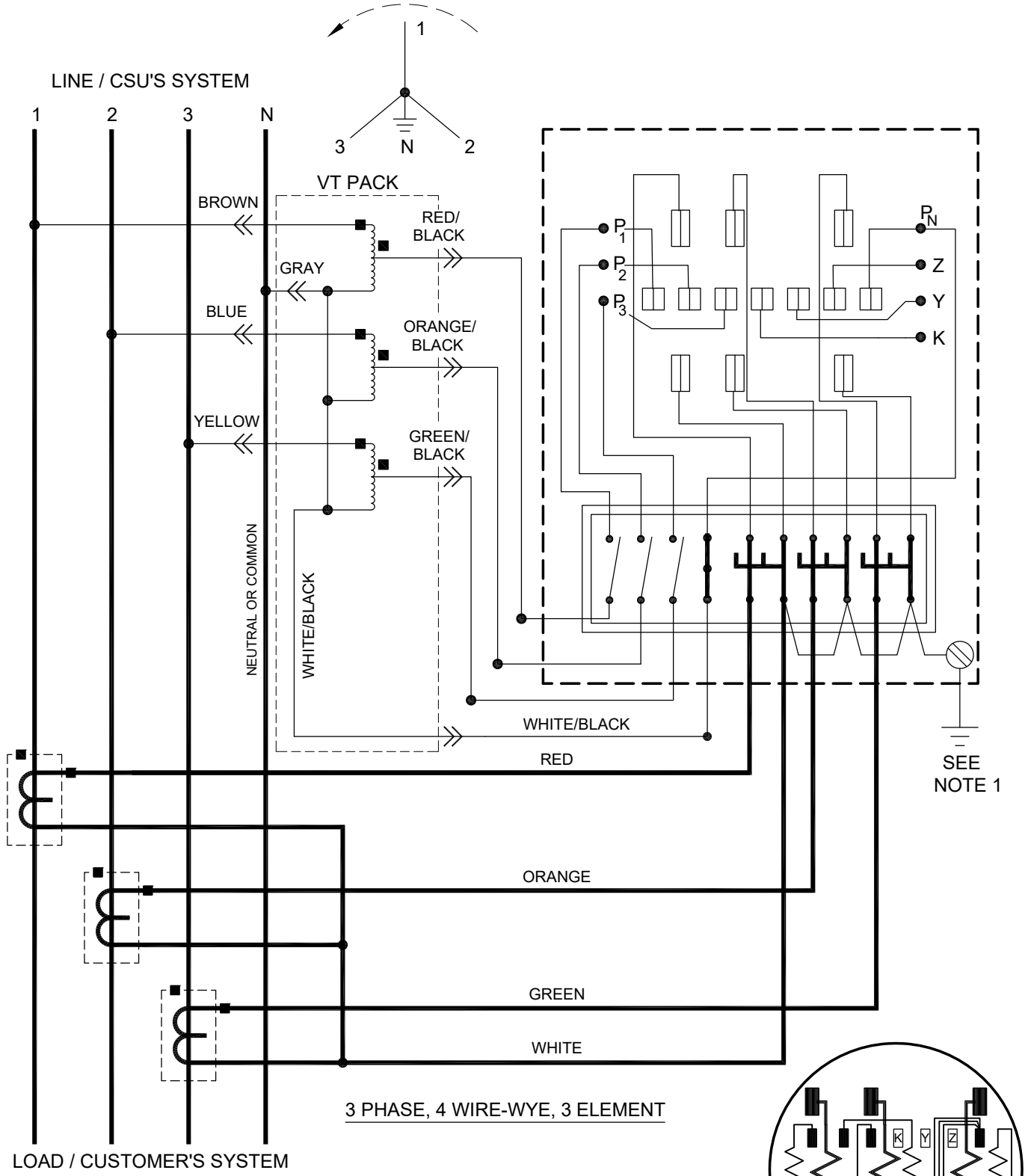
3 PHASE, 4 WIRE, 3 ELEMENT,
120/208V & 277/480V WYE,
120/240/208V DELTA SERVICE.

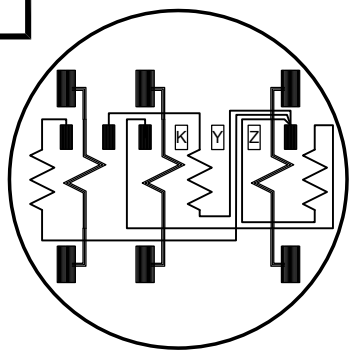


INTERNAL
METER CONNECTION
(PREFERRED CONNECTION)

NOTES:

1. See Distribution Construction Standard 15-1 for primary system grounding requirements and Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for secondary grounding requirements.
2. See Material Specification 102-600-077 for socket specifications.
3. 120/208 or 277/480 volt secondary metering.
4. EEI form type 9S, CSU types 72, 72C, 72M.
5. For 277/480 volt services, a VT ("VT Pack") is required (see page 11).

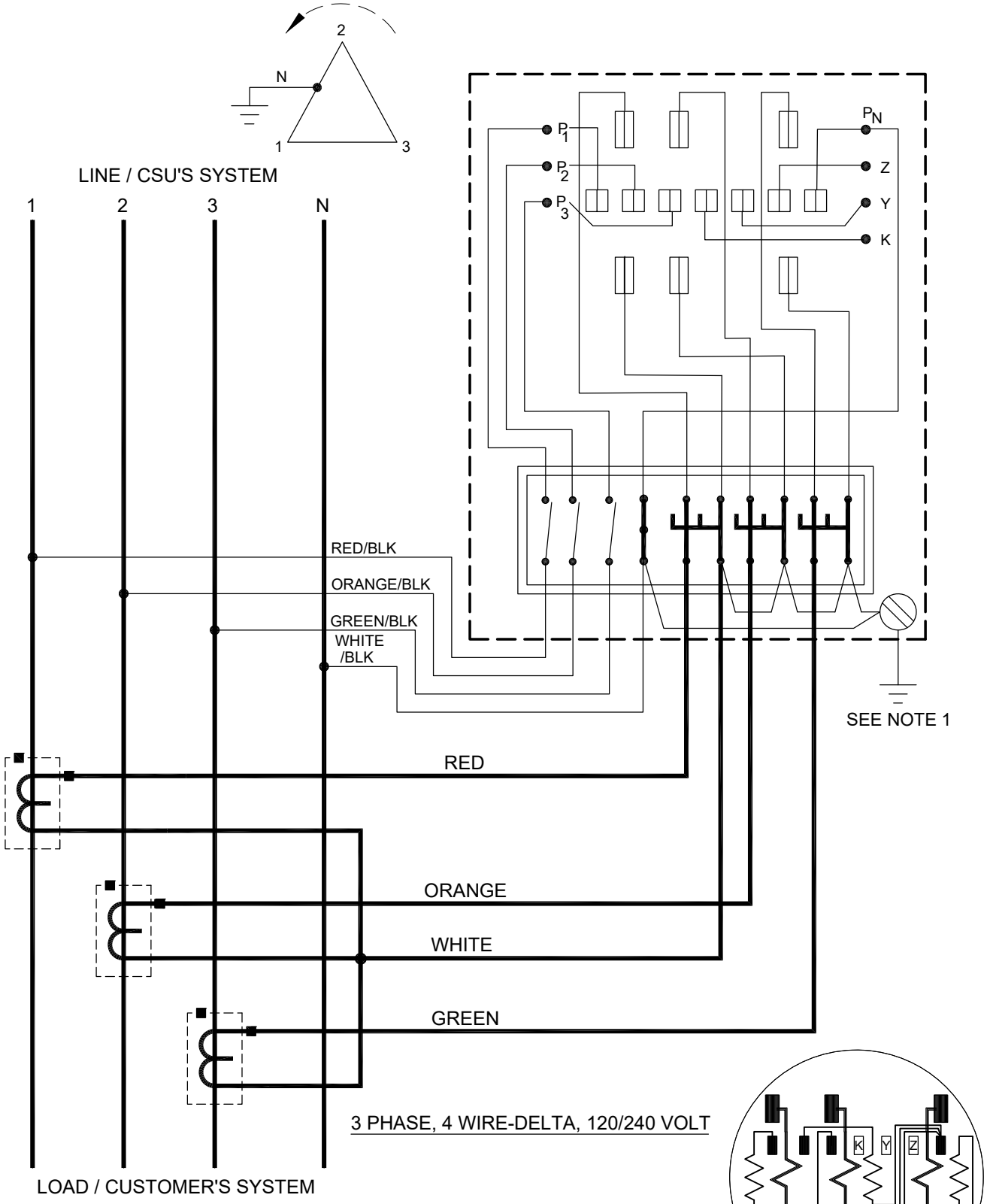


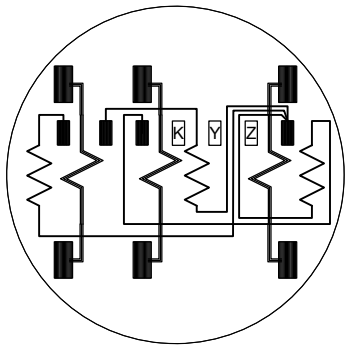


INTERNAL
METER CONNECTION
(PREFERRED CONNECTION)

NOTES:

1. See Distribution Construction Standard 15-1 for primary system grounding requirements and Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for secondary grounding requirements.
2. See Material Specification 102-600-077 for socket specifications.
3. 277/480 volt secondary metering.
4. EEI form type 9S, CSU types 72, 72C, 72M.
5. "VT PACK" to be installed in CT cabinet, connect wiring harness as shown.

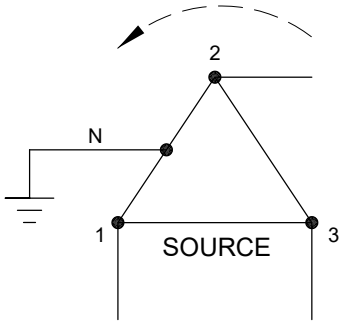




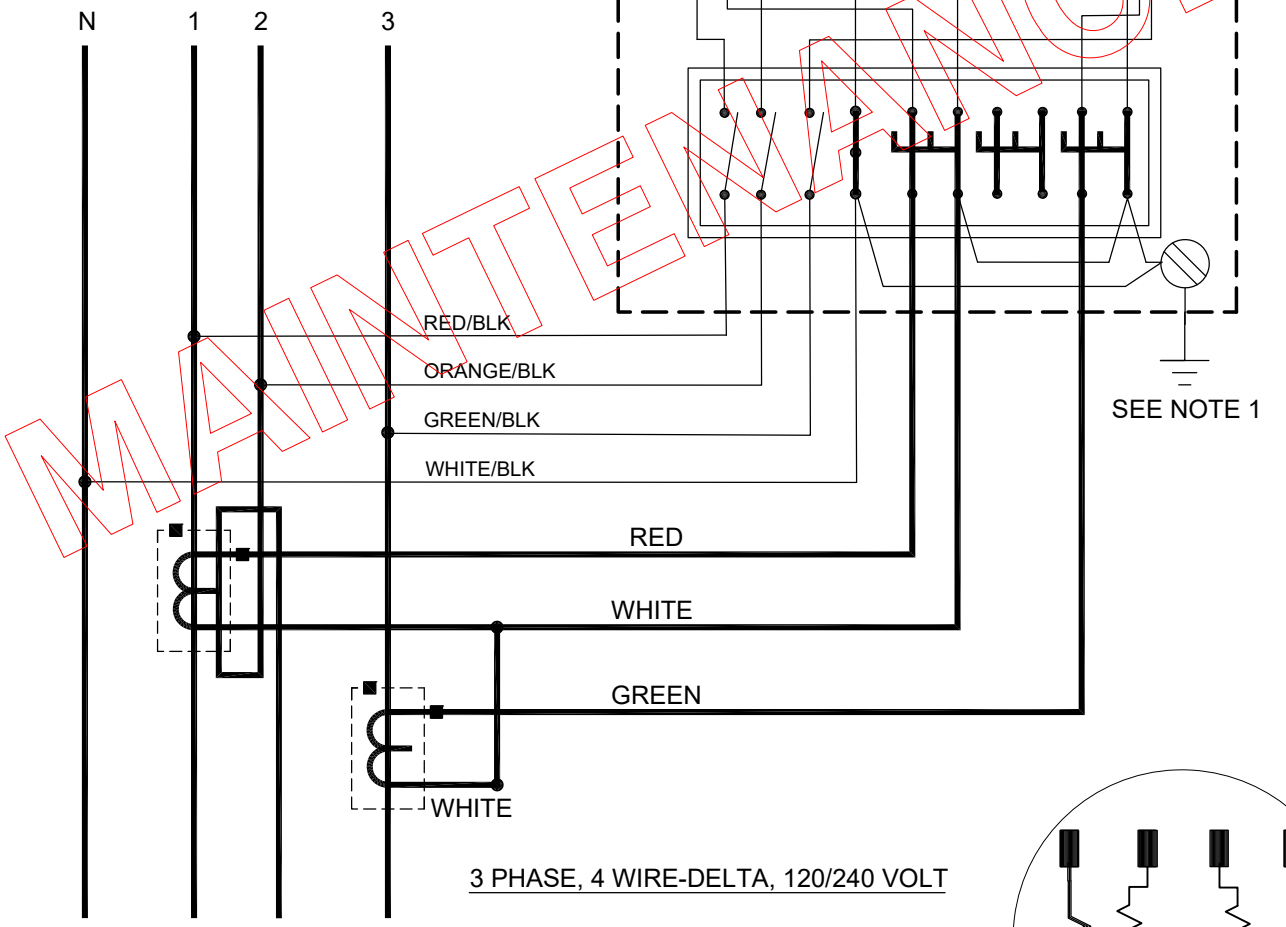
INTERNAL
METERING CONNECTION
(PREFERRED CONNECTION)

NOTES:

1. See Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for secondary grounding requirements.
2. See Material Specification 102-600-077 for socket specifications.
3. EEI form type 9S, CSU types 72, 72C, 72M.

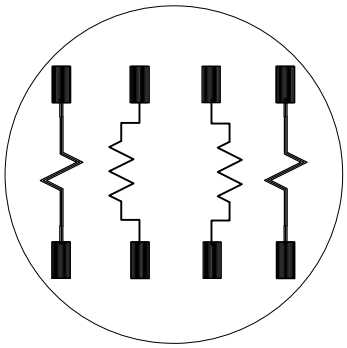


LINE / CSU'S SYSTEM



3 PHASE, 4 WIRE-DELTA, 120/240 VOLT

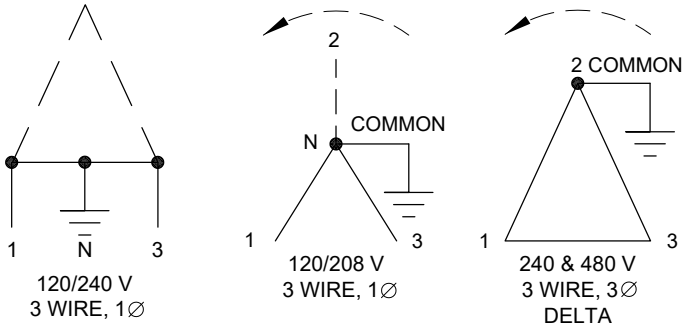
LOAD / CUSTOMER'S SYSTEM

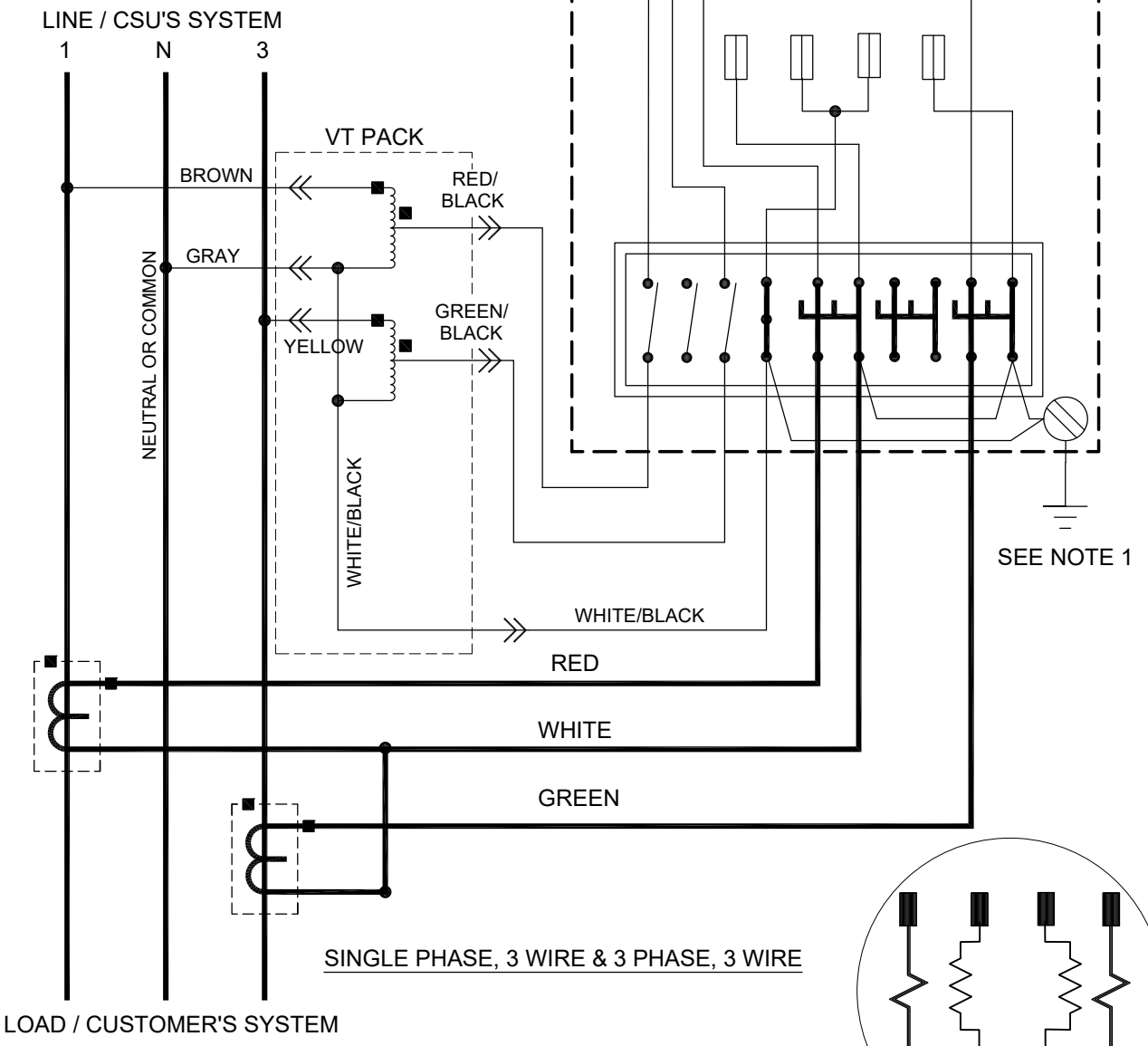


INTERNAL
METER CONNECTION

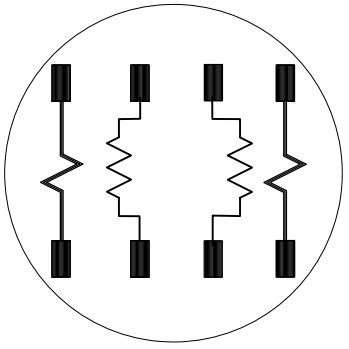
NOTES:

1. See Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for secondary grounding requirements.
2. See Material Specification 102-600-070 for socket specifications.
3. This is a non-preferred connection.
4. Not to be used on loads in excess of 100kW.
5. Off leg C.T. ratio is 1/2 that of a looped C.T.
6. EEI form type 45S, CSU types 60, 60C, 60M.





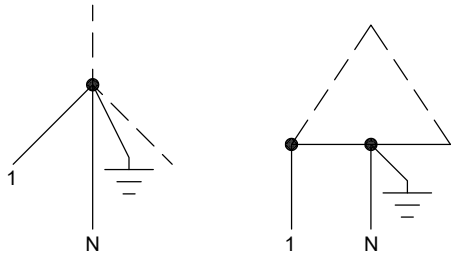
SINGLE PHASE, 3 WIRE & 3 PHASE, 3 WIRE



INTERNAL
METER CONNECTIONS

NOTES:

1. See Distribution Construction Standard 15-1 for primary system grounding requirements and Drawings 16 & 17 in the Electric Line Extension & Service Standards Manual for secondary grounding requirements.
2. See Material Specification 102-600-070 for socket specifications.
3. 120/208 or 120/240 single phase, 3 wire.
4. 240 or 480 volt, 3 phase, 3 wire reference only - NOT available for new installations.
5. EEI form type 45S, CSU types 60, 60C, 60M.
6. "VT PACK" to be installed in CT cabinet, connect to wiring harness as shown.



LINE / CSU'S SYSTEM

1 2 OR NEUTRAL

RED/BLACK

WHITE/BLACK

CURRENT SHORTING DEVICE

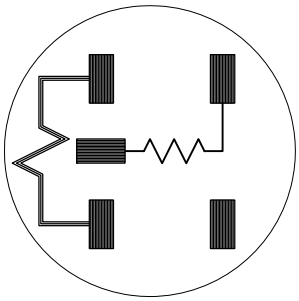
SEE NOTE 1

RED

WHITE

LOAD / CUSTOMER'S SYSTEM

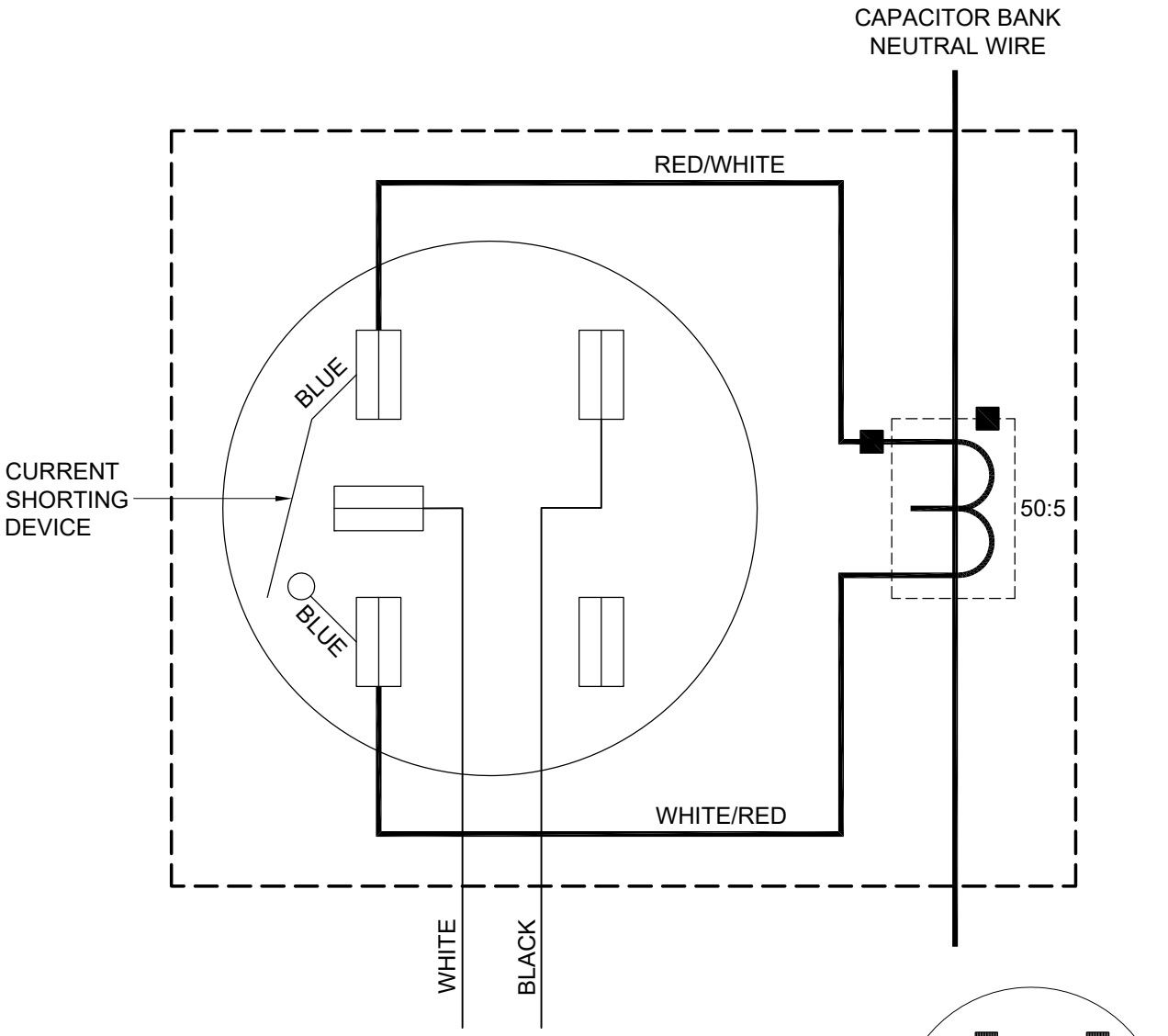
SINGLE PHASE, 2 WIRE, PRIMARY
120V, 2 WIRE



INTERNAL METER CONNECTION

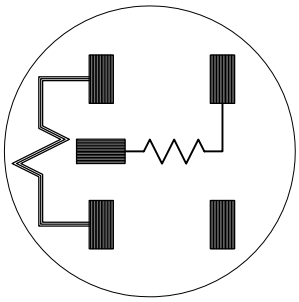
NOTES:

1. See Section 15 for primary meter grounding requirements.
2. EEI form type 3S, CSU type 52.



1
NEUTRAL/CSU'S SYSTEM

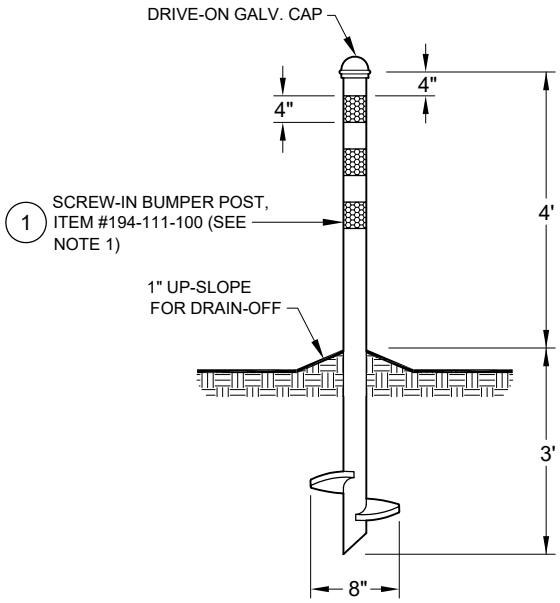
SINGLE PHASE, 2 WIRE, PRIMARY
120V, 2 WIRE



INTERNAL METER
CONNECTION

NOTES:

1. For capacitor bank neutral current monitoring. See EDCS 13-1 for installation details.
2. See Material Specification 102-600-120.
3. Current shorting device closes CT circuit when meter is removed, and opens when meter is installed.
4. EEI form type 3S, CSU type 55.

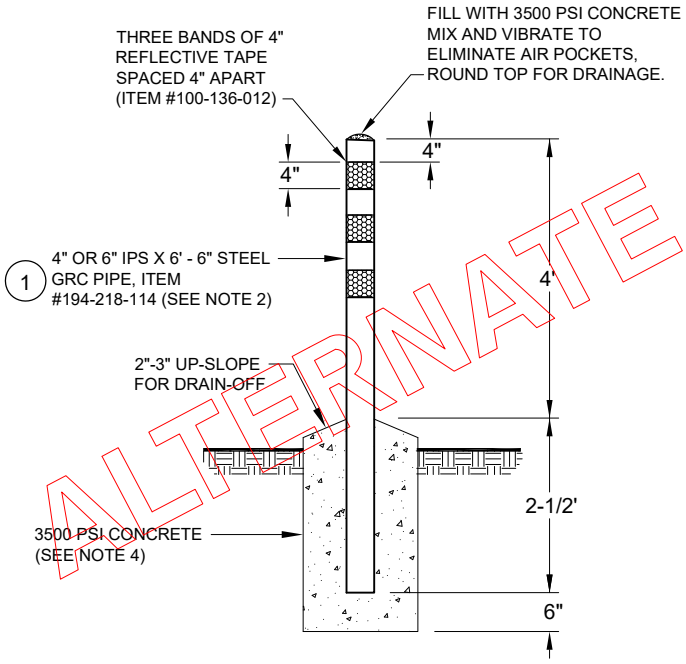


SCREW-IN BUMPER POST

THIS IS THE PREFERRED POST TO BE USED (USE CONCRETE-FILLED BUMPER POST IF USE IS IMPRACTICAL DUE TO PROXIMITY TO BURIED LINES OR SUBSTRUCTURES).

NOTES:

1. Barricade post to be installed plumb and level across the tops from one to another when two are used.
2. Post is galvanized- no painting required.
3. Post can be filled with sack mix of concrete.
4. Post requires 3,000-4,000 ft-lbs. installation torque.
5. Use bands of reflective tape (Item #100-136-012) on top of posts to warn motorists, cyclists, etc. The first band should be no lower than 8" from the top of the post.

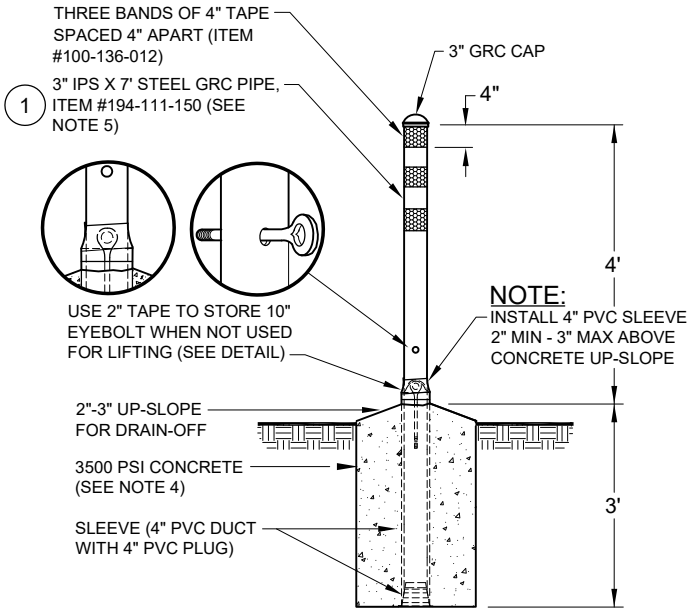


CONCRETE-FILLED PIPE BUMPER POST

THIS IS NON-PREFERRED POST AND WILL BE USED ONLY WHEN SCREW-IN BUMPER POST CANNOT BE USED.

NOTES:

1. Bumper posts to be installed plumb and level across the tops from one to another when two are used.
2. Use scrap 4" or 6" GRC pipe and paint with two coats of silver or yellow paint, unless conduit piece is new.
3. Dig 20" x 36" hole- conduit to be centered in hole.
4. Concrete for anchoring posts to be 3500 psi T&D Mix #2, approximately 8.3 Cu.Ft./Pole (see EDCS 11-1, pg 5).



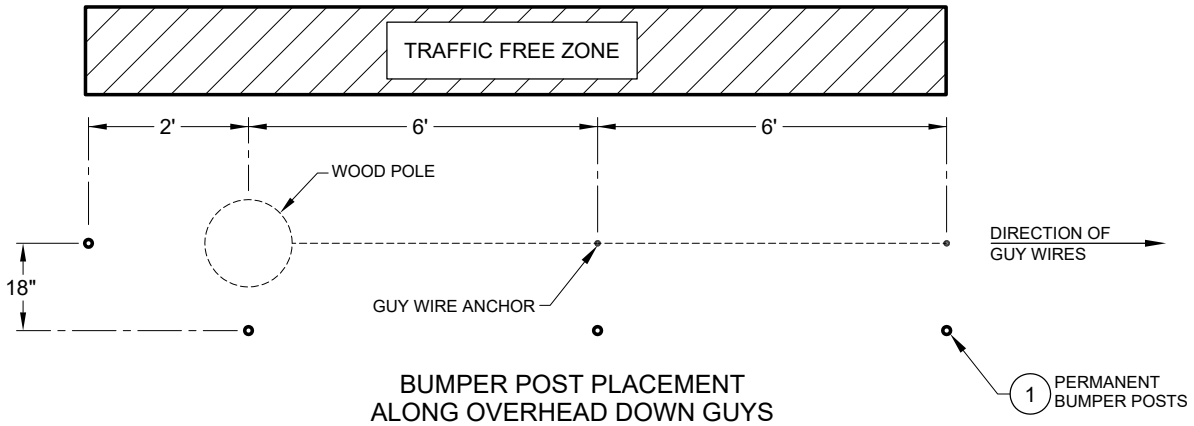
REMOVABLE CAPPED-PIPE BUMPER POST

THIS POST IS USED BETWEEN PERMANENT POSTS WHEN THE DISTANCE BETWEEN THE PERMANENT POSTS EXCEED 6' AND POST PLACEMENT MAY INTERFERE WITH EQUIPMENT OPERATION.

5. For removable post (Item #194-111-150) assemble with scrap 4" PVC duct sleeve, 10"x 1/2" eyebolt, 4" PVC pipe plug, 2" black tape and 4" orange reflective tape as shown.
6. Use bands of reflective tape on top of posts to warn motorists, cyclists, etc. (Item #100-136-012). The first band should be no lower than 4" from the top of the post.
7. Intermediate posts across at least one side (preferably the front) of the apparatus shall be of the removable type, all others can be permanent.

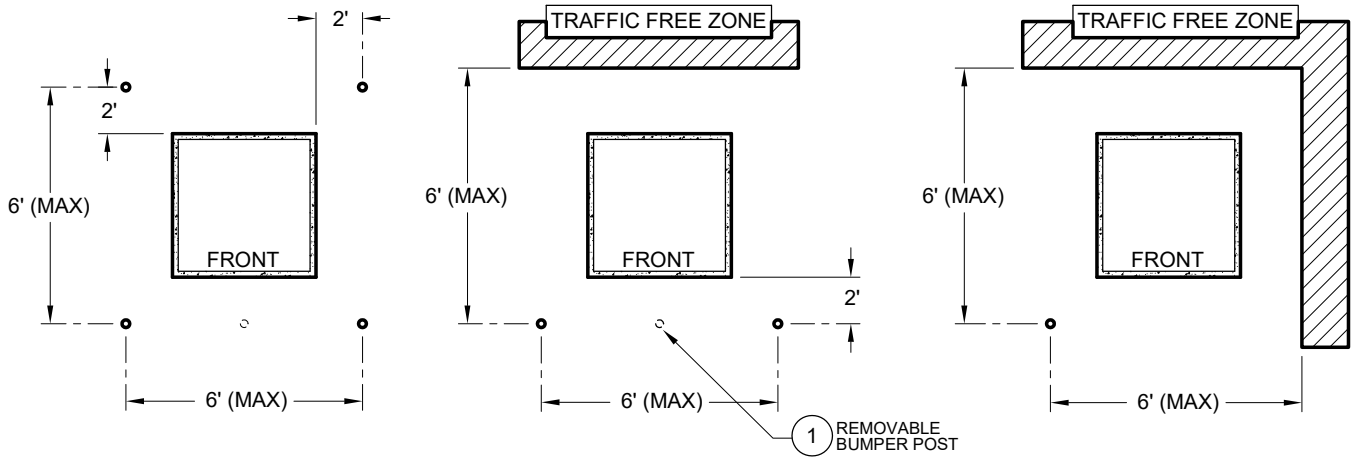
CUID EXAMPLE:
E.BUMPER-POST-SCREW-IN

Colorado Springs Utilities
It's how we're all connected

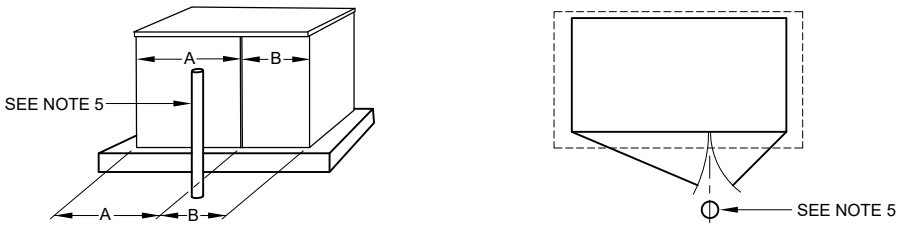


BUMPER POST PLACEMENT
ALONG OVERHEAD DOWN GUYS

PLACE BUMPER POSTS NEXT TO DOWN GUYS
LOCATED IN PARKING LOTS OR ALLEYS



BUMPER POST PLACEMENT
AROUND PADMOUNT APPARATUS

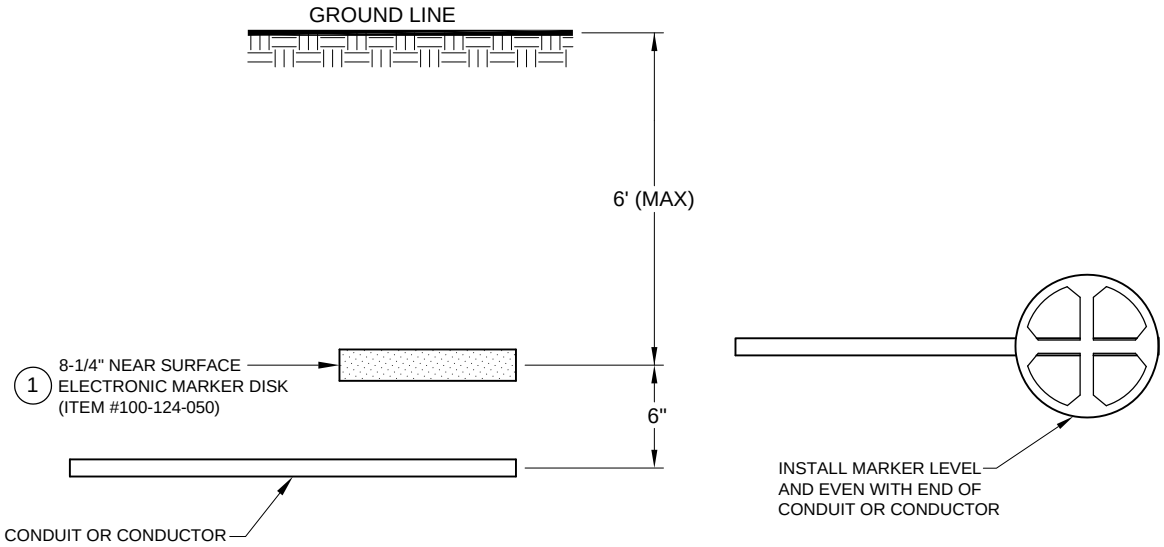


REMOVABLE BUMPER POST PLACEMENT

NOTES:

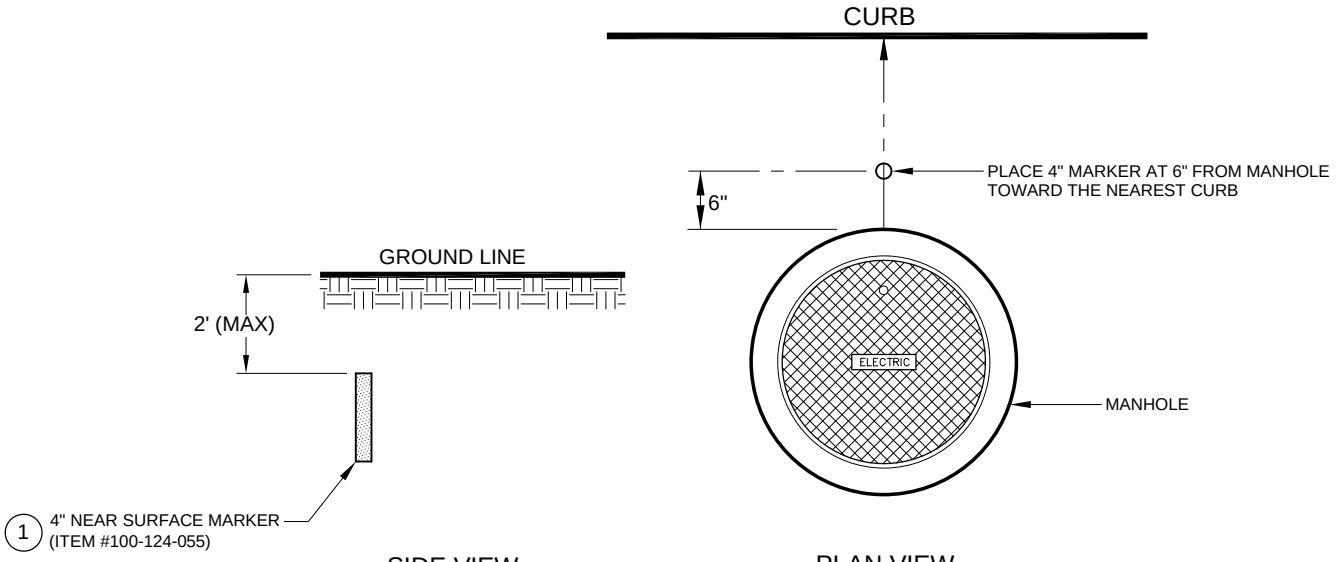
1. Barrier posts shall be set at the corners of pad-mounted apparatus adjacent to traffic areas. The posts are to be placed a minimum of 2' to the side and 2' from the corner of the concrete pad and will allow the door(s) of the apparatus to be opened to the locking positions.
2. If the distance between two corner posts exceeds 6', an intermediate post(s) should be added between the existing posts.
3. Intermediate posts across the front of the apparatus shall be of the removable type to allow full access to the apparatus.
4. If the distance between the corner of the apparatus and the traffic free area exceeds 6', a barrier post will be installed at the corner of the apparatus adjacent to the traffic free zone.
5. Intermediate (removable) posts shall be placed in line with equipment doors so as not interfere when doors are fully opened.

ELECTRONIC MARKER LOCATIONS



SIDE VIEW PLAN VIEW

8-1/4" NEAR SURFACE MARKER DISK



SIDE VIEW PLAN VIEW

4" NEAR SURFACE MARKER

NOTES:

1. Install 8" markers for use with secondary submersible enclosers, underground J-boxes, conduit stubs, road crossings, repair joints and streetlight stubs. Maximum locating range is 6' below surface. Install marker with flat side up and level. This ensures that the marker signal will be read directly above the marker, even if the final grade is not level.
2. Install 4" marker for locating manhole covers on 6' x 12' vaults. Maximum locating range is 2' below the surface.
3. Pre-test all near surface markers to avoid installing any defective units.

Colorado Springs Utilities
Specification for Ground Level Spot Network Vaults

1. SCOPE:

This General Specification is to be used as a definition of Company policy concerning the installation of transformer vaults within customer premises. This shall be understood to be minimum requirements. Any deviation from this specification must be approved in writing by Colorado Springs Utilities (SU). SU will not provide electrical service to the customer until the vault is completed in accordance with this specification.

The customer shall provide an electrical vault at ground level, with external access, inside of the building that meets the requirements of this document. All alternate vault locations must be approved in writing by SU.

The Vault shall be built in accordance with NEC Article 450-41 through 450-48, and Article 230-250, and other applicable sections of the requirements. Where conflicts occur between this document and the NEC the more stringent requirement shall apply.

After the vault is completed and accepted by SU, no work shall be done on, in or through the vault without the permission of SU. This includes all future customer services, and vault modifications. **Maintenance of the vault once complete will be the responsibility of the building owner.**

2. STANDARD SERVICE VOLTAGE:

A. 480grdY/277v, 3ph 4w

3. SIZE OF VAULT

The size of the vault is determined by the building's load. The typical vault drawing show SU requirements for vault space based upon the customer's load demand. Minimum inside vault dimensions:

A. 2 transformer vault – 10'H x 27'w x22'd
B. 3 transformer vault – 10'H x 40'-6" w x 22'd

4. BUILDING MATERIALS FOR VAULT

A. The support walls, floor, and ceiling shall have a minimum 3 hour fire rating, (class A) and be constructed as follows.
   1. Reinforced concrete – 6" thick minimum, (preferred construction)
   2. Reinforced concrete – filled block – 8" thick minimum

B. The floor shall be designed to support the weight of the transformer and other associated equipment that is installed. Each transformer bay should be able to support the minimum weight of 21,000 lbs. This is based on a 1500 KVA transformer.

C. The vault shall have a 4 inch tall concrete curb that is sealed for oil containment per NEC 450.43B. A removable 4" curb section will be provided at the doorway to provide complete oil containment area. The removeable section shall span the entire doorway, shall be bolted to the floor and sealed with flexible caulking. The floor shall be flat and level with the outdoor sidewalk or roadway to facilitate rolling equipment.

D. The floor and curb shall be sealed with Dayton Superior Corporation DAY-CHEM AGGRE-GLOSS (J-25) or equivalent.

E. Barrier walls between transformers shall be provided by the customer and have a 3-hour fire rating. These are to be constructed of concrete (preferable) or reinforced concrete – filled concrete block and shall be at least 12ft. long, 8ft. high, and no less than 13ft. – 5 inches. apart (center to center). The barrier walls shall be self supporting and rigidly attached to the floor.

F. The customer shall provide rolling and jacking equipment for the installation and removal of the transformer. The rolling equipment shall be TECHIMPEXUSA model number SFT-16 and the jacking equipment shall be (2) TECHIMPEXUSA model number Z-5 or equivalents. (2) 4" X 4" X 40" long steel channels shall be provided to set the transformer on and capable of supporting the load at 4 points, up to 6,ooo lbs. at each point.

G. When a 3 transformer vault is constructed the center transformer bay may have the primary connections mounted on the front wall of the vault between the center bay and the left or right bay doors or mounted to either barrier wall (whichever location works best). The primary connections shall be mounted at a minimum 8.5 ft above the vault floor.

H. See drawings at the end of this specification for more details on vault requirements.

5. VAULT VENTILIATION

The ventilation system for the vault shall be unique and will be reviewed and approved by SU. There shall be no tie to the building system (no exceptions) for both intake and exhaust. These intake and exhaust openings shall not be located near any adjacent ventilation systems. The ventilation system can be either Gravity Flow or Forced Air.

A. The air spacing or opening between each louver shall measure a maximum distance of 4 inches. The louvers shall be thermostatically controlled and the electrical feed to the louvers shall come from a separate grid vault. **Thermostatically controlled louvers are required on both gravity flow and forced air venting.** A screen or wire mesh, which covers the vault-side of the entire louvered section(s), is required to prevent birds and such from entering the vault.

   This layout and others which are designed to freely circulate a sufficient amount of air throughout the vault and around the electrical equipment will be acceptable.

B. Gravity Flow – The net free area (opening area minus the area of the louvers and, or grating) shall be no less then (3) square inches per KVA capacity installed in the vault. The ventilation openings shall conform with Article 450-45 of the NEC. Final ventilation locations to be verified by the SU engineer.

C. Forced Air – Forced air ventilation will required additional vault space for the duct and blower motor. The customer shall provide Colorado Springs Utilities with the complete specification for the ventilation system. The customer shall install the ventilation system. The blower shall be thermostatically controlled.

Requirements: For forced air, the ventilation system shall be capable of providing five (5) cubic feet per minute per KVA of capacity installed in the vault. Air flow shall be directed to the transformers so that is will flow through and around the radiators of the transformer tank.

6. ELECTRICAL

A. **Grounding:** The rebar superstructure in the floor and the rebar superstructure in all of the vault walls surrounding the transformers shall be bonded together. Each corner (4) of the transformer vault shall have a grounding connection point bonded to the rebar superstructure in the walls. The grounding connection point shall consist of a significant piece of 2/0 stranded bare copper wire bonded to the rebar superstructure to allow 12" of said 2/0 stranded copper wire to be exposed from the face of the wall (See Detail A). The exposed wire shall be no higher than 3" above the finished floor surface. The connection for 1/2" rebar shall be made with Burndy Compression Connector (YGHP29C2), the connection for 5/8" rebar shall be made with Burndy Compression Connector (YGHP34C26). The connections shall be made with Burndy type Y-35 Hypress hand-operated hydraulic tool. No other method for attaching 2/0 stranded bare stranded copper will be accepted. **All rebar and grounding connection points shall be inspected by SU Quality Control Inspectors before any concrete is poured. Any failure to comply with this specification will mean the removal of all concrete for inspection purposes.**

B. **Disconnect Switches:** A 600V class, 2000 Amp minimum disconnect switch, one per phase, shall be provided for each transformer and wall mounted as shown in the drawings. The switches shall be Eaton VisoBlock Model# NAS0612G01.

C. The collector bus, conductors and connections shall be installed and owned by the customer, installed in the customer's room, and separate from the Spot Network Vault. The secondary collector buss shall be approved by SU before purchase. The secondary cables from the network protector shall connect to the top spade of the Eaton VisoBlock disconnect switch. The secondary cables shall exit the disconnect switches bottom spade, pass through the vault wall and attach to the customer's bus work at the designated service entrance. (See Detail B). The point at which the service entrance enters the vault shall be approved by SU before construction begins. The tap connections to each disconnect switch shall be rated at 2000A minimum. Per NESC 3550: The bus duct shall be sealed to prevent the entrance of gas into the building.

D. Conduits and Cables

1. The customer shall provide all conduit runs needed by Utilities conductors within the building. Any conduit run(s) encased in concrete shall have a minimum of 2" cover. In all cases conduit runs should be as near straight as possible, and free of excessive bends. Utilities shall designate the location of all conduit entrances prior to construction. Utilities will provide all primary services conduit from outside the building to the transformer vault, entering up through the floor into the room. Duct openings shall be installed at least 6 inches above the floor and sealed as stated above. Utilities will provide and own the primary conductors.

E. Lighting of transformer vaults shall be provided and owned by the customer. Fixtures may be installed by a contractor before SU occupies the vault space. Lighting shall be 48" LED light strips that are ceiling or wall mounted. SU will designate the final placement of all lighting, before installation in the vault. Lighting shall not be positioned directly over the network transformers. All wiring must conform to the current edition of the NEC and the "Electric Line Extension & Service Standards" (ELESS). The transformer vault shall have, at a minimum, one 120 volt convenience outlet.

F. The metering for the building shall conform to chapter 5 of the ELESS. All metering shall be located outside of the network vault. The customer shall have prior approval from the SU Meter Shop and Field Engineering Departments for any job requiring instrument transformers and any fabrication of such equipment. All such drawings for the specified equipment shall be provided to both SU Meter Shop and Field Engineering Departments for approval prior to fabrication of the metering equipment.

G. Smoke alarms shall be installed and owned by the customer per NFPA standards.

7. VAULT ACCESS

A. Provisions must be made for the installation of all vault equipment, including transformer, etc. All passageways and openings shall be made so that the vault equipment (including transformers) can be replaced during future maintenance. **The main doorways to the street shall be a minimum 8 feet tall and 6 feet wide, the doors shall be Class "A" fire rated. If two doors with a center post are used in each opening, the center post must be removable**. The doors shall open out of the vault and all double doors must be capable of latching at the top, bottom, and middle. The hinges on these doors should have a set screw to prevent hinge pins and doors from being lifted out. These doors shall not open into or near any of the building's air supply/ ventilation systems. Doors shall be labeled and include Fire Exit hardware as required by NEC 110.31. All access doors to the vault shall have electrical warning labels installed. Two such access locations are required. The customer shall provide all door lock sets to be keyed alike to Sargents lock number (For Sargents Lock number, call Downtown Network Crew Supervisor at 719-650-6029 mobile or 719-668-8640 office).

B. (2) lockable boxes shall be provided by the customer and attached next to the vault doors. One box shall contain a labeled key for fire emergency access with a Colorado Springs Fire Department designated lock. The other box shall be made available for a SU padlock. The boxes shall be ordered from Colorado Springs Fire Department.

C. Each vault door shall have an electrical warning label attached to it. SU item number 100-130-455 is approved and shall be used for this purpose.

8. ACCEPTANCE CRITERIA

The vault shall be energized only after an inspection by SU. The following items must be completed before such inspection (and the subsequent vault energizing) occurs:

1. Fireproofing of steel beams within the vault must be completed.
2. Ventilation system shall be installed and operable.
3. Vault floor, curb and 4" removable curb shall be sealed as required to prevent transformer oil from penetrating the vault floor.
4. Customer service entrance conduit shall be installed and sealed where the bus goes through the vault wall to the customer's switch gear room.
5. Permanent fire doors, smoke detectors, and locks shall be installed and operational.
6. Removable curb furnished per spec.
7. **Utilities does not allow any foreign objects to enter the transformer vault. Surface-mounted rigid electrical conduit and outlet boxes are allowed provided they are approved by the local authorities.**

9. CUSTOMER AGREEMENT

A statement shall be signed and returned to SU agreeing to build the vault according to these vault specifications. An additional statement shall be signed and returned to SU designating the vault as a SU substation with a copy of the statement sent to the Pikes Peak Regional Building Department Electrical Inspector. The only authorized signer is the building owner.

The following statement must be signed by the owner and one copy of the specification returned to:

Colorado Springs Utilities Representative
Energy Services Electric Planning
Colorado Springs Utilities
1521 Hancock Expressway
Colorado Springs, CO 80947-1821

The preceding vault specifications meet with our approval.

_____Owner
_____Date

The undersigned hereby authorizes the use of the transformer vault located in:

Customer Name _____
Address _____
City, State, & Zip Code _____

The vault is designated as a Colorado Springs Utilities Substation.

Signed _____

Title _____

Date _____

Cc: Pikes Peak Regional Building Department, Chief Electrical Inspector

Acceptance Check List

1. Rebar superstructure and grounding connection points. Pass □ Fail □

Comments: _____
_____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

2. Primary and Secondary conduit feeds. Pass □ Fail □

Comments: _____
_____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

3. Ventilation system installed and working at required CFM. Pass □ Fail □

Comments: _____
_____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

4. Permanent fire doors, smoke detectors, and locks installed & operational. Pass □ Fail □

Comments: _____
_____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

5. Customer service entrance ducts installed & sealed where the bus goes through the vault wall to the customer's switch gear rooms. Pass □ Fail □

Comments: _____
_ _____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

6. Secondary services tested for proper alignment before being energized. Pass □ Fail □

Comments: _____
_____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

7. Removable curb installed with accessible bolts and sealed for oil penetration. Pass ☐ Fail ☐

Comments: _____
_____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

8. Vault floor and curbing sealed. Pass ☐ Fail ☐

Comments: _____
_____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

9. Fireproofing completed. Pass ☐ Fail ☐

Comments: _____
_____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

10. No foreign piping in vault. Pass ☐ Fail ☐

Comments: _____
_____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

11. All required lock boxes installed Pass ☐ Fail ☐

Comments: _____
_____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

12. Jacks and roller placed in vault. Pass ☐ Fail ☐

Comments: _____
_____

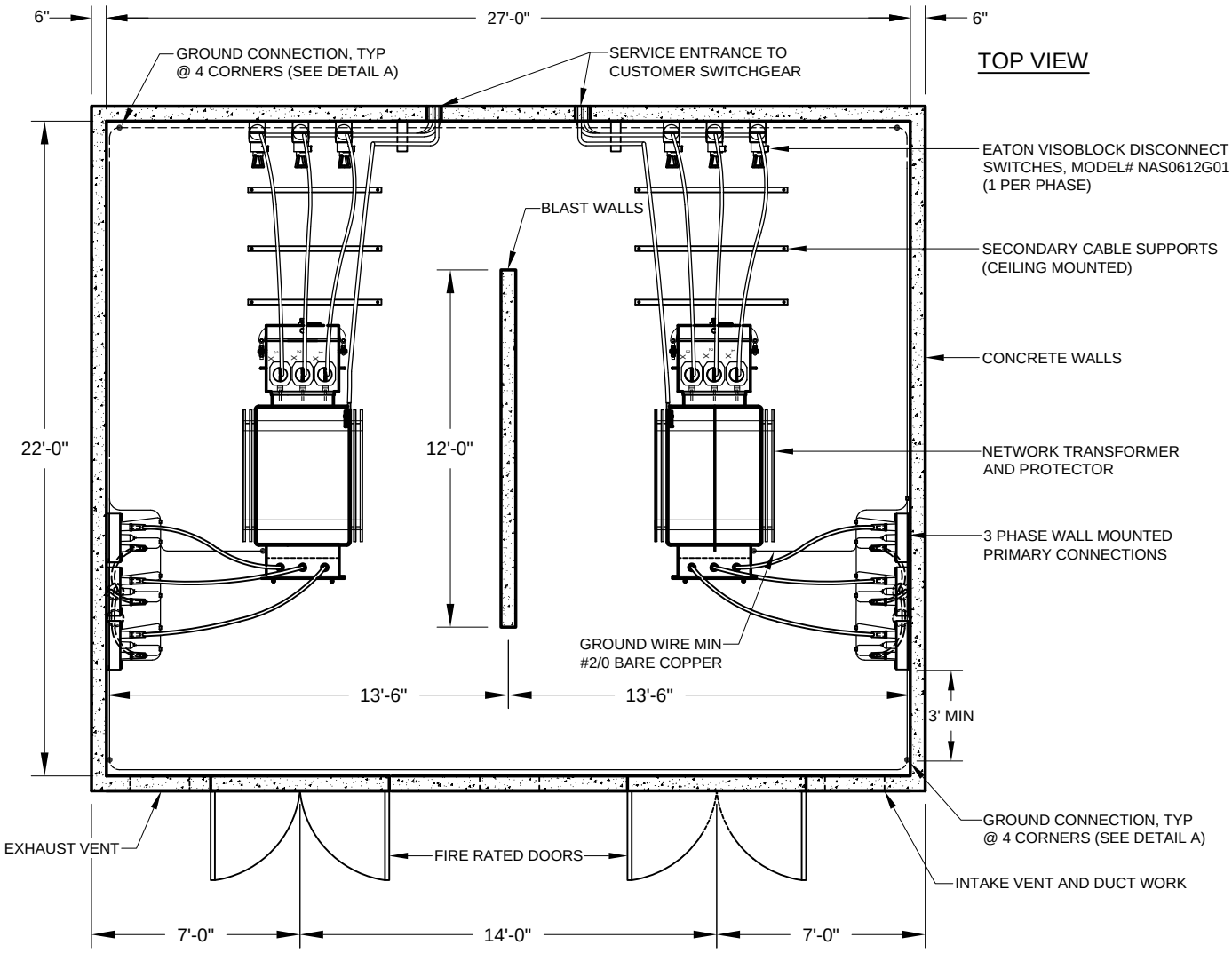
SU Inspector: _____ Owner/ Project Manager_____ Date _____

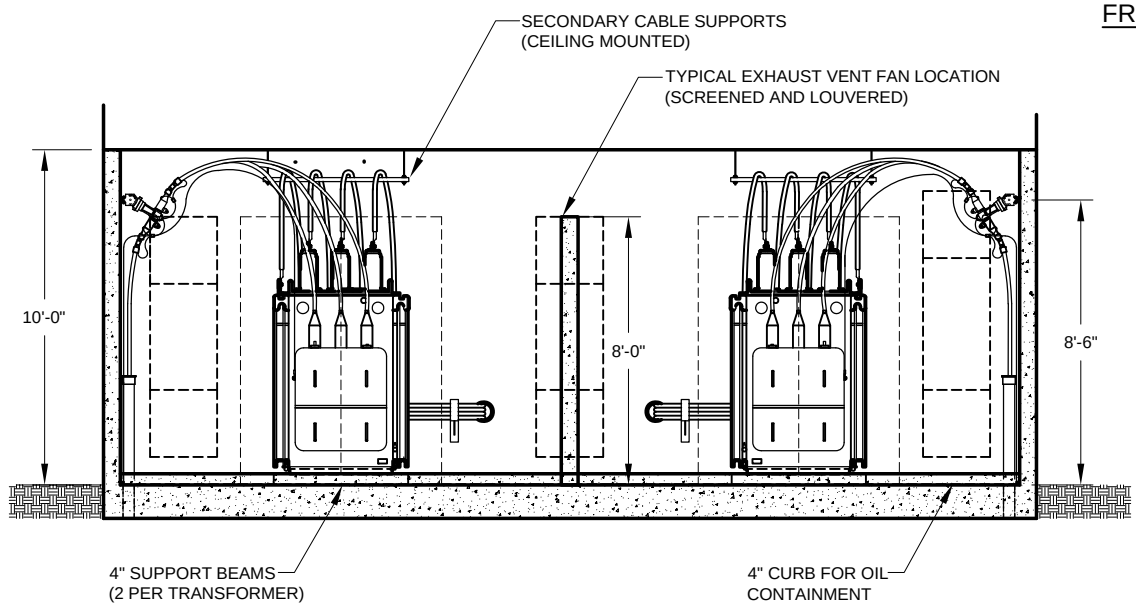
	Pass	Fail
13. Finished vault inspected.	□	□

Comments: _____
_____

SU Inspector: _____ Owner/ Project Manager_____ Date _____

GROUND LEVEL TRANSFORMER SPOT NETWORK VAULT

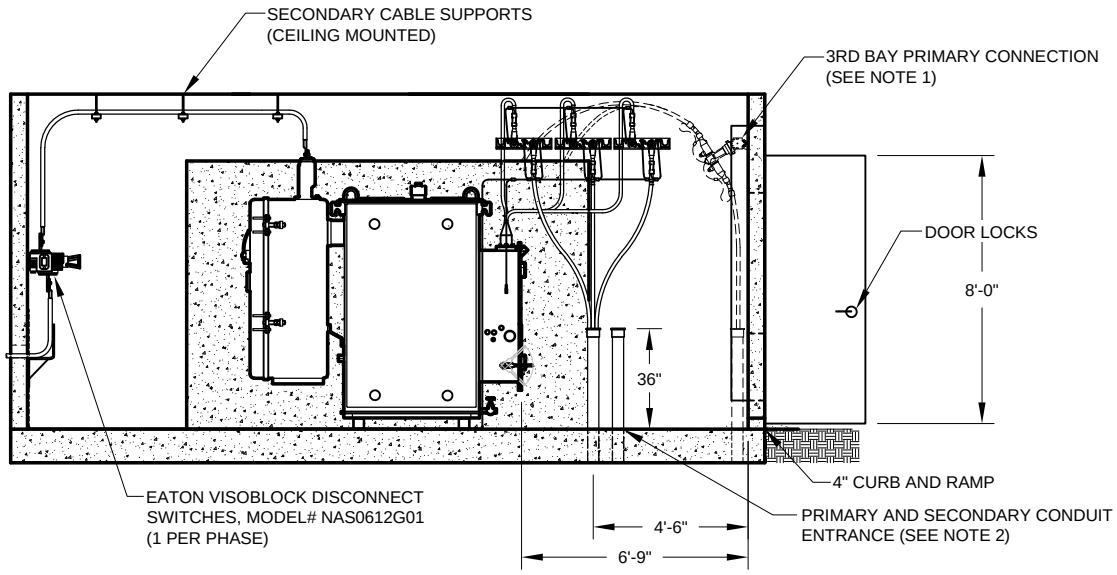




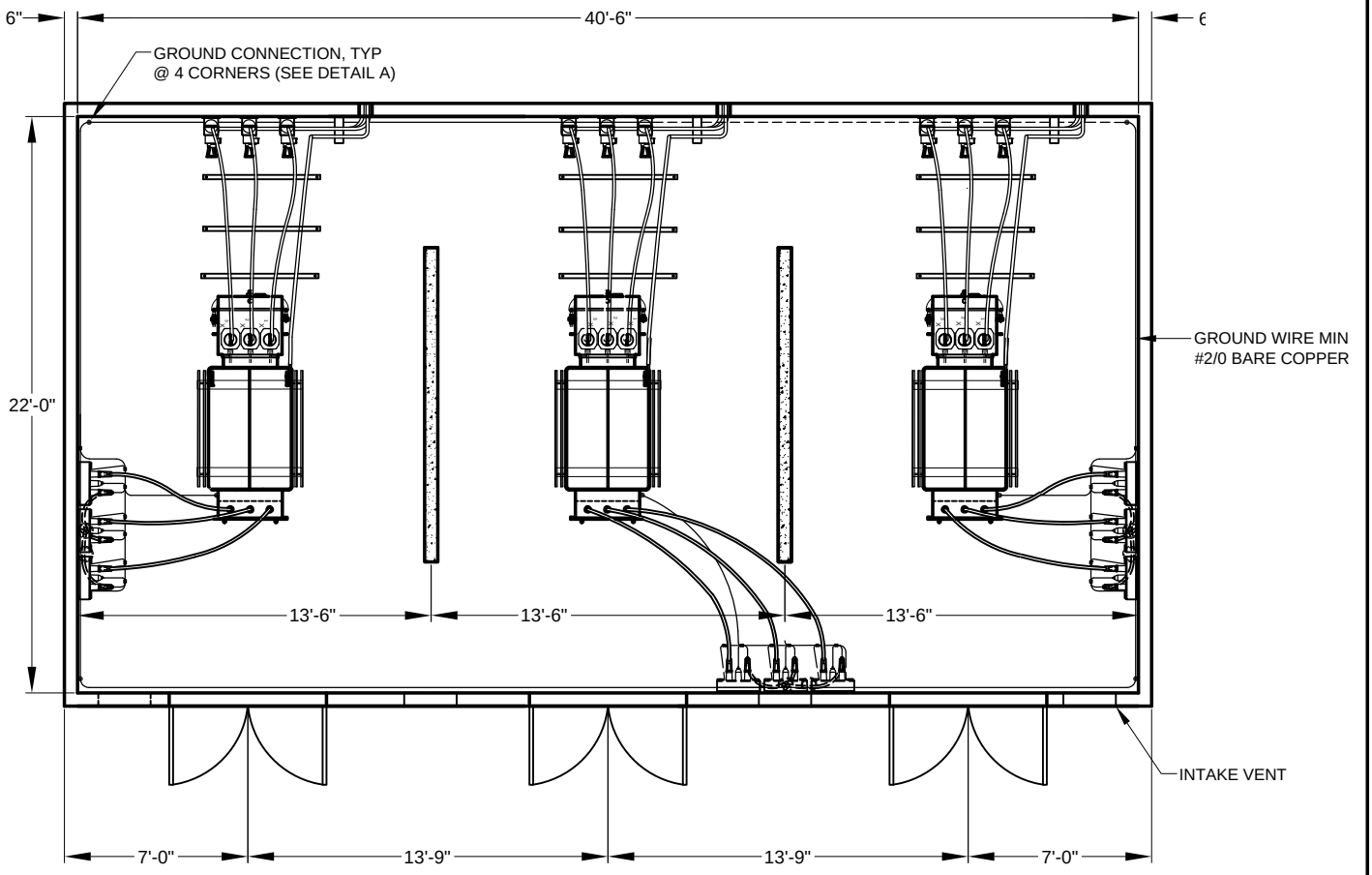
NOTE:
DOORS AND VENTS ARE
DASHED FOR CLARITY

GROUND LEVEL SPOT NETWORK VAULT

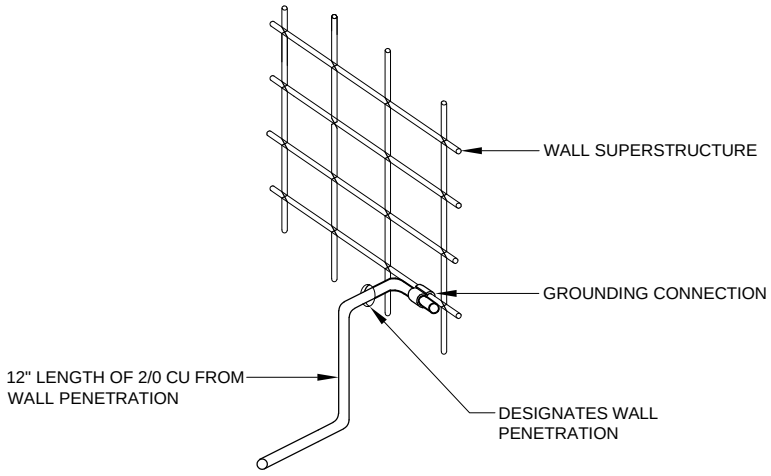
SIDE VIEW



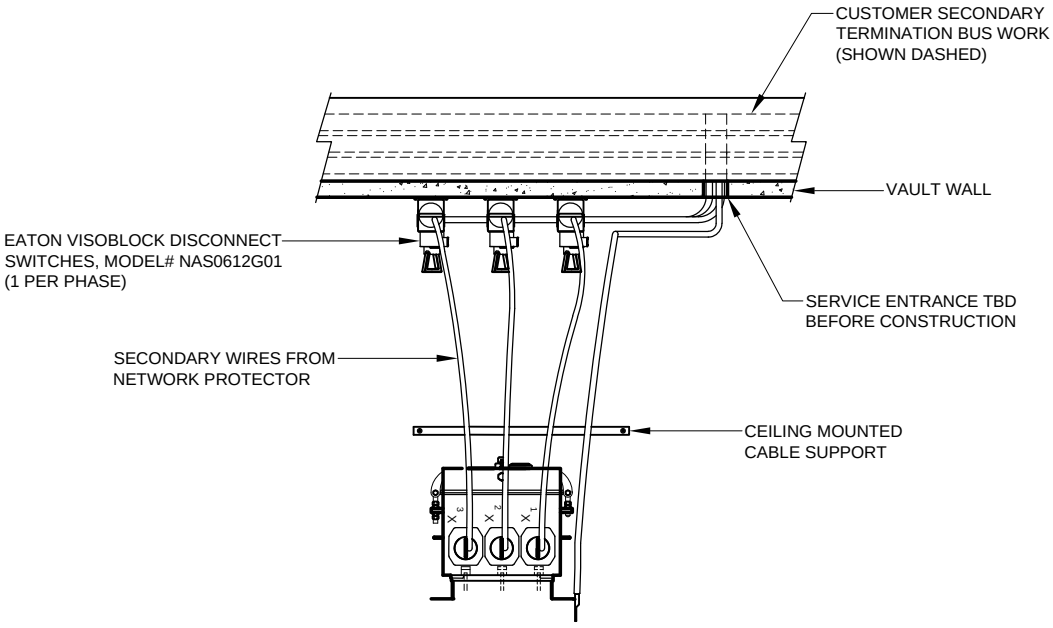
3 TRANSFORMER GROUND LEVEL SPOT NETWORK VAULT



GROUND LEVEL SPOT NETWORK VAULT



DETAIL A



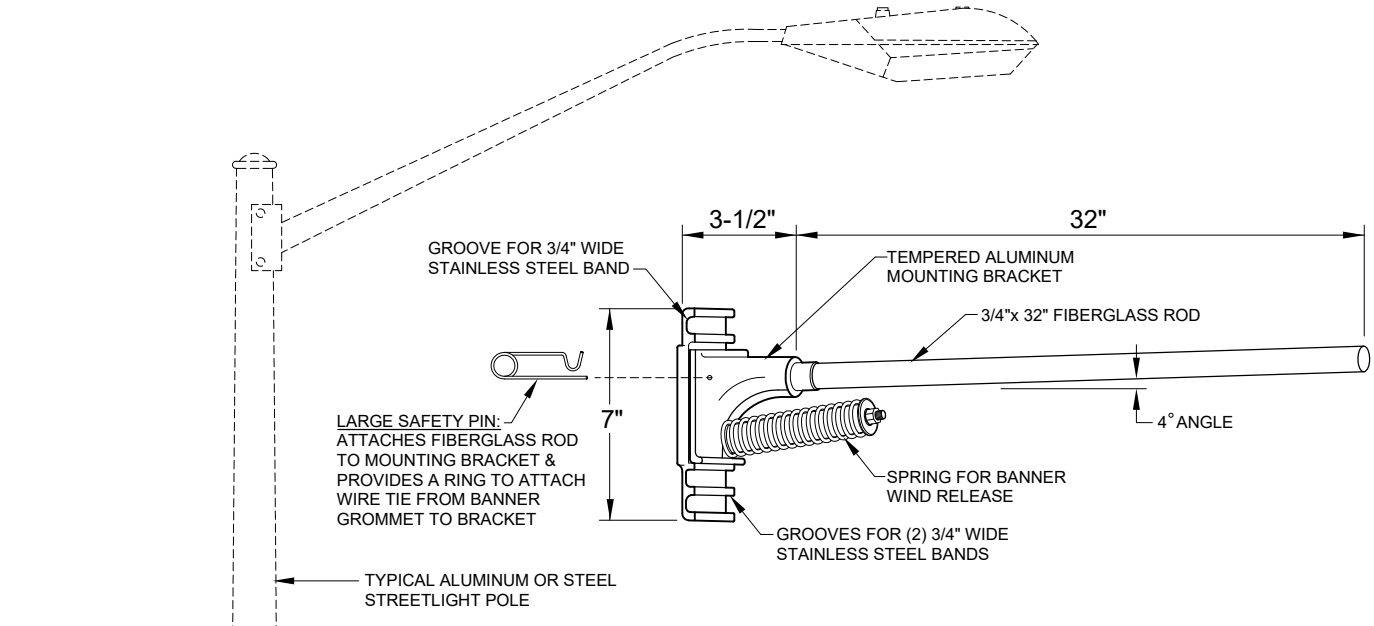
DETAIL B
TOP VIEW

NOTES:

1. For 3 transformer configurations the primary connection for the center transformer can be mounted on the front wall of the vault between the doors or the barrier wall.
2. Primary and secondary conduits can enter the vault wherever convenient. location shall be determined before construction. Conduit size is determined by size and number of cables.
3. Train primary conductors along the vault walls to the transformer junction.

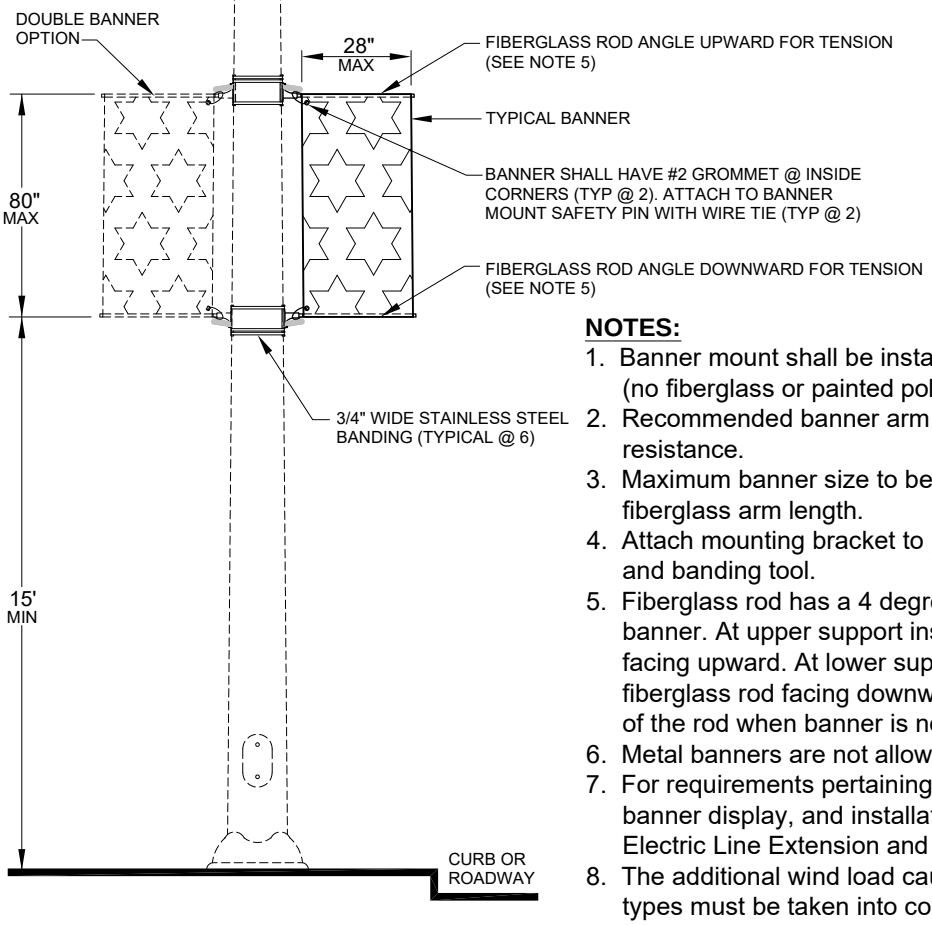
BANNER INSTALLATION GUIDE

(ALUMINUM OR STEEL POLES)



BANNER MOUNTING BRACKET & ARM

DESCRIPTION	ITEM NO.	WEIGHT (LBS)
BRACKET, STREETLIGHT BANNER, WITH SPRING-TYPE ARM	120-500-100	4

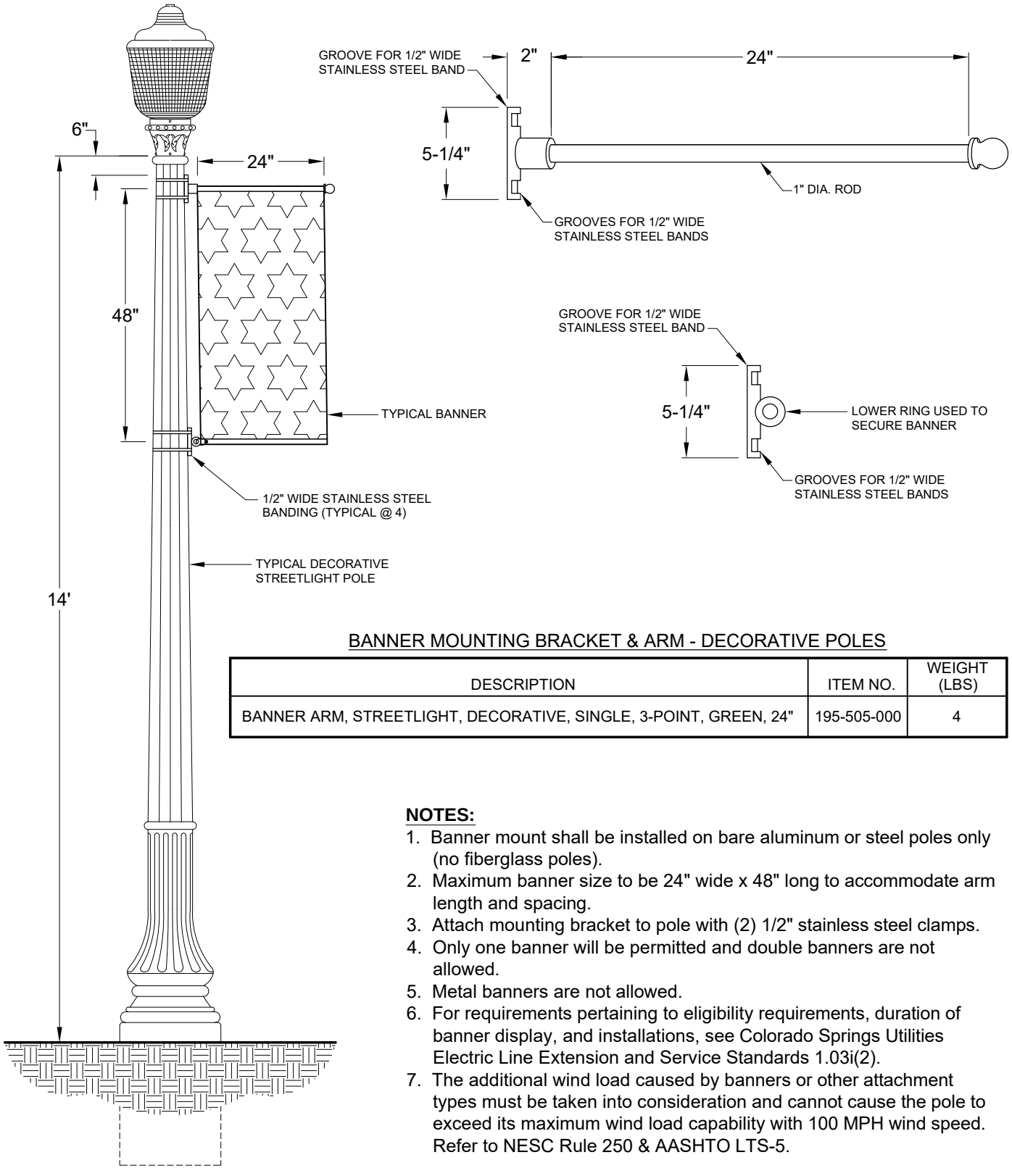


NOTES:

1. Banner mount shall be installed on bare aluminum or steel poles only (no fiberglass or painted poles).
2. Recommended banner arm bends @ 30 mph to spill away wind resistance.
3. Maximum banner size to be 28" wide x 80" long to accommodate fiberglass arm length.
4. Attach mounting bracket to pole with (3) 3/4" stainless steel bands and banding tool.
5. Fiberglass rod has a 4 degree angle to provide tension on the banner. At upper support install banner bracket with fiberglass rod facing upward. At lower support install banner bracket with fiberglass rod facing downward. Large safety pin allows removal of the rod when banner is not used.
6. Metal banners are not allowed.
7. For requirements pertaining to eligibility requirements, duration of banner display, and installations, see Colorado Springs Utilities Electric Line Extension and Service Standards 1.03i(2).
8. The additional wind load caused by banners or other attachment types must be taken into consideration and cannot cause the pole to exceed its maximum wind load capability with 100 MPH wind speed. Refer to NESC Rule 250 & AASHTO LTS-5.

BANNER INSTALLATION GUIDE

(DECORATIVE POLES)



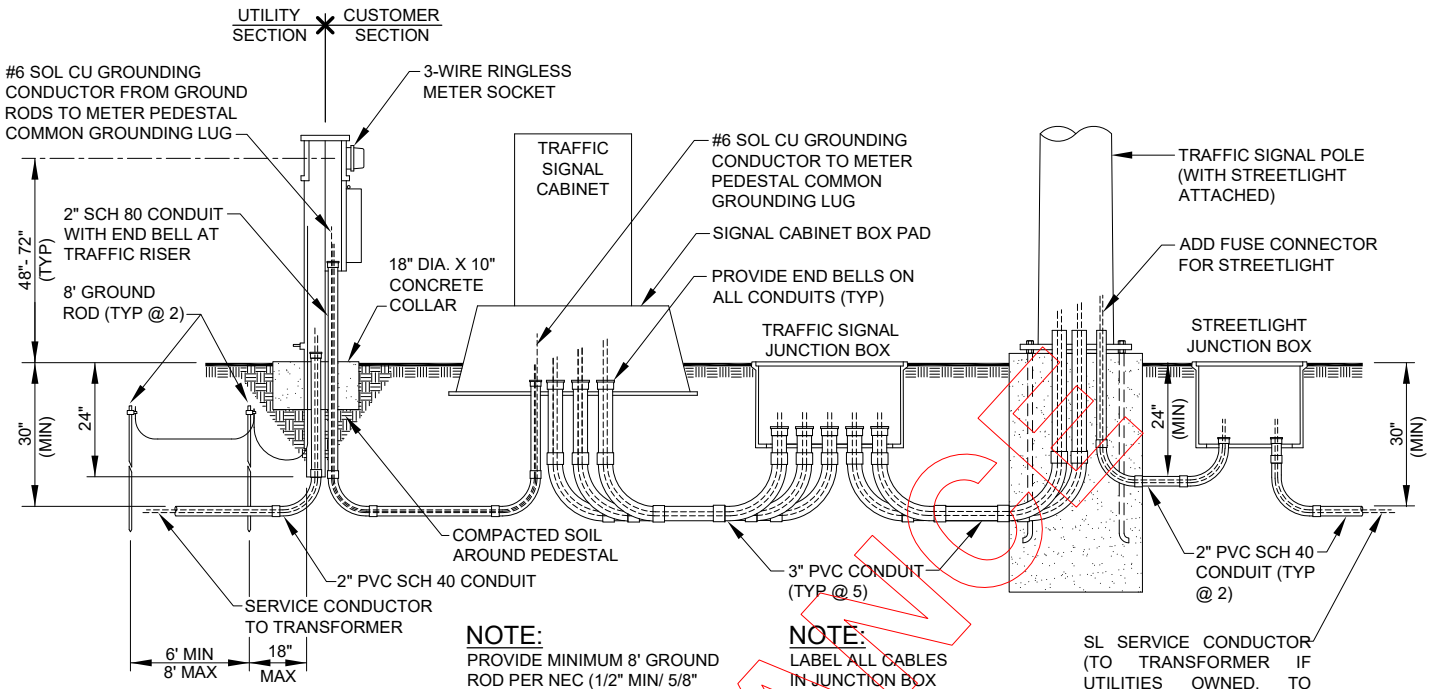
BANNER MOUNTING BRACKET & ARM - DECORATIVE POLES

DESCRIPTION	ITEM NO.	WEIGHT (LBS)
BANNER ARM, STREETLIGHT, DECORATIVE, SINGLE, 3-POINT, GREEN, 24"	195-505-000	4

NOTES:

1. Banner mount shall be installed on bare aluminum or steel poles only (no fiberglass poles).
2. Maximum banner size to be 24" wide x 48" long to accommodate arm length and spacing.
3. Attach mounting bracket to pole with (2) 1/2" stainless steel clamps.
4. Only one banner will be permitted and double banners are not allowed.
5. Metal banners are not allowed.
6. For requirements pertaining to eligibility requirements, duration of banner display, and installations, see Colorado Springs Utilities Electric Line Extension and Service Standards 1.03i(2).
7. The additional wind load caused by banners or other attachment types must be taken into consideration and cannot cause the pole to exceed its maximum wind load capability with 100 MPH wind speed. Refer to NESC Rule 250 & AASHTO LTS-5.

STREETLIGHT & TRAFFIC SIGNAL INSTALLATION FOR UTILITY OWNED STREETLIGHTS

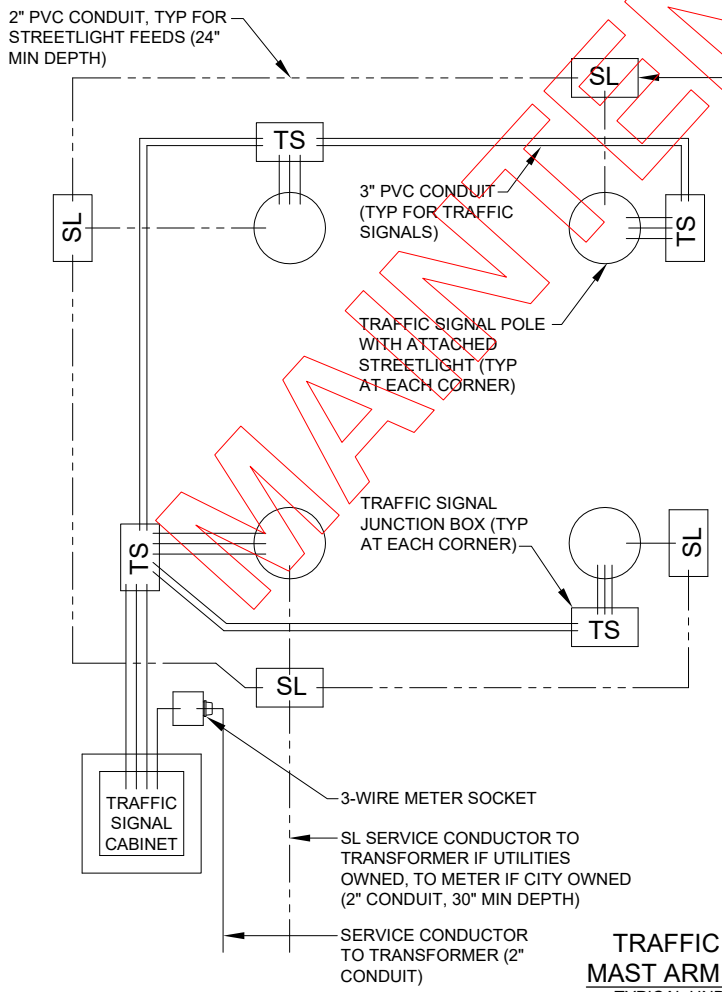


NOTE:
PROVIDE MINIMUM 8' GROUND ROD PER NEC (1/2" MIN/ 5/8" MAX DIAMETER)

NOTE:
LABEL ALL CABLES IN JUNCTION BOX

SL SERVICE CONDUCTOR (TO TRANSFORMER IF UTILITIES OWNED, TO METER IF CITY OWNED)

TYPICAL TRAFFIC SIGNAL WITH MAST ARM CONDUIT LAYOUT



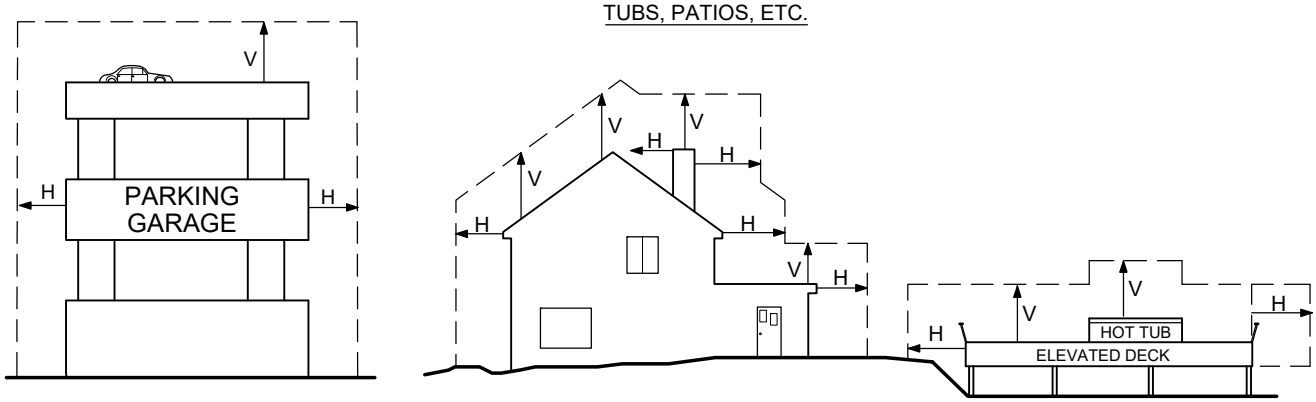
NOTES:

1. City owned streetlights on traffic signal poles will be metered, owned and maintained by the city. The Point of Common Coupling (PCC) will be at the meter pedestal (as with any other commercial customer).
2. Commercial services, such as traffic signals, need to be designed with a specific feed from the Utilities transformer or Utility secondary junction box, not from a streetlight junction box.
2. Streetlights and bus shelters are the only services allowed to feed directly from a streetlight junction box.
3. As with our contractor community, these transformer secondary junction box installations will be inspected by our Quality Control personnel, and treated as commercial services.
4. Meter pedestal construction & installation shall comply with Electric Distribution Construction Standard 8-5 (Appendix-F), and Material Specification 194-113-406 (Appendix-E).
5. Approved Utilities streetlight conduit materials are shown on Table 3 (Appendix-C).
6. For conduit trench and boring requirements, see Electric Distribution Construction Standard 11-1 (Appendix-F).

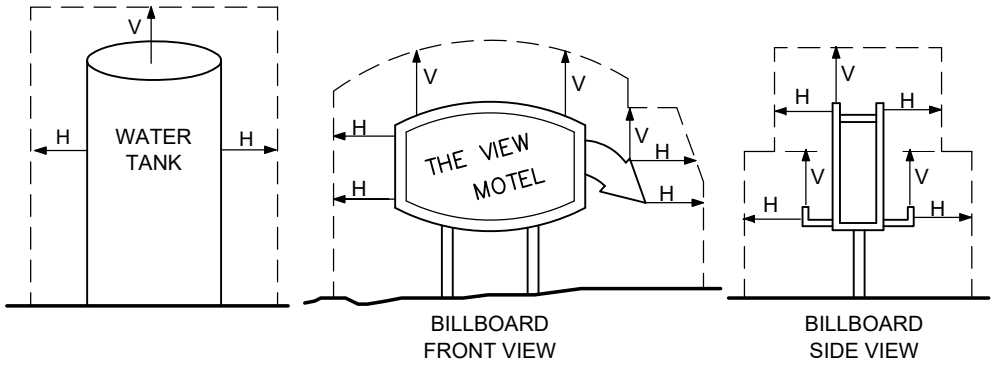
TRAFFIC SIGNAL WITH MAST ARM INTERSECTION
TYPICAL UNDERGROUND LAYOUT

CLEARANCE OF WIRES & UNGUARDED RIGID LIVE PARTS ADJACENT BUT NOT ATTACHED TO BUILDINGS, SIGNS, TANKS, ANTENNAS, OTHER SUPPORT POLES, ETC. (NESC RULE 234.C ADAPTED TO COLORADO SPRINGS UTILITIES ELECTRIC DISTRIBUTION SYSTEM)

OVER OR NEAR (NOT ATTACHED TO) BUILDINGS, BALCONIES, DECKS HOT TUBS, PATIOS, ETC.



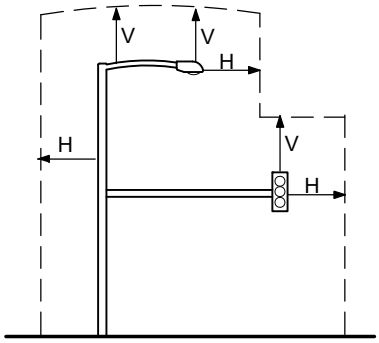
OVER OR NEAR (NOT ATTACHED TO) SIGNS, CHIMNEYS, BILLBOARDS, & TANKS



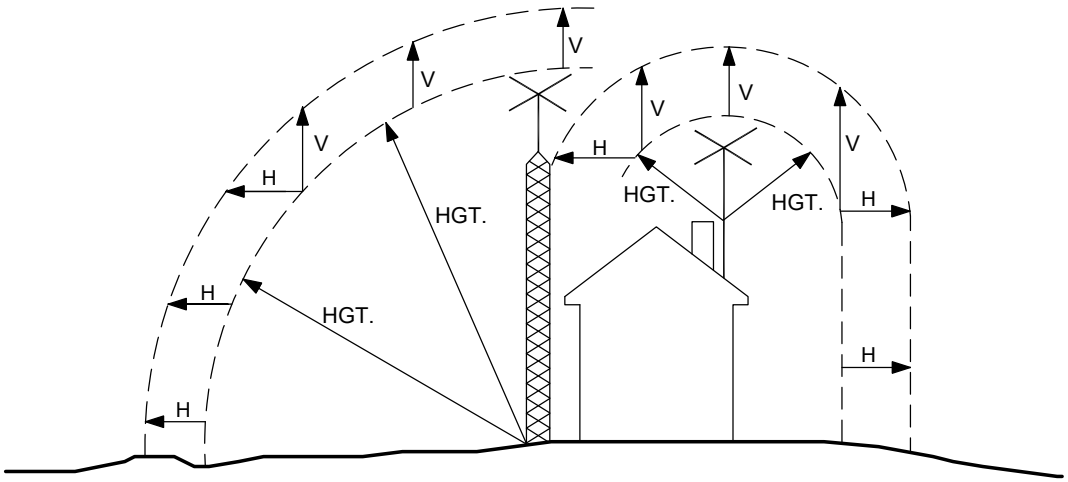
BILLBOARD FRONT VIEW

BILLBOARD SIDE VIEW

OVER OR NEAR (NOT ATTACHED TO) OTHER SUPPORT STRUCTURES: LIGHTING, TRAFFIC, WOOD POLES



OVER OR NEAR ANTENNAS



ANTENNA CLEARANCES ARE ADDED TO ANTENNA HEIGHT (COLORADO SPRINGS UTILITIES RULE-SEE NOTE 2)

Colorado Springs Utilities
It's how we're all connected

ELECTRIC DISTRIBUTION CONSTRUCTION STANDARDS

APPROVED AS OF: 12-12-2016	CLEARANCE OF WIRES & RIGID LIVE PARTS TO BUILDINGS, SIGNS, ETC. (NOT ATTACHED)	18-207	PG. 1/2

T02–01626

CLEARANCE OF WIRES & UNGUARDED RIGID LIVE PARTS ADJACENT BUT NOT ATTACHED TO BUILDINGS, SIGNS, TANKS, ANTENNAS, OTHER SUPPORT POLES, ETC. (NESC RULE 234.C ADAPTED TO COLORADO SPRINGS UTILITIES ELECTRIC DISTRIBUTION SYSTEM)

NOTE: Clearances must be adjusted to wires at maximum sag conditions (See 18-202).

CLEARANCE OF:	A GND. NEUTRALS, MESSENGERS, GUYS, INSULATED COMMUNICATION CABLES (FEET)	B MULTIPLEX CABLE 0-480 VOLTS (FEET)	C UNGUARDED RIGID LIVE PARTS 0-480 VOLTS (FEET)	D INSULATED OPEN WIRE SECONDARY CABLES 0-480 VOLTS (FEET)	E UNGUARDED RIGID LIVE PARTS OVER 480 VOLTS TO 35KV* (FEET)	F BARE PRIMARY CONDUCTORS OVER 480 VOLTS TO 35KV* (FEET)
1. BUILDINGS						
A. HORIZONTAL TO WALLS, PROJECTIONS, WINDOWS, BALCONIES, AND AREAS ACCESSIBLE TO PERSONS [1]						
-WITHOUT WIND DISPLACEMENT	4.5	5.0	5.0	5.5	7.0	7.5
-WITH WIND DISPLACEMENT	N/A	N/A	N/A	3.5	N/A	4.5
B. VERTICAL						
(1) OVER ROOFS OR PROJECTIONS NOT ACCESSIBLE TO PERSONS	3.0	3.5	10.0	10.5	12.0	12.5
(2) OVER BALCONIES AND ROOFS ACCESSIBLE TO PERSONS (INCL. HOT TUBS & DECKS) AND ROOFS ACCESSIBLE TO VEHICLES UP TO 8 FT. HEIGHT (NO TRUCK OVER 8')	9.5	10.0	10.0	10.5	14.0	14.5
(3) OVER ROOFS ACCESSIBLE TO TRUCK TRAFFIC	15.5	16.0	16.0	16.5	18.0	18.5
2. SIGNS, CHIMNEYS, BILLBOARDS, FLAGPOLES, FLAGS, BANNERS, ANTENNAS,[2] TANKS, SUPPORTING STRUCTURES AND OTHER INSTALLATIONS NOT CLASSIFIED AS BUILDINGS OR BRIDGES [3]						
A. HORIZONTAL						
-WITHOUT WIND DISPLACEMENT						
-PORTIONS THAT ARE READILY ACCESSIBLE TO PERSONS	4.5	5.0	5.0	5.5	7.0	7.5
-PORTIONS THAT ARE NOT READILY ACCESSIBLE TO PERSONS	3.0	3.5	5.0	5.5	7.0	7.5
-WITH WIND DISPLACEMENT	N/A	N/A	N/A	3.5	N/A	4.5
B. VERTICAL						
(1) OVER OR UNDER CATWALKS & OTHER SURFACES UPON WHICH PERSONNEL WALK	9.5	10.0	10.0	10.5	14.0	14.5
(2) OVER OR UNDER OTHER PORTIONS OF SUCH INSTALLATIONS	3.5	3.5	5.5	6.0	7.5	8.0
3. OTHER SUPPORT STRUCTURES: TRAFFIC SIGNAL POLES/ARMS, LIGHTING POLES, OTHER LINES' WOOD/METAL POLES (NESC 234B)						
A. HORIZONTAL						
-WITHOUT WIND DISPLACEMENT	3.0	3.5 [4]	5.0	5.0	5.0	5.0
-WITH WIND DISPLACEMENT	N/A	3.5 [5]	N/A	3.5	N/A	4.5
B. VERTICAL OVER	2.0	4.5 [6]	4.5	4.5	4.5	4.5

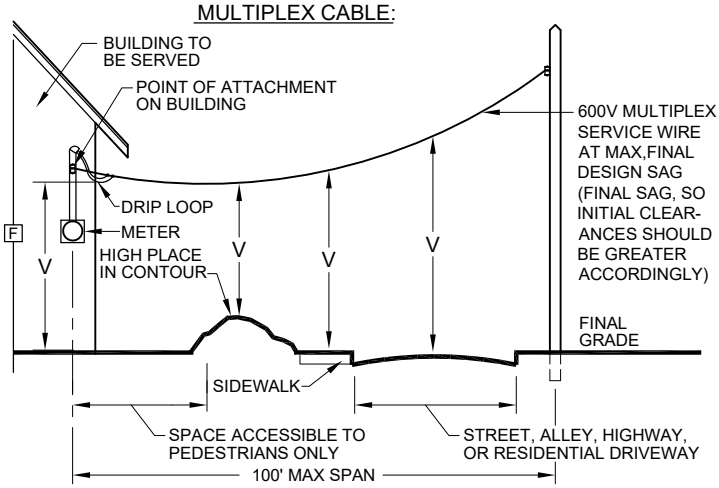
*For clearances shown, 35kV must be effectively grounded 4 wire type; add 1 ft for use with 35kV 3 wire circuits/equipment.

NOTES:

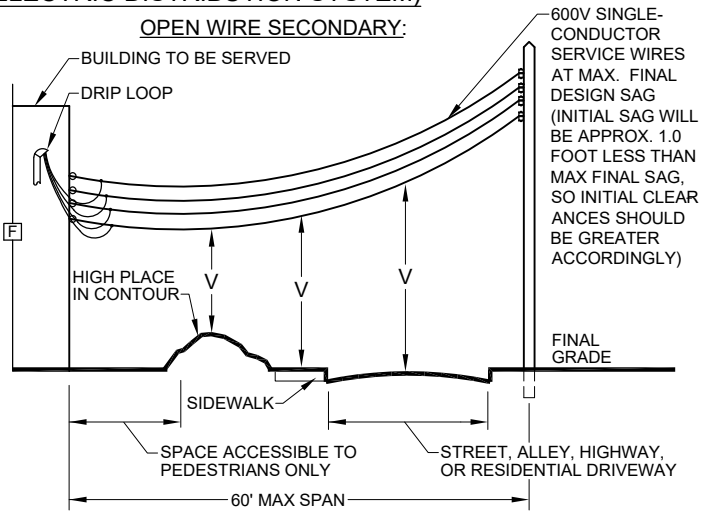
1. A roof, balcony, or area is considered readily accessible to pedestrians if it can be casually accessed through a doorway, ramp, window, stairway, or permanently mounted ladder by a person on foot who neither exerts extraordinary physical effort nor employs tools or devices to gain entry. A permanently mounted ladder is not considered a means of access if its bottom rung is 8 ft. or more from the ground or other permanently installed accessible surface, or otherwise equipment with barriers to inhibit climbing.
2. As shown in the drawing, it is Colorado Springs Utilities policy to add antenna height to the clearances listed unless antenna installation and removal is performed by a licensed contractor.
3. The required clearances shall be to the closest approach of motorized signs or moving portions of signs.
4. This clearance may be reduced to 3 feet for multiplex cables up to 300 volts to ground (all secondaries except 480 delta connections).
5. This clearance with wind displacement is applicable only for voltages above 300 volts.
6. Similarly, this clearance may be reduced to 2 feet for multiplex cables up to 300 volts to ground.

MINIMUM VERTICAL CLEARANCES OF 0 - 600 VOLT SERVICE DROPS ABOVE GROUND, ROADS, ETC. (NESC TABLE 232-1 & FOOTNOTES 7, 8, & 13 ADAPTED TO COLORADO SPRINGS UTILITIES ELECTRIC DISTRIBUTION SYSTEM)

MULTIPLEX CABLE:



OPEN WIRE SECONDARY:



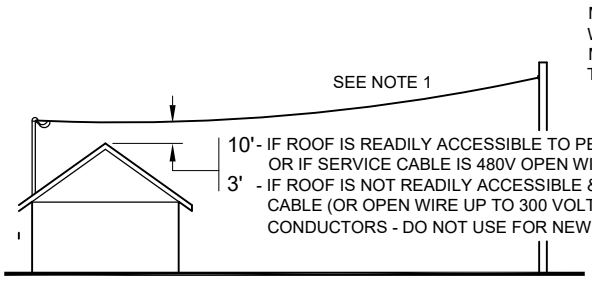
Sketch showing minimum ground clearances of service drop wires having voltages of 0-600 volts above open spaces, sidewalk, street, alley or highway, as recommended by the National Electrical Safety Code. Note that span length is limited to 100 feet typically. NOTE: Clearances must be adjusted to wires at maximum sag conditions. See 18-202.

	MULTIPLEX CABLE			OPEN WIRE CABLE	
	Nominal Clearances A	Reduced Clearances B	Reduced Clearances C	Nominal Clearances D	Reduced Clearances E
	VOLTS TO GROUND:			VOLTS TO GROUND:	
NATURE OF SURFACE UNDER WIRES:	301-600	151-300	0-150	301-600	0-300
1. Railroad Tracks	24.0	24.0	24.0	24.5	24.5
2. Colorado State/Interstate Highways	24.0	24.0	24.0	24.0	24.0
3. Roads, Streets, & Other Land Subject to Truck Traffic	16.0	16.0	16.0	16.5	16.5
4. Alleys, Parking Lots, Non-Residential Driveways not subject to truck traffic	15.0 [4]	15.0 [4]	15.0 [4]	16.5	16.5
5. Residential Driveways (Drip Loops)	15.0 [4] (15.0) [4]	12.5 [5] (10.5) [5]	12.0 [5] (10.0) [5]	16.5 (16.5)	12.5 [5] (10.5) [5]
6. Areas Subject To Persons Or Restricted Traffic Only (i.e. No[3] Equestrians Or Vehicles Over 8') (Drip Loops)	12.0 (12.0)	10.5 [6] (10.5) [6]	10.0 [6] (10.0) [6]	12.5 (12.5)	10.5 [6] (10.5) [6]
7. Hot Tubs, Decks, Patios, Etc. Not Attached To The Building Served [7]	11.0	11.0	11.0	11.5	11.5
8. Water Areas Without Sailboating	14.5	14.5	14.5	15.0	15.0
9. Other	REFER TO THE NESC			REFER TO THE NESC	

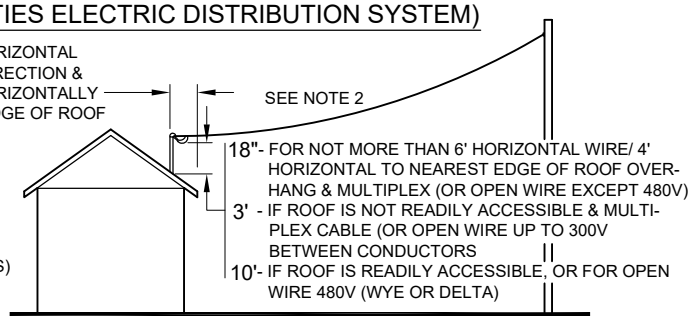
NOTES:

1. Tabulated clearances above provide reduced values per NESC Table 232-1 footnotes 7, 8, & 13 for situations where normally encountered or reasonably anticipated vehicles exceeding 8 ft. in height do not permit the values in columns A & D, or where the line crosses over or runs along alleys, parking lots or driveways.
2. Service drops are slack spans to limit maximum NESC heavy loading tension to 400 lbs. maximum per messenger or per conductor of open wire secondary. The change in sag from minimum initial conditions (-20°F) to max. final (120/167°F or 32°F with 1/2" ice) design conditions is a max. of 1 ft. for these slack spans up to 125 feet span length.
3. Spaces and ways subject to pedestrians or restricted traffic only are those areas where riders on horseback or other large animals, vehicles or other mobile units exceeding 8 feet in height are prohibited by regulation or permanent terrain configurations or are otherwise not normally encountered nor reasonably anticipated. These clearances should be applied carefully. If it is reasonably anticipated that anything higher than a person on foot may get under the line, e.g. a person riding a horse, then another clearance category should be used. It is expected that this category will not be used frequently.
4. See NESC Table 232-1, footnote 13.
5. See NESC Table 232-1, footnote 7.
6. See NESC Table 232-1, footnote 8 (Residential Buildings Only).
7. See NESC Table 234-1, similar to that over balconies readily accessible to pedestrians.

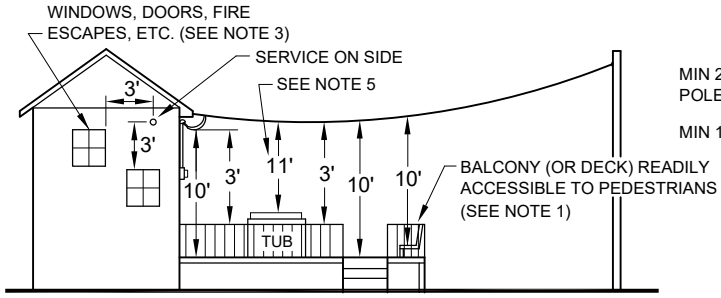
MINIMUM CLEARANCES OF 600 VOLT SERVICE DROPS TO BUILDINGS, SIGNS, AND OTHER INSTALLATIONS TO WHICH ATTACHED (NESC RULE 234C3 & 235C1 ADAPTED TO COLORADO SPRINGS UTILITIES ELECTRIC DISTRIBUTION SYSTEM)



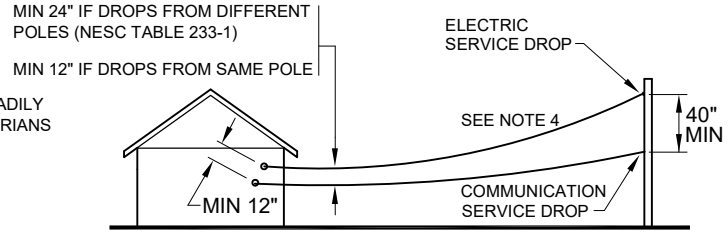
OVER BUILDING, SIGN, OR OTHER INSTALLATION TO WHICH ATTACHED



OVER PORTION OF ROOF (OVERHANG)

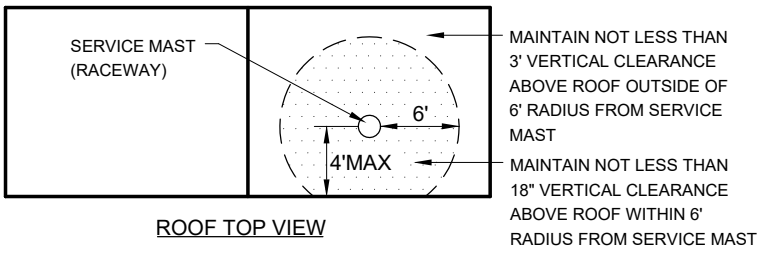


TO WINDOWS, DOORS, FIRE ESCAPES, ETC.

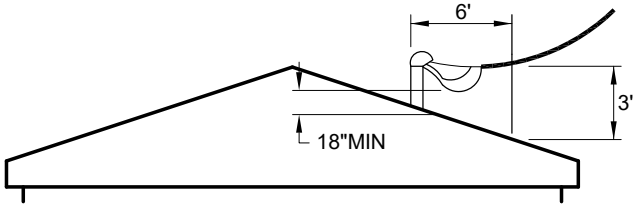


BETWEEN ELECTRIC POWER & COMMUNCIATION SERVICE DROPS

1. If a roof or balcony is not readily accessible and the service cable is multiplex (up to 600 volts) or is insulated open wire (up to 300 volts between conductors, i.e. not including 400 volt wye or delta), the clearance may be a minimum of 3 feet per NESC 234C3d(1) Exception-1 (NEC 230-24a Exception-2 also requires 3' minimum for up to 300 volts between conductors and a roof slope of at least 4" in 12" to be considered not accessible to pedestrians). NESC defines a roof or balcony readily accessible if it can be casually accessed through a doorway, window, ramp, stairway, or permanently mounted ladder by a person, on foot, who neither exerts extraordinary physical effort nor employs special tools or devices to gain entry. (A permanently mounted ladder is not considered a means of access if its bottom rung is 8' or more from the ground or from a permanently installed accessible surface). NESC shall govern from the Utility's pole to the drip loop at the customer's service entrance; NEC shall govern from that drip loop into the building.
2. Where not more than 6 feet, measured horizontally, of a service drop passes over a roof to terminate at a service mast located not more than 4 feet, measured horizontally, from the nearest roof edge, and the cable is either multiplex (up to 600 volts), or is insulated open wire (up to 300 volts between conductors, i.e. not including 480 volt wye or delta), the clearance above the roof may be a minimum of 18" (NEC 230-24a Exception-3 allows the same 18" clearance for services up to 300 volts between conductors and not more than 4 feet of overhang)- see Roof Top View below:



ROOF TOP VIEW



ROOF ELEVATION VIEW

3. A clearance of 3 feet in any direction from windows, doors, fire escapes, or similar locations is required, except it does not apply to: a) multiplex cable above the top of a window, or b) windows that do not open (NEC 230-9 requires the same 3' of clearance except above the top level of a window; service conductors are not allowed below windows or openings through which materials may be moved, e.g. in farm or commercial buildings).
4. A spacing of not less than 12" is required between electric service drops of 0-600 volts running above and parallel to communication service drops. This applies to any point in the span as well as at the building attachment. Other clearances apply at the pole. If these are run from different support structures, NESC Table 233-1 requires 24" spacing. Communication cables should be installed below power supply conductors whenever possible.
5. NESC 234E2 Note 2 states: Spas (including whirlpools, hot-tubs, or other similar installations not suitable for swimming) are not considered as swimming pools covered by Rule 234E, Table 234-3. Table 234-1 shall be used, which is 11 feet, from the highest point of the installation upon which people can stand.
6. Clearances of 5 ft. horizontally from and 3 ft. vertically below porches, fire escapes, or similarly attached structures are required.

CAUTION: ALL NESC VERTICAL CLEARANCES APPLY TO THE CONDUCTORS AT MAXIMUM FINAL SAG. ALLOW FOR 1.0 FOOT OF ADDITIONAL SAG FOR INCREASE FROM INITIAL SAG TO MAXIMUM FINAL CONDITIONS FOR COLORADO SPRINGS UTILITIES STANDARD SAG/TENSIONS OF SERVICE DROP CONDUCTORS (SLACK SPANS).

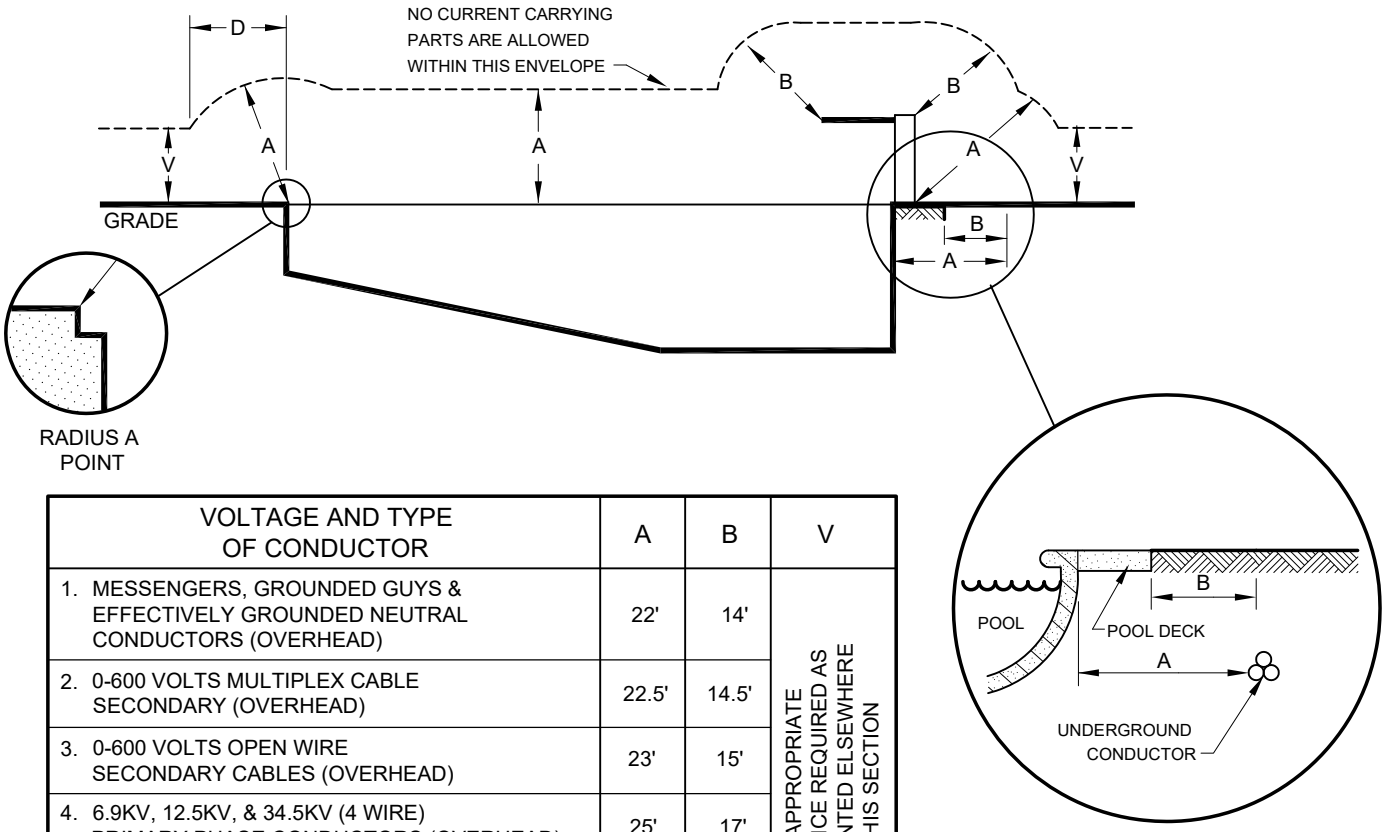
ELECTRIC DISTRIBUTION CONSTRUCTION STANDARDS

Colorado Springs Utilities
It's how we're all connected

APPROVED AS OF: 6-24-2017	CLEARANCE OF SERVICE DROPS TO BUILDINGS, SIGNS, ETC. (ATTACHED)	18-209	PG. 1/1

T02–01626

CLEARANCES OF WIRES, CONDUCTORS, OR CABLES OVER OR NEAR SWIMMING AREAS, AND SWIMMING POOLS (NESC 234E, 351C & TABLE 234-3 ADAPTED TO COLORADO SPRINGS UTILITIES ELECTRIC DISTRIBUTION SYSTEM)

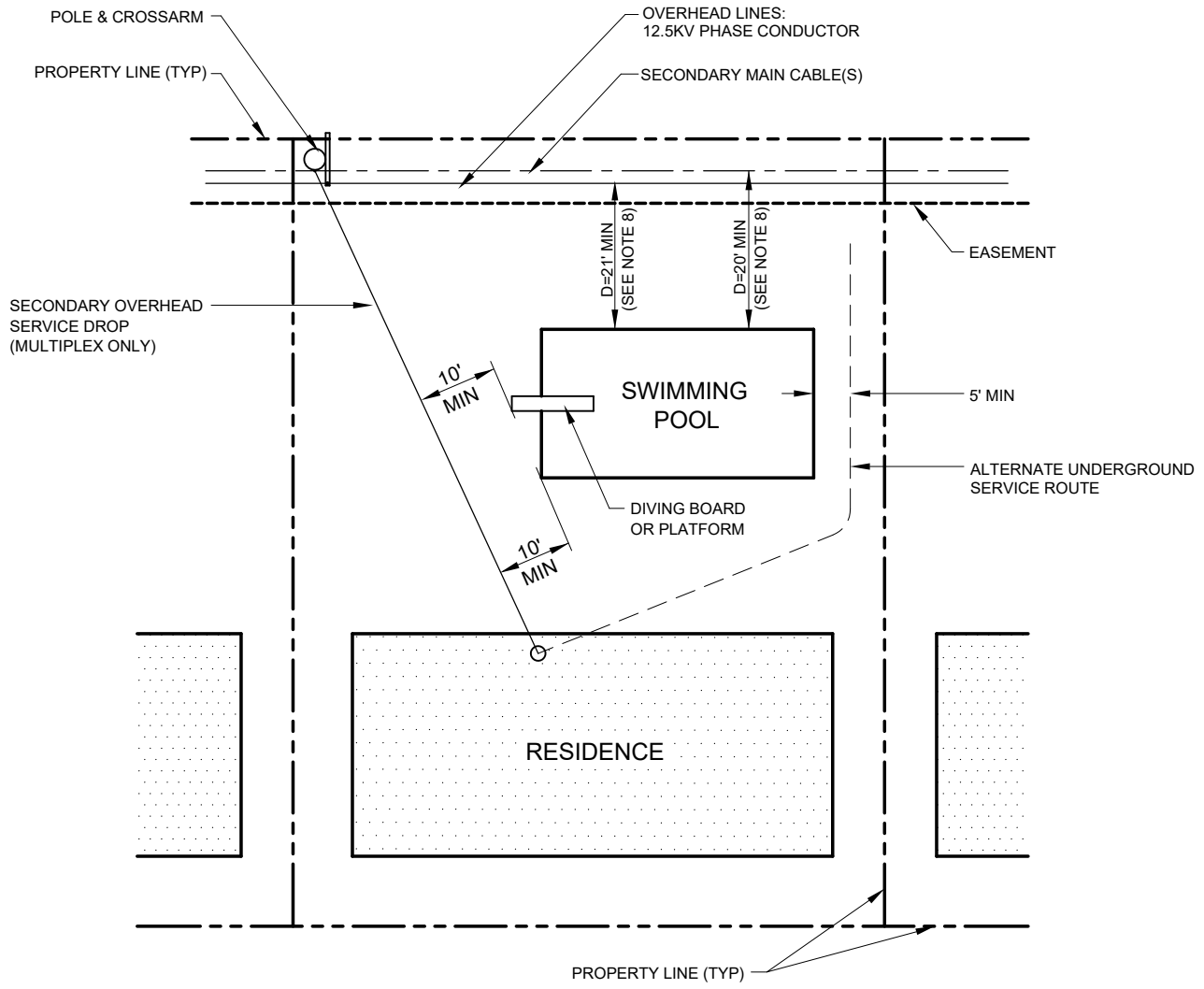


VOLTAGE AND TYPE OF CONDUCTOR	A	B	V
1. MESSENGERS, GROUNDED GUYS & EFFECTIVELY GROUNDED NEUTRAL CONDUCTORS (OVERHEAD)	22'	14'	USE APPROPRIATE CLEARANCE REQUIRED AS DOCUMENTED ELSEWHERE IN THIS SECTION
2. 0-600 VOLTS MULTIPLEX CABLE SECONDARY (OVERHEAD)	22.5'	14.5'	
3. 0-600 VOLTS OPEN WIRE SECONDARY CABLES (OVERHEAD)	23'	15'	
4. 6.9KV, 12.5KV, & 34.5KV (4 WIRE) PRIMARY PHASE CONDUCTORS (OVERHEAD)	25'	17'	
5. 34.5KV (3 WIRE) PRIMARY PHASE CONDUCTORS (OVERHEAD)	26'	18'	
6. UNGUARDED RIGID LIVE PARTS 480V-34.5KV (4-WIRE) (OVERHEAD)	24.5	16.5	
7. UNDERGROUND CABLES PRIMARY AND SECONDARY	5'	2'	
8. 115 & 230KV OVERHEAD OR UNDERGROUND TRANSMISSION LINES	SEE NOTE 7	SEE NOTE 7	

NOTES:

1. The vertical clearances to overhead lines apply under whichever conditions of conductor temperature and loading produce the closest approach:
   A. 120°F, no wind, final sag
   B. Maximum conductor operating temperature for which line is designed to operate, no wind, final sag:
      1. Primary: 212°F (477 ACSR & 559 AAAC) or 167°F (#4/0 ACSR & similar).
      2. Open wire secondary and neutrals: 167°F.
   C. 32°F, with 1/2" ice, no wind, final sag.
2. Swimming area includes beaches, waterways, etc., where swimming is allowed.
3. These clearances to overhead lines do not apply to pools fully enclosed by a solid or screened permanent structure.
4. By Colorado Springs Utilities policy, service drop cables shall not cross within 10' horizontally from the edge of pools or diving platforms.
5. Direct buried underground cables must have a 5' minimum horizontal separation from a swimming pool (in ground).
6. Pool decking may come no closer than 2 feet to underground facilities. The swimming pool (in ground) and auxiliary equipment shall not be installed within 5 feet horizontally of direct buried cable.
7. Contact Planning and Engineering for clearances to 115kV and 230kV lines.
8. The "A" dimension shown above shall be used for over decks or the top of ladders for permanently installed aboveground swimming pools. Refer to NESC figures 234-3(b) or (c).

CLEARANCES OF WIRES, CONDUCTORS, OR CABLES OVER OR NEAR SWIMMING AREAS, AND SWIMMING POOLS (NESC 234E, 351C & TABLE 234-3 ADAPTED TO COLORADO SPRINGS UTILITIES ELECTRIC DISTRIBUTION SYSTEM)



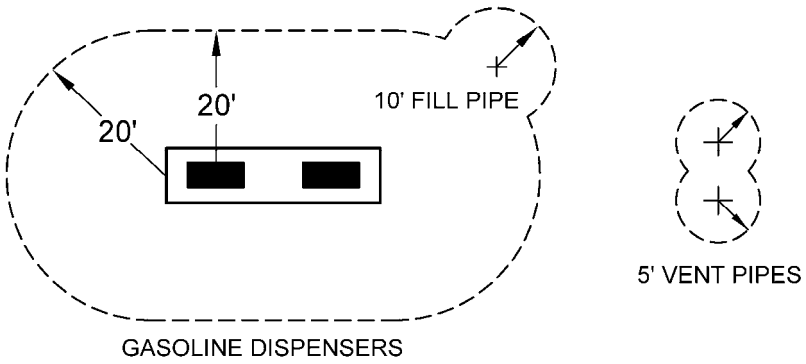
9. Horizontal separation ($D=\sqrt{A^2- V^2}$) from secondary main cable(s) and primary phase conductors is based on vertical clearances for that conductor assuming the pool area is at grade level and subject to pedestrian traffic only, i.e. minimum vertical conductor heights for worse case horizontal separation to assure higher clearances near swimming pools.
10. When planning a swimming pool, call 811 for location of all underground facilities to determine suitable siting or need for any utility relocation work prior to construction bids.

CLEARANCES OF COLORADO SPRINGS UTILITY FACILITIES FROM HAZARDOUS LOCATIONS

(See Note 1)

Springs Utilities Electric equipment and conductors are not normally suitable for installation above, below, or within areas defined by the NEC as hazardous locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings. This guide covers only some of the more common installations encountered outdoors and potentially in the vicinity of Springs Utilities Electric lines or equipment; for other situations, refer to Chapter 5 of the NEC and consult local fire prevention authorities for help to determine the boundaries of classified areas.

Some of the most commonly encountered flammable materials include: acetylene, hydrogen, acetone, ammonia, benzene, butane, ethanol, gasoline, methanol, methane, natural gas, naphtha, propane, turpentine, Compressed Natural Gas (CNG); Liquefied Natural Gas (LNG); combustible metal dusts including aluminum, magnesium, and their commercial alloys; atmospheres containing combustible carbonaceous dusts, including carbon, black charcoal, coal or coke dusts; atmospheres containing combustible dusts including flour, grains, wood, plastic and chemicals; atmospheres containing easily ignitable fibers or flyings including some parts of rayon, cotton, and other textile fibers.



EXAMPLE OF HAZARDOUS BOUNDARIES AT A SERVICE STATION

Classified Area	Location	Horizontal Clearance	Reference
Gasoline, CNG, & other flammable fueling stations	Dispensers	20’	NEC Art. 514
	Underground storage tank loose fill connections; remote outdoor pumps; vapor processing equipment not within a protective enclosure; vacuum assist blowers	10’	NEC Art. 514
	Tight fill connections of underground tanks	5’	NEC Art. 514
	Lubrication pits	3’	NEC Art. 514
Bulk Storage Plants where flammable liquids are received, stored, or blended in bulk	Dome of tank car or vehicle where loading through open dome; point of venting to atmosphere where loading tank car or vehicle through bottom connections or through closed dome with venting to atmosphere; drainage ditches, separators and impounding basins	15’	NEC Art. 515
	Outdoor equipment where flammable vapor-air mixtures may exist under normal operation; aboveground tanks & vents; underground tanks loose fill opening; vent or fill openings in drum & container filling locations; pumps, bleeders, withdrawal fittings, meters, and similar devices; point of loading connections where loading tank cars or vehicles through bottom connections	10’	NEC Art. 515

	Tight fill connection of underground tank; vent discharging upwards	5’	NEC Art. 514
	Dikes around aboveground tanks; pits	Prohibited within	NEC Art. 515
Spray Application Areas	Areas where flammable or combustible liquids or powders are regularly or frequently applied	20’	NEC Art. 516
Coal Handling Areas	Unventilated spaces inside or above coal storage silos or bunkers, or other enclosed coal handling or coal storage spaces where methane may accumulate in explosive or ignitable mixtures	Prohibited within	NESC 127A
	Tunnels beneath stockpiles or surge piles	Prohibited within	NESC 127A
Gaseous Hydrogen Systems	Outdoor storage areas of gaseous hydrogen used for supply equipment (generators)	15’	NESC 127G, NFPA 50A-1999
Liquid Hydrogen Systems	Points of connection to liquid hydrogen storage systems; liquid hydrogen storage tanks	25’	NESC 127H, NFPA 50B-1999
Liquid Petroleum Gas (LPG or Propane)	Tanks, loading and unloading areas, vents, relief valves, container filling areas	15’ (see Note 1)	NESC 127K, NFPA 58
Natural Gas (Methane) Areas (see Note 2)	Gas pipe connections, valves, gages, meters, and regulators installed above grade	15’ (see Note 1)	NESC 127L, NFPA 59A
Bulk Oxygen, Liquid Nitrogen	Not classified as flammable or combustible	None (see Note 4)	NESC 127J
Diesel Fuel Oil (see Note 3)	Identified as Class II liquid, not flammable at normal ambients	None (see Note 4)	NESC 127B4

NOTES:

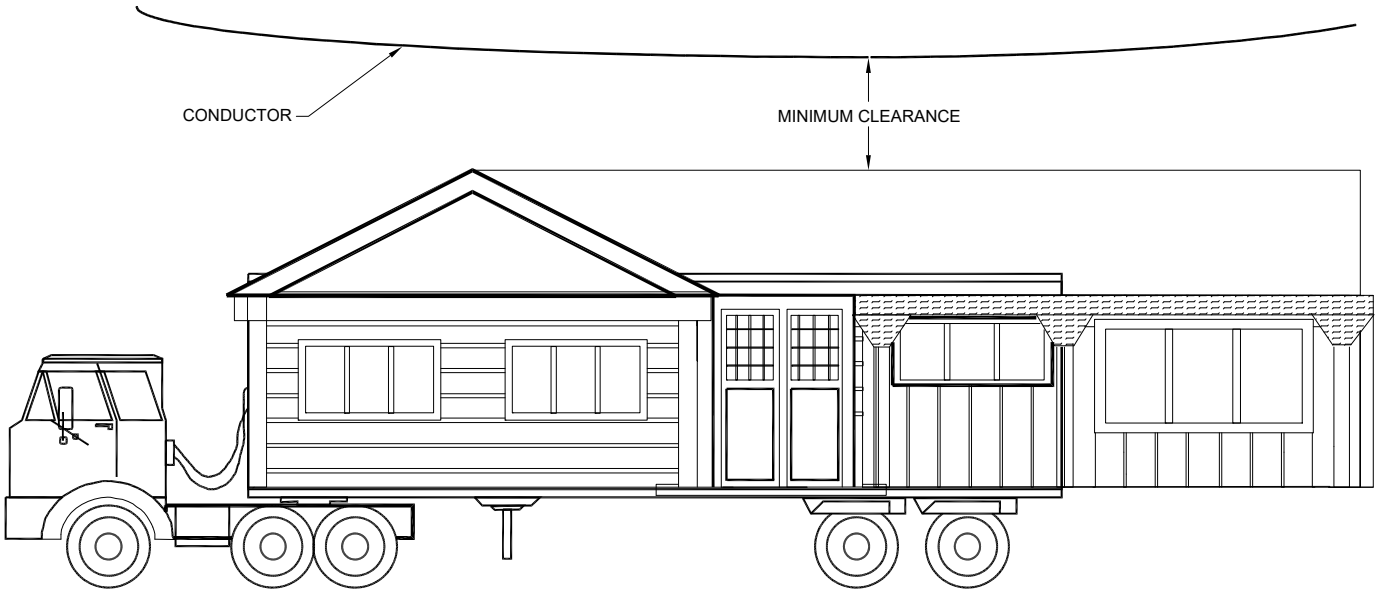
1. These clearances do not apply to portable or mobile DOT cylinders used to store propane (LPG) or CNG or other fuels, but do apply to areas used for container filling.

2. For secondary voltage services and meters (less than 600 volts) in non-hazardous locations, a radial separation of 3 feet is allowed from the gas meter regulator vent per NFPA 54 (5.8.5.1). For transformer and generator separation requirements, the minimum distance that padmount transformers and generator equipment may be located from any part of a gas meter, gas regulator, or gas meter piping is 15 feet. (Exception: For a natural gas only fueled generator, the only separation clearance requirement is between the generator and the gas meter regulator that may be reduced to 3’.) This distance may be reduced to 6 feet minimum if a solid masonry wall is built between the two. The minimum distance from the masonry wall to the gas meter, or any portion of the meter set piping, shall not be less than 3 feet. The masonry wall must be made of reinforced concrete, reinforced brick, or reinforced concrete block, with a minimum 3 hour fire rating. The wall must be at least twice the width of the transformer or generator, and at least 6 feet tall. If the generator equipment is greater than 6 feet in height, the wall must be equal to or greater in height than the equipment. The wall shall be anchored to the footing to withstand a minimum of 5 lbs. per square foot of wind load, and meet all applicable local building codes. See Gas Line Extension and Service Standard 4.05(d)3)d)1)i.

3. Diesel Fuel Oil (No. 1 or 2): Although considered a “combustible” Class II liquid with a flash point greater than or equal to 100 degrees Fahrenheit, diesel is not classified as a “flammable” liquid. Where stored and dispensed at normal ambient temperatures outdoors with the diesel below its flash point temperature, utility padmount transformers can be installed at standard clearances from diesel tanks and filling ports. Recommended clearance between diesel generators/tanks is 15 feet to permit future change to natural gas or similar fuel without extensive renovation.

4. Standard clearances apply to these non-flammable locations, typically 2 feet minimum horizontal for access and 8 feet horizontal from padmount equipment operating sides for hotsticking (see also 18-301 & 302).

VERTICAL CLEARANCES[1] FROM WIRES FOR OVERHEIGHT VEHICLES INCLUDING HOUSE MOVING



CONDUCTOR TYPE & VOLTAGE (LINE-TO-LINE)	MINIMUM CLEARANCE REQUIRED[2] (IN FEET)
Grounded Neutrals, Messengers, Grounded Guys, Insulated Communication Cables	1.5
Multiplex Secondary Up to 480 Volts	2.0
Open Wire Secondary Up To 480 Volts	2.5
Transformer Primary Bushings Up To 35kV	4.0
Open Primary Conductors Up to 35kV	4.5
Transmission Lines - 115kV @ Max. 9000' Elevation	6.5
Transmission Lines - 230kV @ Max. 9000' Elevation	9.5 (see note 3)

NOTES:

1. Clearances are the sum of the electrical and mechanical clearance components of NESC Appendix A, Table A-1. See NESC 232C for additional clearances above 35kV.
2. Clearance shall be from the highest point on the vehicle or structure being moved to the lowest point of the conductor overhead (apply to NESC maximum final sag or the maximum operating sag at the time of the move).
3. Avoid stopping under 230kV lines and avoid personnel contact between vehicle and ground in the immediate vicinity of 230kV lines due to electrostatic effects.

IMPORTANT:

These clearances apply to equipment and transported structures only! Approach distances to electric conductors by personnel are dictated by OSHA construction regulation 29CFR1910.333(c)(3). This regulation requires personnel (other than qualified electric supply utility line workers) to stay 10 feet away from energized conductors (reference section 202). If no personnel are on top of the vehicle or structures being moved, then the above clearances would apply.

PLACEMENT FOR PADMOUNTED OIL-FILLED EQUIPMENT

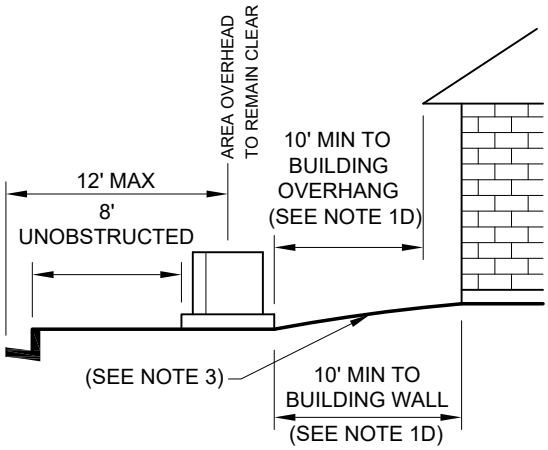


FIGURE 1

NOTES:

1. Clearance requirements for oil filled transformers or other oil filled equipment:
   * A. 8' clear area in front (door opening).
   * B. 2' clear area on both sides (3' if enclosed- see 18-301, pg. 4).
   * C. Equipment is to be clear of all overhead obstructions.
   * D. This dimension may be reduced to 3 feet if the building wall and any overhang are made of brick, steel, tile, slate, or other non-combustible material approved by local fire protection officials, and the building wall has no windows, air intakes, vents, stairs, doors, or other wall openings within 10' of the pad measured horizontally. (This 10' clearance to combustible walls adopted for installations beginning in 1994.) Contact Field Engineering for help to design a suitable fire resistant barrier in cases where this clearance cannot be obtained.
2. 12' maximum distance from a drivable surface.
   * A. Distance to be proportionately closer on large transformer.
   * B. See Electric Line Extension & Service Standards Book, Section 10.01f(2) for definition of drivable surface.
3. In the event of an oil leak (possible fire hazard), a gradual slope in the land is required from the building/structure to the padmount transformer.

*Measurements from pad or equipment, whichever is closer.

NON-COMBUSTIBLE WALLS

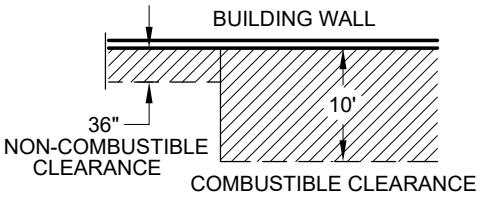


FIGURE 2

The minimum allowable clearance from a non-combustible wall to padmounted oil filled equipment is 36" when no additional consideration must be given for doors, fire escapes, air intakes, windows or combustible materials (see Figure 2).

Materials such as steel, iron, brick, tile, concrete, slate, and asbestos are considered non-combustible. Additional materials may be developed that are considered to be non-combustible, however, these materials may only be used when defined as non-combustible by the local fire protection district.

COMBUSTIBLE WALLS

The basic minimum clearance from a combustible wall to padmounted oil filled equipment is 10 feet (See Figure 2). If it is impossible to meet this clearance, the construction of a fire resistant barrier either physically attached to the wall or free-standing and separating the equipment from the wall is permissible (see Fire Resistant Barriers, pages 2 & 3).

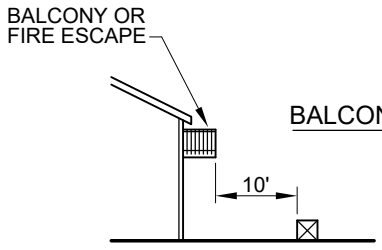


FIGURE 3

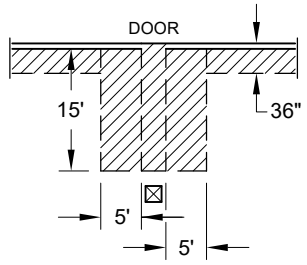
BALCONIES, FIRE ESCAPES OR OTHER OVERHANGS

For a balcony, fire escape, or overhang, the minimum clearance shall be 10 feet from the farthest projection of the overhang to the ground. No padmounted device shall be located under any overhang that will prevent the use of equipment normally used for installation or changeouts.

ADDITIONAL RESTRICTIONS FOR DOORS/FIRE EXITS, AIR INTAKES, AND WINDOWS/OTHER OPENINGS

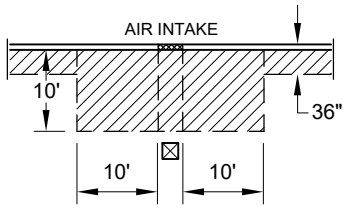
The following restrictions are in addition to the basic clearances above. The drawings that follow are shown with a non-combustible wall. For combustible walls, the 10 foot clearance or a fire resistant barrier must be used. The equipment shall not face the building and a minimum of eight feet shall be maintained from the equipment doors to any obstruction. Side clearances must always be maintained (continued next page).

DOORS AND FIRE EXITS



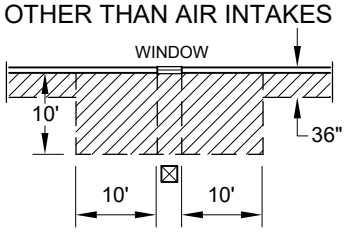
Oil filled equipment shall not be located within a zone extending 15 feet outward or 5 feet to either side of a doorway or fire exit.

AIR INTAKES



Oil filled equipment shall not be located within a zone extending 10 feet outward or 10 feet to either side of air intake vents for a building.

WINDOWS OR OPENINGS OTHER THAN AIR INTAKES



Oil filled equipment shall not be located within a zone extending 10 feet outward or 10 feet to either side of a window. Every effort should be made to maintain these clearances.

In some situations, the clearance for windows shown above may be impossible to obtain. If the preferred clearance can not be obtained, it may be reduced to a minimum of 36" from the building wall provided the following additional requirements are met:

1. All windows shall be considered combustible.
2. Oil filled equipment shall not be placed below an operating window. There shall be NO exceptions.
3. If a window is non-operating and in a non-combustible wall, then the bottom of the window must be located twice the height of the oil filled equipment above the ground.
4. Non-operating windows in a combustible wall must also be located twice the height of the oil filled equipment above the ground and a fire-resistent barrier must be utilized.

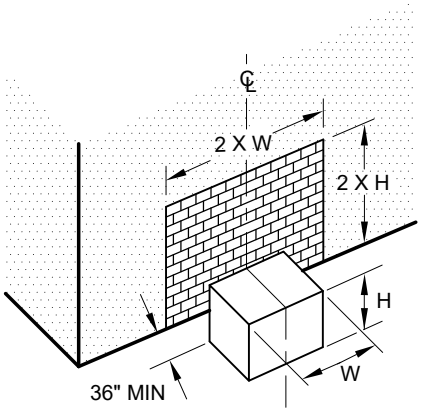
FIRE RESISTANT BARRIERS

In locations where basic clearances can not be met, a fire resistant barrier shall be installed either by the customer or at the customer's expense to reduce the required clearance to combustible walls, doors, air intakes or windows. The barrier shall be constructed of a non-combustible material certified to have a 2 hour fire rating. It shall be of sufficient strength and have stability to resist tipping and satisfy local building ordinances. If a specific ruling regarding fire ratings is necessary, contact the local fire protection district. The customer will coordinate the construction and location of the barrier, however, the customer is responsible for all maintenance. The barrier shall satisfy the following dimensional requirements. Where dimensions are:

H= Height in inches of the oil filled equipment.
W=Width in inches of the oil filled equipment.
A= Height of barrier required to completely shield the door, air intake or window of a building from an equipment fire.
B= Width of barrier required to completely shield the door, air intake or window of a building.
C= Height of barrier required to obtain a projected height of two times the height of the oil filled equipment on the building wall.
D= Width of barrier required to obtain a projected width of two times the width of the oil filled equipment on the building wall.

BARRIER ATTACHED DIRECTLY TO WALL

The height of the barrier shall be twice the height, in inches, of the oil filled equipment. The width of the barrier shall be twice the width, in inches, of the oil filled equipment.

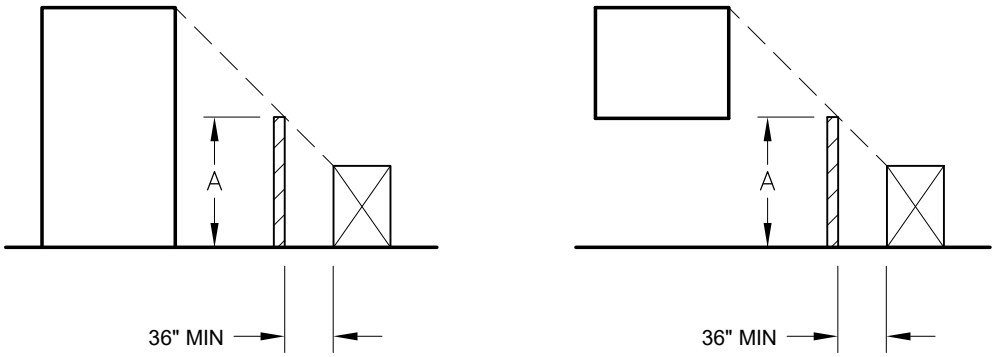


KVA	1-PHASE	3-PHASE	H	W
75-167	X	-	3'	3'
45-500	-	X	6'	6'
750-2500	-	X	6' *	6' *

These dimensions are typical for new 15kV transformers and should be used for estimates only. Actual dimensions of equipment should be verified with Field Engineering after the transformer has been allocated.

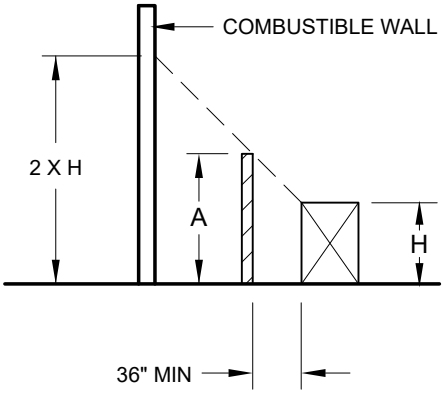
* 8' with radiators

BARRIER SHIELDING OF DOORS, AIR INTAKES OR WINDOWS

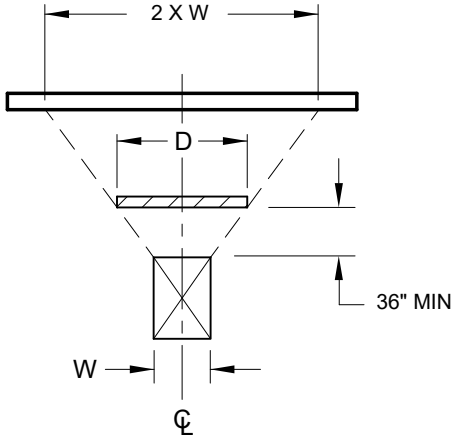


FRONT VIEW

BARRIER SHIELDING OF COMBUSTIBLE BUILDING WALLS

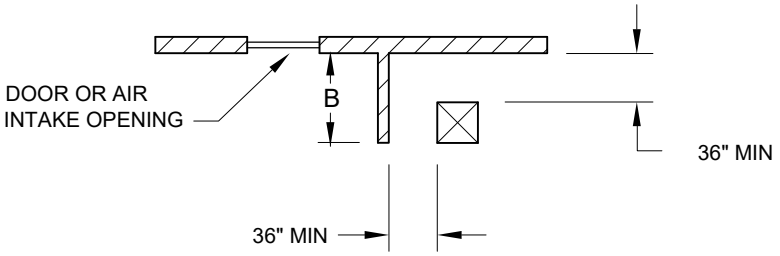


SIDE VIEW



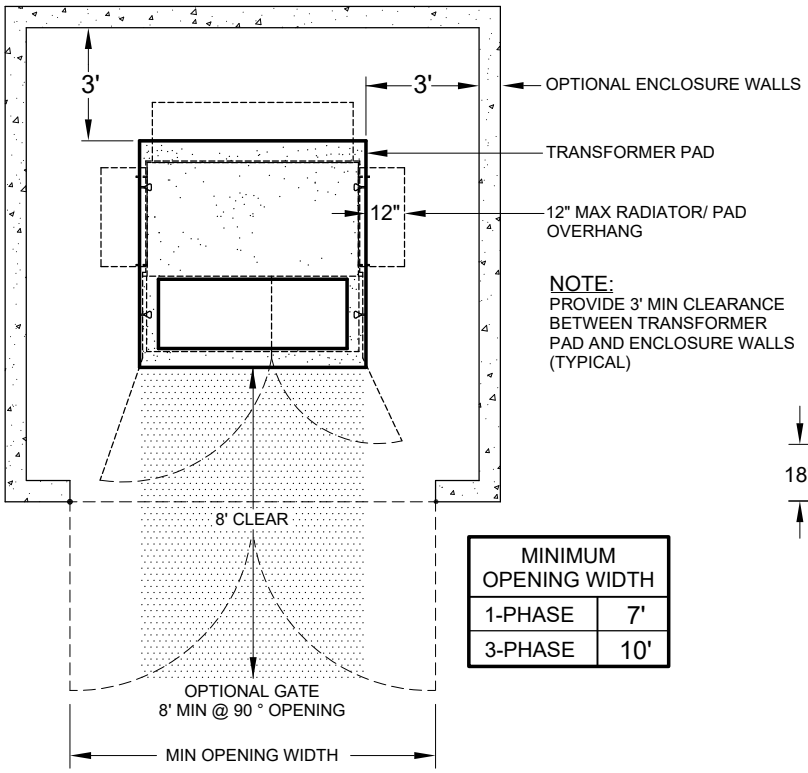
TOP VIEW

NON-COMBUSTIBLE WALL



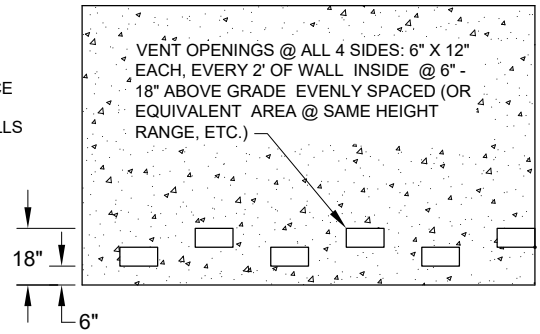
TOP VIEW

OPTIONAL ENCLOSURES AROUND COMMERCIAL PADMOUNT TRANSFORMERS



PLAN VIEW

MINIMUM OPENING WIDTH	
1-PHASE	7'
3-PHASE	10'

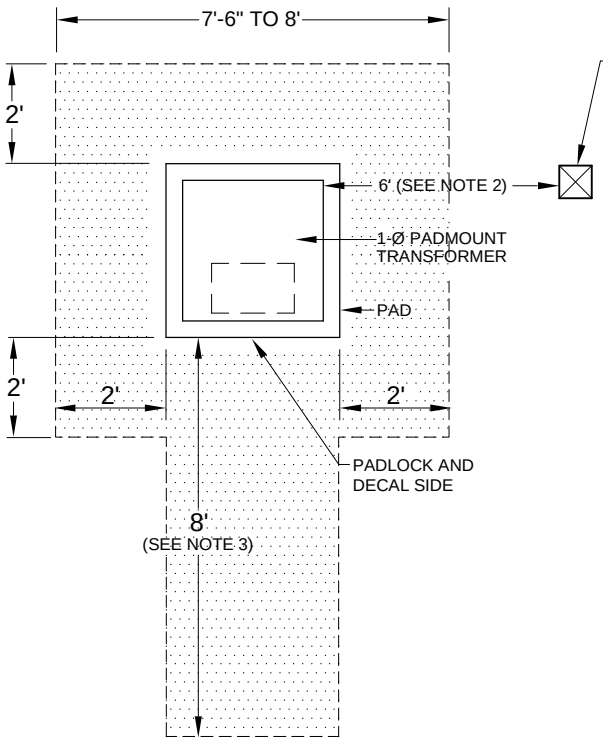


PROFILE VIEW - BACK AND SIDE WALLS

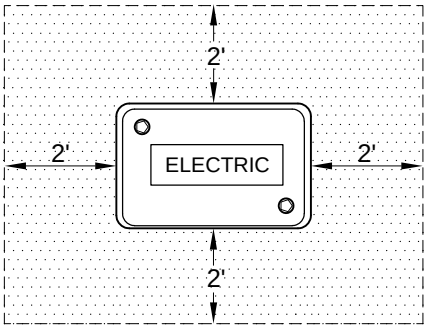
NOTES:

1. For optimal performance (cooling, reliability, economics, safety) Springs Utilities prefers to install padmount transformers in the open with minimal obstruction to airflow and away from occupied buildings as detailed on previous pages. However, to accommodate a customer's desire for aesthetic screening, Springs Utilities allows enclosures to be built/maintained at customer expense around padmount installations when the following guidelines are met:
   - A. Such enclosures are bulit on private property outside of street right-of-ways, platted/dedicated easements, or restrictive utility easements. Enclosures are structurally sound and built to required local building codes.
   - B. For fences/enclosures along 2 or more sides of a padmount transformer, a minimum clear space measuring 3' horizontally from the edge of the pad will be required to the inside of enclosure walls on all sides. With Springs Utilities 1' radiator/pad overhand limit, this leaves at least 2' of clear space for worker access around all sides and allows for movement of cooling air.
   - C. A gated opening is permitted along the front (operating side). Gates shall provide a minimum opening at least 10' wide for full operating/removal access to 3-phase padmounts, or at least 7' wide for 1-phase padmounts. In all cases, at least 8' of clear space is required in front of each pad for adequate hotstick operating space. A minimum 2' wide exit route shall remain clear when gates are in their fully opened position. Gates shall remain free of locks that would inhibit access by utility personnel. Gates shall provide ventilation openings either by being constructed of mesh, bar, louver, or similar ventilating material, or if solid, by a 6" gap above grade to the bottom of the gate.
   - D. When constructed of conductive materials, walls/gates shall be bonded to the transformer LV neutral/ground with a minimum #6 bare copper buried at least 6" below grade.
   - E. For adequate air circulation and cooling of the transformer, the top of the enclosure shall remain open. Additionally, both end walls and the back shall have air ventilation openings provided at 6"-18" above grade equivalent in cross-sectional area to one 6" x 12" opening every 2 feet of fence/enclosure length inside and evenly spaced along the full length.
   - F. Customers shall maintain/clear the area immediately adjacent to these air-vents, i.e. no material storage, trash bins, vegetation, weeds/grass or other debris shall be allowed to block free air flow through the required vents.
   - G. Such enclosures (with vent openings near the bottom) can also serve as fire barriers when they meet all other requirements for that application.
   - H. Trash dumpsters/bins will not share the same enclosure with padmount transformers, i.e. they will have a wall between and separate gate/access opening.
   - I. Maximum distance from pad and opening to paved access drive area shall be 12 feet for small kVA sizes and proportionally closer for larger transformers. This shall provide clear access by boom truck for transformer removal and replacement through the opening.

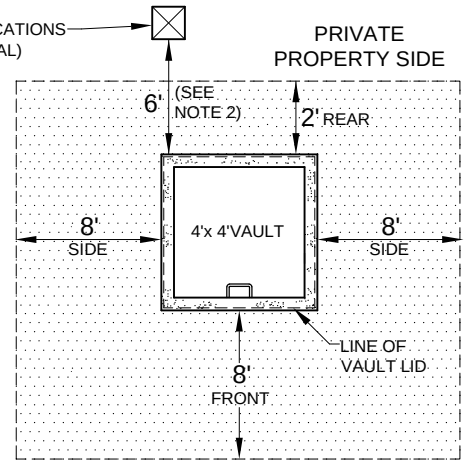
15/35kV 200 AMP 3-PHASE OR 1-PHASE CLEARANCES



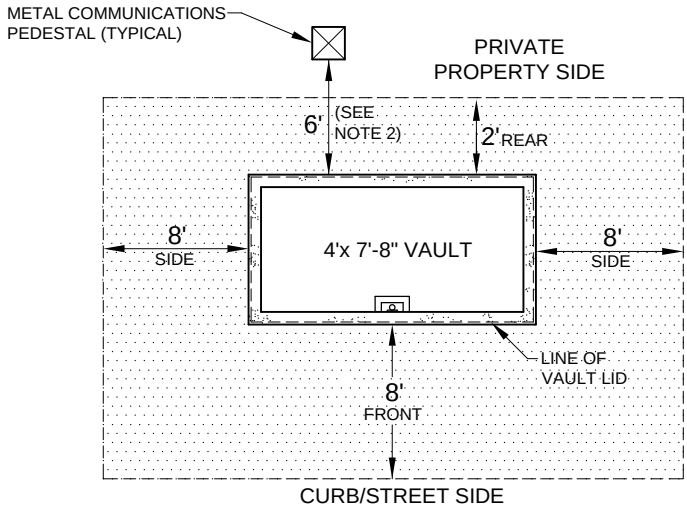
15/35kV 1-PHASE PADMOUNT TRANSFORMER CLEARANCES



SECONDARY JUNCTION BOXES
(ELECTRIC OR STREET LIGHT)



4' X 4' VAULT

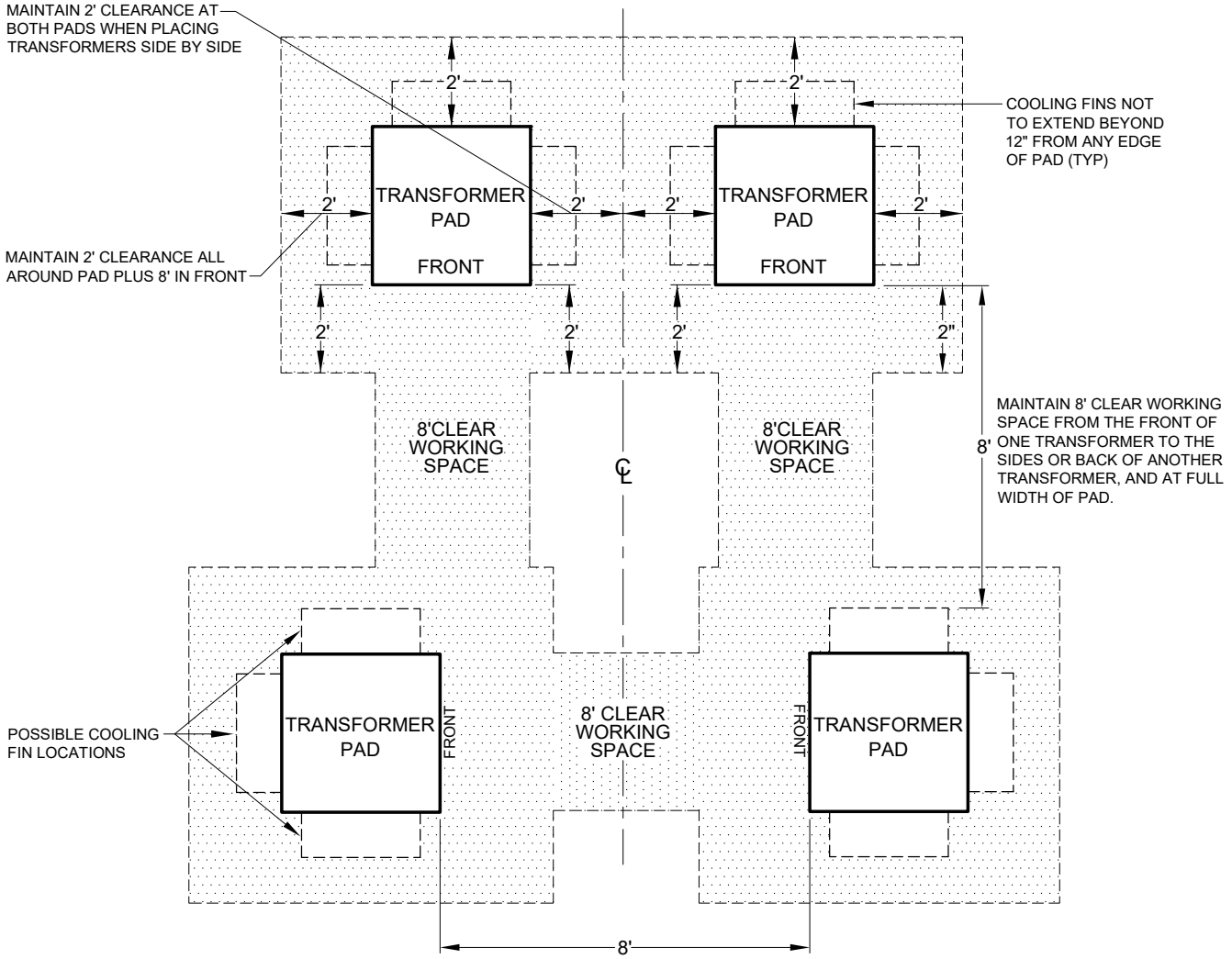


4' X 7'-8" VAULT

NOTES:

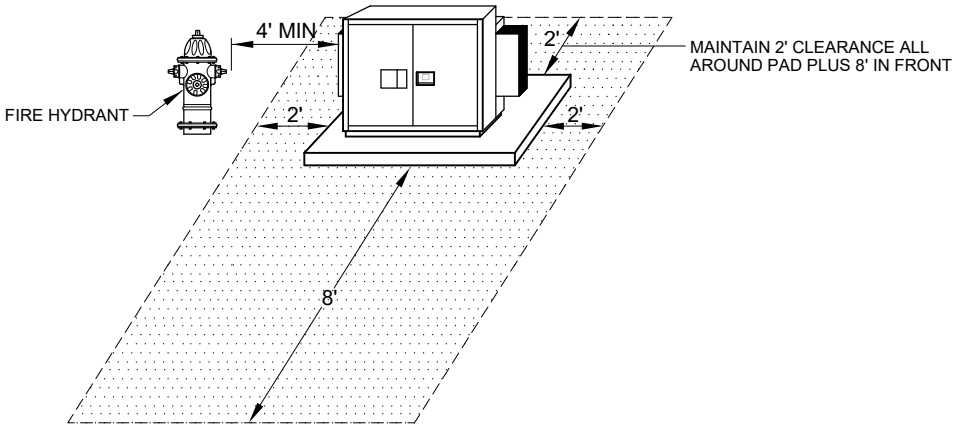
1. In the event of an equipment failure or power outage, it is necessary for utility crews to have adequate access to vaults and padmount equipment for safe operation and repair work. Access to the operating sides shall be 8 feet, access to the non-operating sides/rear shall be 2 feet or as shown. The vault, cover, and internal equipment shall be oriented during construction to provide the adequate working space. This working space should not encroach the roadway unless the roadway can be adequately barricaded and have enough room to provide at least one lane for traffic outside of the barricaded area. No trees, shrubs, fences, large landscape rocks, communications equipment or other obstructions shall be permitted in access area. Trees should be planted far enough from equipment so that when they reach maturity, overhanging branches will not obstruct a crane from setting or removing equipment.
2. NESC Rule 384C: Bond all above ground metallic supply and communication enclosures that are separated by 6 feet or less. Use minimum #6 bare copper wire direct buried a minimum 18" below grade, to a suitable bolted or screw connection that can be temporarily opened when locating cables. Treat open ground connections as energized!
3. 2' x 8' clear working area shall be maintained around all transformers, as shown above.

15/35kV 3-PHASE PADMOUNT TRANSFORMER CLEARANCES



NOTE:

4. For additional information, see Colorado Springs Utilities Electric Distribution Construction Standard 18-301 (oil-filled equipment from buildings.)

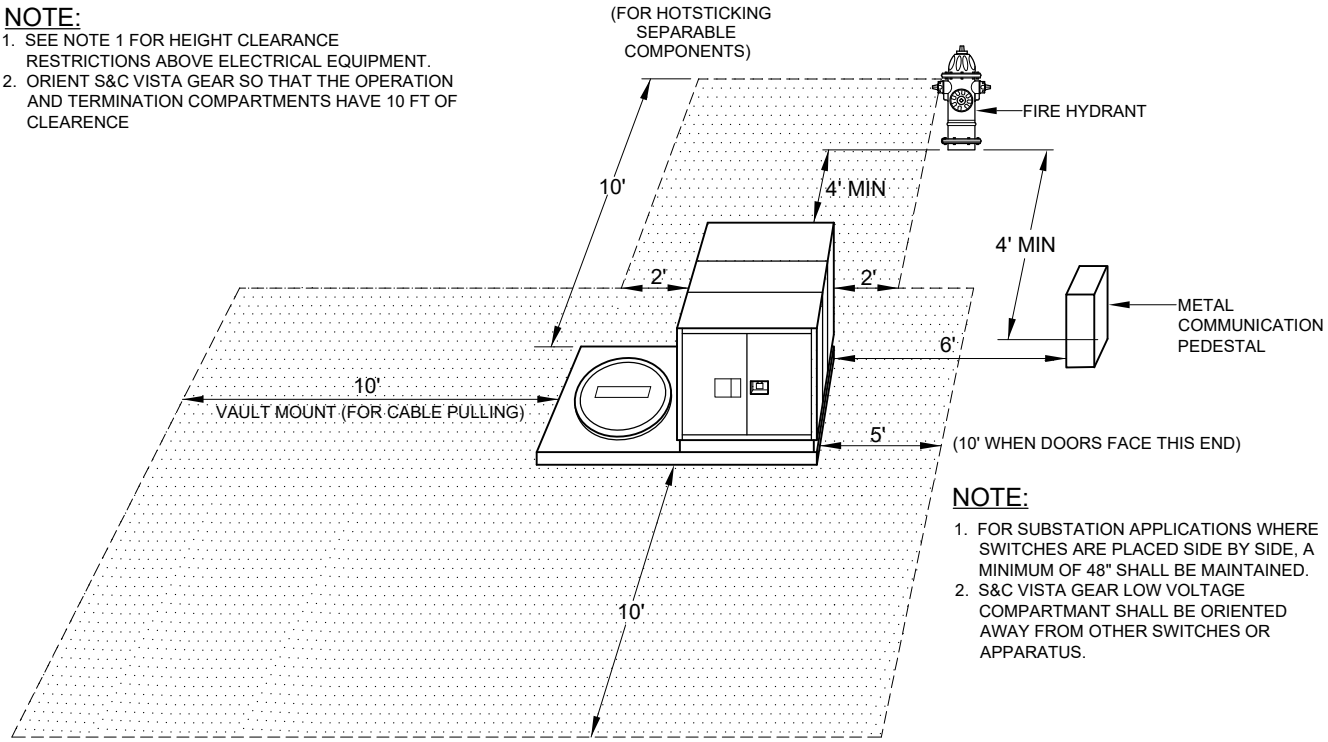


3-PHASE PADMOUNT TRANSFORMER

PAD AND VAULT ACCESS CLEARANCES

NOTE:

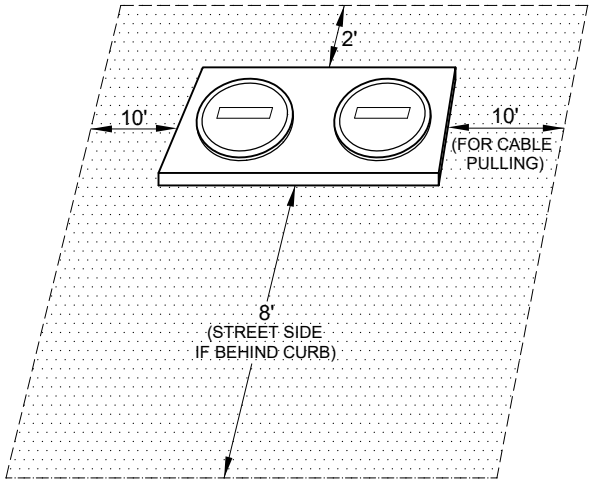
1. SEE NOTE 1 FOR HEIGHT CLEARANCE RESTRICTIONS ABOVE ELECTRICAL EQUIPMENT.
2. ORIENT S&C VISTA GEAR SO THAT THE OPERATION AND TERMINATION COMPARTMENTS HAVE 10 FT OF CLEARENCE



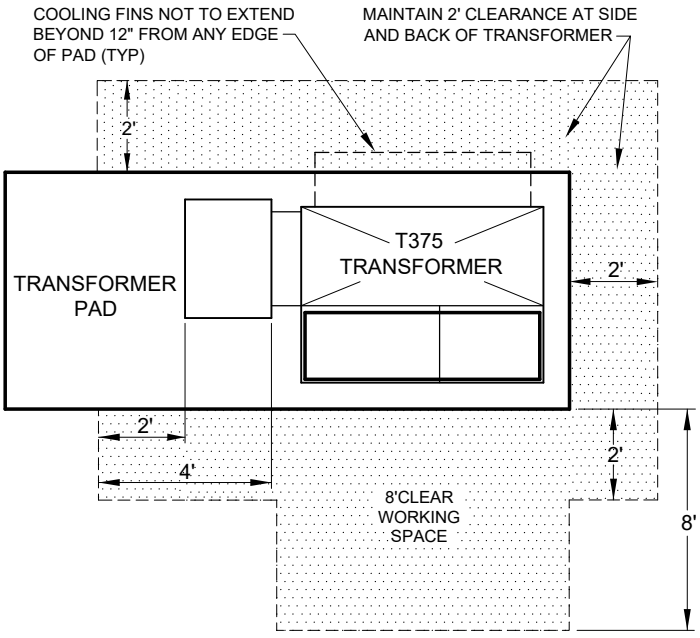
NOTE:

1. FOR SUBSTATION APPLICATIONS WHERE SWITCHES ARE PLACED SIDE BY SIDE, A MINIMUM OF 48" SHALL BE MAINTAINED.
2. S&C VISTA GEAR LOW VOLTAGE COMPARTMANT SHALL BE ORIENTED AWAY FROM OTHER SWITCHES OR APPARATUS.

15/35kV SWITCH CLEARANCES



6' X 12' (& LARGER) MANHOLES



MAINTAIN 8' CLEAR WORKING SPACE FROM THE FRONT OF ONE TRANSFORMER TO THE SIDES OR BACK OF ANOTHER TRANSFORMER AND AT FULL WIDTH OF TRANSFORMER CABLE CABINET

T375 TRANSFORMER CLEARANCES

CLEARANCES (SEPARATION) OF UG ELECTRIC CONDUIT/CABLE FROM OTHER FACILITIES

See the Typical Parallel (Separate Trench) and Crossing Clearance Matrix Tables and notes on page 3

1. **Primary Conduit Structure, Manholes and Vaults:** NESC 320B: Conduit Systems Separation from Other Underground Facilities (Cables installed in a single duct not part of a conduit system, i.e. not including manholes/vaults, shall meet the rules for direct buried cables (see notes 2 & 3).

   1.1 General:

   The separation between a conduit system and other underground structures paralleling it should be as large as necessary to permit maintenance of the system without damage to the paralleling structures.. A conduit that crosses over another subsurface structure shall have a separation sufficient to prevent damage to either structure. The parties involved should determine these separations. **Colorado Springs Utilities minimum horizontal separation from conduit structure to above ground structures (buildings, walls, etc.) is 10' (5' minimum with approval from Field Engineering) plus any amount required to prevent damage to the structure. Minimum vertical clearance from a building structure located over the electric underground trench shall have a minimum of 20' of clearance from the roadway surface to the building structure with no vaults or padmounted equipment (transformers, switchgear, etc.) located underneath the building structures.**

   EXCEPTION: When conduit crosses a manhole, vault, or subway tunnel roof, it may be supported directly on the roof with the concurrence of all parties involved.

   1.2 Separations Between Supply and Communication Conduit Systems (within the same trench):

   Conduit systems to be occupied by communication conductors shall be separated from conduit systems to be used for supply systems by:

   1.2.1 3 inches of concrete

   1.2.2 4 inches of masonry

   1.2.3 12 inches of well-tamped earth

   EXCEPTION: Lesser separations may be used where the parties concur.

   1.3 Sewers, Sanitary and Storm:

   1.3.1 If conditions require a conduit to be installed parallel to and directly over a sanitary or storm sewer, it may be done provided both parties are in agreement as to the method. **Colorado Springs Utilities policy is to maintain 10' or more horizontal separation from primary electric where possible (5' minimum with approval of Field Engineering).**

   1.3.2 Where a conduit run crosses a sewer, it shall be designed to have suitable support on each side of the sewer to prevent transferring any direct load onto the sewer.

   1.4 Water Lines:

   Conduit should be installed as far as is practical from a water main in order to protect it from being undermined if the main breaks. Conduit that crosses over a water main shall be designed to have suitable support on each side as required to limit the likelihood of transferring any direct loads onto the main. **Colorado Springs Utilities policy is to maintain 10' or more horizontal separation from primary electric where possible (5' minimum with approval of Field Engineering).**

   1.5 Gas and Other Lines that Transport Flammable Material:

   Radial separation of conduit systems from gas and other lines that transport flammable material shall not be less than 12 inches (within the same trench) and should have sufficient separation from gas and other lines that transport flammable material to permit the use of pipe maintenance equipment. Conduit shall not enter the same manhole, handhole, or vault with gas or other lines that transport flammable material. **Colorado Springs Utilities policy is to maintain a min 12 inches radial separation from plastic gas service pipe within the same trench, 6' from gas mains, and 10' or more horizontal separation where possible from 150 psi or steel gas pipelines (5' minimum with approval of Field Engineering) for welding operations.**

   1.6 Steam Lines:

   Conduit should be so installed so as to limit the likelihood of detrimental heat transfer between the steam and conduit systems.

2. **Primary and Secondary Single Duct or Direct Buried Cables:** NESC 353: Direct Buried Cables- Deliberate Separation from Other Underground Facilities (sewers, water lines, fuel lines, building foundations, steam lines, other supply or communication conductors not in random separation, etc.). **Colorado Springs Utilities minimum horizontal separation from above ground structures (buildings, walls, etc.) to primary electric is 10' (5' minimum with approval from Field Engineering) and separation from secondary electric is 12 inches, plus any amount required to prevent damage to the structure. Minimum vertical clearance from a building structure located over the electric underground trench shall have a minimum of 20' of clearance from the roadway surface to the building structure with no vaults or padmounted equipment (transformers, switchgear, etc.) located underneath the building structures.**

   2.1 Radial Separation:

   The radial separation between a single conduit or direct-buried cable and other underground structures should be not less than 12 in (within the same trench) to permit access to and maintenance of either facility without damage to the other. Installations with less than 12 in separation between supply and communication cables shall conform to requirements of NESC Rule 354, random separation (see note 3 on next page).

   2.2 Crossings:

2.2.1 Where a cable crosses under another underground structure, the structure shall be suitably supported to limit the likelihood of transferring a detrimental load onto the cable system.

2.2.2 Where a cable crosses over another underground structure, the cable shall be suitably supported to prevent transferring a detrimental load onto the structure.

2.2.3 Adequate support may be provided by installing the facilities with sufficient vertical separation.

2.3 Parallel Facilities:

2.3.1 Where a cable system to be installed with less than 12 inches (300 mm) horizontal separation or directly over and parallel to another underground structure (or another underground structure installed directly over and parallel to a cable), it may be done providing all parties are in agreement as to the method. Adequate vertical separation shall be maintained to permit access to and maintenance of either facility without damage to the other.

2.4 Thermal Protection:

2.4.1 Cable should be installed with sufficient separation from other underground structures, such as steam or cryogenic lines, to avoid thermal damage to the cable. Where it is not practical to provide adequate clearance, a suitable thermal barrier shall be placed between the two facilities.

3. **Primary and Secondary Single Duct or Direct Buried Cables:** NESC 354: Direct Buried Cables- Random Separation Between Electric Supply and Communication Cables
(see Colorado Springs Utilities Electric Distribution Construction Standard 18-305 for "NESC Requirements for Joint Trench").

4. Cable in Underground Structures (incl. Joint-Use Manholes & Vaults):

4.1. Installation (NESC 341):
4.1.1. General (NESC 341A):
4.1.1.1. Bending of the supply cable during handling, installation, and operation shall be controlled to avoid damage.
4.1.1.2. Supply, cables shall not be installed in the same duct with communication cables unless all the cables are operated and maintained by the same utility.
4.1.2. Cable in Manholes and Vaults (NESC 341B):
4.1.2.1. Supports: Cable supports shall be designed to withstand both live and static loading and should be compatible with the environment. Supports shall be provided to maintain specified clearance between cables. Horizontal runs of supply cables shall be supported at least 3" above the floor, or be suitably protected (does not apply to grounding or bonding conductors).
4.1.2.2. Clearance: Adequate working space shall be provided in accordance with NESC Rule 323B (horizontal clear work space not less than 3', vertical not less than 6' etc.).
4.1.2.3. Clearance between supply (power) and communication facilities (cables, equipment, or both):
4.1.2.3.1. Where cable, equipment or both are to be installed in a joint-use manhole or vault, it shall be done only with the concurrence of all parties concerned.
4.1.2.3.2. Supply and communication cables should be racked from separate walls. Crossings should be avoided.
4.1.2.3.3. Where supply and communication cables must be racked from the same wall, the supply cables should be racked below the communication cables.
4.1.2.3.4. Supply and communication facilities shall be installed to permit access to either without moving the other.
4.1.2.3.5. Clearances shall not be less than specified in the table:

PHASE-TO-PHASE SUPPLY VOLTAGE	SURFACE TO SURFACE (INCHES)
0 to 15,000	6
15,001 to 50,000	9
50,001 to 120,000	12
120,001 and above	24
Grounding conductors	Not applicable
Exception: These clearances may be reduced by mutual agreement between the parties concerned when suitable barriers or guards are installed.	

4.1.2.4. Identification: Cables in a joint-use manhole or vault that are operated and maintained by different utilities shall be permanently identified by marking or tags denoting the utility name and type of cable use, e.g. "Colorado Springs Utilities 12,000 V" or "Century-Link Fiber-Optic".

4.2. Grounding and Bonding (NESC 342):
4.2.1. Insulation shielding of cable and joints shall be effectively grounded.
4.2.2. Cable sheaths or shields that are connected to ground at a manhole shall be bonded or connected to a common ground.
4.2.3. Bonding and grounding leads shall be of a corrosion-resistant material suitable for the environment or suitably protected.

4.3. Fireproofing (NESC 343): Although fireproofing is not a requirement, it may be provided in accordance with each utility's normal service reliability practice to provide protection from external fire.

4.4. Communication Cables Containing Special Supply Circuits (see NESC Rule 344).

Typical Parallel/Horizontal Clearance Matrix for Colorado Springs Underground Utilities (Separate Trenches):

(All dimensions are in feet) All separations shown are the clear horizontal distance between two objects measured surface to surface

Colorado Springs Utilities (Underground)	Potable Water	Non-Potable Water	Waste-water	Storm Sewer	Gas mains 150 psig (MAOP)	Gas main	Gas Service	Electric Primary up to 34.5kV	Electric Secondary (0-480 Volt)	Telecom / Fiber
Potable Water	X	10	10	10 [c]	10	6	3	10 [d]	3	5
Non-Potable Water	10	X	10	10	10	6	3	10	3	5
Wastewater	10	10	X	10 [c]	10	6	3	10 [d]	3	5
Storm Sewer	10 [c]	10	10 [c]	X	10	6	3	10	3	5
Gas mains 150 psig (MAOP)	10	10	10	10	X	6	6	10	10	10
Gas main	6	6	6	6	6	X	3	6	3	5 [e]
Gas Service	3	3	3	3	6	3	X	3	3	3
Electric Primary up to 34.5kV	10 [d]	10	10 [d]	10	10	6	3	X	3	5 [e]
Electric Secondary (0-480 Volt)	3	3	3	3	10	3	3	3	X	5 [e]
Telecom / Fiber	5	5	5	5	10	5 [e]	3	5 [e]	5 [e]	X

Typical Crossings/Vertical Clearance Matrix for Colorado Springs Underground Utilities:

(All dimensions are in feet) All separations shown are the clear vertical distance between two objects measured surface to surface

Colorado Springs Utilities (Underground):	Potable Water	Non-Potable Water	Waste-water	Storm Sewer	Gas mains 150 psig (MAOP)	Gas main	Gas Service	Electric Primary up to 34.5kV	Electric Secondary (0-480 Volt)	Telecom / Fiber
Potable Water	X	1.5 [a]	1.5 [a]	1.5 [a]	5	1	1	1	1	1
Non-Potable Water	1.5 [a]	X	1.5 [a]	1.5 [a]	5	1	1	1	1	1
Wastewater	1.5 [a]	1.5 [a]	X	1.5	5	1	1	1	1	1
Storm Sewer	1.5 [a]	1.5 [a]	1.5 [a]	X	5	1	1	1	1	1
Gas mains 150 psig (MAOP)	5	5	5	5	X		5	5	5	5
Gas main	1	1	1	1		X	1	1/5 [b]	1	1
Gas Service	1	1	1	1	5	1	X	1	1	1
Electric Primary up to 34.5kV	1	1	1	1	5	1/5 [b]	1	X	0	1
Electric Secondary (0-480 Volt)	1	1	1	1	5	1	1	0	X	1
Telecom / Fiber	1	1	1	1	5	1	1	1	1	X

[a] These utilities require a sleeve when crossing under another utility.

[b] 1' separation from electric primary to plastic pipe gas main and 3' separation from electric primary to metallic gas main.

[c] Exception: Minimum 5' separation if meets the means of secondary containment listed in the Water Line Extension and Service Standards Book 2.6.F.2 Separation Criteria and Wastewater Line Extension and Service Standards Book 2.5.D.2 Separation Criteria.

[d] Exception: Minimum 6'-10" clearance from Electric Primary to Potable Water and Wastewater.

e Exception: Telecom/fiber may be permitted to have a 3' horizontal separation from gas mains, electric primary or electric secondary in locations where the gas main and electric primary or secondary are behind the curb and either in the tree lawn or under sidewalk. The exception may be allowed when the following requirements are met:

1) potholing and exposing the pipe every 50 feet must occur when directional drilling is within 5 feet of the electric or gas pipe;
2) the use of pneumatic missiles must be in compliance with City Policy and may prohibit the use of pneumatic methods for installation of underground utilities in the right-of-way and public utility/improvement easements. If the City Policy does allow for the use of pneumatic methods to install underground utilities, then potholing and exposing pipe every 25 feet is required when pneumatic missiles/moles are used within 5 feet of electric or gas pipe;
3) for bores less than 50 feet and within 5 feet of electric or gas pipe (regardless of trenchless technology used), a minimum of one pothole is required;
4) potholing and exposing electric or gas pipe where points of typical deviation may occur (e.g., hydrants, transformers, etc.) and;
5) compliance with all State and local excavation, boring, and damage prevention rules and regulations.

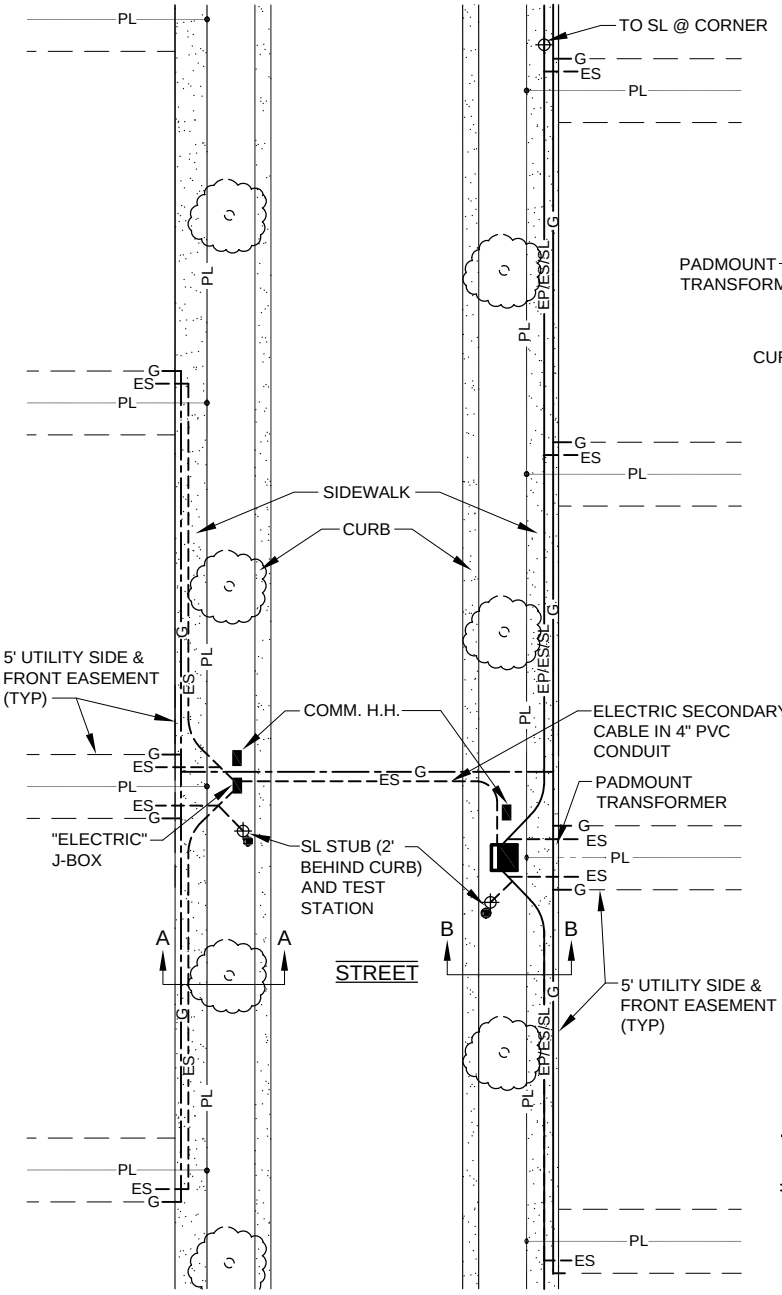
All other scenarios must comply with clearance requirements in the matrix table above. If any one of the 5 listed requirements are not met, a 5-foot clearance is required. In all cases, the high pressure gas main requires a 10-foot horizontal clearance with no exceptions.

The horizontal clearance distance also applies to fiber appurtenances, to include boxes (boxes must be the required horizontal and vertical distance away from gas and electric and shall not be placed over electric or gas pipe.)

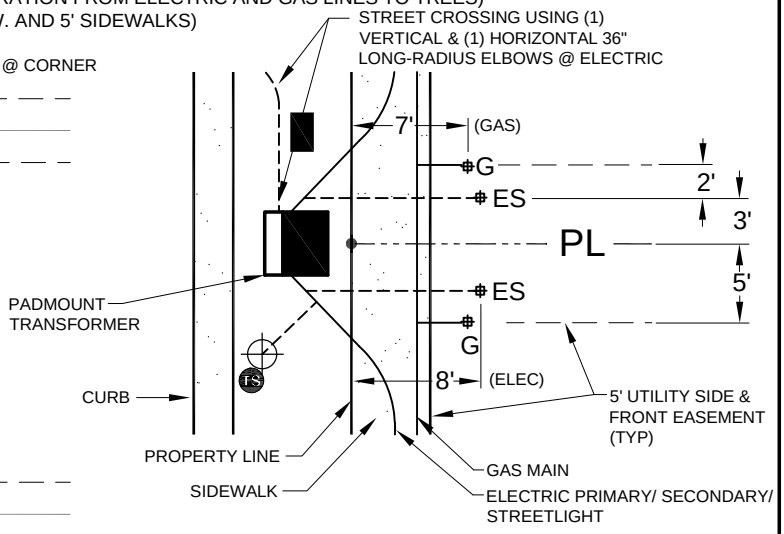
1. If compliance with these separation requirements, or those set forth in the Clearance Matrix cannot be met they will be addressed on a case-by-case basis following variance procedures described in the applicable Line Extension and Service Standard book. This includes areas of redevelopment within alleys. Colorado Springs Utilities subject matter experts for the utility being impacted will make the determination regarding clearances.
2. These clearance matrix table dimensions are for separate trenches. Joint trench between Gas and Colorado Springs Utilities Telecom./ Fiber requires a 1' radial separation. Joint trench between Electric and Colorado Springs Utilities Telecom./ Fiber requires a 3" in concrete and 6" in fill earth radial separation.
3. See the Gas Line Extension and Service Standards 2.02c for certain exceptions.
4. See Water & Wastewater Line Extension and Service Standards, latest edition.
5. Clearance to other Colorado Springs utilities (telecommunication, fiber optics, etc.) or high voltage underground transmission cables shall be determined on a case-by-case basis by Field Engineering.
6. Storm Sewer clearances must be verified by City Engineering.
7. Larger clearances than shown may be required – clearances must meet all requirements set forth in all four of the Colorado Springs Utilities Line Extension and Service Standards, Colorado Springs City Codes, NEC, and NESC, latest editions.
8. Additional support structures may be required at crossings.
9. For separation from trees to gas and electric line, see GLESS 2.02c and ELESS 4.02c1.
10. See City of Colorado Springs Standard Drawings #1 "Street Cross Sections" and Drawings #2 "Street Sections Plan View" at the following web address link: https://coloradosprings.gov/public-works/page/standard-drawings

JOINT TRENCH - FRONT LOT LAYOUT WITH DETACHED SIDEWALKS AND TREES BEHIND CURB

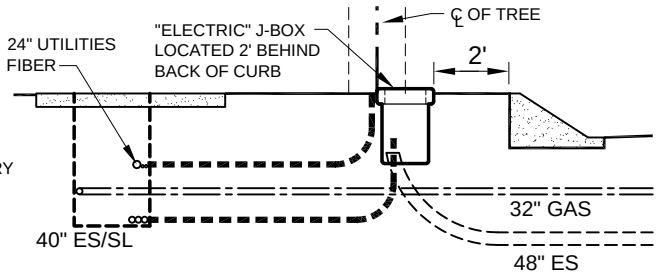
(THIS LAYOUT ACCOUNTS FOR 6' SEPARATION FROM ELECTRIC AND GAS LINES TO TREES)
(50' R.O.W. AND 5' SIDEWALKS)



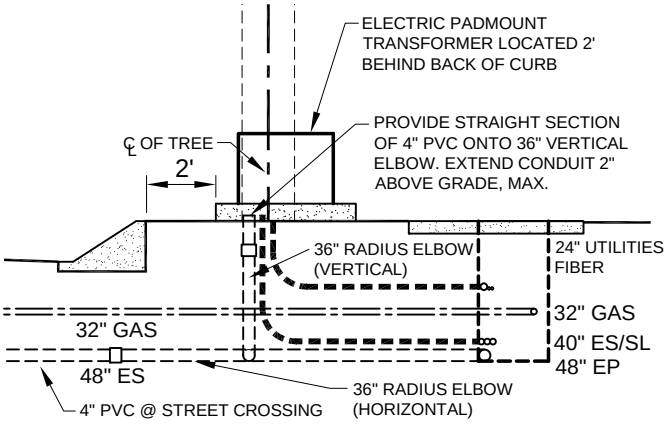
FRONT LOT LAYOUT PLAN VIEW



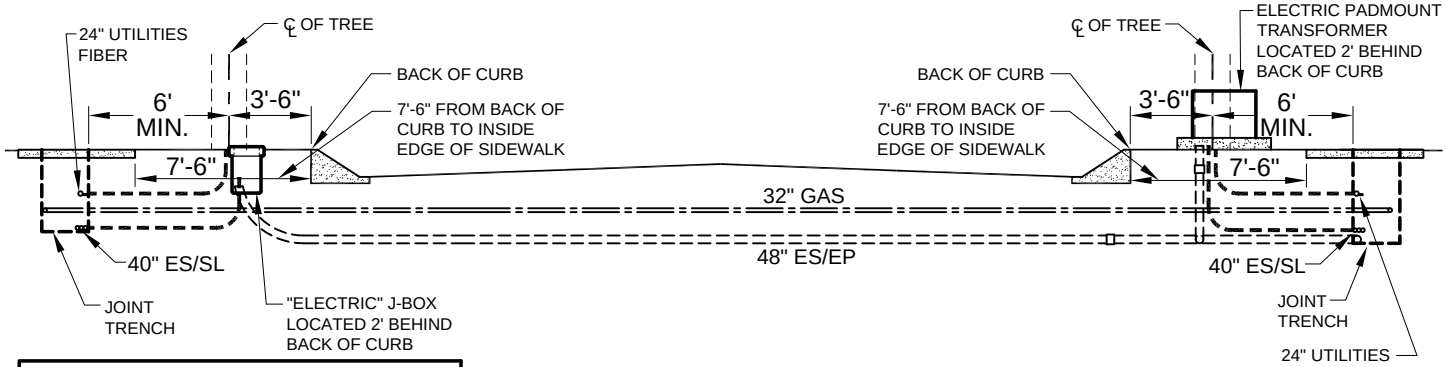
SIDE EASEMENT DETAIL



STUBS TRENCH PROFILE @ J-BOX (A-A)



MAIN TRENCH PROFILE @ TRANSFORMER (B-B)



LEGEND	
EP= ELECTRIC PRIMARY	G= GAS
ES= ELECTRIC SECONDARY	W= WATER
SL= ELECTRIC STREETLIGHT	WW= WASTEWATER
PL= PROPERTY LINE	

TRENCH PROFILE & STREET CROSSING VIEW

(50' R.O.W. AND 5' SIDEWALKS)

ELECTRIC DISTRIBUTION CONSTRUCTION STANDARDS

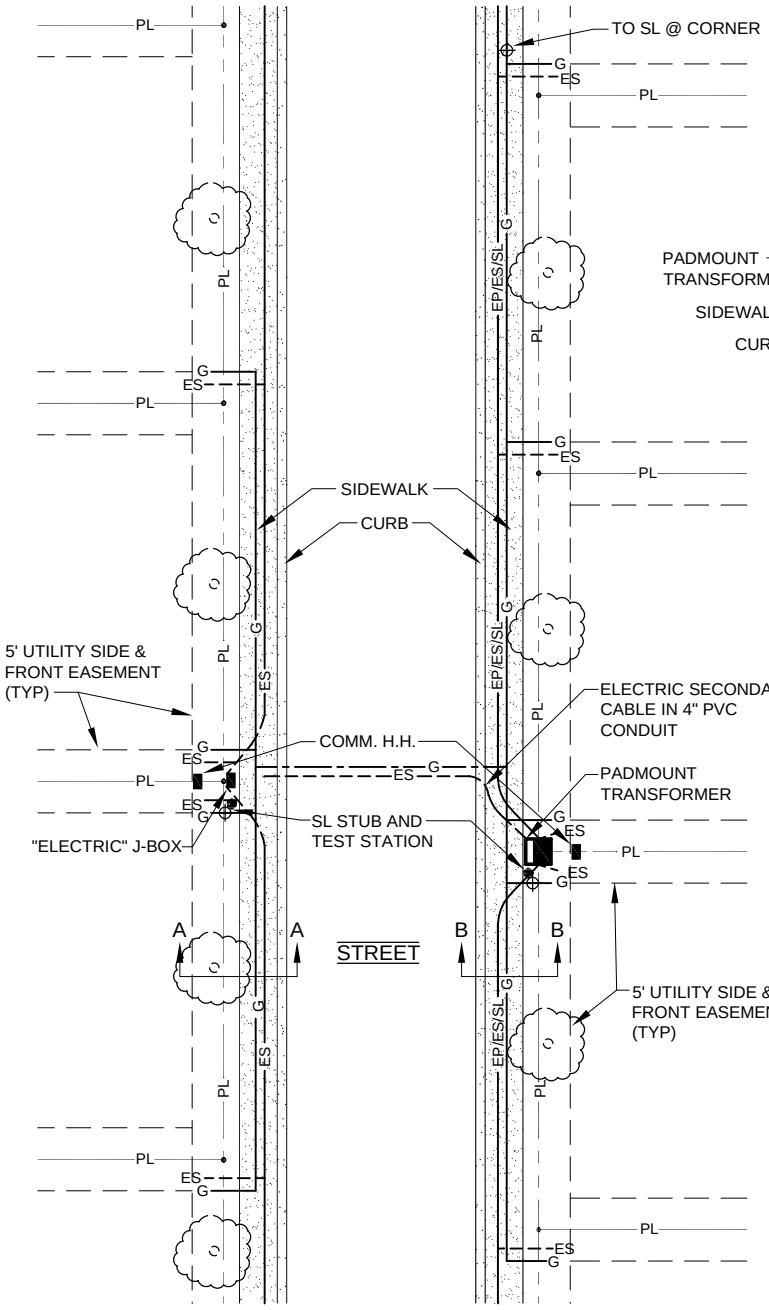
Colorado Springs Utilities
It's how we're all connected

APPROVED AS OF:	UG LAYOUTS: RESIDENTIAL JOINT TRENCH AND TOWNHOMES	19-8	PG. 1/19
4-27-2023			

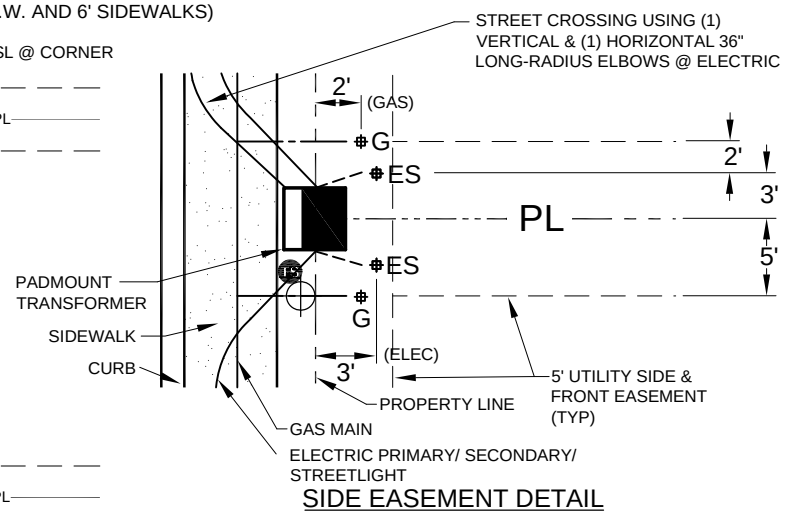
T02–01626

JOINT TRENCH - FRONT LOT LAYOUT WITH ATTACHED SIDEWALKS AND TREES BEHIND SIDEWALK

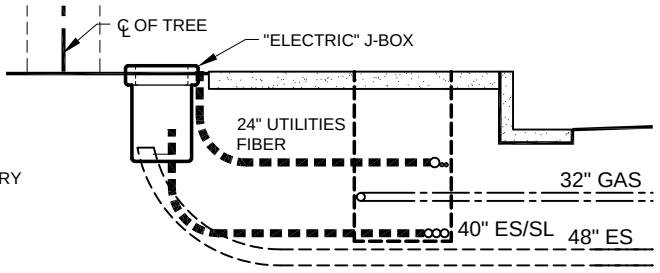
(THIS LAYOUT ACCOUNTS FOR 6' SEPARATION FROM ELECTRIC AND GAS LINES TO TREES)
(ATTACHED SIDEWALKS WILL TYPICALLY ONLY BE LOCATED ON CUL-DE-SACS)
(50' R.O.W. AND 6' SIDEWALKS)



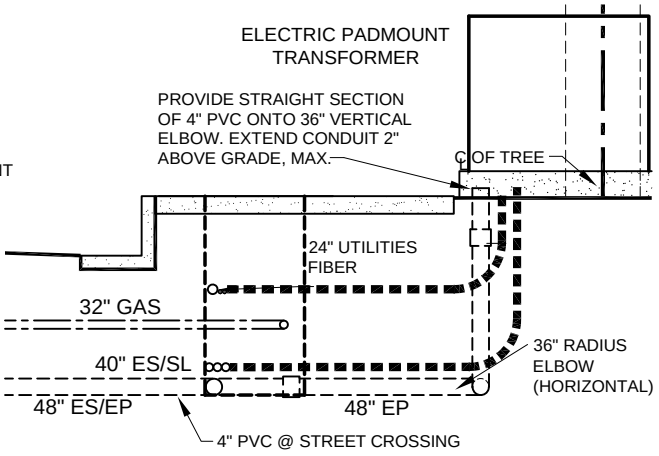
FRONT LOT LAYOUT PLAN VIEW



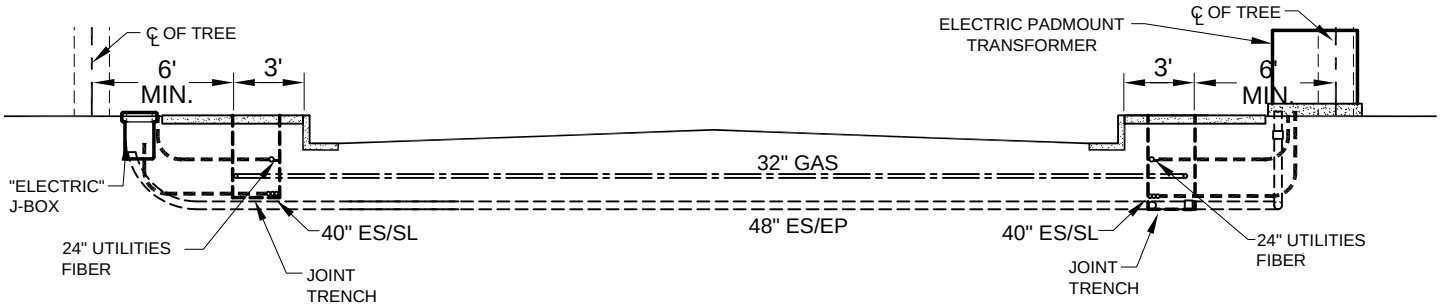
SIDE EASEMENT DETAIL



STUBS TRENCH PROFILE @ J-BOX (A-A)



MAIN TRENCH PROFILE @ TRANSFORMER (B-B)



LEGEND	
EP= ELECTRIC PRIMARY	G= GAS
ES= ELECTRIC SECONDARY	W= WATER
SL= ELECTRIC STREETLIGHT	WW= WASTEWATER
PL= PROPERTY LINE	

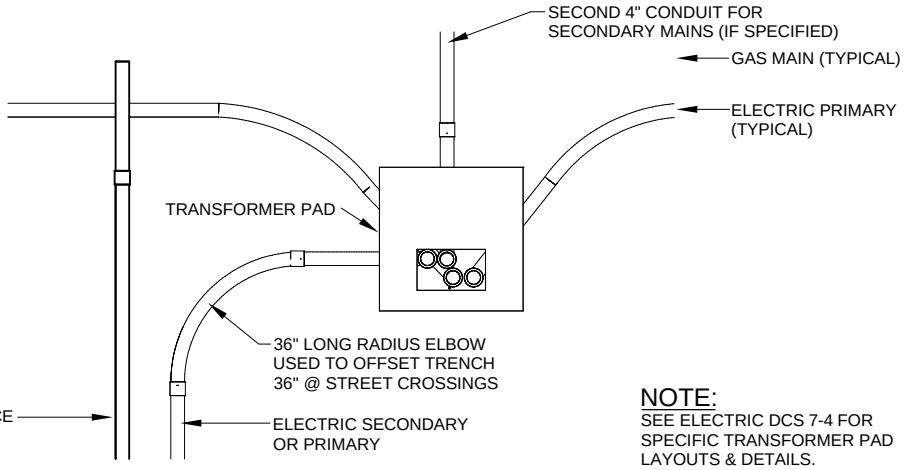
TRENCH PROFILE & STREET CROSSING VIEW
(50' R.O.W. AND 6' SIDEWALKS)

Colorado Springs Utilities
It's how we're all connected

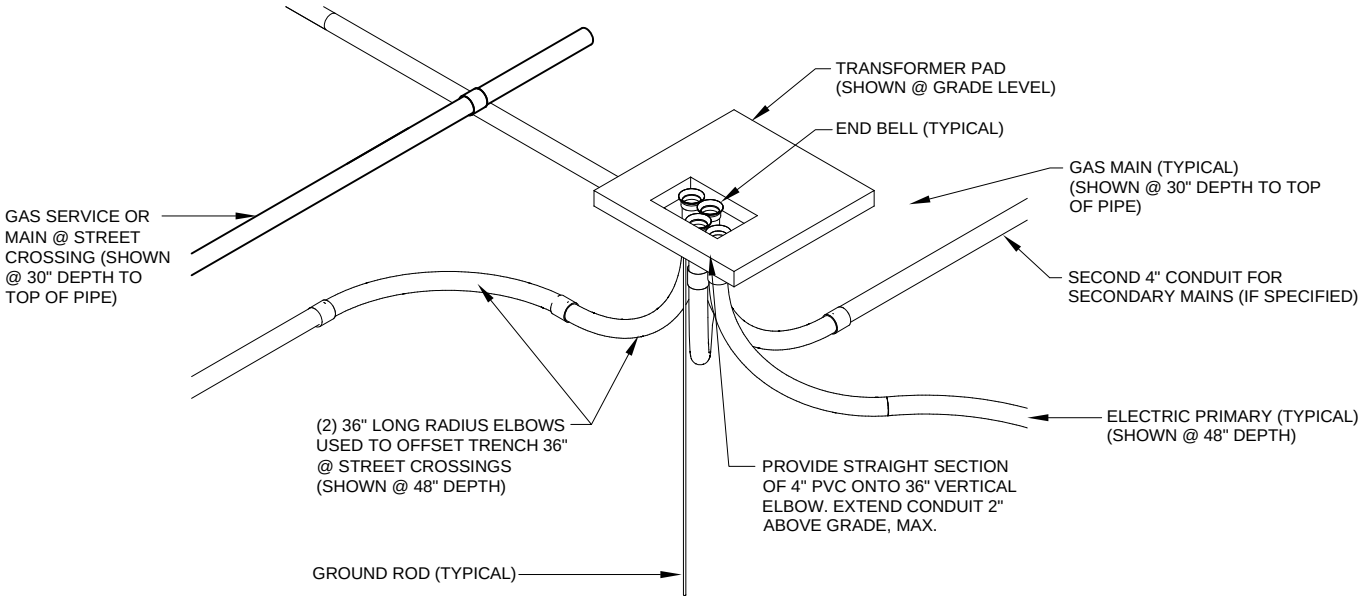
RESIDENTIAL JOINT TRENCH LAYOUTS

OFFSET TRENCH:

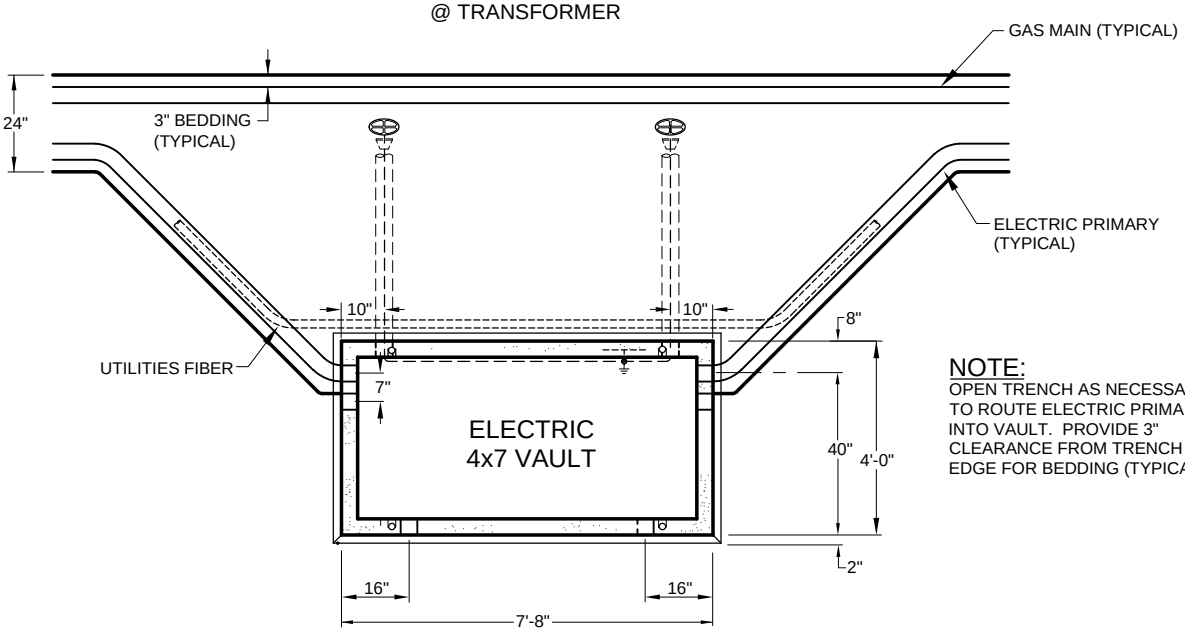
ALWAYS PROVIDE AN OFFSET TRENCH WHEN ELECTRIC IS INSTALLED JOINT WITH GAS.



NOTE:
SEE ELECTRIC DCS 7-4 FOR SPECIFIC TRANSFORMER PAD LAYOUTS & DETAILS.



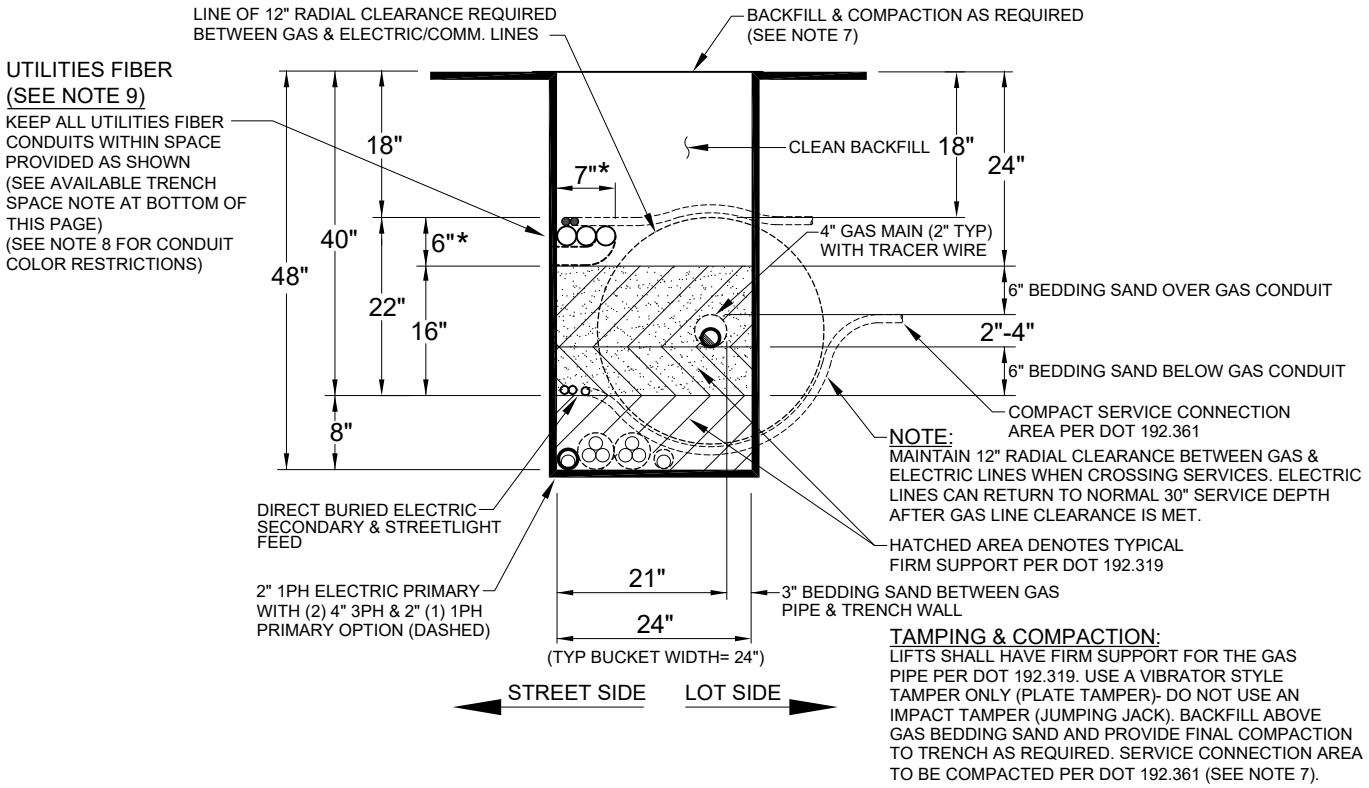
STREET CROSSING TRENCH DETAIL
@ TRANSFORMER



NOTE:
OPEN TRENCH AS NECESSARY TO ROUTE ELECTRIC PRIMARY INTO VAULT. PROVIDE 3" CLEARANCE FROM TRENCH EDGE FOR BEDDING (TYPICAL).

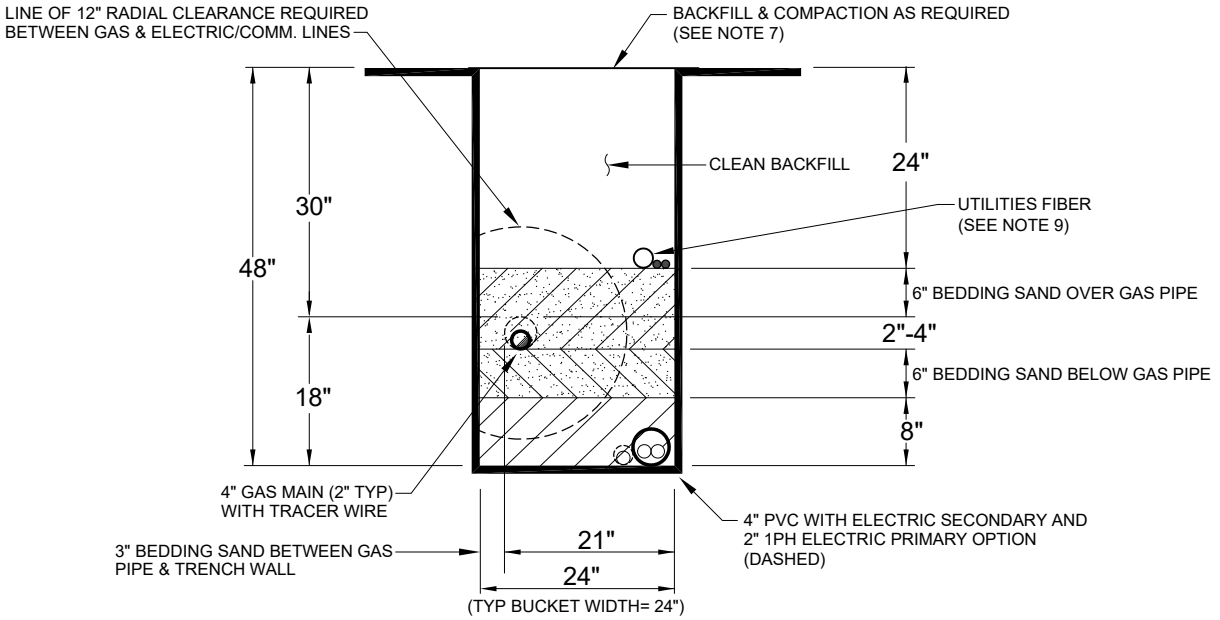
HORIZONTAL SEPARATION DETAIL
@ 4x4 & 4x7 VAULTS, TRANSFORMER PADS

RESIDENTIAL JOINT TRENCH LAYOUTS



TAMPING & COMPACTION:
LIFTS SHALL HAVE FIRM SUPPORT FOR THE GAS PIPE PER DOT 192.319. USE A VIBRATOR STYLE TAMPER ONLY (PLATE TAMPER)- DO NOT USE AN IMPACT TAMPER (JUMPING JACK). BACKFILL ABOVE GAS BEDDING SAND AND PROVIDE FINAL COMPACTION TO TRENCH AS REQUIRED. SERVICE CONNECTION AREA TO BE COMPACTED PER DOT 192.361 (SEE NOTE 7).

MAIN JOINT TRENCH WITH HORIZONTAL SEPARATION



STREET CROSSING WITH 12" RADIAL SEPARATION @ EACH TRANSFORMER

LEGEND

- 1PH ELECTRIC PRIMARY DISTRIBUTION
- 3PH ELECTRIC PRIMARY DISTRIBUTION
- DIRECT BURIED ELECTRIC SECONDARY
- GAS MAIN
- UTILITIES FIBER
- TRACER WIRE

* AVAILABLE TRENCH SPACE:
UTILITIES FIBER AVAILABLE TRENCH IS LIMITED TO A 7" HORIZONTAL SPACE x 6" VERTICAL SPACE BETWEEN THE 18"-24" DEPTH. UTILITIES FIBER WILL UTILIZE ONE TO FOUR 2" CONDUITS. ALL CROSSINGS SHALL BE ABOVE THE REQUIRED 12" SEPARATION FROM GAS. UTILITIES FIBER SHALL MAINTAIN 12" SEPARATION FROM ELECTRIC CONDUITS. SERVICE CROSSINGS MAY GO BELOW THE 12" SEPARATION FROM GAS AT UTILITIES CONSENT ONLY (ABOVE PREFERRED). (SEE NOTE 5).

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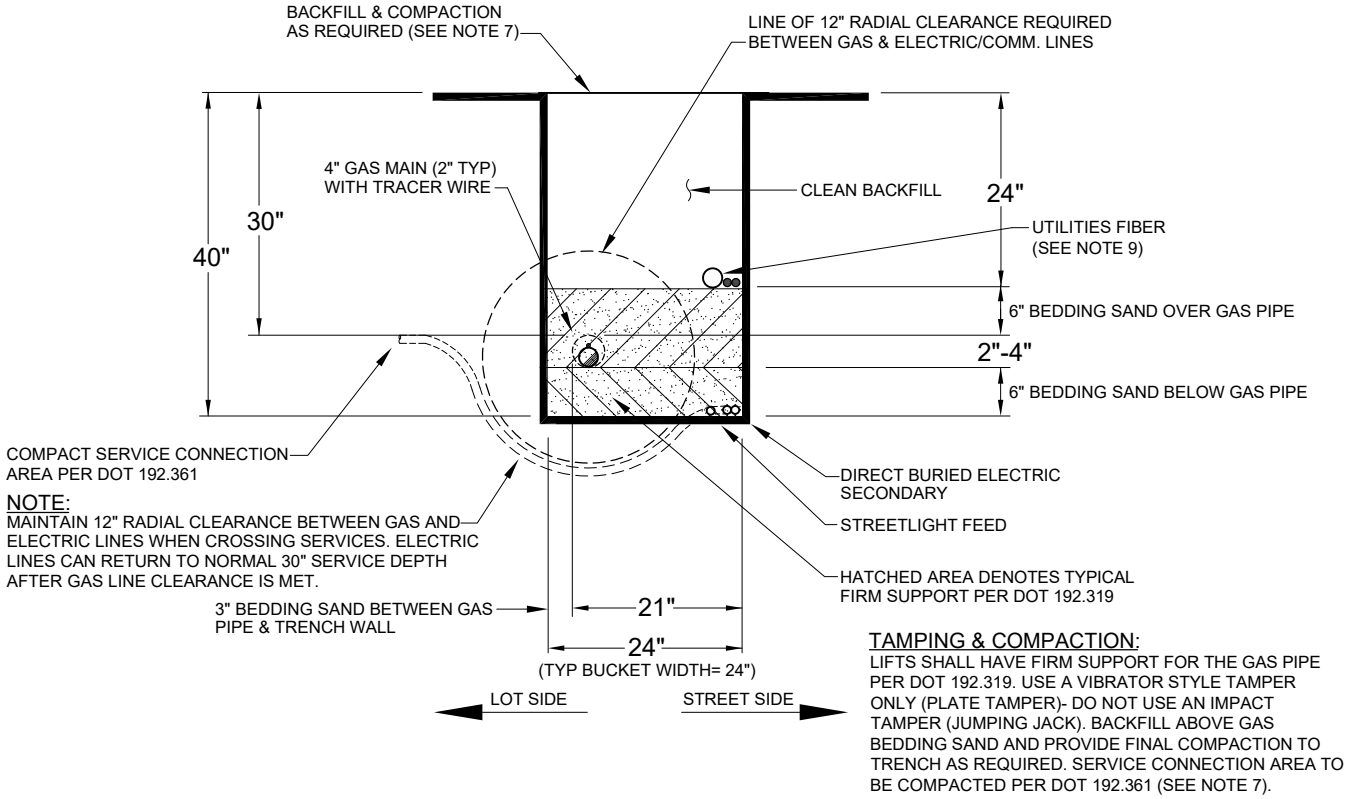
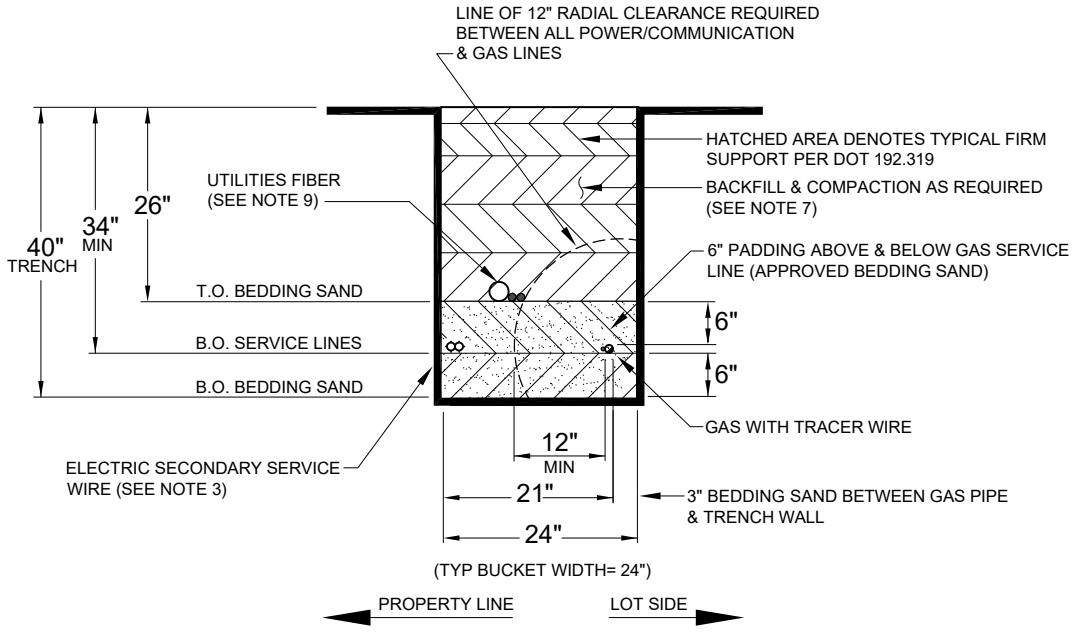
RESIDENTIAL JOINT TRENCH LAYOUTS



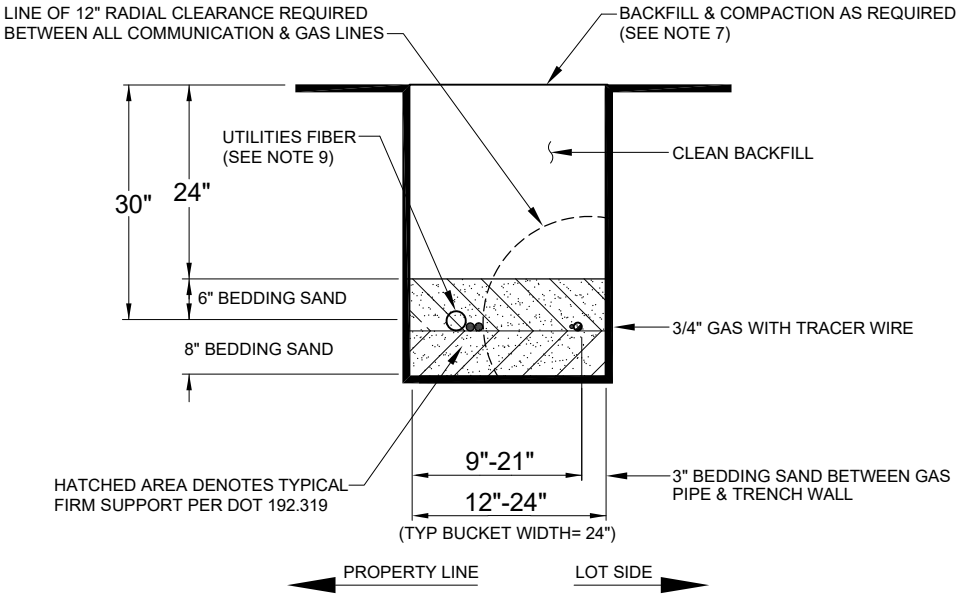
TAMPING & COMPACTION:
LIFTS SHALL HAVE FIRM SUPPORT FOR THE GAS PIPE PER DOT 192.319. USE A VIBRATOR STYLE TAMPER ONLY (PLATE TAMPER)- DO NOT USE AN IMPACT TAMPER (JUMPING JACK). BACKFILL ABOVE GAS BEDDING SAND AND PROVIDE FINAL COMPACTION TO TRENCH AS REQUIRED. SERVICE CONNECTION AREA TO BE COMPACTED PER DOT 192.361 (SEE NOTE 7).

STUBS OPPOSITE STREET SIDE WITH HORIZONTAL SEPARATION

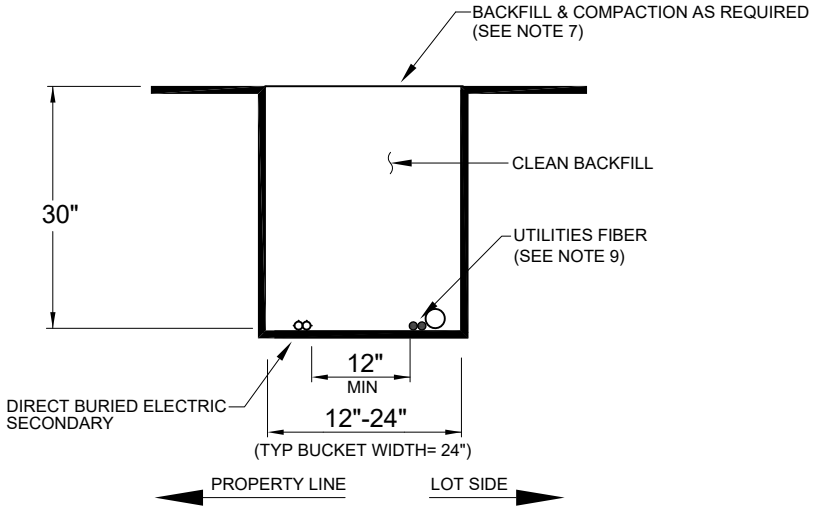


JOINT SERVICES WITH HORIZONTAL SEPARATION

RESIDENTIAL ELECTRIC & GAS TRENCH LAYOUTS



GAS ONLY SERVICE INSTALLATION

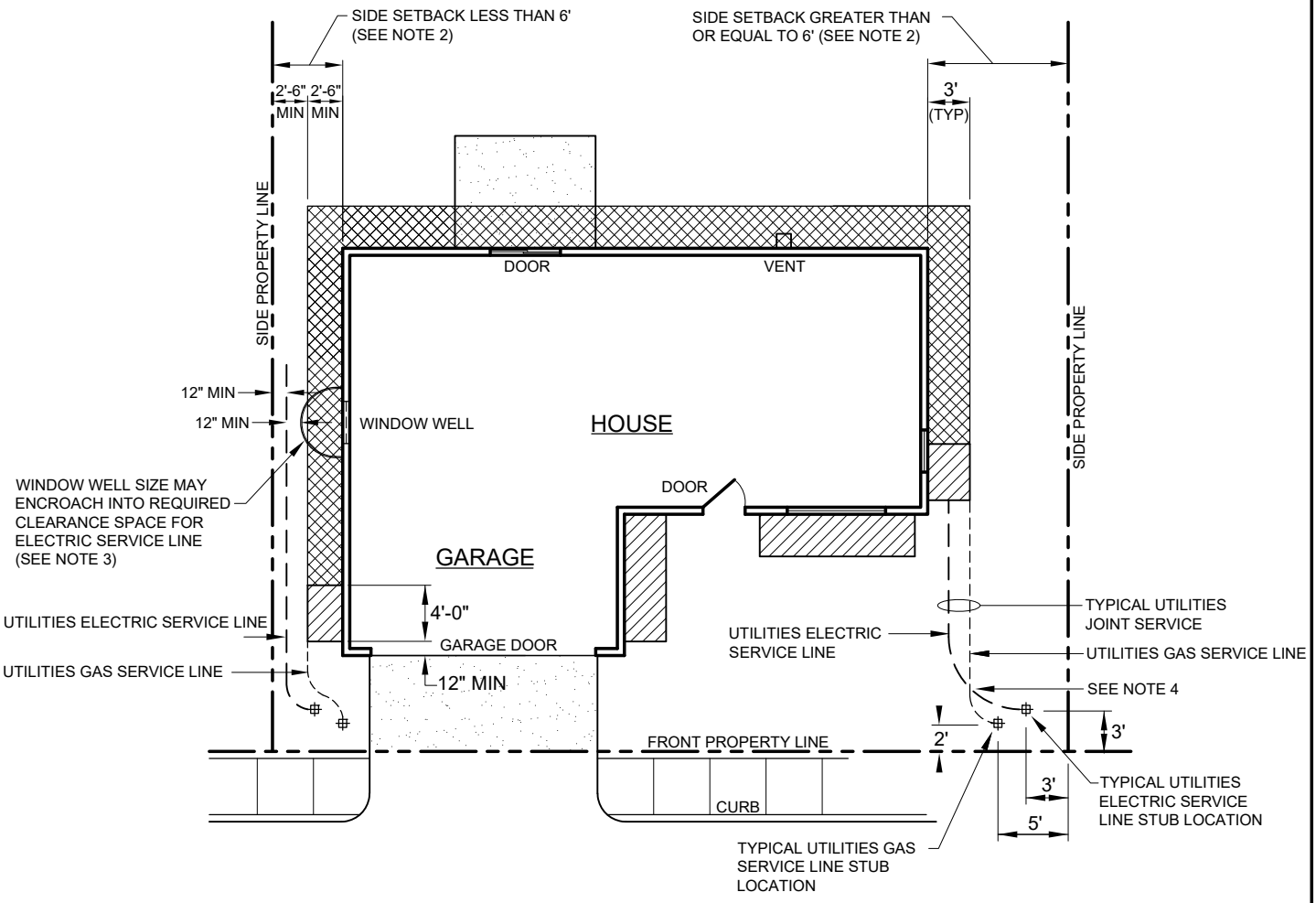


ELECTRIC ONLY SERVICE INSTALLATION

NOTES:

1. All electric service cables to be direct buried from the transformer to each lot, to a point typically 3' past front lot line (gas 2') & 3' from side lot line (gas 5'). Avoid service wire crossing private property of any lot other than the one served.
2. Service cable end to be connected to temporary service equipment (pedestal or post type- see DCS 8-6), left energized & locked. Keep temporary service equipment at least 1' within easement & off private property (see page 10 for relocating temporary service equipment at time of joint trench installation).
3. Service cable to be #1/0, #4/0, or 350 kcmil aluminum triplex as specified on the job print.
4. NESC RULE 354A: RADIAL SEPARATION OF SUPPLY OR COMMUNICATION CABLES OR CONDUCTORS FROM GAS AND OTHER FUEL LINES SHALL BE NOT LESS THAN 12"- NO EXCEPTIONS.
5. Maintain 12" minimum separation between UTILITIES FIBER and electric lines as required by Colorado Springs Utilities policy.
6. TEL/CATV companies to adhere to NESC/DOT requirements, current edition.
7. Backfill & compaction of all trenches shall meet the requirements of the City of Colorado Springs City Engineering Standard Specifications and all other applicable State, Federal, or railroad requirements (see EDCS 11-1).
8. Joint trench with UTILITIES FIBER must not use the same color scheme as Utilities' standard color for electric, gas, water and wastewater conduit or pipe to avoid confusion for installation and maintenance of trench. Utilities' electric and gas standard colors to avoid are grey, black with red stripes and yellow. Reference Utilities water and wastewater standards for approved colors.
9. Utilities fiber will utilize between one to four 2" conduits and is orange in color. Install orange tracer wire on top of center duct (See 11-5)

UTILITIES OWNED JOINT/SEPARATE ELECTRIC UTILITIES LOT LAYOUT



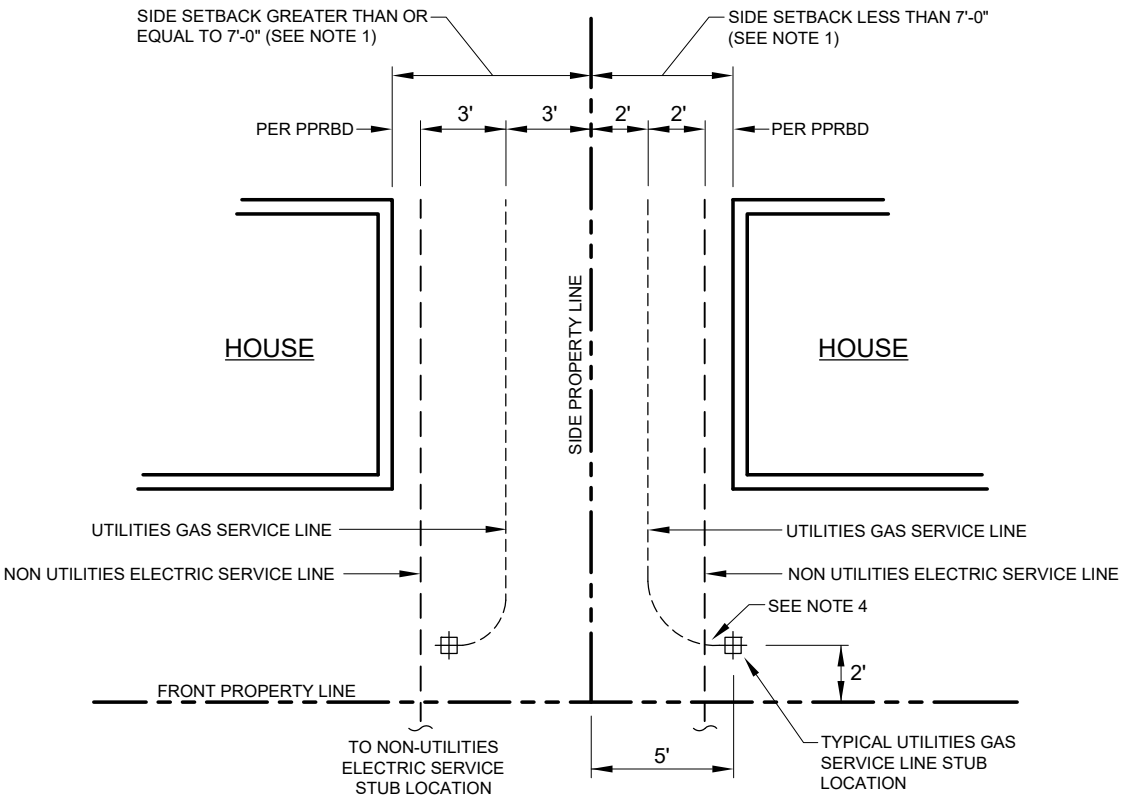
PREFERRED LOCATION — Electric meter location at front wall or front side wall at 1' minimum and 5' maximum from front corner of building.

NON-PREFERRED LOCATION — Electric meter alternate location (should be used only when a preferred location is not practical)

NOTES:

1. Preferred Utilities residential electric meter location is on the side of the structure and within 5 feet of the front corner of the structure, or on the front wall of the structure facing typical public access. It is preferred, but not mandatory, to have both the natural gas and electric meters located on the same side of the structure.
2. Utilities electric service line minimum 2'-6" horizontal separation from property lines, above or below ground structures, and/or other utilities, shall only be allowed where and when residential structures are built on less than a 6' foot setback from the side property line (distance of less than 6' feet between the side wall of the structure and the side property line). Side setbacks greater than or equal to 6 feet will require the typical 3'-0" horizontal separation. Separation clearances at the structure are measured from walls or projections such as foundations, window wells, etc.
3. The electric service wire may be able to pass by the window well as long as there is the required 12" clearance from the electric service wire to both the window well and the property line.
4. If electric and gas service lines ever need to cross each other, maintain 12" vertical separation between the crossing lines, and maintain 6" bedding sand above and below gas service line.

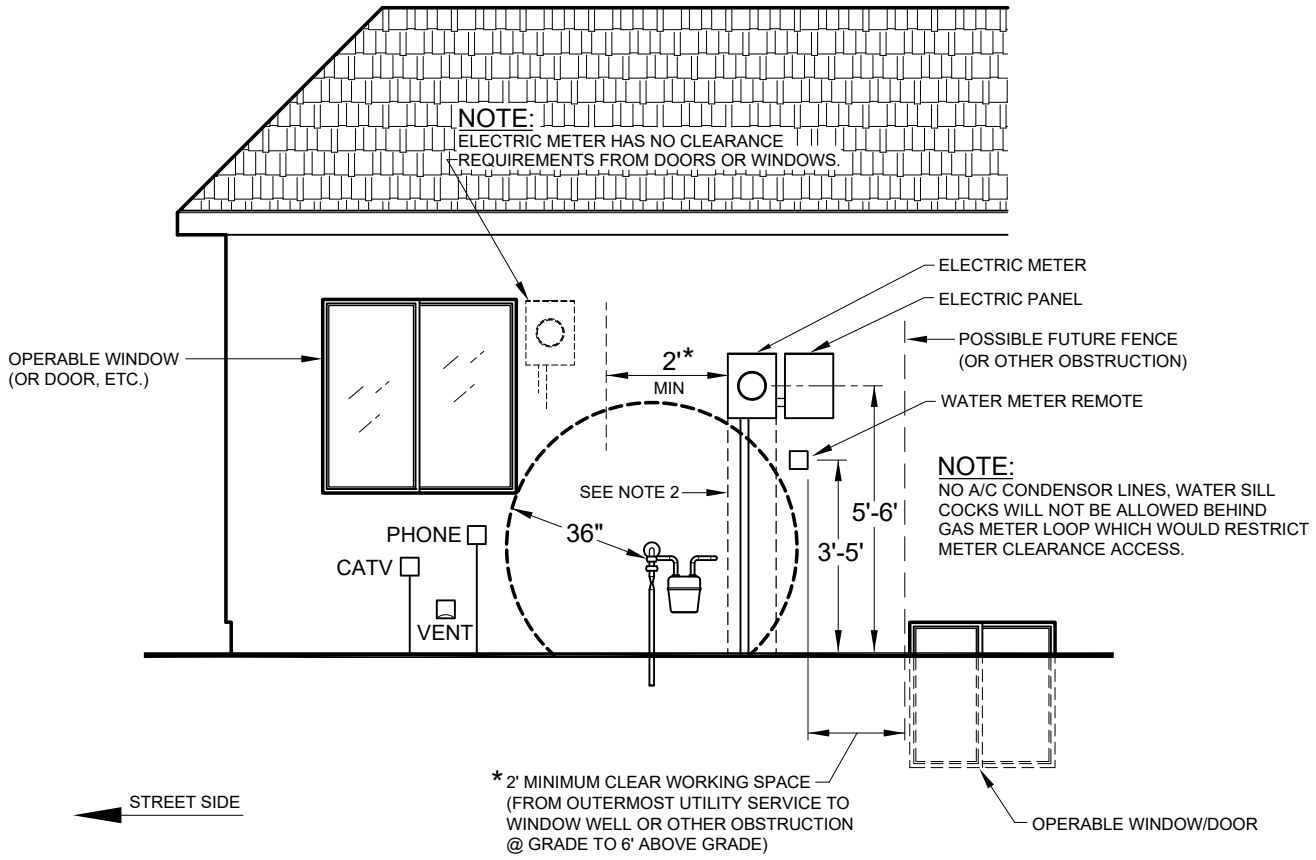
NON-UTILITIES OWNED ELECTRIC UTILITY LOT LAYOUT
(WHEN IN COLORADO SPRINGS UTILITIES NATURAL GAS TERRITORY)



NOTES:

1. For Non-Utilities service lines (electric or gas) being installed in separate trenches, maintain 3 feet minimum horizontal separation between service lines where the distance between side property line and building is 7 feet or greater. Where and when residential structures are built on a 7 feet or less setback from the side property line (distance of 7 feet or less between side wall of the structure and side property line), reduced clearances shall be allowed as shown in the figure above. For these reduced clearances, maintain 2 feet minimum horizontal separation between gas and electric (or other utility) service line conduit, 2 feet minimum horizontal clearance between gas service line and the building, and 2 feet minimum horizontal clearance between gas service line and the property line. The minimum horizontal separation from electric service line conduit and building and/or property line shall be per Pikes Peak Regional Building Department (PPRBD).
2. Non Utilities electric service wire shall be installed in a grey electrical rated conduit, which has a minimum diameter of 2" and be either schedule 40 or 80, in all areas where this electric service line has less than 3 feet of horizontal separation from the Utilities gas service line. This electric conduit shall be placed in the ditch and be ready to be inspected by Utilities personnel at the same time the gas service line has been scheduled for an inspection and tie-in, so that all clearances and the size and type of conduit can be verified, and its installation approved.
3. Licensed Utility Service Installer (LUSI) is responsible for sand padding 6" around the gas service line with 12" of spoil on top of the sand, before the tie-in and inspection personnel leaves the jobsite address.
4. If electric and gas service lines ever need to cross each other, maintain 12" vertical separation between the crossing lines, and maintain 6" bedding sand above and below gas service line.

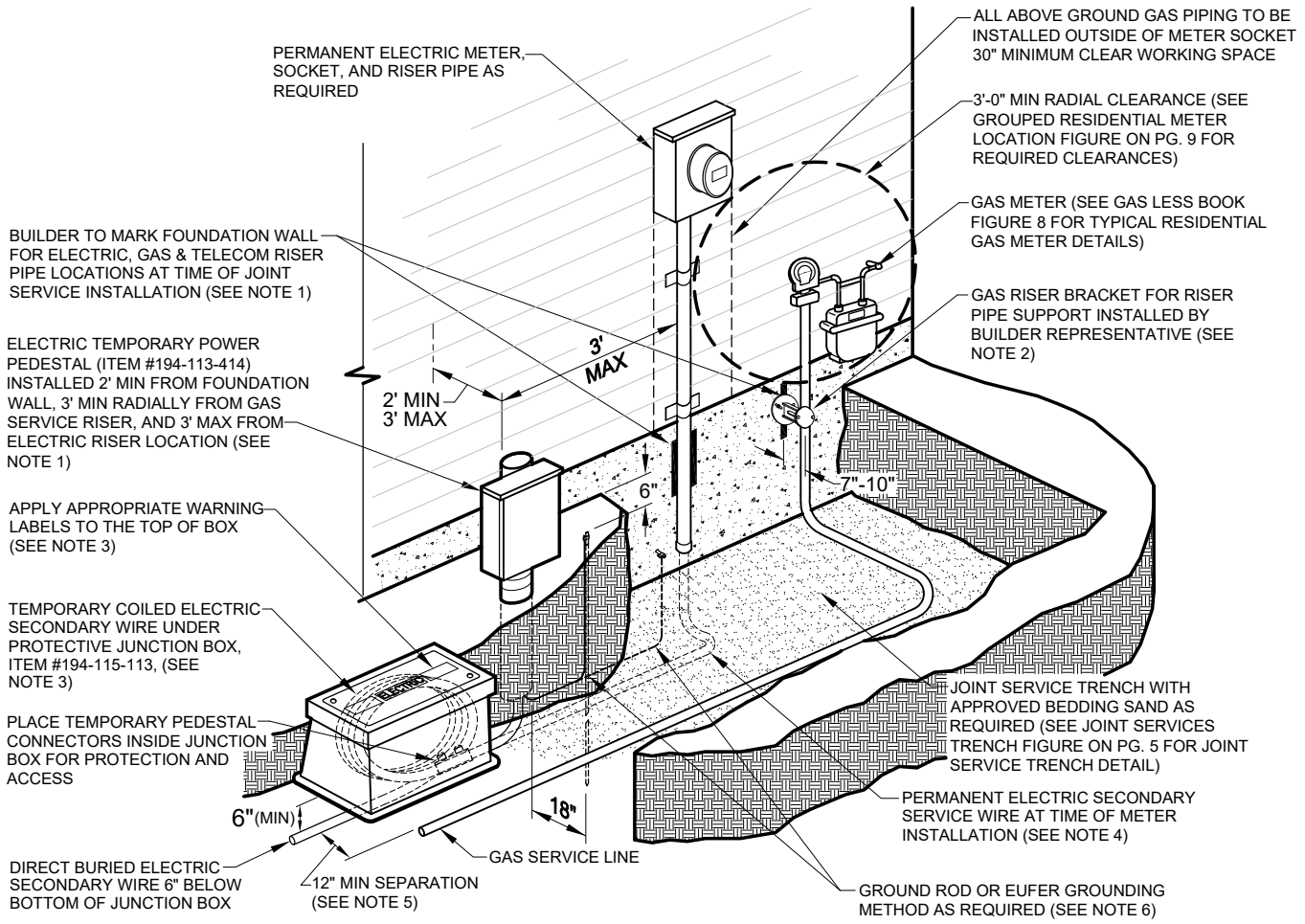
RESIDENTIAL GROUPED METER LOCATIONS
(GAS, ELECTRIC, & WATER REMOTE METERS)



GROUPED (ELECTRIC, GAS & WATER REMOTE) RESIDENTIAL METER LOCATION
SCALE: 1/4"=1'-0"

NOTES:
1. No vents, sump pump vents, water sill cocks, operable windows, doors, chimney, heat generating devices, sources of ignition (to include electric meter socket and panel), or other openings into the building allowed within 3 feet of the regulator vent hole (The service regulator vent hole is at the same height as the fuel gas piping inlet).
2. All above ground gas piping to be installed outside of meter socket 30" minimum clear working space.

RESIDENTIAL GROUPED METER LOCATIONS AT JOINT SERVICE INSTALLATION (GAS & ELECTRIC)



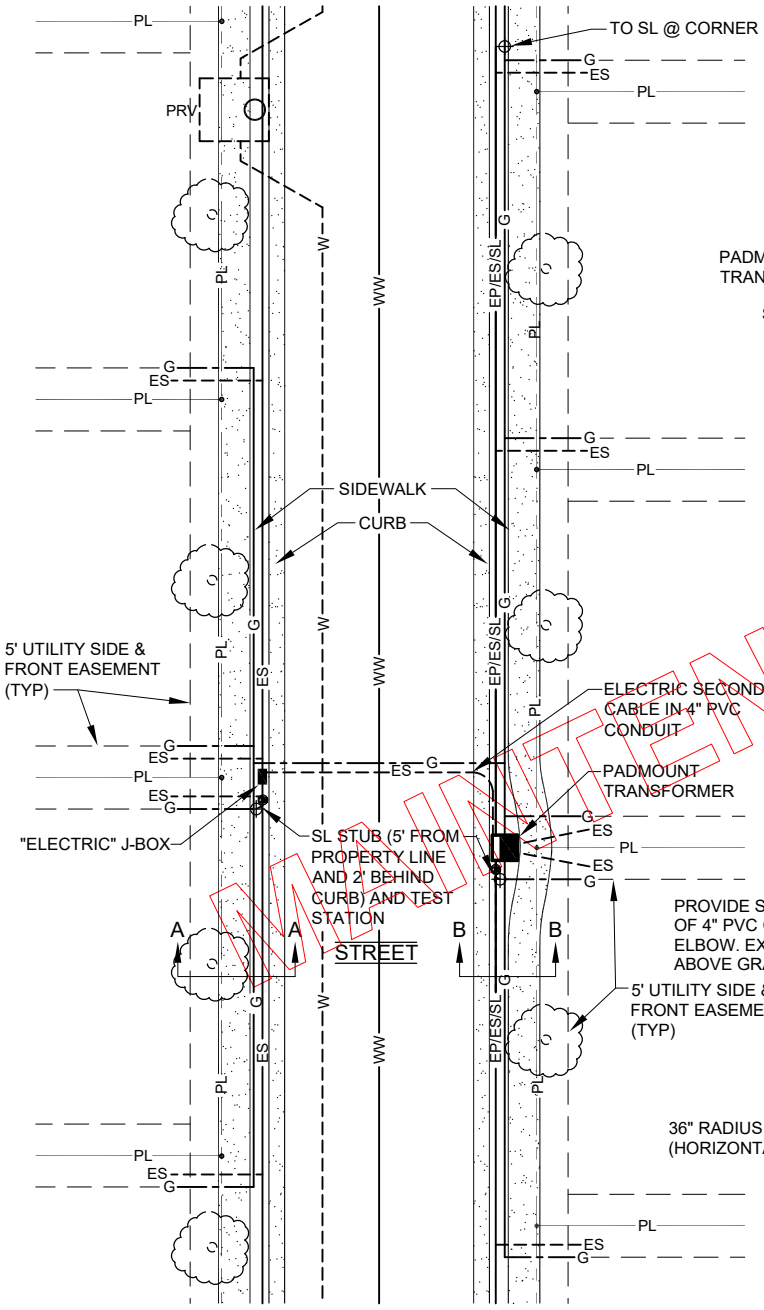
JOINT SERVICE TRENCH (ELECTRIC & GAS) RESIDENTIAL METER LOCATION
(INCLUDING TEMPORARY POWER PEDESTAL LOCATION DURING CONSTRUCTION)

NOTES:

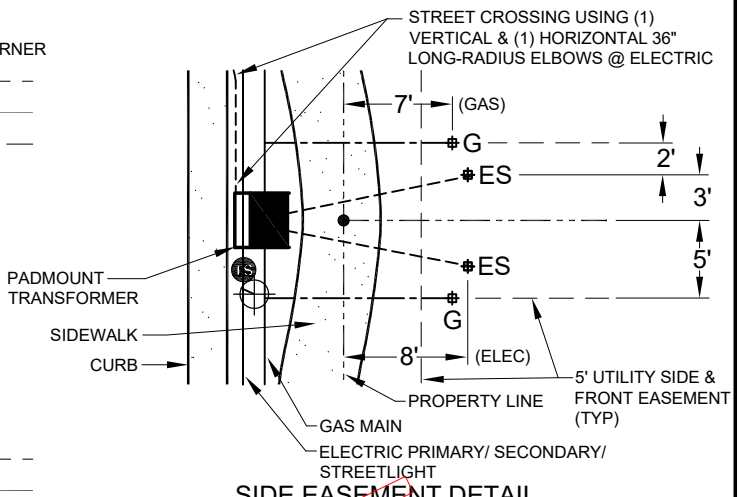
1. Joint Service trench to be installed at the foundation stage of the residence construction. As part of the trench installation, the electric temporary power pedestal is to be relocated from the property line to 3 feet (maximum) from the foundation wall of the residence. Install the gas service line in same trench. The builder is required to mark the foundation wall for the electric, gas and telecom riser pipe locations (use red for electric, yellow for gas, and orange for telecom). The electric temporary power pedestal shall be 3 feet minimum distance from the gas riser pipe location, and 3' maximum distance from the electric riser location. See DCS 8-6 for temporary power pedestal details.
2. Builder's representative to install gas riser support bracket to foundation wall and connect to gas riser pipe at time of riser pipe installation. Use 1-1/2" to 2" long anchors set with a powder actuated tool to attach bracket to foundation wall (refer to manufacturer's instructions for proper load size). See Gas Line Extension & Service Standards Book, Table 7 for riser bracket and riser pipe approved manufacturers.
3. Coil 15-20 feet of extra secondary electric wire vertically in a 24" minimum diameter loop and store below grade under a protective junction box. Keep box and loop close to the temporary power pedestal and 12" minimum distance from the gas service line. At time of permanent electric meter installation, remove temporary power pedestal and terminate coiled wire into permanent meter socket after passing required electric inspection. Apply warning labels to the top of the protective box, Item Number 194-113-417 (english), and Item Number 194-113-418 (spanish). See DCS 8-4 for protective box details.
4. Provide 6" cable slack at bottom of electric riser for possible future grade settling.
5. Maintain 12" minimum clearance at all times between the gas and electric service lines.
6. Effectively ground temporary power pedestal utilizing either a ground rod or Eufer grounding method as required. See Electric Line Extension & Service Standards Book, Appendix D, Drawing 16 & 17 for typical grounding requirements. Ground rod to be 18" from pedestal base and 6" minimum below grade.
7. Stub a Utilities Fiber Optic Conduit at the base of the foundation and cap the conduit.

JOINT TRENCH - FRONT LOT LAYOUT WITH DETACHED SIDEWALKS AND TREES BEHIND SIDEWALK

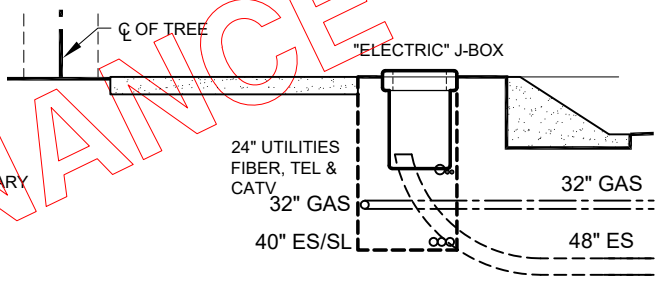
(THIS LAYOUT ACCOUNTS FOR 6' SEPARATION FROM ELECTRIC AND GAS LINES TO TREES)
(50' R.O.W. AND 5' SIDEWALKS)



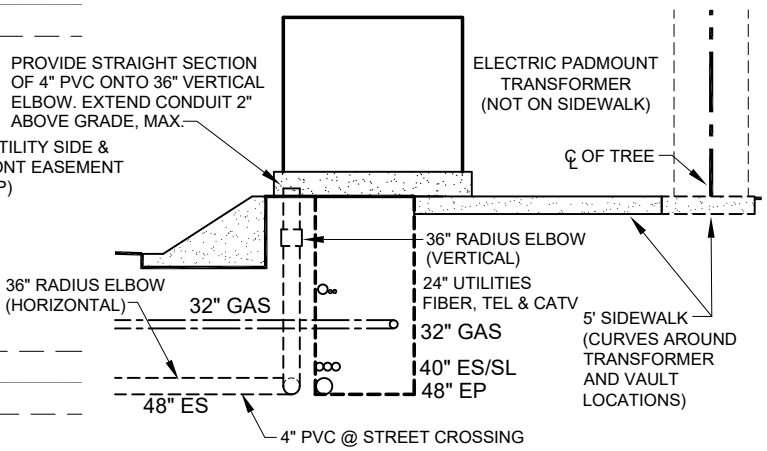
FRONT LOT LAYOUT PLAN VIEW



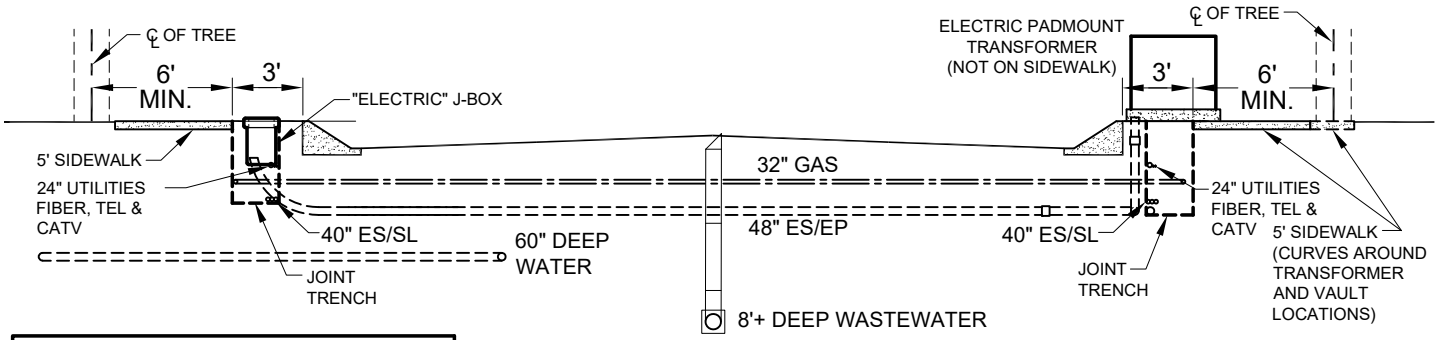
SIDE EASEMENT DETAIL



STUBS TRENCH PROFILE @ J-BOX (A-A)



MAIN TRENCH PROFILE @ TRANSFORMER (B-B)



LEGEND	
EP= ELECTRIC PRIMARY	G= GAS
ES= ELECTRIC SECONDARY	W= WATER
SL= ELECTRIC STREETLIGHT	WW= WASTEWATER
PL= PROPERTY LINE	

TRENCH PROFILE & STREET CROSSING VIEW

(50' R.O.W. AND 5' SIDEWALKS)

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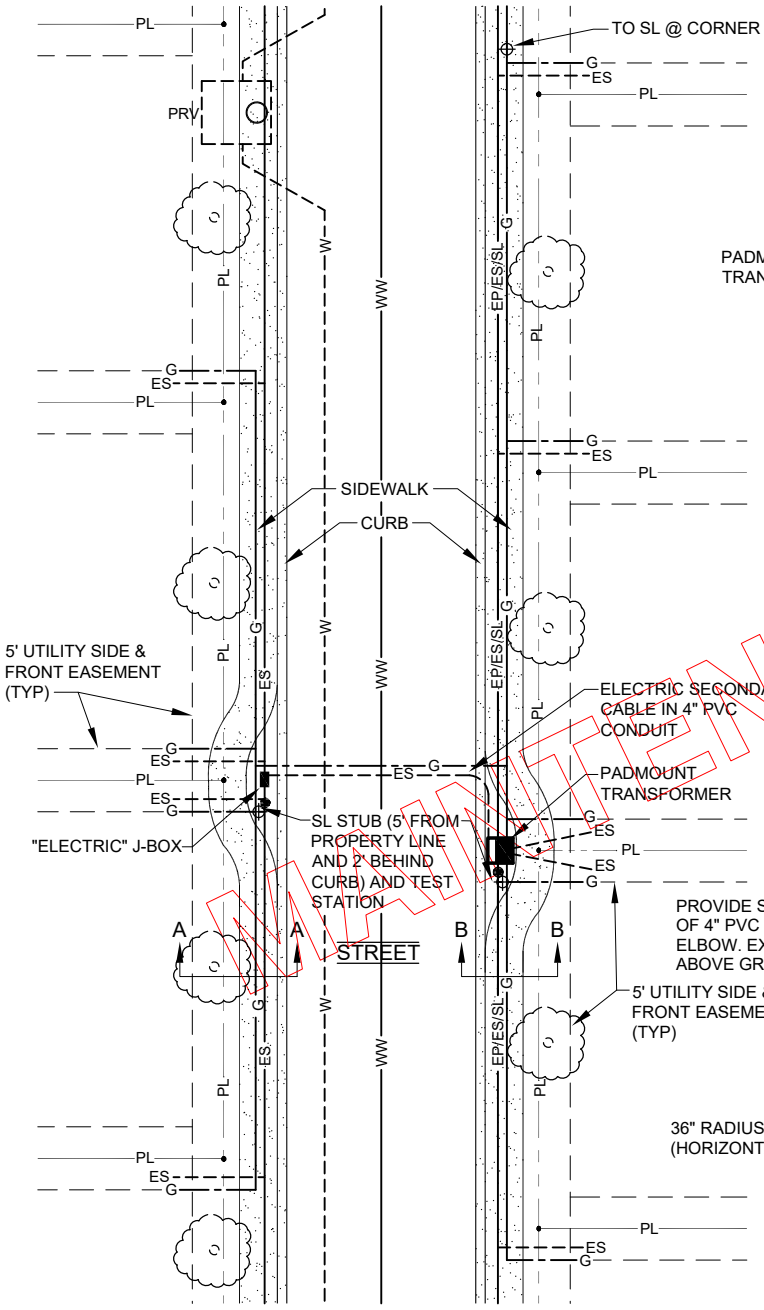
ELECTRIC DISTRIBUTION CONSTRUCTION STANDARDS

APPROVED AS OF: 10-21-2020	UG LAYOUTS: RESIDENTIAL JOINT TRENCH AND TOWNHOMES	19-8	PG. 11/19

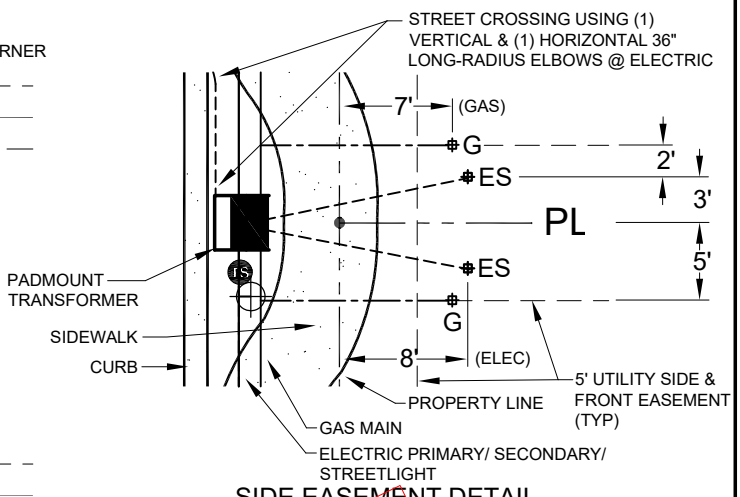
T02–01626

JOINT TRENCH - FRONT LOT LAYOUT WITH ATTACHED SIDEWALKS AND TREES BEHIND SIDEWALK

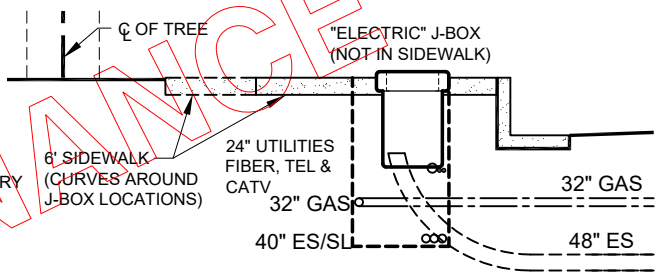
(THIS LAYOUT ACCOUNTS FOR 6' SEPARATION FROM ELECTRIC AND GAS LINES TO TREES)
(50' R.O.W. AND 6' SIDEWALKS)



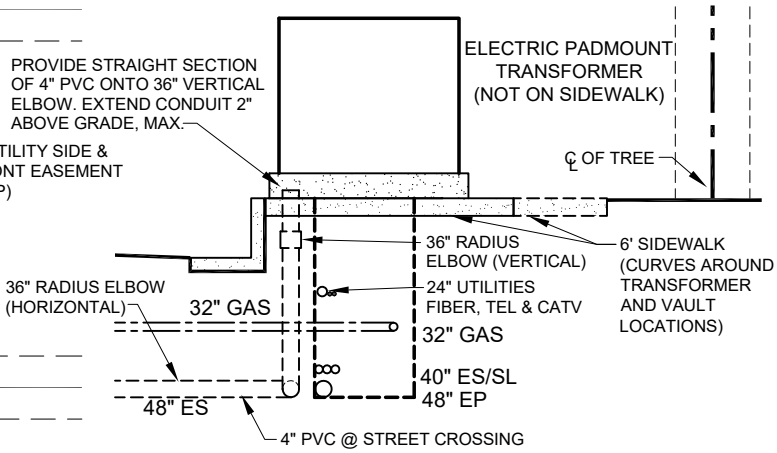
FRONT LOT LAYOUT PLAN VIEW



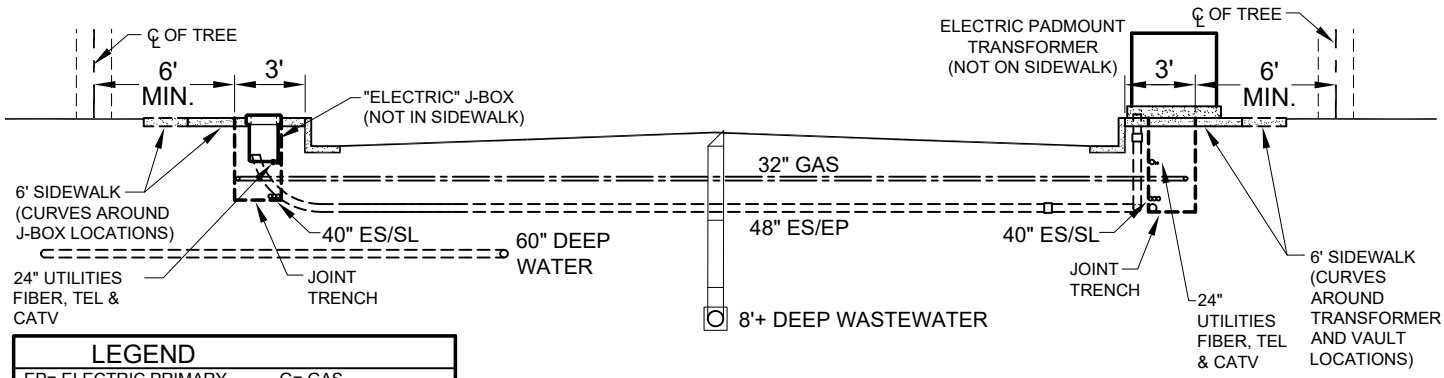
SIDE EASEMENT DETAIL



STUBS TRENCH PROFILE @ J-BOX (A-A)



MAIN TRENCH PROFILE @ TRANSFORMER (B-B)



TRENCH PROFILE & STREET CROSSING VIEW

(50' R.O.W. AND 6' SIDEWALKS)

LEGEND	
EP= ELECTRIC PRIMARY	G= GAS
ES= ELECTRIC SECONDARY	W= WATER
SL= ELECTRIC STREETLIGHT	WW= WASTEWATER
PL= PROPERTY LINE	

ELECTRIC DISTRIBUTION CONSTRUCTION STANDARDS

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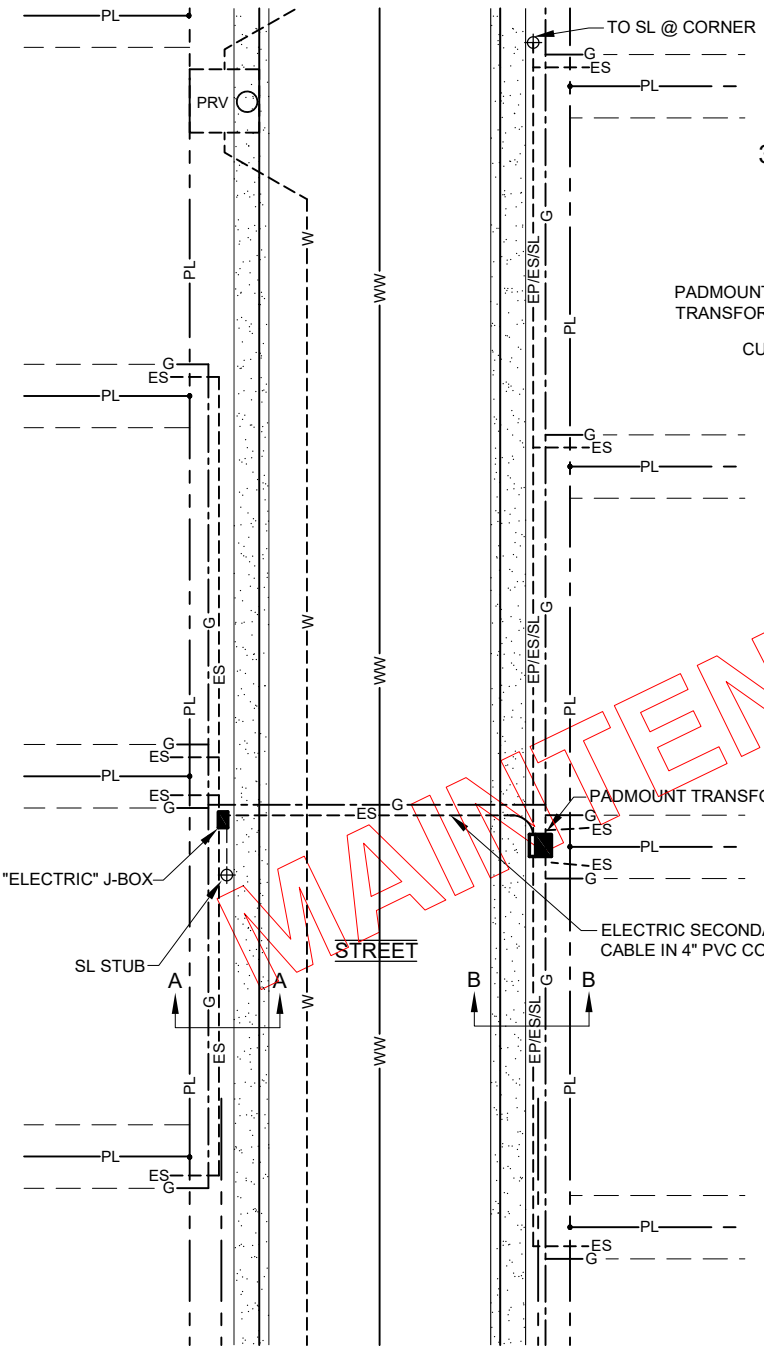
APPROVED AS OF:	UG LAYOUTS: RESIDENTIAL JOINT TRENCH AND TOWNHOMES		
10-21-2020		19-8	PG. 12/19

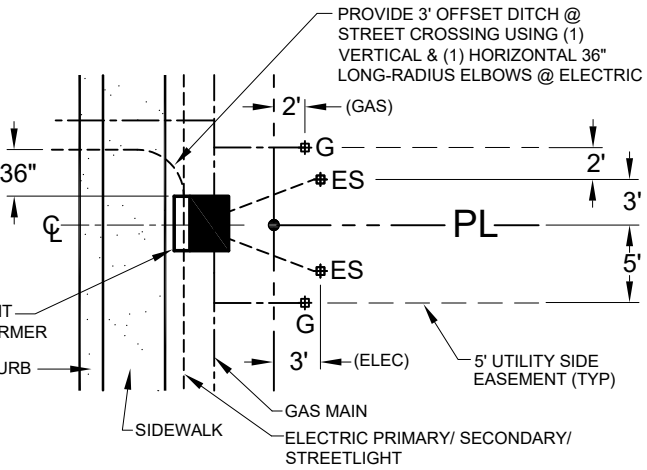
T02–01626

JOINT TRENCH - FRONT LOT LAYOUT WITH ATTACHED SIDEWALKS

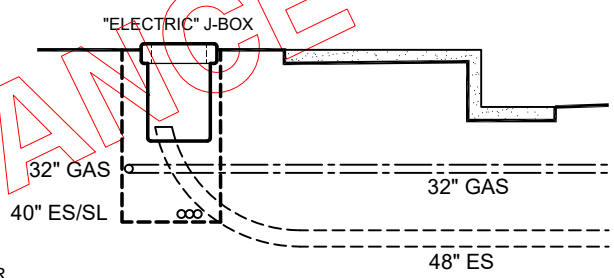
(THIS LAYOUT DOES NOT ACCOUNT FOR 6' SEPERATION FROM ELECTRIC AND GAS LINES TO TREES)
(60' R.O.W. AND 4' SIDEWALKS)



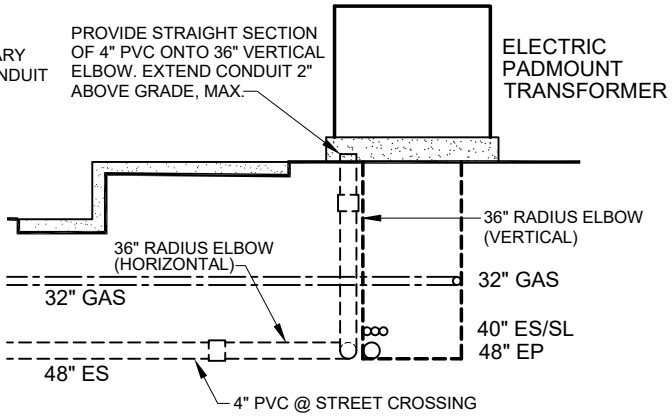
FRONT LOT LAYOUT PLAN VIEW



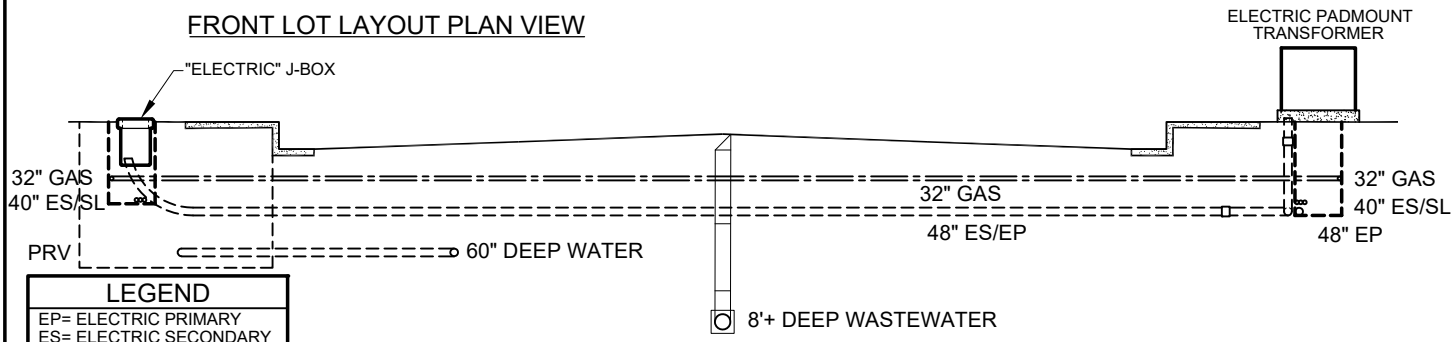
SIDE EASEMENT DETAIL



STUBS TRENCH PROFILE @ J-BOX (A-A)



MAIN TRENCH PROFILE @ TRANSFORMER (B-B)



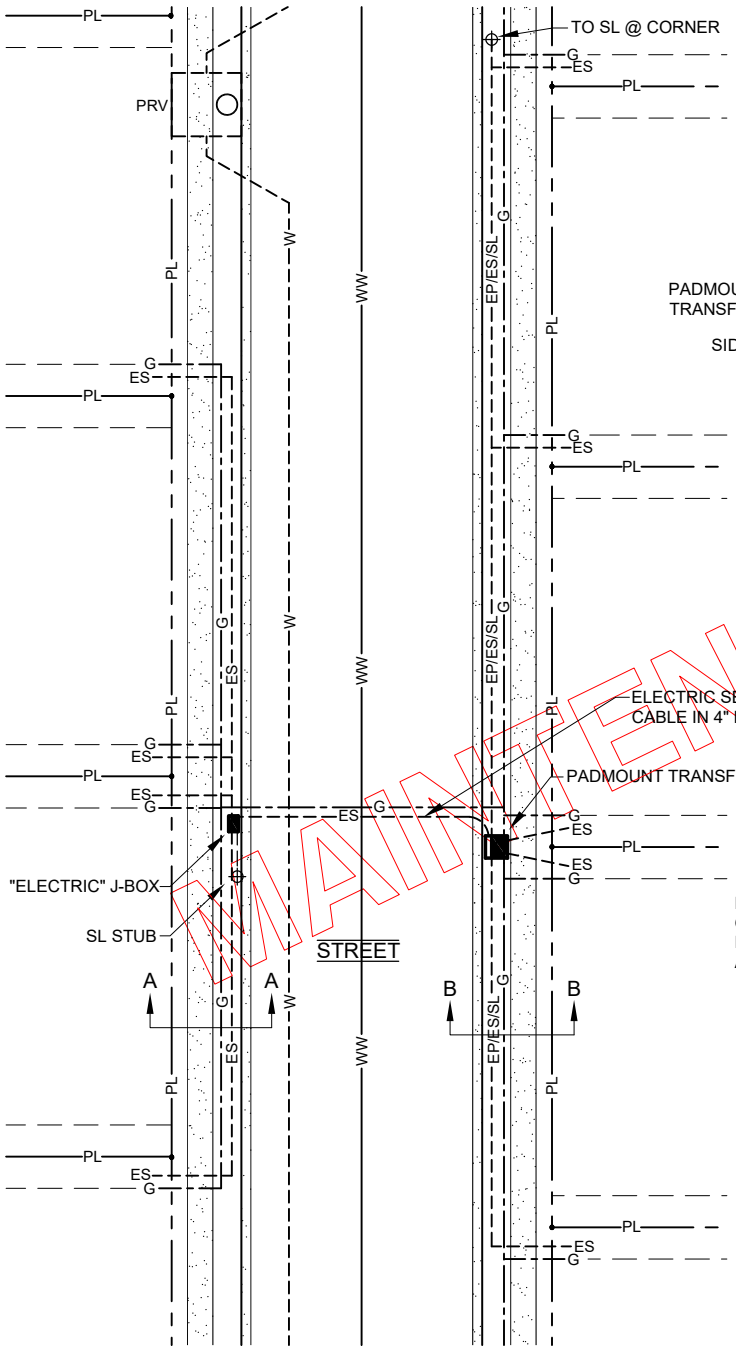
TRENCH PROFILE & STREET CROSSING VIEW

(60' R.O.W. AND 4' SIDEWALKS)

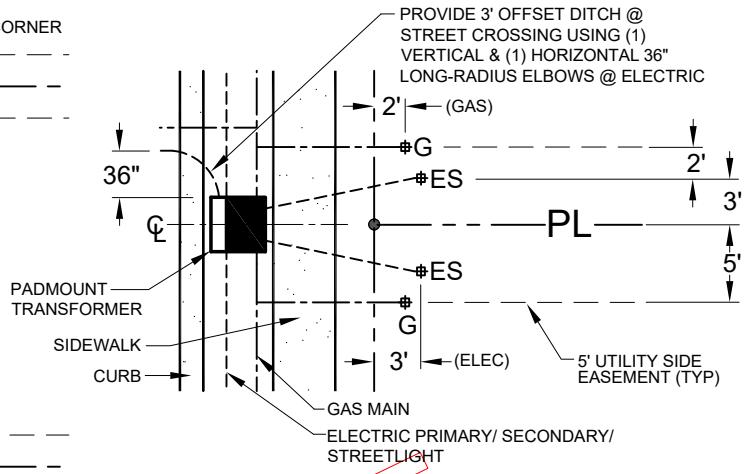
LEGEND
EP= ELECTRIC PRIMARY
ES= ELECTRIC SECONDARY
SL= ELECTRIC STREETLIGHT
G= GAS
W= WATER
WW= WASTEWATER
PL= PROPERTY LINE

JOINT TRENCH - FRONT LOT LAYOUT WITH DETACHED SIDEWALKS

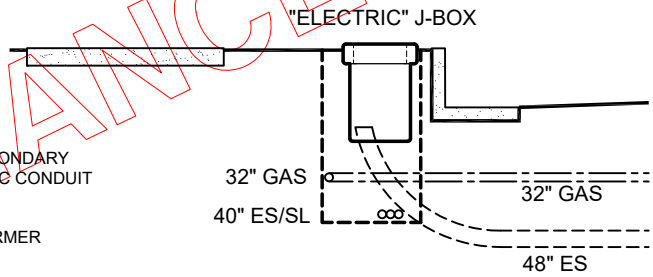
(THIS LAYOUT DOES NOT ACCOUNT FOR 6' SEPERATION FROM ELECTRIC AND GAS LINES TO TREES)
(60' R.O.W. AND 4' SIDEWALKS)



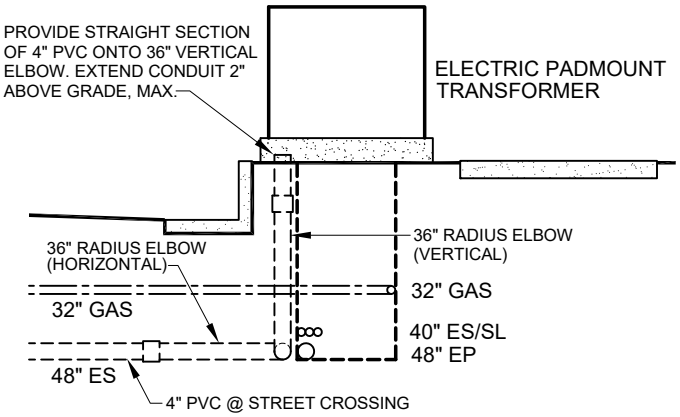
FRONT LOT LAYOUT PLAN VIEW



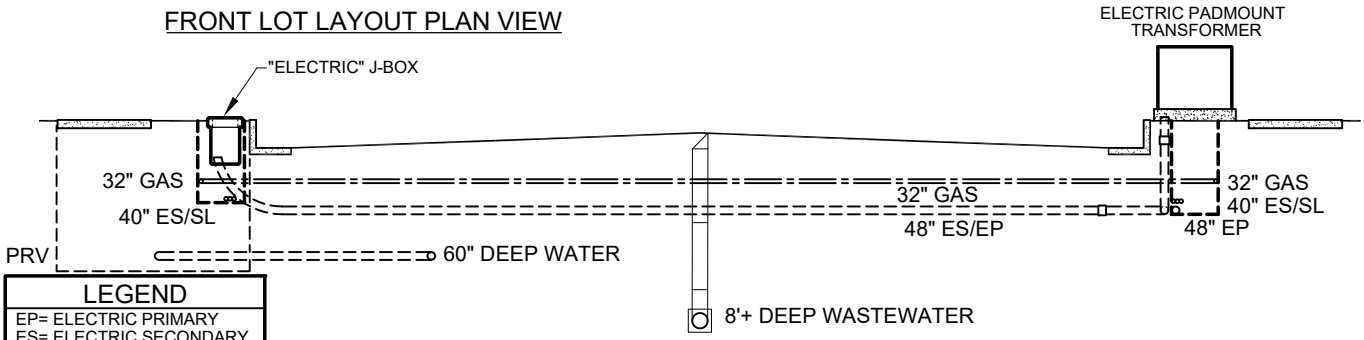
SIDE EASEMENT DETAIL



STUBS TRENCH PROFILE @ J-BOX



MAIN TRENCH PROFILE @ TRANSFORMER



TRENCH PROFILE & STREET CROSSING VIEW
(60' R.O.W. AND 4' SIDEWALKS)

LEGEND
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ELECTRIC DISTRIBUTION CONSTRUCTION STANDARDS

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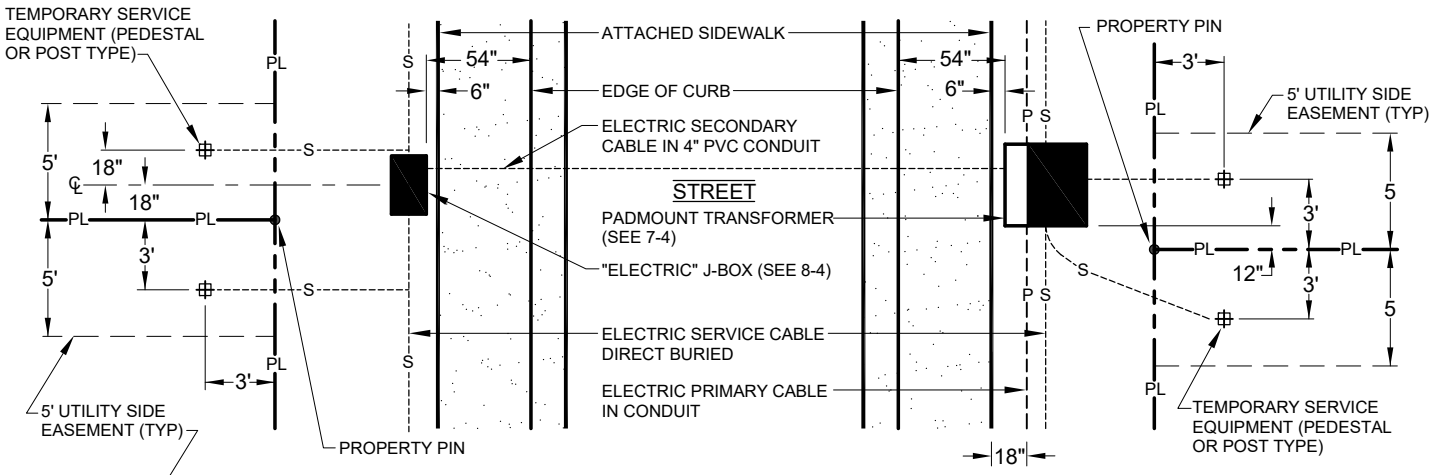
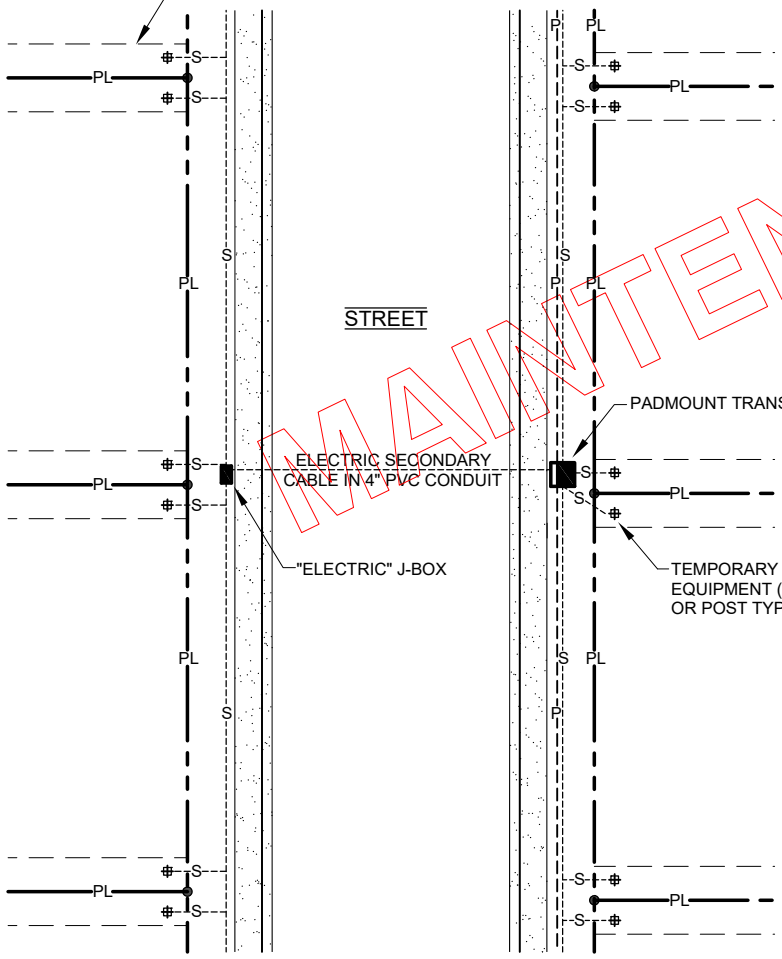
APPROVED AS OF: 10-22-2019	UG LAYOUTS: RESIDENTIAL JOINT TRENCH AND TOWNHOMES	19-8	PG. 14/19

T02–01626

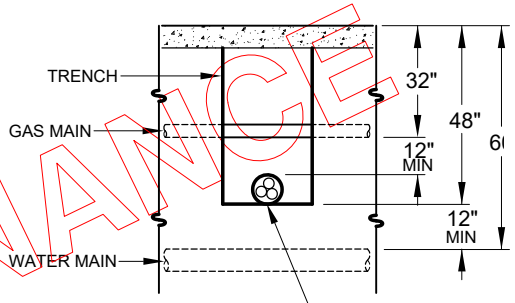
ELECTRIC ONLY - FRONT LOT LAYOUT WITH ATTACHED SIDEWALKS

(60' R.O.W. AND 4' SIDEWALKS)

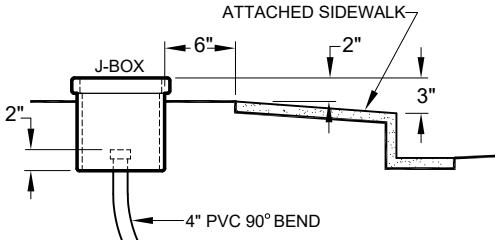




8-LOT PLAN VIEW



STREET CROSSING TRENCH DETAIL



J-BOX PLACEMENT DETAIL

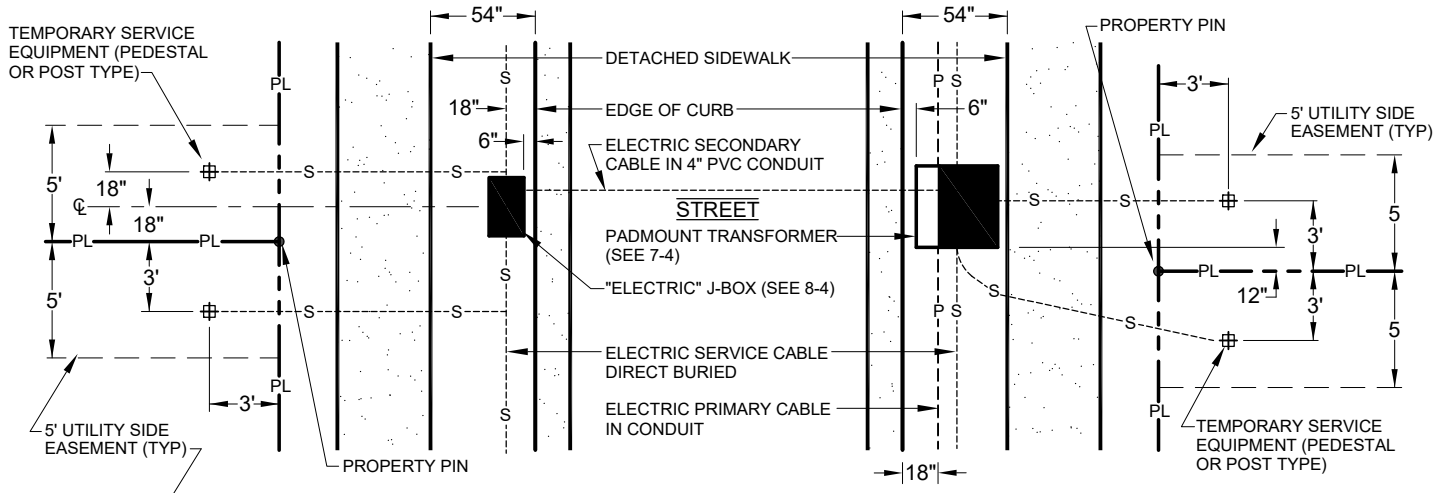
LEGEND	
PL — PL	PROPERTY LINE
S — S	ELECTRIC SERVICE CABLES
P — P	PRIMARY CABLE
	TEMPORATRY SERVICE EQUIPMENT
	PROPERTY PIN

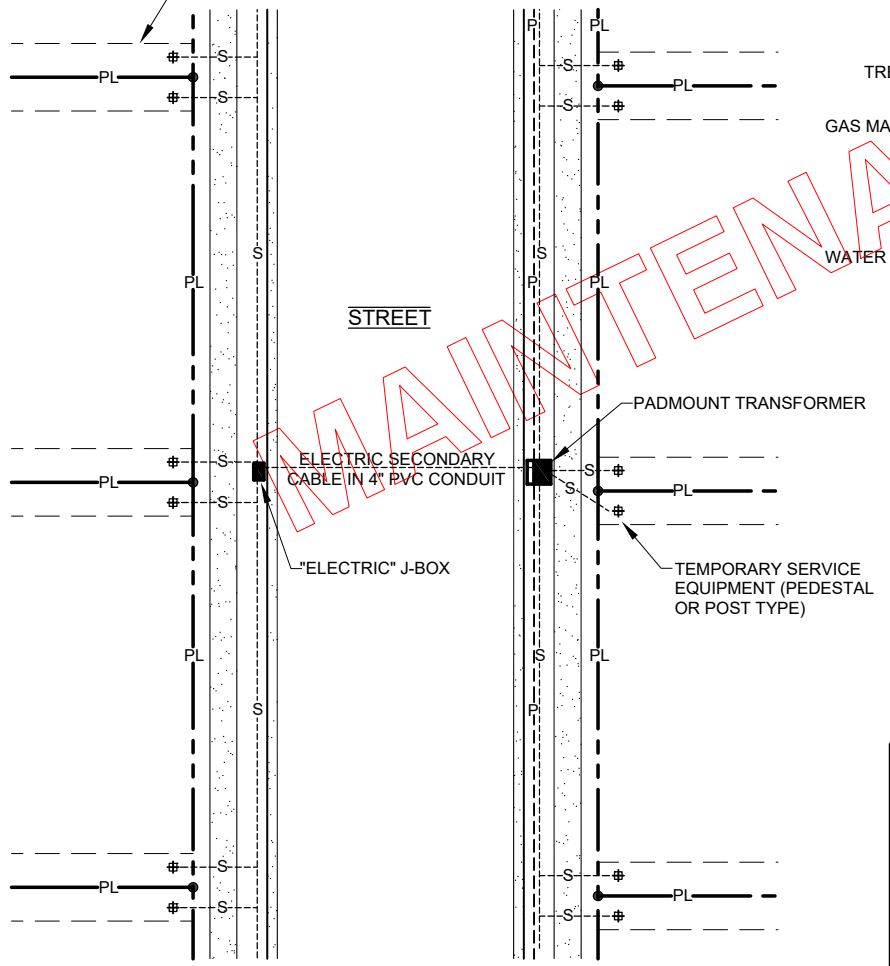
NOTES:

1. All electric service cables to be direct buried from the transformer to each lot, to a point typically 3' past front lot line & 3' from side lot line. Avoid service wire crossing private property of any lot other than the one served.
2. Service cable end to be connected to temporary service equipment (pedestal or post type- see 8-6), left energized & locked. Keep temporary service equipment at least 1' within easement & off private property.
3. Service cable to be #1/0, #4/0, or 350 kcmil aluminum (2 conductor concentric neutral or triplex) as specified on the job print.

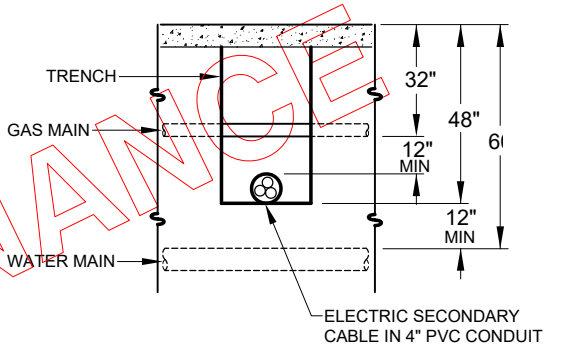
ELECTRIC ONLY - FRONT LOT LAYOUT WITH DETACHED SIDEWALKS

(60' R.O.W. AND 4' SIDEWALKS)

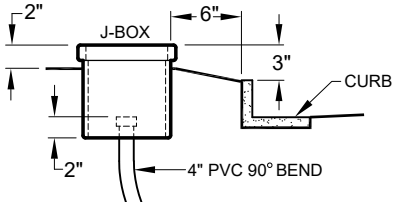




8-LOT PLAN VIEW



STREET CROSSING TRENCH DETAIL



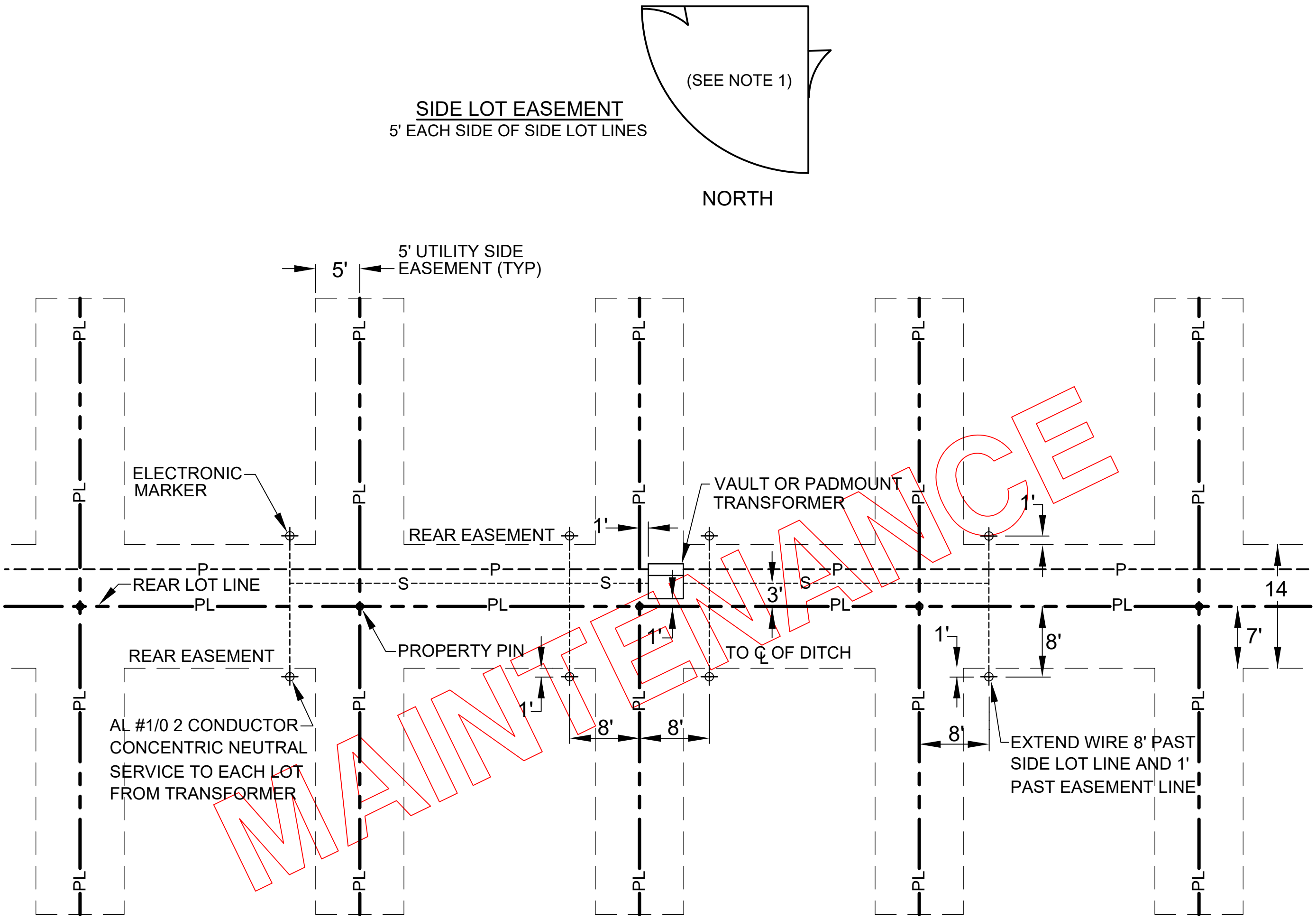
J-BOX PLACEMENT DETAIL

LEGEND	
PL PL	PROPERTY LINE
S S	ELECTRIC SERVICE CABLES
P P	PRIMARY CABLE
	TEMPORATRY SERVICE EQUIPMENT
	PROPERTY PIN

NOTES:

1. All electric service cables to be direct buried from the transformer to each lot, to a point typically 3' past front lot line & 3' from side lot line. Avoid service wire crossing private property of any lot other than the one served.
2. Service cable end to be connected to temporary service equipment (pedestal or post type- see 8-6), left energized & locked. Keep temporary service equipment at least 1' within easement & off private property.
3. Service cable to be #1/0, #4/0, or 350 kcmil aluminum (2 conductor concentric neutral or triplex) as specified on the job print.

REAR LOT LAYOUT
(MAINTENANCE ITEM- NOT FOR NEW INSTALLATION)

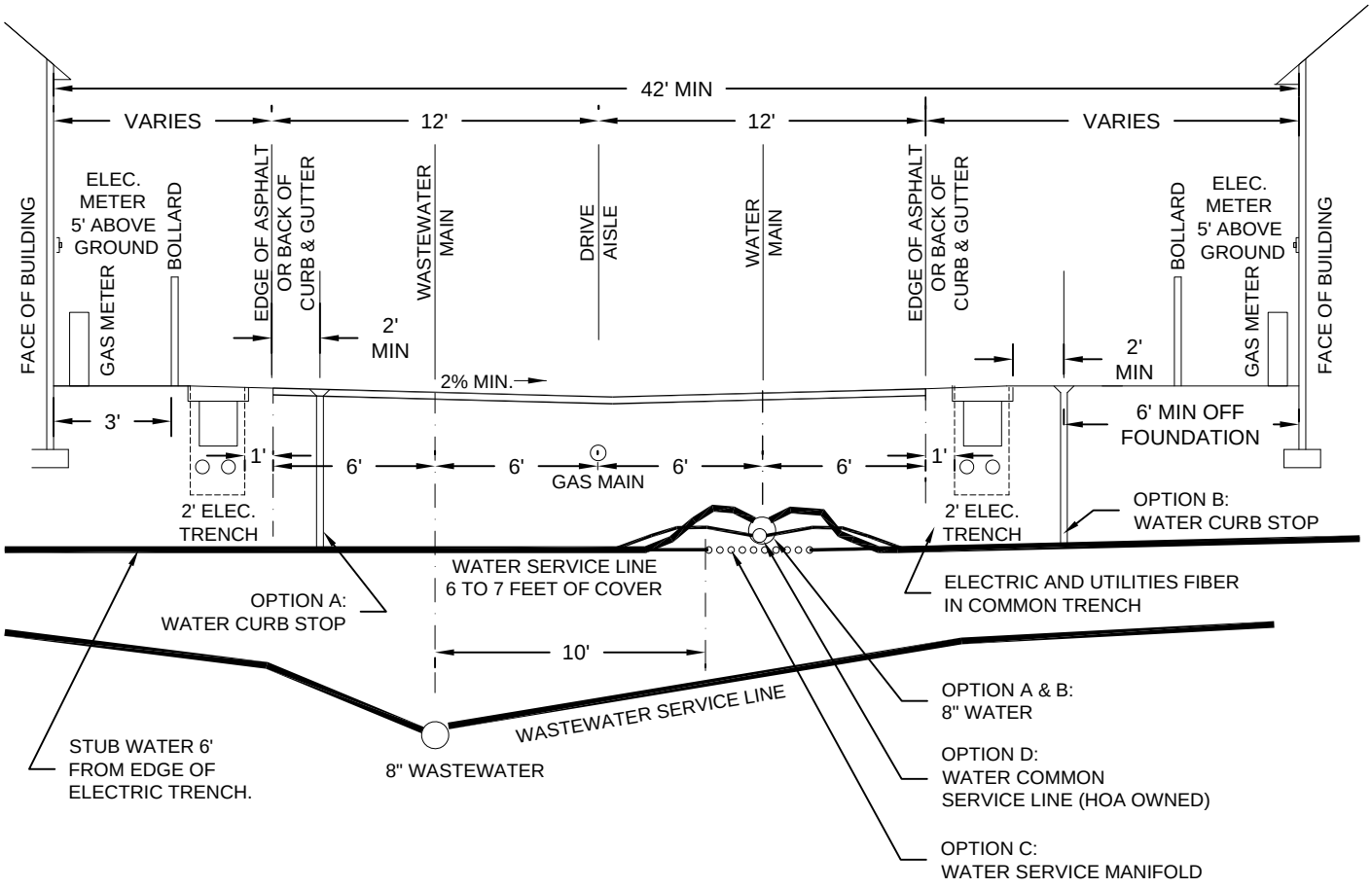


LEGEND	
—PL——PL—	PROPERTY LINE
---S------S---	ELECTRIC SERVICE CABLES
– –P– – –P– –	PRIMARY CABLE
⌖	ELECTRONIC MARKER
•	PROPERTY PIN

NOTES:

1. Primary and secondary to be located in south and east portions of all easements of rear lot line construction.
2. All secondary services to be direct buried from the transformer to each lot to a point 8' from rear lot line and 8' from side lot line.
3. Service cable ending to be sealed, left energized and marked with an electronic marker 30" deep.
4. Service cable to be #1/0 aluminum 2 conductor concentric neutral in gas-heat subdivision.
5. Electric heat subdivisions' wire size to be specified on job prints.
6. Front lot line construction is the preferred standard for all new work. This shows detail of older construction methods.

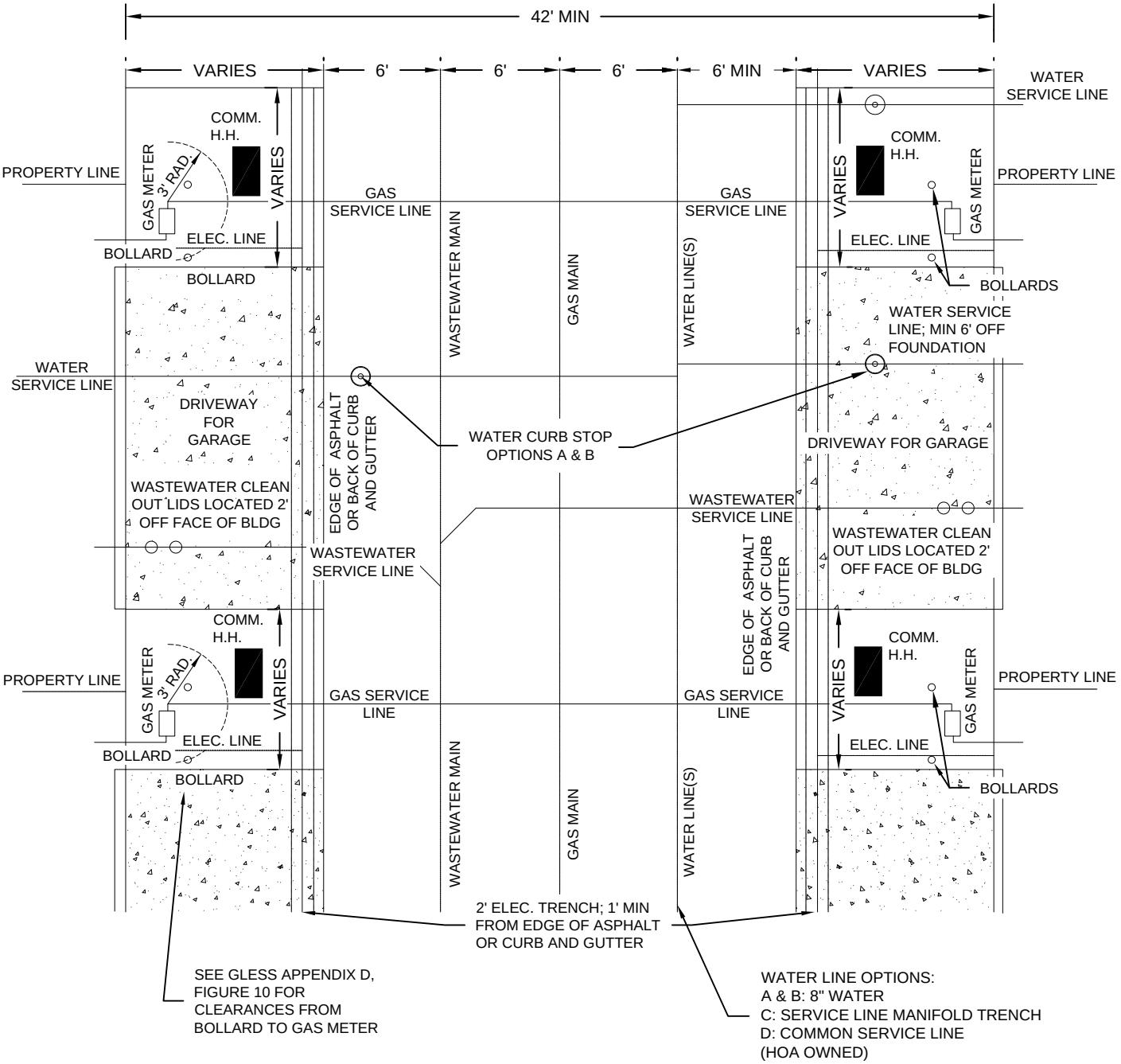
DESIGN GUIDELINES FOR UTILITY CROSS
SECTION FOR A TOWNHOUSE PUD



NOTES:
THE DRIVE AISLE RESTRICTIONS:

1. NO STORM DRAIN FACILITIES
2. NO SIDEWALKS
3. NO STREET LIGHTS
4. NO PARKING
5. NO EDIFICE (BUILDING) PROJECTIONS IN THE UTILITY EASEMENT, (I.E. DECKS) WITH THE EXCEPTION FOR THE ROOF SOFFIT.
6. SEE EDCS 18-304 OR ELESS APPENDIX F, 18-304 FOR CLEARANCES FROM BUILDINGS AND OTHER UTILITIES.
7. SEE WLESS BOOK FOR DRAWINGS A3-12 TO A3-19 FOR CURB STOP LOCATIONS OPTIONS A THROUGH D.

TYPICAL DESIGN FOR SERVICES FOR A TOWNHOUSE PUD

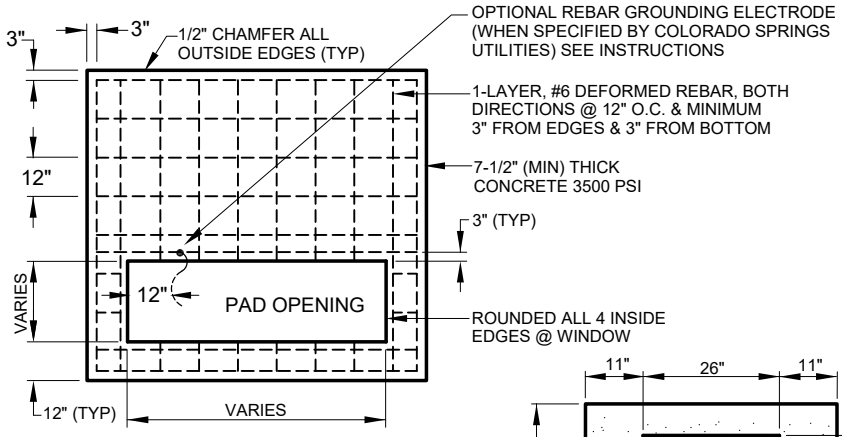


REQUIREMENTS FOR POURED IN PLACE CONCRETE PADS

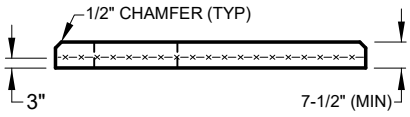
1. Concrete shall be T&D Underground Mix #2. Refer to concrete mix in Electric Distribution Construction Standard 11-1 page 5: minimum compressive strength 3500 psi @ 28 days.
2. To prevent any sharp edges, pad opening edges shall be rounded. Top surface shall be smooth and level in all directions so that installed equipment is evenly supported and cabinet security is maintained; chamfer top surface at all four sides to avoid cracking edges.
3. Reinforcement shall be #6 rebar, as specified below in the detailed drawing.
4. All forms used in placing concrete shall be sufficiently designed and braced to maintain alignment.
5. The Utility Inspector shall approve pad construction at these phases:
   a) After primary and secondary duct placement and after trench backfill and pad site compaction is complete (compaction tests approved).
   b) After placement of poured-in-place pad forms and reinforcing steel but prior to concrete pour.
   c) After pad is finished.

POURED-IN-PLACE CONSTRUCTION DETAILS

NOTE: IF POURED BELOW FREEZING TEMPERATURES, DO NOT USE CALCIUM CHLORIDE, AND COVER WITH THERMAL BLANKETS AS NECESSARY FOR PROPER CONCRETE SETUP.



PLAN VIEW

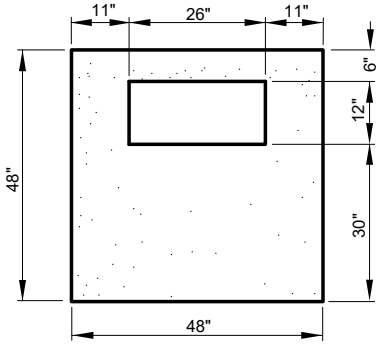


RIGHT SIDE VIEW

REBAR GROUNDING ELECTRODE INSTALLATION INSTRUCTIONS

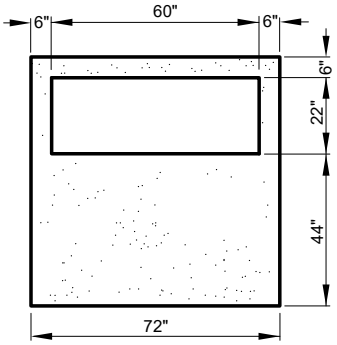
USING A SUITABLY SIZED COMPRESSION CONNECTOR (OR BRONZE SPLIT-BOLT CONNECTOR), BOND EXPOSED END OF A 10' LENGTH OF 600 VOLT (GREEN OR BLACK WITH GREEN TAPE) INSULATED #6 COPPER (MIN) TO ONE REBAR.

INSULATE THE EXPOSED COPPER AND CONNECTOR WITH MASTIC TAPE OVERLAPPING THE REBAR I" ON BOTH SIDES. ROUTE INSULATED LENGTH UNDER FORM AND COIL INSIDE PAD OPENING.



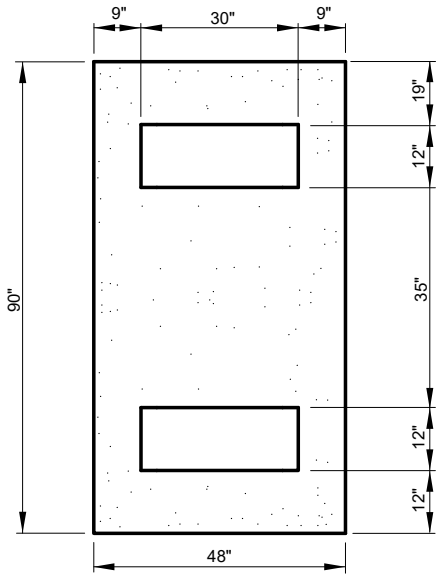
48" x 48"

SUPPORT FOUNDATION FOR 1 PHASE TRANSFORMERS (7.2 & 19.9KV) MVI, MCLF & JUNCTION PADS
(PRECAST ITEM NUMBER 194-115-108/ WEIGHT CAPACITY= 9,595 LBS)



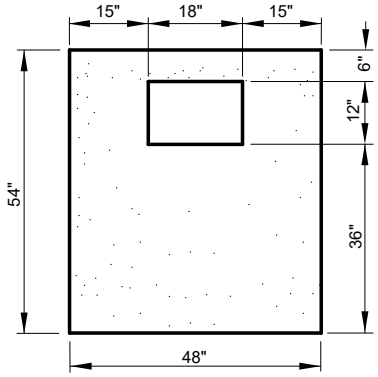
72" x 72"

SUPPORT FOUNDATION FOR 3 PHASE TRANSFORMERS
12.5KV (208 & 480V), 45-2500 KVA
(PRECAST ITEM NUMBER 194-115-102/ WEIGHT CAPACITY= 14,073 LBS)



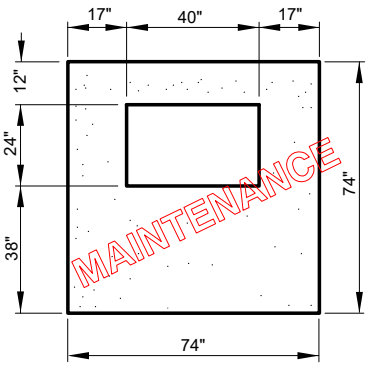
48" x 90"

SUPPORT FOUNDATION FOR 3 PHASE FUSED SWITCHES, 12.5KV (T32 & T301)
(PRECAST ITEM NUMBER 194-115-112)



48" x 54"

SUPPORT FOUNDATION FOR 1 PHASE FUSED SWITCHES, 12.5KV (T701) & 34.5KV (T153)
(PRECAST ITEM NUMBER 194-115-110)



74" x 74"

SUPPORT FOUNDATION FOR 3 PHASE RECLOSERS, 12.5KV TYPE-25
(PRECAST ITEM NUMBER 194-115-101)

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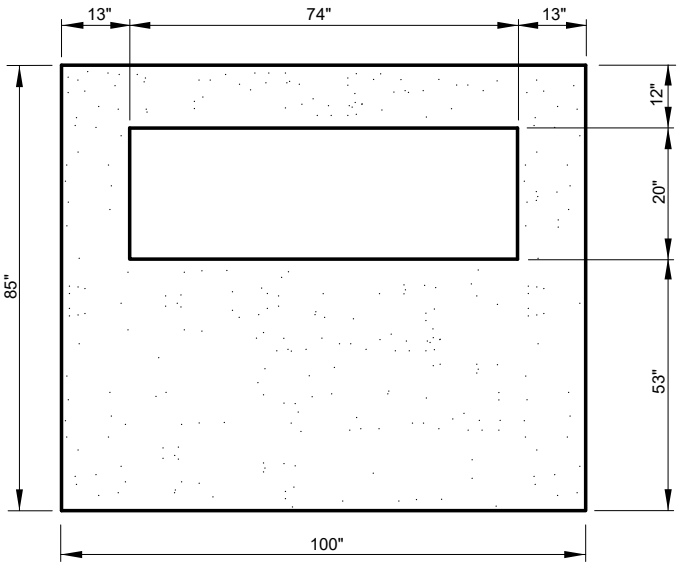
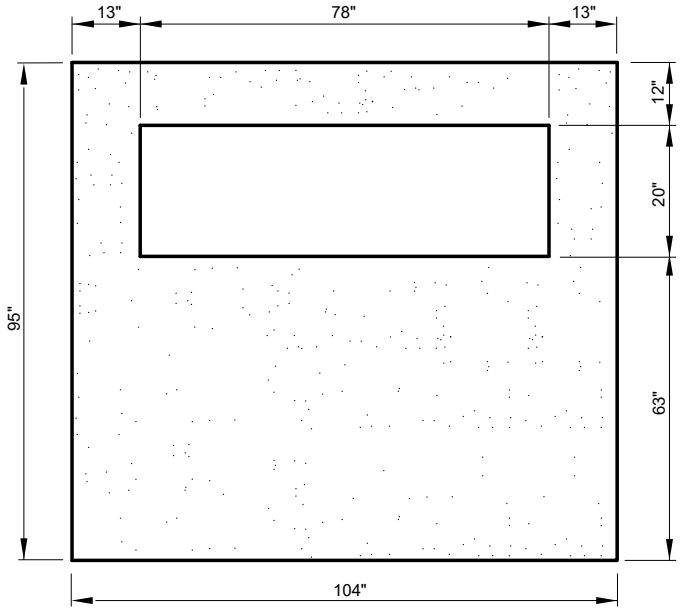
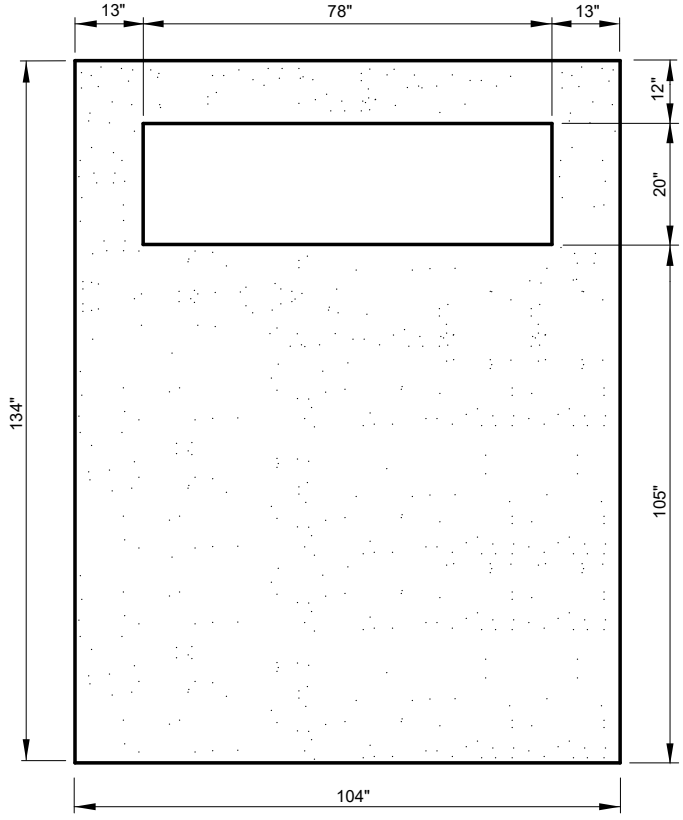


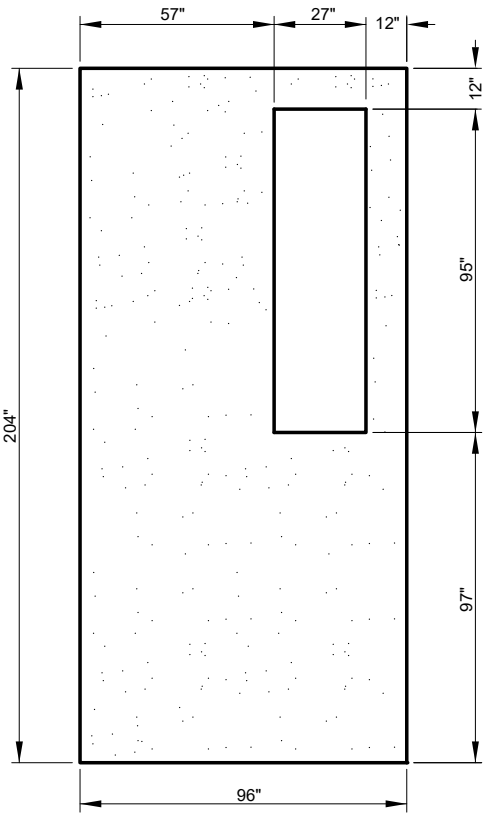
85" x 100"
SUPPORT FOUNDATION FOR SMALL 3 PHASE
INDUSTRIAL TRANSFORMERS
34.5KV, (208 & 480V), 75-500 KVA
(PRECAST ITEM NUMBER 194-115-128/
WEIGHT CAPACITY= 18,504 LBS)



95" x 104"
SUPPORT FOUNDATION FOR MEDIUM 3 PHASE
INDUSTRIAL TRANSFORMERS
34.5KV, (208 & 480V), 750-1500 KVA
12.5KV, (2400V), 1000-2500 KVA
(PRECAST ITEM NUMBER 194-115-131)

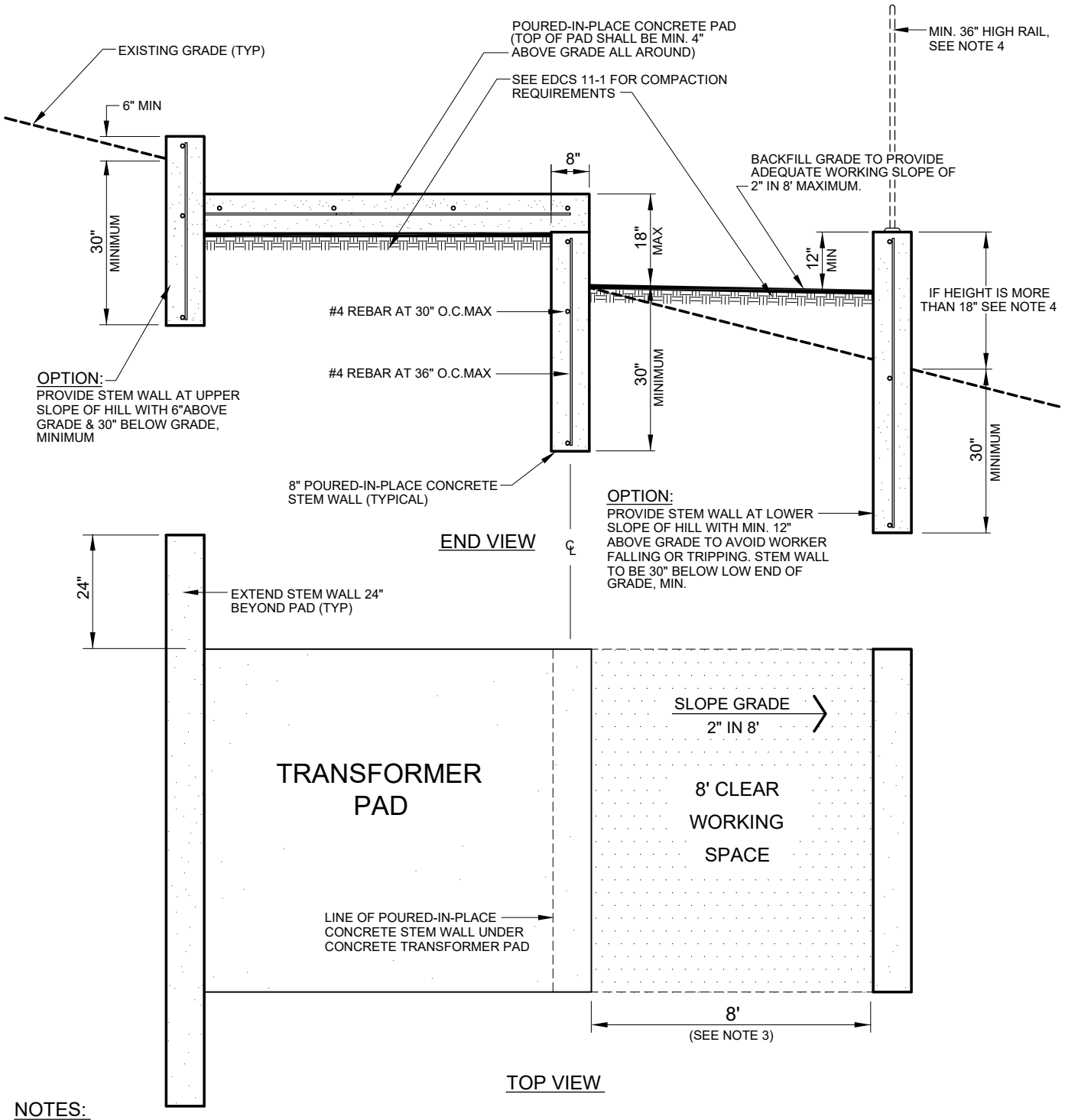


104" x 134"
SUPPORT FOUNDATION FOR LARGE 3 PHASE
INDUSTRIAL TRANSFORMERS
34.5KV, (480V), 2000-2500 KVA
(PRECAST ITEM NUMBER 194-115-134)



96" x 204"
SUPPORT FOUNDATION FOR LARGE 3 PHASE
INDUSTRIAL TRANSFORMERS
TYPE 375, 34.5KV, (2400V), 1500-2500 KVA

CONCRETE STEM WALL FOR SLOPING GRADES



NOTES:

1. Use poured-in-place concrete stem wall construction when a concrete pad is installed on a sloping grade which is too steep for adequate support. Construct as shown above.
2. Provide other concrete stem wall options if necessary to offset grade for proper equipment protection and safe working space, if native soil cannot be utilized.
3. Provide a safe working area of 8' in front of pad. Backfill grade as necesary to provide a 2" in 8' maximum slope. Finished grade to be 18" maximum (12" preferred) to the top of the pad for adequate safe working angle for hot stick operation.
4. Provide minimum 36" high rail with ballusters at 4" o.c.,max. if difference between sloping grade and top of stem wall exceeds 18".
5. Obtain P.E. stamp on detail design & Regional Building Department approval on retaining walls with drop greater than 30".

FIELD PAINTING DISTRIBUTION ELECTRICAL EQUIPMENT

1. **Surface Preparation:**
   All loose paint, blister, scale, rust, grease, and moisture must be thoroughly removed. Treat any rusted areas with a rust inhibitor ("Conquest by Chemsearch", Item #194-110-140 or equivalent). Follow all manufacturer instructions for applying the rust inhibitor. If the surface condition warrants complete removal of the old paint, media blasting or chemical stripping is recommended. Use a safety solvent with no flash point to remove any residue from the stripping process before priming

2. **Priming:**
   Priming is necessary if surface preparation exposes bare metal.

   Alkyd System:
   For all priming, a brown primer (Item #194-110-160 or equivalent) is suggested. For small areas, this material is available in aerosol cans. For brush application, the primer may be used as received. For spraying, the primer should be thinned to the viscosity as measured at 70°F using a Zahn Viscosimeter spraying 14-17 seconds. Use PPG Delstar DTR602 (Item #557-050-100 or equivalent) for thinning. Apply approximately 2 mils to all surfaces and allow to dry a minimum of sixteen hours before handling the unit or applying the finishing coat. Drying times will depend on the method of application. Before applying the finish coats, air-dry the primer a minimum of 24 hours if sprayed and 48 hours if brushed.

   Epoxy System:
   This paint is a two-part epoxy polyamide primer. Thoroughly mix equal volumes of both parts and allow to stand 20 minutes before using. Mix only enough paint for one day since the pot life of the mixture is approximately eight hours.

   Always follow the manufacturer mixing and application instructions.

3. **Finishing Coats:**
   Apply one or two coats, as required, of air-dry multi-use enamel or silicone acrylic paint. If more than one mil build is required, allow the paint to dry thoroughly (2-3 hours) and apply the second coat. Do not attempt to apply more than one mil at a time or runs and sags are likely to result. For brush application, thin the paint only as required to facilitate painting. For spraying, mix with cello solve acetate (approximately two parts paint, one part thinner, Item #557-050-100) and adjust viscosity to 25-35 seconds on a #2 Zahn cup. Between coats and after final coat, protect the unit from foreign objects for approximately two hours. The standard color for steel vault covers (4'x 4' x 3") ordered from the manufacturer is silver gray (Item #194-110-150). The standard color for transformers and switch gear is Bell Green and can be ordered through the Colorado Springs Utilities Apparatus Shop.

   NOTE:
   The above refinishing procedure shall only be used by Colorado Springs Utilities personal or contractors working for Utilities.

4. **Custom Paint Design on Distribution Electrical Equipment:**
   Colorado Springs Utilities customers may paint the electrical distribution equipment only after abiding by the following procedures. The customer shall contact Colorado Springs Field Engineering for design approval. Colorado Springs Utilities reserves the right to reject a customer's paint design. Each location will require a site visit by a Utilities Field Engineering representative for approval. The Field Engineering representative shall determine if the equipment to be painted warrants being stripped and primed before the custom paint is applied, in which case the customer shall use Rustoleum 157 primer or equivalent. After stripping the apparatus, clean-up should abide by all local, state and federal regulations. All electrical equipment labels shall be covered to protect them during the painting process and shall be visible to Utilities personnel after painting. On electrical equipment that does not need to be stripped, the paint should be scuffed with an abrasive cloth to aid in adhesion and then cleaned with a tack cloth to remove any debris. The customer shall apply 3 mils of

Direct-to-Metal Acrylic paint (DTM) when painting any electrical equipment. The finish for padmounted equipment and vault covers shall consist of pigment type paint. Metallic flake type paint is strictly prohibited.

The customer will be responsible to maintain paint condition of the padmounted equipment after the customer paint design has been applied. If the padmounted equipment or vault cover is replaced by Utilities for any reason, Colorado Springs Utilities will not be responsible to repaint the equipment to match the color or design that was applied by the customer. In the case of graffiti or rust on the equipment, Utilities will attempt to contact the customer responsible for the custom paint before repainting the equipment to its original color. This will allow the customer to repaint the design at their expense. At anytime the custom paint needs to be touched-up or repainted, the customer shall follow the proceeding procedure.

THREE-PHASE PADMOUNT OR OVERHEAD WYE-WYE BANKS

	120/208 VOLT SECONDARY					277/480 VOLT SECONDARY				
3-PHASE kVA	FULL LOAD AMPS	%R	%X	MIN. %Z	MAX. AVAILABLE FAULT CURRENT (RMS SYMMETRIC AMPS)	FULL LOAD AMPS	%R	%X	MIN. %Z	MAX. AVAILABLE FAULT CURRENT (RMS SYMMETRIC AMPS)
45	125	0.85	0.85	1.20	10,500	N/A	N/A	N/A	N/A	N/A
75	208	0.85	0.85	1.20	17,400	90	0.85	0.85	1.20	7,600
150	417	0.85	0.85	1.20	34,800	181	0.85	0.85	1.20	15,100
225	624	0.85	0.85	1.20	52,200	270	0.85	0.85	1.20	22,800
300	833	0.99	0.99	1.40	59,600	361	0.94	1.04	1.40	25,800
500	1389	0.70	1.87	2.00	69,500	602	0.71	1.21	1.40	43,000
750	2083	0.57	4.75	4.78	43,600	903	0.61	4.74	4.78	18,900
1000	2778	0.57	4.75	4.78	58,200	1203	0.61	4.74	4.78	25,200
1500						1805	0.51	4.75	4.78	37,800
2000						2407	0.51	4.75	4.78	50,400
2500						3008	0.51	4.75	4.78	63,000

DOWNTOWN NETWORK SYSTEMS

NETWORK SYSTEM	MAX. AVAILABLE FAULT CURRENT (RMS SYMMETRIC AMPS)	NOTES
208 VOLT GRID	100, 000	Limited by design on secondary system, spacing between transformers, number and size of secondary main cables
480 VOLT SPOT	100,000	Based on 3-1000kVA transformers in parallel

THREE-PHASE OVERHEAD BANKS, DELTA CONNECTED SECONDARY

	240 VOLT DELTA CONNECTIONS					480 VOLT DELTA CONNECTION				
3-PHASE kVA	FULL LOAD AMPS	%R	%X	%Z	AVAILABLE FAULT CURRENT (RMS SYMMETRIC AMPS)	FULL LOAD AMPS	%R	%X	%Z	AVAILABLE FAULT CURRENT (RMS SYMMETRIC AMPS)
45	63	1.00	1.00	1.41	7,700	31	1.00	1.00	1.41	3,900
75	104	1.00	1.00	1.41	12,800	52	1.00	1.00	1.41	6,400
150	208	1.00	1.00	1.41	25,600	104	1.00	1.00	1.41	12,800
225	313	1.00	1.00	1.41	38,300	156	1.00	1.00	1.41	19,200
300	417	1.00	1.00	1.41	51,100	208	1.00	1.00	1.41	25,600
500	694	1.00	1.00	1.41	85,100	347	1.00	1.00	1.41	42,600

Note 1: Maximum short circuit current at the secondary terminals of an open wye/open delta bank made of equal kVA transformers is the same as for a closed delta bank.

Note 2: If unequal sized transformers are used, maximum short circuit current will fall between the single phase short circuit current for the largest transformer and that for a closed delta bank made up of 3 transformers the same size as the largest.

Note 3: If the effect of secondary conductors is to be included, it is much simpler to assume a closed delta bank with 3 units of the largest kVA size in the bank and use simplified methods. This yields results on the safe, high side.

MAXIMUM AVAILABLE SECONDARY FAULT CURRENTS
FOR MINIMUM IMPEDANCES OF COLORADO SPRINGS UTILITIES TRANSFORMERS

The following tables provide Colorado Springs Utilities 1997 minimum impedances, typical X/R ratios, and maximum available secondary fault currents from distribution transformers for use in the selection of customers service entrance equipment short circuit interrupting rating. These values are based on Colorado Springs Utilities Alliance partner Asea Brown Boveri's (ABB) recommendations on minimum impedance for modern distribution transformers with allowances for manufacturing tolerances on any tap; many values of impedance tabulated here are above ANSI minimums.

Single Phase Padmount or Overhead, 120/240 Volt Secondary

	120 VOLT FAULTS					240 VOLT FAULTS			
SIZE (KVA)	FULL LOAD AMPS	%R	%X	MIN. %Z	MAX. AVAILABLE FAULT CURRENT (RMS SYMMETRIC AMPS)	%R	%X	MIN. %Z	MAX. AVAILABLE FAULT CURRENT (RMS SYMMETRIC AMPS)
10	42	1.5	1.2	1.9	4,400	1.0	1.0	1.4	3,000
15	63	1.5	1.2	1.9	6,600	1.0	1.0	1.4	4,500
25	104	0.8	1.4	1.6	12,744	0.9	1.3	1.3	8,077
50	208	1.5	1.2	1.9	21,700	1.0	1.0	1.4	14,800
75	313	1.5	1.2	1.9	32,600	1.0	1.0	1.4	22,100
100	417	1.5	1.2	1.9	43,400	1.0	1.0	1.4	29,500
167	696	1.5	2.0	2.5	55,700	1.0	1.0	1.4	49,300

Approximate Minimum Length of Springs Utilities Residential Secondary Cable (Twin Concentric or Triplex) to Limit Available 120 and 240 to Volt Fault Current to 10,000 amps rms symmetrical (Fault current interrupt rating of all new or upgraded molded case breakers must be 22 kA per Region Building Department. This table may be used to calculate the fault current of an existing service when the transformer is upgraded. See note 2):

SINGLE PHASE TRANSFORMER SIZE (kVA)	MINIMUM LENGTH OF OVERHEAD OR UNDERGROUND 600 VOLT ALUMINUM CABLE FOR COLORADO SPRINGS UTILITIES STANDARD CONDUCTOR SIZES:						
	#4 AL	#2 AL	#1/0 AL TWIN CON.	#4/0 AL TWIN CON.	350 AL TWIN CON.	#4/0 AL TRIPLEX	350 AL TRIPLEX
15 & BELOW	0'	0'	0'	0'	0'	0'	0'
25	5'	10'	10'	20'	30'	15'	25'
50	15'	20'	30'	50'	70'	40'	70'
75	20'	30'	45'	80'	120'	65'	120'
100	25'	35'	50'	95'	140'	80'	140'
167	25'	40'	60'	115'	170'	95'	170'

NOTES:

1. On commercial new installations, designers should provide electrical contractors the maximum available fault current considering not only the initial size transformer, but also that of the next larger and/or next smaller kVA size for possible future changeouts. Notice in particular the 3-phase 300 & 500 kVA sizes have higher available fault current than larger kVA units because of ANSI impedance differences.

2. Replacement of failed transformers or other operating/maintenance changeouts of transformers should be done with the same kVA rating or else all service entrance equipment verified to have adequate interrupting ratings for the fault current available from a new kVA size.

INDEX

COLORADO SPRINGS UTILITIES
ELECTRIC LINE EXTENSION & SERVICE STANDARDS

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COLORADO SPRINGS UTILITIES
ELECTRIC LINE EXTENSION/SERVICE INSTALLATION

PHONE NUMBERS & CONTACT INFORMATION

P L A N N I N G

Utilities Development Services 668-8259

Utility Data Management (FIMS)
Land Base Maps & Plat Maps 668-8779
Electric and Street Light GIS Data..... 668-3524 Opt. 3
Utilities Addressing Plan (UAP) and Utilities Design CAD Files (UDCF) 668-7920

Underground Utility Line Locations
Before you dig (All Utilities, ex: Springs Utilities, phone, cable) - Call 3 business days before digging.....811
Utilities Locating Dispatch (For Colorado Springs Utilities gas, electric, water and wastewater)
Main Number……668-7205

D E S I G N

Design of Electric Line Extensions & Street Lights (Field Engineering)
Field Engineering Supervisor: Tim Benedict ……..Office 668-3574…….Cell 661-5505
North Area Main Number.....668-4985 South Area Main Number 668-4985

North Workcenter Field Engineering
7710 Durant Drive, Colorado Springs, CO 80947-2150/ Fax: 719-668-4998

Name	Title	Area	Office	Cell
Dylan Quintana	Engineer Support Supervisor	Gas & Joint Trench	719-668-8330	719-675-0099
Tony Gius	Field Engineer	Joint Trench	719-668-3575	719-500-1943
Steve Travnicek	Field Engineer	Gas & Joint Trench	719-668-7716	719-728-3271
Tim Wendt	Field Engineer	Gas & Joint Trench	719-668-4962	719-237-7968
Justin Noel	Field Engineer	Gas	719-668-4872	719-377-0419
Ryan Pogue	Field Engineer	Gas	719-668-7840	719-828-4618
Santiago Tijerina	Field Engineer	Gas	719-668-3572	719-828-1772
Timothy Williams Jr	Field Engineer	Gas	719-668-7276	719-257-8426

South Workcenter Field Engineering
1521 Hancock Expressway, Colorado Springs, CO 80947-1812/ Fax: 719-668-5956

Name	Title	Area	Office	Cell
Joe Reuter	Field Engineering Supervisor	Electric	719-668-7885	719-499-5798
Jim Bradbury	Field Engineer	Electric	719-668-3243	719-433-3112
Dave Coker	Field Engineer	Electric	719-668-8796	719-649-2665
Rudy Duran	Field Engineer	Electric	719-668-8762	719-464-7961
Josh Hoepfner	Field Engineer	Electric	719-668-3242	719-322-6048
Kyle Leibhart	Field Engineer	Electric	719-668-8767	719-313-1504
John Martinez	Field Engineer	Electric	719-668-3244	719-323-4778

Street Light Requests Outside City Limits:

Cherokee Metropolitan District Mark Cuchiara 597-5080 1335 Valley Street Colorado Springs, CO 80915 Phone: 597-5080	**Green Mountain Falls** 7035 Oak Street Green Mountain Falls, CO 80819 Phone: Town Clerk 684-9414 *(Closed on Wednesdays)*

CONSTRUCTION

Construction Scheduling
North Area ..... 668-4991 South Area 668-5557

Inspections (Q.C. – Quality Control) 668-5416

SERVICE INSTALLATION

Electric Service Department
Utilities Electric Meter and Service Installation, Construction Temporary Electric Service Installation & Outage Requests 668-5524

Joint Trench Gas/Electric Scheduling Inspections and Tie-Ins 668-2TIE (2843)

Pikes Peak Regional Building Department
Building Permits 327-2880
Electrical Inspections 327-2883

OTHER TELEPHONE NUMBERS

Main Customer Service Number
Overhead Power-Line Cover, Tree Trimming Near Overhead Electric Power Lines 448-4800

Damage Claims 385-5960

Energy Construction Operations and Maintenance Department Managers
Construction and Maintenance …668-5957 Operations and Engineering 668-5723

Engineering and Planning
Demand Side Management and Renewable Energy Planning (Solar/Distributed Generation) 668-7719
Standards 668-5806
Substation and Transmission Engineering 668-8361

General Accounting (Inquiry for Time-and-Material Refunds) 668-8550

Meter Shop (AMT - Advanced Metering Technologies Group) 668-5525
Supervisor 668-3505

Repairs: Cable & Utility Line/Street Light
Colorado Springs Utilities Street Light Malfunction 448-4800
Colorado Springs Utilities (Electric, Gas, Water & Wastewater) 448-4800
City Traffic Signals 385-6721
Comcast (Cable Repair) 633-6616
CenturyLink Customer Service Repair 1-800-573-1311

Utility Safety Outreach and Education
Schedule a free utility safety outreach and education at communityrelations@csu.org 668-8386

Warehouse
North Work Center 668-4981
South Work Center 668-5550

ELECTRIC FIELD ENGINEERS AREAS

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NORTH WORK CENTER
7710 DURANT DRIVE, P.O. BOX 1103
MAIL CODE 2150
COLORADO SPRINGS, CO
80947-2150
MAIN PHONE: 668-4985
FIELD ENGINEERING FAX: 668-4998

TIM BENEDICT
GAS AND JOINT TRENCH FIELD
ENGINEERING SUPERVISOR
668-3574
661-5505

LINDA ISAACSON
PLANNER ANALYST SR.
668-4691

JULIE GROSE
ADMIN SPEC.
668-8129

ELECTRIC/WATER/GAS
EMERGENCY (ONLY):
DISPATCH 668-8800
CUSTOMER SERVICE 448-4800
ADDRESS: 111 S. CASCADE,
COLORADO SPRINGS, CO 80903
HOURS: M-F 7am-7pm / SAT
8am-12pm
CALL BEFORE U-DIG: 811

ELECTRIC
TIM WENDT
668-4962
237-7968

ELECTRIC
JIM BRADBURY
668-3243
433-3112

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668-3243
433-3112

ELECTRIC
RUDY DURAN
668-8762
464-7961

ELECTRIC
JOSH HOEPFNER
668-3242
322-6048

ELEC
DOWNTOWN
NETWORK
DAVE COKER
668-8796
649-2665

ELECTRIC
KYLE
LEIBHART
668-8767
313-1504

ELECTRIC
JOHN MARTINEZ
668-3244
323-4778

ELEC
AIRPORT
DAVE COKER
668-8796
649-2665

DAVE COKER
PETERSON SFB,
CHEYENNE MTN
SFB, & FT CARSON
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ERIC GUNDRED
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SR. 668-5558

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499-5798

SOUTH WORK CENTER
1521 HANCOCK EXPRESSWAY,
P.O. BOX 1103, MAIL CODE 1812
COLORADO SPRINGS, CO
80947-1812
MAIN PHONE: 668-5564
FAX: 668-5956

JOINT TRENCH AREA MAP

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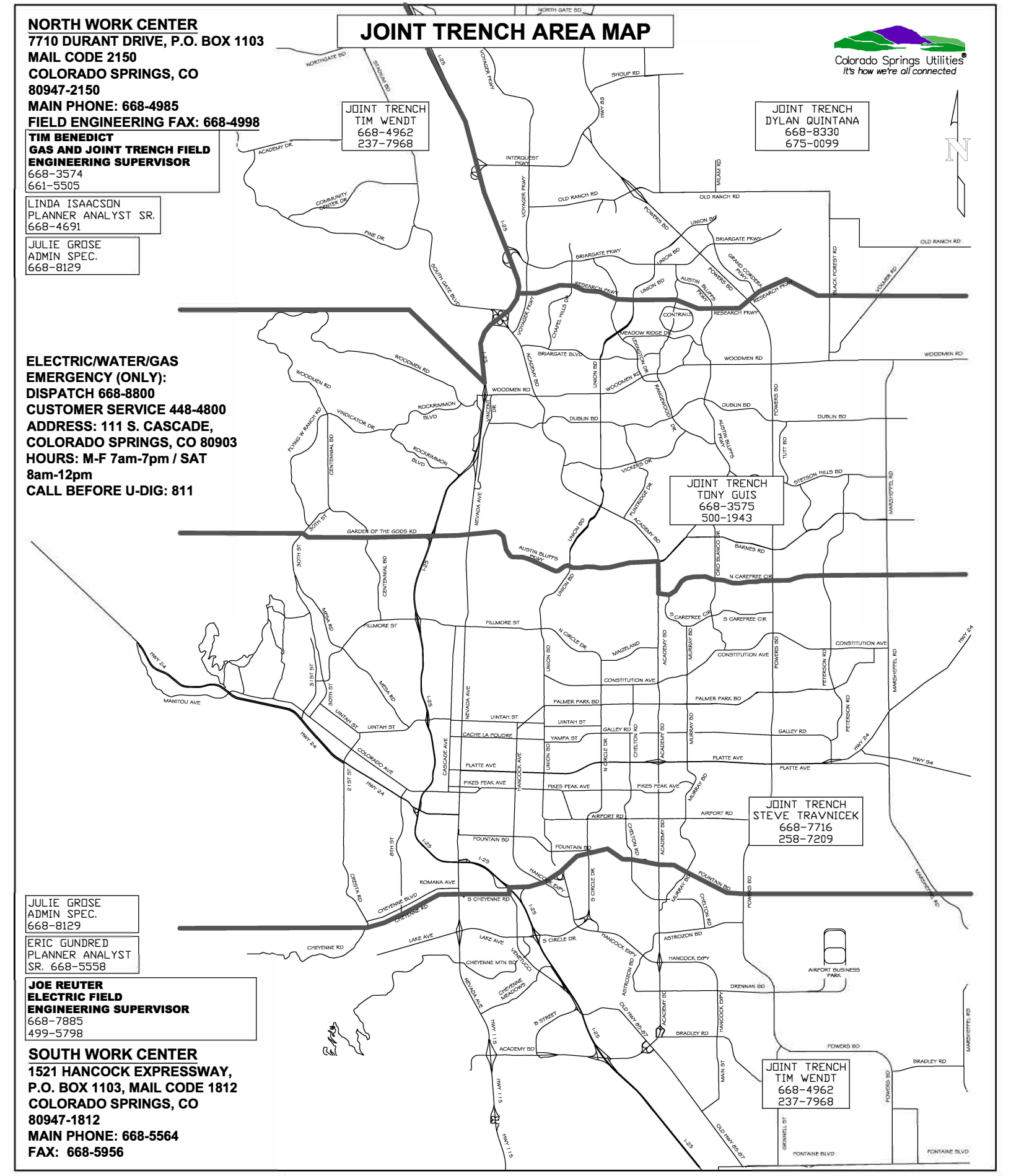

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NOTES


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