Draft
REQUIREMENTS FOR ELECTRIC SERVICE

City of Loveland
Power Operations Division

EFFECTIVE DATE: **May 1, 2014**

City of Loveland
Water and Power
200 N. Wilson Ave.
Loveland, CO 80537
(970) 962-3000

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LOVELAND WATER AND POWER
REQUIREMENTS FOR ELECTRIC SERVICE

This *Requirements for Electric Service* book, as revised, has been approved and adopted by the Loveland City Council. These requirements apply to all new installations and additions to or modifications of existing installations. Go to http://www.cityofloveland.org/RES to access this document electronically.

Customers must demonstrate compliance with all applicable provisions within these Requirements for Electric Services before receiving electrical service from the City of Loveland Water and Power, unless exempted in writing by the Director of Water and Power or his designee. Existing installations that fail to meet requirements for clearance and/or access to City equipment may be subject to additional fees and/or disconnection of electric service.

This edition of *Requirements for Electric Service* is effective May 1, 2014. This book replaces all previous editions of the *Requirements for Electric Service* or *Contractor Construction Standards* books. All previous editions should be destroyed.

IMPORTANT CONTACTS

Before doing any digging or excavation call for an underground cable location
811

Call to discuss planned new electrical construction or for construction assistance
1-970-962-3000

For all Water & Power Forms, visit the City Website, http://www.cityofloveland.org/.

The Service Center and Warehouse are located at
200 N. Wilson Ave., Loveland, CO 80537

IMPORTANT DOCUMENTS

The documents below are separate from the Requirements for Electric Services; however, there are references made to these throughout this document. Please check the City of Loveland website for electronic copies or contact us at 970-962-3000 to obtain a copy.

City of Loveland Documents

- Contractor License Application
  http://www.cityofloveland.org/modules/showdocument.aspx?documentid=1776
- Distributed Generation/Interconnection
  http://www.cityofloveland.org/index.aspx?page=1553
- Exemption/Revision Form
  http://www.cityofloveland.org/index.aspx?recordid=140&page=1214
- Interconnection Agreement
  http://www.cityofloveland.org/modules/showdocument.aspx?documentid=7919
- Municipal Code Title 13 Utilities Chapter 13.12 Electricity
  http://www.cityofloveland.org/modules/showdocument.aspx?documentid=69
- Pulse Metering Request Form
  http://www.cityofloveland.org/modules/showdocument.aspx?documentid=2206
- Request for Electric Service Form
  http://www.cityofloveland.org/modules/showdocument.aspx?documentid=2205
- Schedule of Rates, Charges and Fees
  http://www.cityofloveland.org/modules/showdocument.aspx?documentid=13169
- Solar Photovoltaic Systems Checklist
  http://www.cityofloveland.org/modules/showdocument.aspx?documentid=7318
- Solar Thermal Systems Checklist
  http://www.cityofloveland.org/modules/showdocument.aspx?documentid=328

Other Documents Referenced

- American National Standards Institute (ANSI)
- American Society for Testing and Materials Specifications (ASTM)
- Colorado Department of Transportation Specifications (C-DOT)
- Institute of Electrical & Electronics Standards (IEEE)
- National Electric Code (NEC)
- National Electric Safety Code (NESC)
- Occupational Safety and Health Administration Regulations (OSHA)

DEFINITIONS & ACRONYMS

ANSI – American National Standards Institute

ASTM – American Society for Testing and Materials is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

C-DOT - Colorado Department of Transportation Specifications

Cable in Conduit (CIC) – An assembly consisting of power cable installed in a polyethylene conduit by the manufacturer.

City – Unless otherwise specified, means the City of Loveland Water & Power.

Customer – The party making application for service, or any contractor, electrician or any other authorized agent representing the same. Contractors employed by the City are required to meet these standards.

Customer Space – A single customer address/location or contiguous addresses/locations not separated by a permanent demising wall.

CT – Current Transformer. A device which transforms the load current to a current level the meter can tolerate.

Demarcation Point - The point which marks the dividing point on the service between who is responsible for maintenance and repairs. For overhead lines, the City's responsibility stops at the weatherhead, and the Customer is responsible for any maintenance or repairs beyond that point. For underground lines, the City's responsibility stops at the electric meter, and the Customer is responsible for any maintenance or repairs beyond that point.

DR – Distributed Resource - An energy generation source located on the Customer's property that is connected to the City's electric distribution system.

Emergency – An event that is threatening life or property or otherwise determined by the Director of Loveland Water & Power or designee.

House Meter – Meters for multiple tenant buildings that measure common electrical usage that is not billable to a single tenant or entity.

NEC – National Electric Code

NESC – National Electric Safety Code

OSHA – Occupational Safety and Health Administration

PCC – Point of Common Coupling

PT – Potential Transformer. A device that transforms the load voltage to a voltage the meter can tolerate. Also referred to as a voltage transformer (VT).

RES – Request for Electric Service

FOREWORD

It is the policy of the City of Loveland Water & Power to assist its customers in securing a safe and beneficial use of electricity. Experience has shown that certain rules and regulations governing customers' wiring and installations to be connected to the City's electric distribution system are necessary to enable the City to serve all its customers in a safe and orderly manner. **These regulations will serve to expedite service connections by establishing uniform standards for electric service.** Therefore, customers' wiring and installations intended for connection to the City's distribution system must comply with the rules of the City, the National Electrical Code, National Electric Safety Code and any other codes or regulations in effect in the area served. **While those regulations are not intended to conflict with other codes or regulations, the City may have requirements that are more stringent.** Questions should be addressed before construction begins.

This booklet has been prepared to assist customers, architects, engineers, contractors, wiremen and inspectors in planning and maintaining electrical installations. It is not intended to ensure adequacy or safety of the customers' wiring or equipment. Such responsibility remains with the customer.

Field Engineering and Electric Metering should be contacted in advance of construction and/or purchase of equipment to resolve possible issues while the project is still in the planning stage. This will resolve issues and minimize the necessity for expensive changes required during the construction stage of the project. Please call (970) 962-3000 as early in the planning stage as possible.

EXEMPTIONS AND REVISIONS

Exemptions:

No set of rules or instructions will cover all conditions. The Director of Water & Power, or his designee, will consider requests for variances from these requirements and may grant such exemption requests on a case-by-case basis in a timely manner.

Revisions:

Due to constant progress in the development of materials and methods, some procedures contained herein may be modified by the City. If users of this book notice additional or better ways of providing some services, they are encouraged to propose revisions to a particular section contained in this book. If the City finds the proposed revision offers equal or better safety and reliability than the current practice, then the suggestion will be reviewed for possible addition to or replacement of current practice(s). Revisions are required for continued application of a work practice, as opposed to an exemption, which is reviewed on a case-by-case basis.

Requests for exemptions or revisions must be submitted online, via the power utility's Exemption/Revision Form. The form can be found on the City's Web site at http://www.cityofloveland.org/index.aspx?recordid=140&page=1214.

SECTION 1 - GENERAL INFORMATION

1.1 General Requirements

a. ***Call for Locates***
CALL 811 BEFORE YOU DIG at least 3 working days in advance.

b. ***Dangers & Penalties for Digging into Buried Electrical Installations***
Digging into buried electrical installations can be dangerous, very expensive, and can create hardships for people and businesses from the interruption of service. In addition to the cost of repair, the State of Colorado imposes severe penalties on parties who dig up electrical facilities without calling 811 at least 3 working days in advance (weekends and holidays are not considered working days). We will gladly locate existing underground electric facilities for you.

c. ***Booklet Contents***
This booklet provides information to power customers concerning conditions for service, and standards for material and construction of the customer's electric service.

d. ***Construction Standards***
Standards contained within this publication are a guide to construction. The standards set by the NESC, NEC, and applicable City municipal codes must also be strictly followed.

e. ***Illegal Modifications & Tampering***
The Customer shall not modify or under any circumstance tamper with any City meter installation facilities. This includes cutting/removing City installed seals on any meter, socket, box or cabinet. To do so is illegal and the Customer will be prosecuted according to the Municipal Code.

f. ***Metered Electrical Power***
All electrical power supplied to customers must be metered except to flat-rate service customers who are approved and accepted by the City.

g. ***Mounting Customer-Owned Equipment***
Customer-owned metering equipment, switching devices, conduits, conductors, luminaires, etc., shall not be mounted on a City owned facility.

h. ***Unmetered Yard Lights***
Unmetered yard lights are no longer available. Street lighting is provided in the subdivision design plan. For subdivisions with electrical designs approved prior to August 1997, the City will continue to furnish unmetered power to one (1) forty-watt lamp at each residential unit and two (2) forty-watt lamps on corner lots of any residential unit, when requested by the Customer. Repairs to unmetered yard light circuits are the responsibility of the Customer. However, the City will maintain the 1 amp fuse supplying the circuit.

i. ***Disconnect Timeframe***
Disconnects require a minimum of 48 hour notice.

j. ***Permits & Meter Inspections***
Permits and inspections for meters are handled by Loveland Building Division. Residential building permits will not be released until the subdivision project has been energized by the City.

k. ***Warehouse Hours***
Materials may be picked up from or returned to the Warehouse, Monday through Friday between 8:00 a.m. and 3:00 p.m.

l. ***Ownership of Electrical Distribution System***
The City owns, operates, and maintains all of its overhead and underground electrical distribution facilities, as well as the meter.

1.2 Overhead and Underground Facilities

a. ***New Services Underground***
All new facilities in newly platted areas of the Loveland city limits will be constructed underground.

b. ***Maintain Existing Overhead Services***
The City maintains existing overhead facilities to serve existing customers.

c. ***Convert Overhead Services to Underground***
In an existing overhead area, customers may request underground service. If sufficient funds are available:

- The City shall underground existing overhead system upon request of owner or developer
- The requesting party is to pay all costs of construction and material for the substructure work
- The City is to pay for wire, terminations, risers and labor
- The City shall pay all costs associated with removal of the overhead system

Please see *Municipal Code 13.12.099 Undergrounding of Existing Overhead Electrical Systems***.**

1.3 Electrical Service Voltage Standards

a. ***Standard Services***
Standard service from the City is single-phase or three-phase 60-hertz alternating current.

b. ***Standard Voltage Classification***
The standard voltage classification is 120/240 single-phase and 120/208 three-phase.

c. ***Nominal Secondary Voltages***
The City offers the following nominal secondary voltages to Customers subject to review and acceptance of application for service.

- Single-phase, three-wire 120/240, grounded
- Single-phase, three-wire 120/208, grounded
- Three-phase, four-wire 120/208 WYE, grounded
- Three-phase, four-wire 277/480 WYE, grounded

d. ***Special Applications***
Contact the City for special applications.

1.4 Service Quality

a. ***Voltage Level***
The voltage level at the Customer's service entrance varies depending on Customer load, length of service and other factors. The nominal voltage variation will be in accordance with the latest version of ANSI C84.1.

b. ***Power Irregularities & Interruptions***
The City will make every effort to provide a continuous reliable source of power to its Customers. **However, the City does not guarantee against irregularities or interruption.** The City shall not be considered at fault and shall not be liable for damages resulting from irregularities and interruption of service. Customers with equipment sensitive to service interruptions, voltage irregularities, single phasing, etc. are responsible for taking the necessary precautions to prevent damage from such events. Customer owned equipment shall not create disturbances or produce harmonic distortion on the system. The City shall require that the Customer take corrective action to prevent a piece of equipment from causing disturbances or harmonic distortion, including disconnection of such equipment at the Customer's expense. Compliance of this requirement is judged upon the City's measurement at the point of common coupling (PCC). In the event that the Customer fails to take corrective action, the City may discontinue electrical service until corrective action is taken.

1.5 Motors and Three-Phase Equipment

a. ***Air Conditioners & Heat Pumps Requiring Soft Starts***
Air conditioners or heat pumps larger than 5 tons shall be required to have a soft start device installed.

b. ***Motors Requiring Soft Starts***
Motor starts may cause unacceptable voltage dips and flicker events for adjacent customers or on the Customer's service. The following motors require a motor start analysis by the City's electrical engineering department to determine whether the equipment requires a soft start device:

- Single-phase motors 3hp or larger within the service territory
- Three-phase motors 35hp and larger within the city limits
- Three-phase motors in the Big Thompson Canyon

c. ***Motor Start Analysis Requirements***
The following information shall be provided to the electrical engineering department for the motor start analysis:

- Horsepower rating
- Nameplate full-load amps
- Nameplate locked rotor amps
- Nameplate voltage
- NEMA code letters
- Frequency of starts per time unit

d. ***Motor Protection Responsibility***

The Customer is responsible for motor protection. The motor protection shall meet all NEC requirements for motor protection, including but not limited to current overload, short circuits, ground faults, low voltage, and single-phasing of three-phase motors.

SECTION 2 - TEMPORARY OVERHEAD & UNDERGROUND

2.1 Temporary Construction Services

a. ***Temporary Construction Power***
The City provides temporary construction power where electrical service is required **for a period of 12 months or less**. The Customer must complete and submit a *Request for Electric Service* form to the City allowing sufficient time for evaluation and response. A construction deposit may be required and will be collected at the Service Center prior to approval of a building/electrical permit.

b. ***Address Posting Requirements***
The Customer shall post the address on or near the temporary power. Posting shall be large enough to be seen from the road.

c. ***Location Requirements***
The Customer shall install the temporary power facility within 2 to 3 feet of an underground electric source. If a transformer will be the power source, do not locate the temporary in front of the transformer. For overhead services, the Customer installs an overhead temporary pole a minimum of ten feet from an existing pole. The temporary facility must meet the requirements of *Drawings No. 1 and 2*. The temporary pole height for overhead installations must allow for the service wire to meet minimum service drop clearance requirements. See *Table 8-1 in Section 8 - Clearances.*

d. ***Conductor Requirements for Underground Temporary Power***
The Customer shall provide a minimum of 36 inches up to a maximum of 48 inches of conductor length exposed at the end of the flex-conduit/weatherhead, with the neutral conductor clearly indicated and a total length sufficient for termination at electric source.

e. ***NEC Requirements***
<u>ALL</u> requirements for permanent wiring found in the latest version of NEC apply to temporary installations.

2.2 Residential Development Construction Power

a. ***Temporary Meter Poles***
The developer, contractor or electrical contractor shall furnish and install the temporary meter pole in proximity to power service (power pole, handhole, etc.). The temporary meter pole must meet City and NEC requirements. See *Drawings No. 1 and 2*.

b. ***Inspection & Energizing***
The City's building inspector or state electrical inspector will inspect the installation. Upon inspection approval, the City will set the meter, make the final termination, and energize the installation.

c. ***Standard Service Size***
The standard service voltage of single-phase 120/240 three-wire service is available for temporary residential construction power applications.

d. ***Service Connection Timeframe***
The City will make the connection within three working days unless a line extension of the system is required to provide the power.

e. ***Contractor Installed Equipment***
Contractors shall install all metering equipment except the meter.

f. ***Approved Meter Sockets***
All service installations must have an approved meter socket with sealing mechanism.

g. ***Accessible Meter Locations***
All meter equipment must be installed in readily accessible locations.

h. ***Meter Ground Rods***
Each meter shall have a separate ground rod.

2.3 Commercial Development Construction Power

a. ***Cost Estimates***
The City will prepare a cost estimate for the installation upon receiving the *Request for Electric Service* form (RES) and an engineering deposit. The Customer must pay the total estimated cost of the project prior to release of materials or installation. When the final cost is determined, the Customer will be billed or refunded the difference between the estimated cost and the actual cost. Frequently, the costs of temporary construction power can be included in the cost of the permanent power.

b. ***Standard Services***
The standard services for temporary construction power applications are single-phase 120/240 volts or Three-phase 120/208 wye, grounded volts. Contact the City for special applications. Temporary 277/480 volts transformers will not be installed.

c. ***Temporary Pole & Meter Equipment Requirements***
The temporary pole and metering equipment must conform to all current regulation of the City, NEC and NESC, including ground fault protection.

d. ***Meter Socket Requirements***
The meter socket must include a lever-operated bypass. Any 120/208 Volts three-wire service shall have a five-jaw meter socket. The fifth jaw shall be installed in the 9 o'clock position and connected to the neutral.

e. ***No Meters on Utility Poles***
The City prohibits meter installation on any of its utility poles.

f. ***Inspection & Energizing***
The City's building inspector or state electrical inspector will inspect the installation. Upon inspection approval, the City will set the meter, make the final termination, and energize the installation.

g. ***Service Connection Timeframe***
The City will make the connection within three working days unless a line extension of the system is required to provide the power.

h. ***Developer/Contractor Installed Equipment***
The Developer, Contractor, or Electrical Contractor shall furnish and install all metering equipment and temporary pole except the meter. See *Drawings No. 1 and 2.*

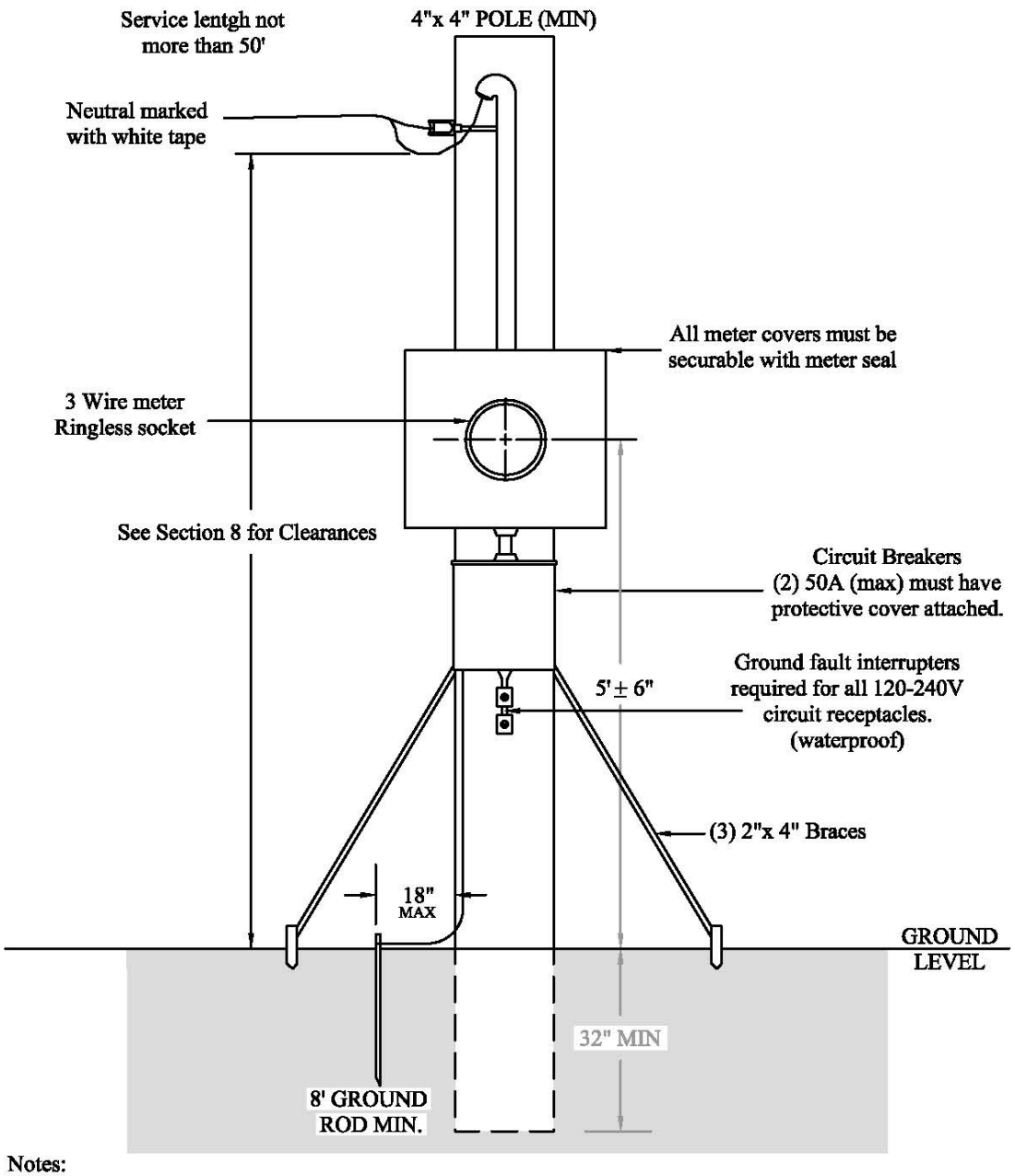
i. ***Approved Meter Sockets***
All service installations must have an approved meter socket with sealing mechanism.

j. ***Meter Location Approvals***
All meter locations shall be approved by the City prior to construction.

k. ***Accessible Meter Locations***
All meter equipment must be installed in readily accessible locations.

l. ***Meter Ground Rods***
Each meter shall have a separate ground rod.

ALL NON-CURRENT CARRYING METALLIC PARTS MUST BE EFFECTIVELY GROUNDED.

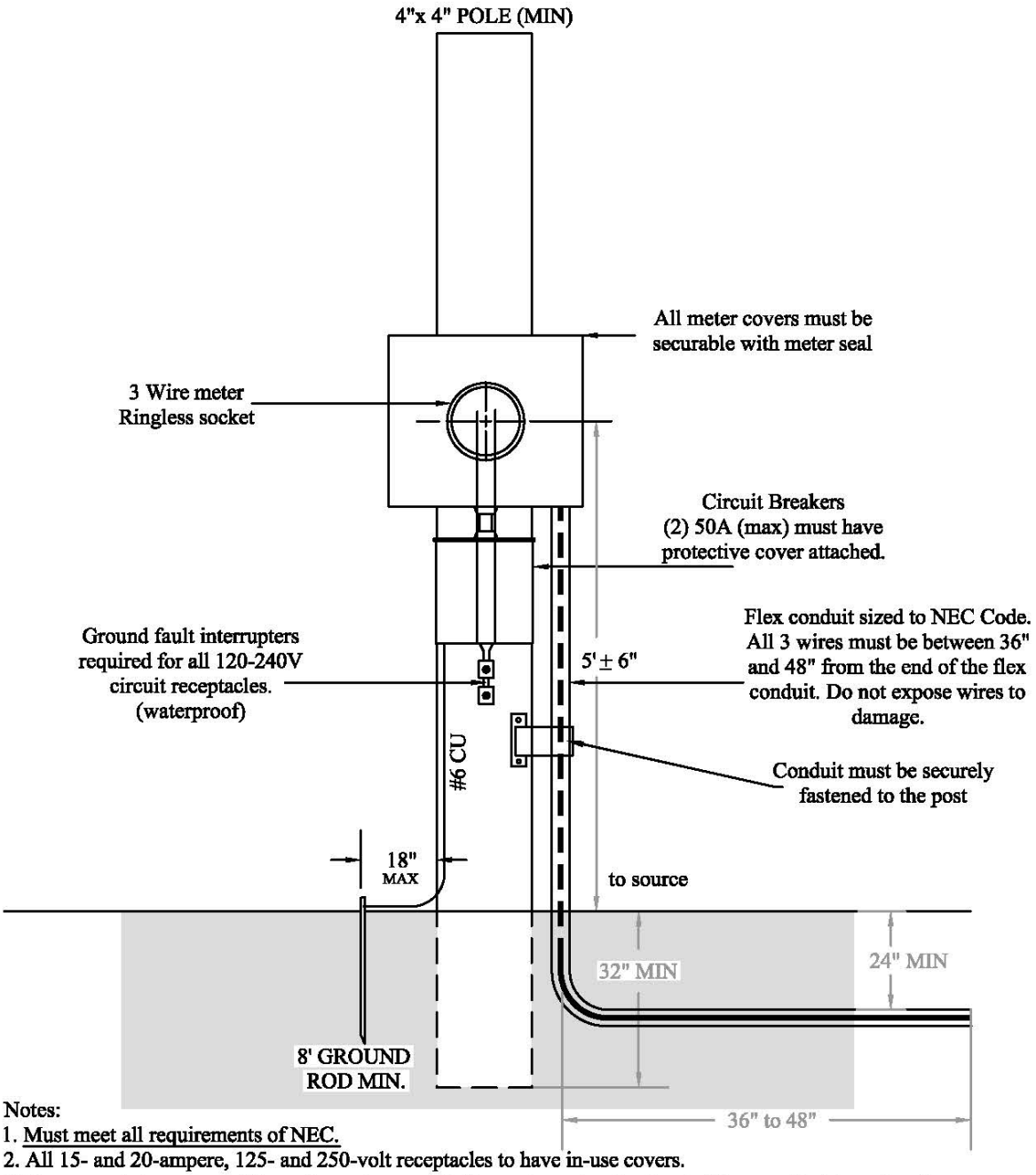


Notes:
1. Must meet all requirements of NEC.
2. All 15- and 20-ampere, 125- and 250-volt receptacles to have in-use covers.
3.Clearances between metallic equipment, non-metallic equipment and poles shall be specified in section 8.

CITY OF LOVELAND - DEPARTMENT OF WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	1	Temporary Meter Installation Overhead

ALL NON-CURRENT CARRYING METALLIC PARTS MUST BE EFFECTIVELY GROUNDED.



Notes:
1. Must meet all requirements of NEC.
2. All 15- and 20-ampere, 125- and 250-volt receptacles to have in-use covers.
3.Clearances between metallic equipment, non-metallic equipment and poles shall be specified in section 8.

CITY OF LOVELAND - DEPARTMENT OF WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	2	Temporary Meter Installation Underground

SECTION 3 - RESIDENTIAL

3.1 New or Upgraded Residential Service - General Procedure

a. ***Submit RES***
The Customer shall submit a *Request for Electric Service* form (RES) to the City.

b. ***Schedule Site Visit Meeting***
The Customer must contact the Loveland Power Department at (970) 962-3000 to schedule a site visit.

c. ***Site Visit Meeting***
At the site meeting the Field Engineer and the Customer will review the scope of work being done by the customer and by the City, along with any fees or deposits that will need to be collected from the Customer for services rendered by the City.

d. ***Completed RES Required for Permit Application***
The Customer will take a copy of the completed RES to the Building Division and apply for a permit.

e. ***Permitting and Payment Procedures***
The Building Division will keep a copy of the RES, collect all permit fees and issue a permit to the Customer. The City Water & Power Department will collect deposits required on the form prior to engineering or construction. Field Engineering will design the installation and provide an estimated cost. The Customer must pay the estimated installation cost prior to the release of construction materials. After work is completed and the final cost is determined, the Customer will be billed or refunded the difference from the estimated cost. Field Engineering can be reached at 970-962-3561.

f. ***Service Disconnects***
The Customer shall call the Field Engineer to schedule a service disconnect. Disconnection shall only be performed by the City.

g. ***When to Schedule the Meter Installation***
After the Customer completes the electrical work and has it inspected by the City Building Inspector or State Electrical Inspector, the City will be notified by the electrical inspector that the new service equipment has been inspected and approved. The Customer must notify the City when the meter is ready to be installed.

h. ***Procedure to Energize & Install the Meter***
Power Operations will schedule a crew to complete the City's portion of work, energize the new equipment, and install the meter. The City requires at least two business days' notice for scheduling.

3.2 Mobile Home Park - Upgrades

a. ***Lots Owned by Mobile Home Parks***
If a mobile home park owner requests an upgrade, the owner will pay all resulting charges.

b. ***Lots Owned Individually***
If the mobile home park lots are sold to individual owners, those individual owners will pay for all charges resulting from upgrades on their lots, including, but not limited to, transformer and secondary upgrades and new transformer installations.

3.3 New Residential Service - General

This section covers single family homes and duplexes with service sizes up to 200 amps. Multiple unit buildings and services larger than 200 amps are considered commercial installations and are covered in *Section 4 - Commercial and Industrial*.

a. ***Building Permits & Fees***

The Customer must apply for a building permit and pay any associated fees to the Building Division prior to issuance of the building permit. All permits shall be obtained before proceeding with construction.

b. ***Easement Requirements***

All easements shall be granted to the City of Loveland. By submitting an approved *Request for Electric Service* form (RES), the Customer agrees to grant or arrange for an easement on the Customer's property for the installation, operation, and maintenance of electric lines and/or equipment necessary to provide service to Customer.

c. ***Mark Lot Corners***

Lot corners must be accurately located and marked with pins and stakes. The lot corners must be marked with lot numbers corresponding to the plat map.

d. ***Two Meters on a Single Residential Lot***

Two services and/or meters to separate buildings on one residential lot are generally not allowed. Additional electric meters will only be allowed on residential accessory structures if all applicable uses, codes and regulations are met. The City Building Division will determine, based on the application for a building permit, if the request is acceptable. No construction will begin without the City Building Department approval. If a second meter is allowed by the City, the proper permits will be approved through the Building Division and notification will be sent to Water & Power that it is appropriate to set the additional meter. The Customer must submit a *Request for Electric Service* form (RES) to the City.

e. ***Meter Socket Requirements***

The Customer is responsible for furnishing and installing an approved meter socket. Refer to *Section 6 - Meters and Meter Connections* for complete metering requirements.

f. ***Accessible Meter & Service Entrance***

The service entrance and meter must be outside of the building in an easily accessible location approved by the City's representative. Contact the City at 970-962-3000 prior to construction. Access to the meter shall not be blocked. If the Customer is found to be negligent of said action, removal of the obstruction or relocation of the meter shall be at the Customer's expense. Refer to *Drawing No. 32* in *Section 8 - Clearances*.

g. ***Service Entrance Standards***

The service entrance must meet the current City Standards, NEC, and all applicable portions of the NESC. The City will install the permanent meter upon satisfactory inspection by the electrical inspector.

h. ***Meter Pedestal Installations***

For meter pedestal installations, see *Drawing No. 19* in *Section 6 - Meters and Meter Connections*.

3.4 New Residential Service – Overhead

a. ***Available in Existing Overhead Areas Only***
Overhead service is only available in areas with an existing overhead primary distribution system. The City does not permit overhead service in an area with an underground distribution system or areas designated as underground areas.

b. ***City Work Paid by Customer***
The City will furnish, install, and energize all overhead services from the source to the weatherhead at the Customer's expense.

c. ***Additional Fees May Apply***
The installation fee paid prior to issuance of the building permit covers only standard service installations of less than 80 feet in length and 150 amps or less. Installations exceeding this standard are charged an engineering deposit, and the Customer will pay the actual cost for the City's time and material. Consult Field Engineering for services longer than 80 feet (they may require guying for risers passing through the roof).

d. ***Demarcation Point***
The point of demarcation for the City stops at the weatherhead where connections are made to the City's service. The Customer is responsible for any maintenance or repairs beyond that point, except the electric meter which the City maintains.

e. ***Attachment Point Requirements***
The point of attachment height for the service drop conductor on the Customer's structure must adequately provide vertical clearances between the service drop and the ground. All clearances must meet the requirements of *Drawing No. 3 and 9* and *Table 8-1* located in *Section 8 - Clearances*.

f. ***Connection Point Requirements***
Contractor must provide a suitable connection point for the service drop. The connection point must have adequate strength to safely withstand the strain of the service drop.

g. ***Attachment Requirements***
The attachment must safely withstand the strain imposed by the riser. Exercise particular care when installing vertical risers on brick, concrete block, or similar building walls. When attaching the service drop support to a wooden building, screw the service entrance wire holders to the building studs or other structural support.

h. ***Keep Area Around Service Clear***
No structure or object shall be placed underneath, over or around the service without permission from the City.

3.5 New Residential Service - Underground

a. ***Easement Area Requirements***
The easement area shall be at final grade or grade must be within 3 inches of final grade and all obstacles such as construction materials shall be removed before service can be installed.

b. ***Customer Installed Item Requirements***

The Customer is responsible for installing the underground service conduit from the conduit stub adjacent to the handhole (junction box) or transformer pad to the permanent meter location. The conduit stubs are marked by a red colored stake. (If the stake has been removed, contact the City or Field Engineer to relocate the stub.) See *Drawings 4,5, 7and 8.* The installation must comply with NEC and with the City of Loveland's Standards and must be inspected by the City's Power Inspector.

c. ***Site Visit Meeting with Field Engineer***

The Customer shall meet with the Field Engineer prior to any installation to discuss meter location, service conduit path and the Requirements for Electric Services. See *Drawing 9.*

d. ***Utility Locates***

The customer is responsible for obtaining all utility locates prior to excavation.

e. ***Access Restrictions to City Equipment***

At no time is the Customer allowed to open or enter the City's handhole (junction box) or any other City owned electrical equipment. The Customer shall contact the City if access is needed.

f. ***Trench Requirements***

- The trench bottom shall be smooth, continuous and free of any large rocks or other sharp objects.
- The top of the conduit shall be a minimum of 24" deep below final grade. The depth shall not exceed 40". For joint service trench detail, refer to *Drawing No. 13* in *Section 5 – Trenching and Cable Handling*.
- The trench shall remain open until the conduit is inspected by the City Power Inspector.

g. ***Conduit Requirements***

- The conduit size shall be 2 ½" PVC SCH 40 conduit. Sweeps must be a minimum 24" radius
- The Customer shall keep conduit free of dirt and debris during installation.
- All conduit (sweeps and straight sections) shall be fully seated within the bell ends and glued to prevent infiltration of water into electrical equipment.
- The path between the conduit stub and the meter shall be as straight as possible. The number of conduit bends shall not exceed a maximum of 270 degrees of bends (including the riser sweep).

h. ***Slip Coupling Riser Requirements***

A slip coupling riser is required below the meter. The thread size shall be 2 ½" to match the meter canister opening. The inside diameter of the slip riser shall be large enough to fit over the 2 ½" conduit. The 2 ½" conduit shall extend the complete length into the slip coupling riser and be fully seated. The slip coupling riser meter must be securely attached to the structure.

i. ***Warning Tape***

Red electric warning tape shall be installed 12" below final grade directly above the conduit.

j. ***Backfill Requirements***

Backfill within 4" of the conduit, on all sides, shall be free of any materials that may damage the conduit system.

k. ***Damage Prevention***

Care shall be taken during installation and during backfill around the conduit to ensure that the conduit is undamaged, crushed or deformed. There shall be no internal burrs or sharp edges that will obstruct the cable installation.

l. ***Meter Sockets***

The Customer will furnish and install the approved meter socket. The Customer will make the load side terminations in the meter socket. The City will make line side terminations.

m. ***Demarcation Point***

The service entrance wire from the source to the meter base and the meter remains the property of the City. The City maintains this portion of the service. Any damage incurred to the City's property will be billed at actual cost to the responsible party. The Customer's electric property will be maintained in a manner that is safe and consistent with City standards. If the Customer's installation is deemed unsafe by City personnel, an attempt will be made to contact the Customer to repair the problem. If not repaired, the City reserves the right to deny service to the customer.

n. ***Additional Fees May Apply***

The installation fees paid prior to issuance of the building permit covers only standard service installations of 100 feet or less in length and 200 amps or less. Installations exceeding this standard will be charged to the Customer at actual cost for City's time and material.

o. ***Construction Standards***

All Customer installed facilities must meet the current NEC and all applicable portions of the NESC.

p. ***Keep Area Around Service Clear***

The service conduit shall not pass under or into any permanent structure or landscaping features.

q. ***Violations***

Any additional costs created by violating these requirements will be borne by the Customer.

r. ***Grounding Method***

The approved grounding method is a concrete-encased electrode (ufer ground) as described in NEC 250.52(3). Any exceptions must be approved by the building inspector in advance.

3.6 Electrical Substructure in New Subdivisions

a. ***Electrical Design, Fees & Contractor Orientation***

The City will design the electrical system upon the receipt of an engineering deposit, a full set of construction drawings and site plans. The Customer shall pay the total estimated cost of the project prior to the release of materials or installation. The Customer may choose a contractor or use the City contractor. The contractor chosen by the Customer must attend a contractor orientation given by the City prior to beginning work.

b. ***Easement Area Requirements***

The easement area shall be at final grade and certified in writing by a Colorado licensed professional engineer or land surveyor.

c. ***Pre-Construction Meeting***

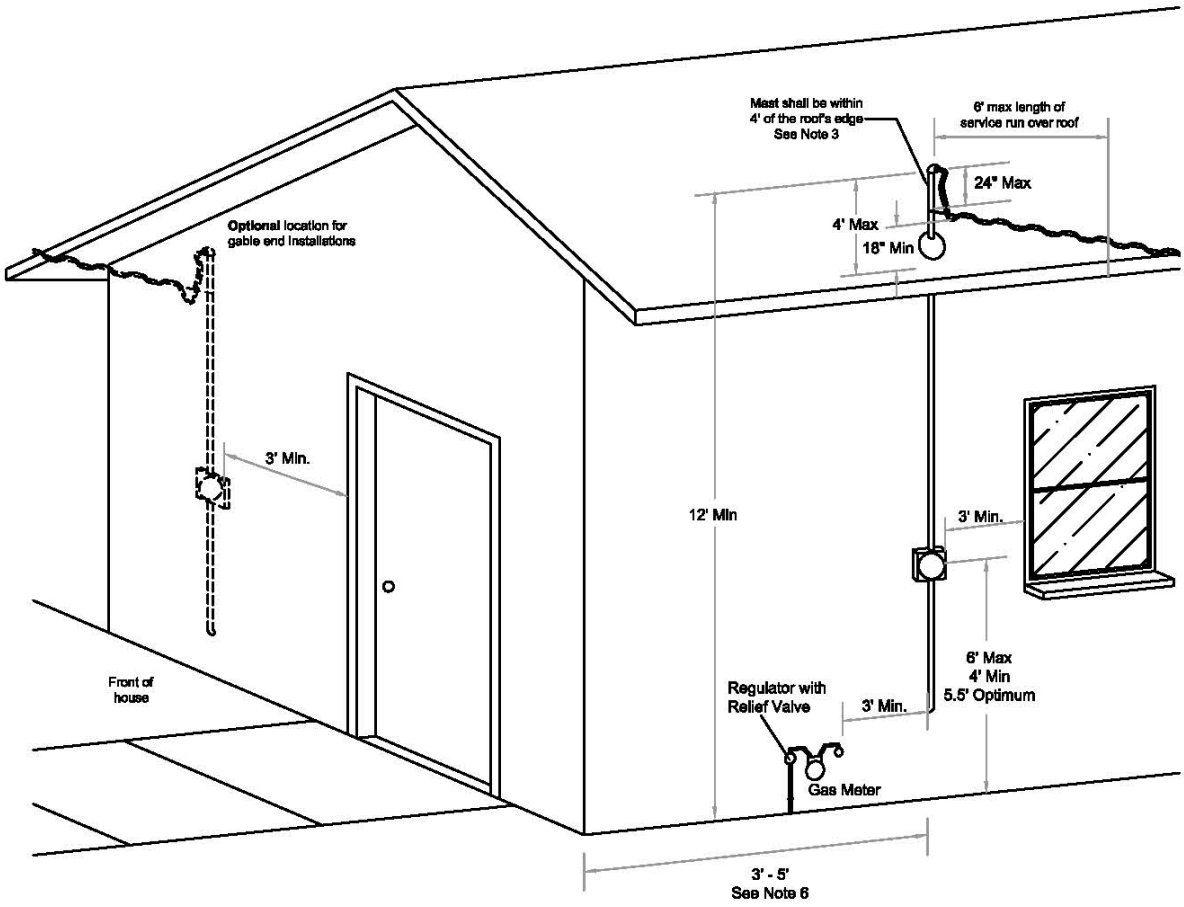
An on-site pre-construction meeting with the Field Engineer and Power Inspector shall be arranged to determine start time and construction schedule for substructure installation. All other utility companies shall be notified of the date and time of this meeting by the developer.

d. ***Trenching & Foundation Requirements***

All trenching and foundations shall meet the requirements of *Section 5 - Trenching and Cable Handling*.

e. ***Installation Requirements***

The installation must conform to all requirements of *Drawings No. 4, 5, 7, 8.*



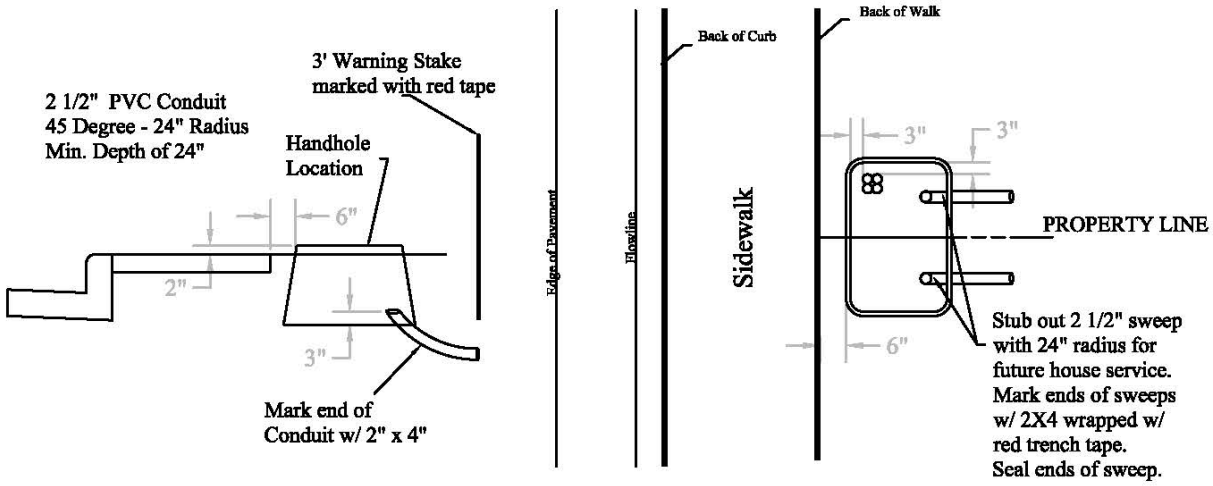
NOTES:

1. Risers must be 2" GRC minimum
2. All meter sockets shall be ringless
3. Through roof fiser-mast shall be within 4' of eave guying of the mast may be required
4. Under eave-attachment clevis must be secured to the stud
5. All non-current carrying metallic parts must be effectively grounded
6. Meter locations shall be 3'-5' from front corner of house. Shorter or longer distances allowed when approved by city.
7. No meters shall be located above or below obstructions (including window wells, stairs, etc.)

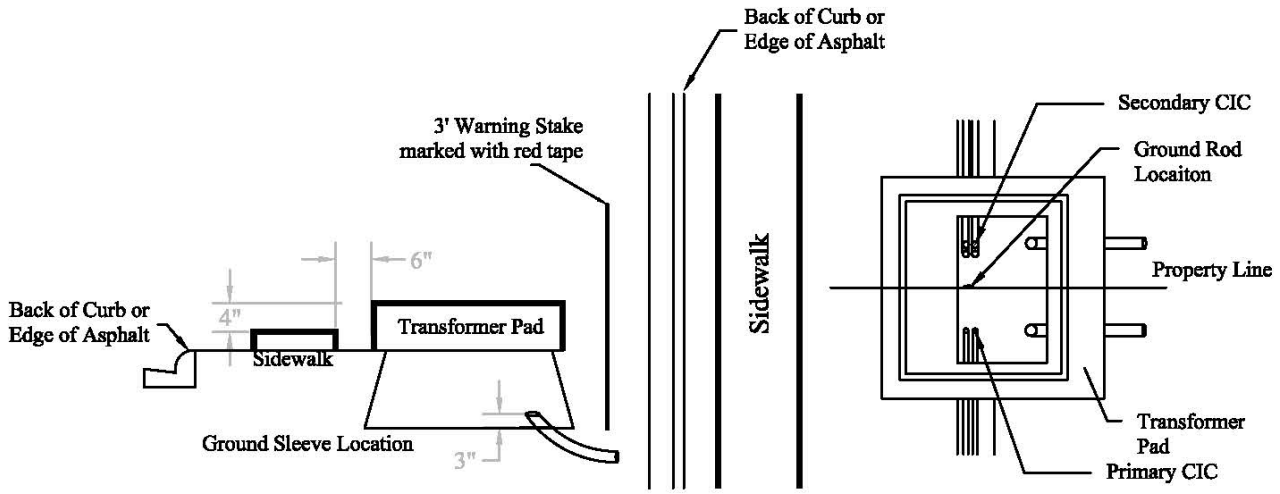
CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	3	Residential Overhead Service

WITH SIDEWALK



HANDHOLE LOCATION



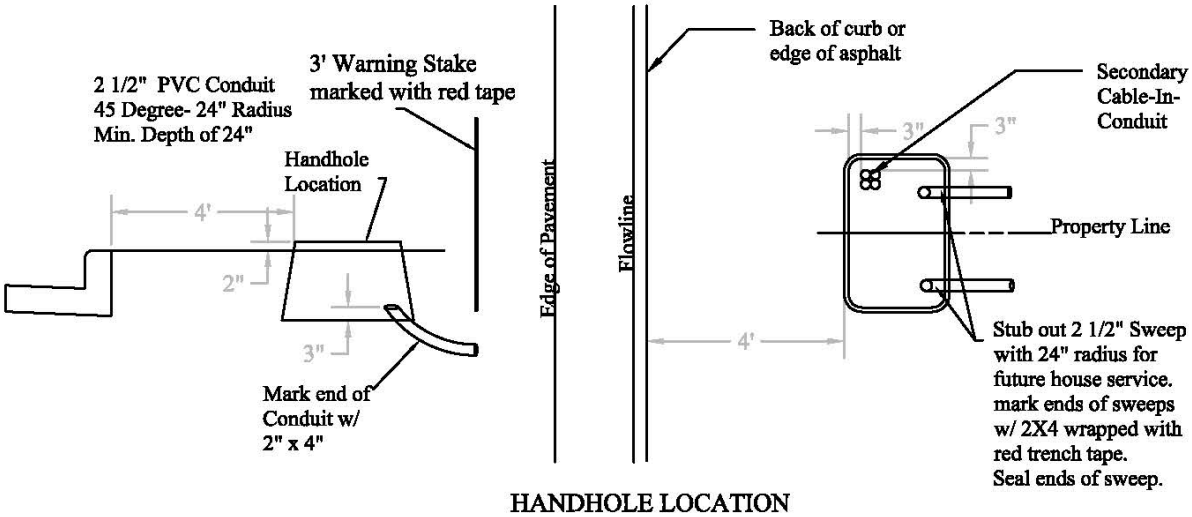
TRANSFORMER PAD LOCATION

CITY OF LOVELAND WATER & POWER

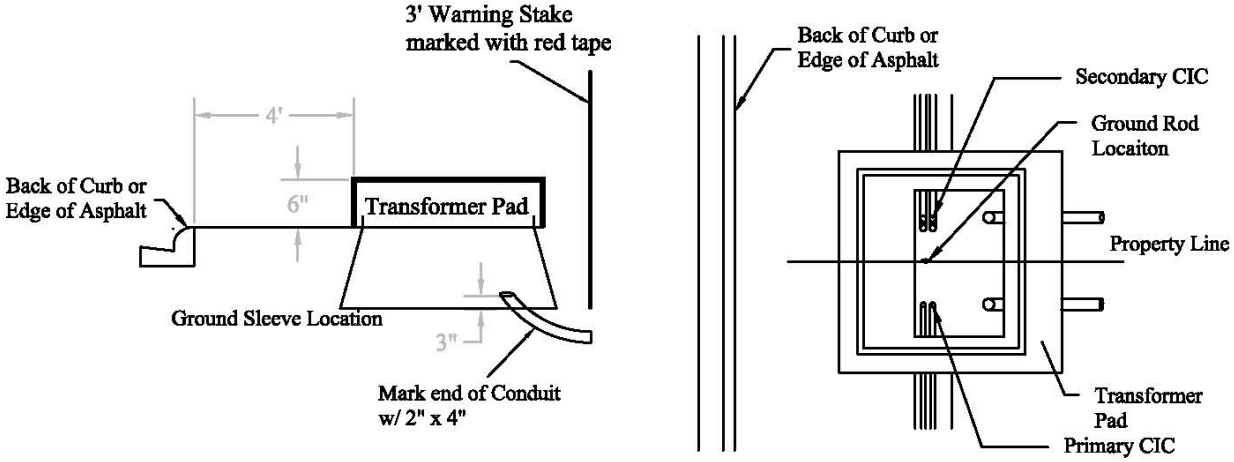
Date:	Drawing No.	Requirements for Electric Service
June 2013	4	Equipment Location With Sidewalk

WITHOUT SIDEWALK

EQUIPMENT LOCATION
CURB OR ASPHALT ONLY-NO SIDEWALK



HANDHOLE LOCATION

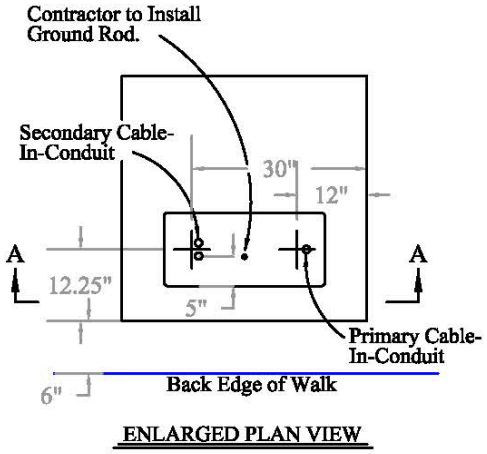


TRANSFORMER PAD LOCATION

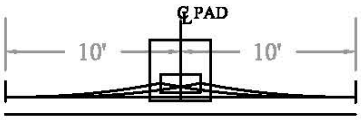
CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	5	Equipment Location - No Sidewalk

SINGLE PHASE TRANSFORMER FOR TEMPORARY SERVICE



ENLARGED PLAN VIEW



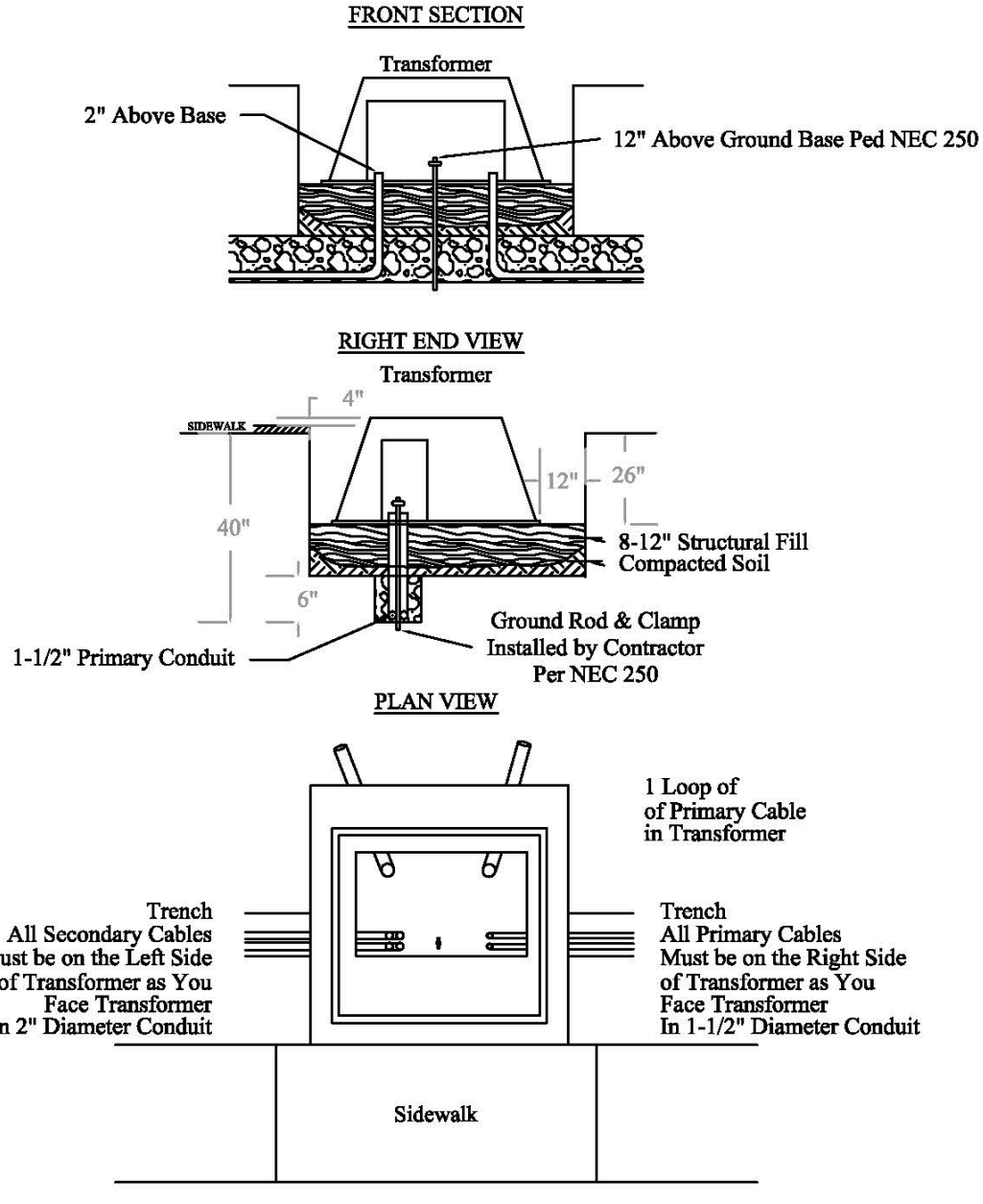
NOTE: Cable Transition to Trench To Pad Should Begin No Further Than 10' From Centerline of Pad

PLAN VIEW

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	6	Single Phase Transformer Ground Sleeve & Pad

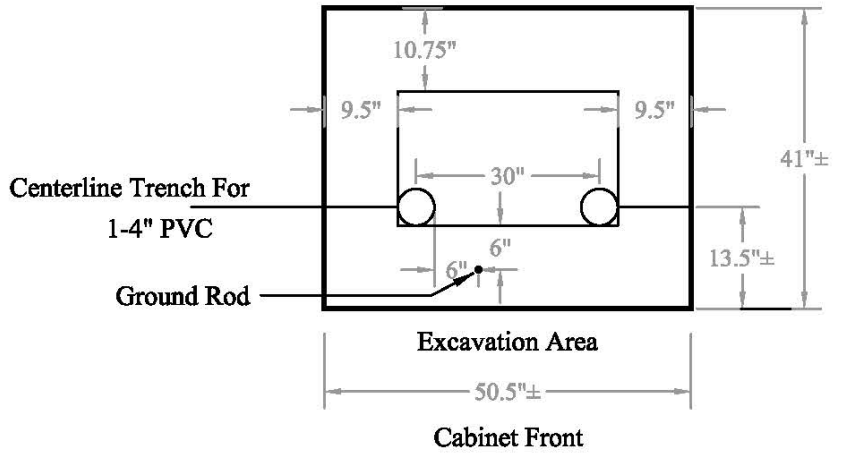
SINGLE PHASE TRANSFORMER WITH BOX PAD

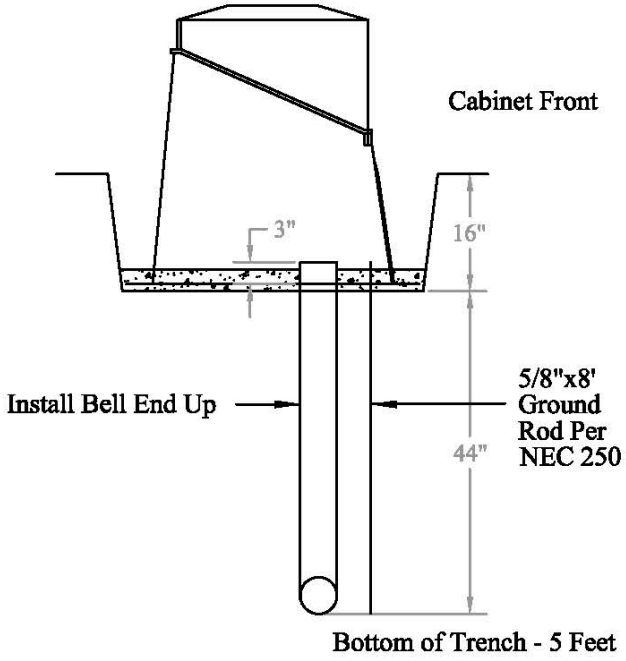


CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	7	Single Phase Transformer Pad Box

SINGLE PHASE SECTIONALIZING CABINET



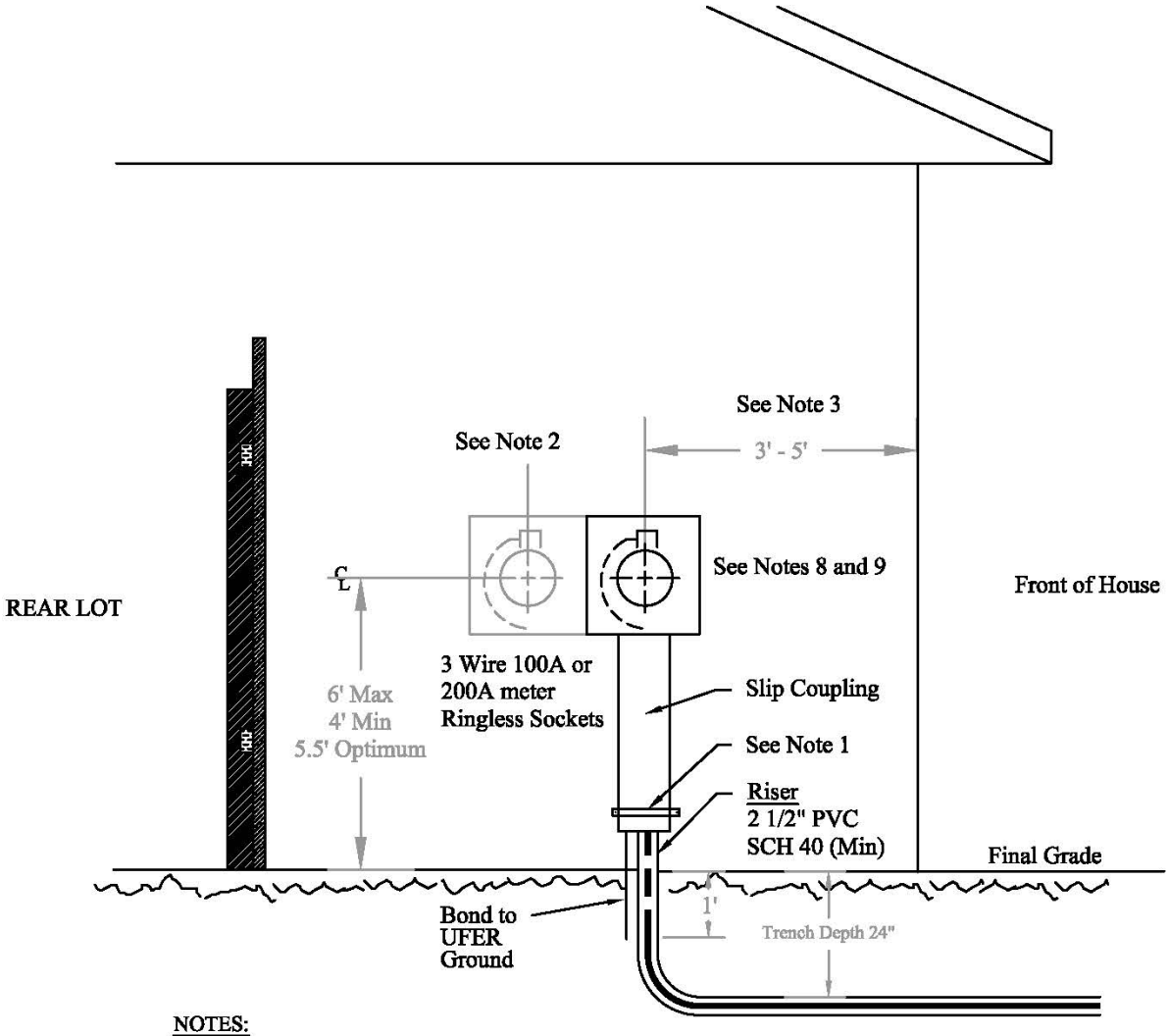


NOTE: Transition the trench Depth From 4' To 5'
Deep Twenty Feet Each Side of Cabinet

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June, 2013	8	Single Phase Sectionalizing Cabinet

UNDERGROUND METER AND SERVICE LOCATIONS



NOTES:

1. Fasten securely to wall plate above foundation.
2. Single main meter combination is required in case of remote meter location
3. Longer or shorter distances allowed when approved by city.
4. Service entrance to be located on the side of the building closest to city connection point.
5. Include ground lug for communications ground.
6. No meters shall be above or below obstructions including window wells and stairs.
7. Service greater than 200 Amps shall be underground.
8. Main breaker provided for each meter. No cold sequencing.
9. Permanent labels must be fastened. See meter section.
10. All non-current carrying metallic parts to be effectively grounded.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	9	Underground Meter and Service Locations

SECTION 4 - COMMERCIAL & INDUSTRIAL

4.1 New or Upgraded Commercial & Industrial Service - General

a. ***Required Items Prior to Applying for a Permit***
When requesting a new or upgraded commercial or industrial service, the Customer or Customer's representative must submit the following to the City prior to applying for a permit from the building department:

- *Request for Electric Service* form (RES)
- *Electrical loading information* (Include main disconnect size/main distribution panel bus size, panel schedules and connected loads)
- *Engineering deposit* made payable to the City of Loveland
- *Electrical site plan & one-line electrical drawing*

b. ***RES Review & Acceptance***
Field Engineering will review and accept the RES, then return it to the Customer. The Customer submits the completed, accepted RES with their building permit application.

c. ***Easement Area Requirements***
All easements shall be granted to the City of Loveland. By submitting a RES, the Customer agrees to grant or arrange for an easement on the Customer's property for the installation, operation, and maintenance of electric lines and/or equipment necessary to provide service to Customer.

d. ***Electrical Design, Fees & Contractor Orientation***
Field Engineering will design the installation and provide an estimated cost. The Customer must pay the estimated installation cost prior to the release of construction materials. After work is completed and the final cost is determined, the Customer will be billed or refunded the difference from the estimated cost. Field Engineering can be reached at 970-962-3561. Any contractor chosen by the Customer must attend a contractor orientation meeting given by the City before beginning work. Call 970-962-3561 to arrange a contractor orientation meeting.

e. ***City Furnished Materials & Installation Standards***
For services less than 600 volts and 200 amps and greater, the City furnishes the meter socket, current transformers (CT) and potential transformers (PT), where required. The electrical contractor must install the above in accordance with all City standards. CTs shall not be installed in any transformer. They shall be installed in an approved CT enclosure, within 10' of the meter on the exterior wall of the building. See *Section 6 - Meters and Meter Connections*, for CT metering requirements.

f. ***Wiring Standards***
All wiring on the Customer side must meet the applicable NEC requirements.

g. ***Final Inspection Prior to Meter Installation***
The City will install the meter upon satisfactory final inspection by the inspecting authority. The installation must conform to all metering requirements before the meter is set. The easement area shall be at final grade.

h. ***Obtain Building Permits Prior to Construction***
All building permits will be obtained by the Customer before proceeding with construction.

i. ***Pre-Construction Meeting***
An on-site pre-construction meeting with the Field Engineer and City's construction inspector shall be arranged to determine start time and construction schedule. All other utility companies shall be notified of the date and time of this meeting by the developer.

j. ***Meter Pedestal Installations***
For meter pedestal installations, see *Drawing No. 19* in *Section 6 – Meters and Meter Connections*.

4.2 Commercial & Industrial Services – Overhead

a. ***Overhead Services Available in Existing Overhead Areas Only***
Overhead service is only available in areas with an existing overhead primary distribution system. The City does not permit overhead service in an area with an underground distribution system or areas designated as underground areas. Services greater than 600 volts or 400 amps shall be served by underground service. See *Section 4.3 - Commercial & Industrial Services – Underground*.

b. ***City Work Paid by Customer***
The City shall design, furnish, and energize all overhead system extensions necessary to provide desired service including the transformer(s). The City will furnish, install, and energize all overhead service conductors from the source to the weatherhead. The Customer bears the cost of such installation. The City will not provide locating services for the Customer's service, except that portion of the Customer's service line located in City-owned property.

c. ***Demarcation Point***
The point of demarcation for the City stops at the weatherhead where electrical connections are made to the City's service. The Customer is responsible for any maintenance or repairs beyond that point.

d. ***Attachment Point Requirements***
- The point of attachment height for the service drop conductor on the Customer's structure must adequately provide vertical clearances between the service drop and the ground. All clearances must meet the requirements of *Table 8-1* in *Section 8 - Clearances*.
- Contractor must provide a suitable point of attachment for the service drop. The point of attachment must have adequate strength to safely withstand the strain of the service drop.

e. ***Attachment Requirements***
- Exercise care when installing vertical risers on brick, concrete block, or similar building walls. The point of attachment must safely withstand the strain imposed by the riser.
- When attaching the service drop support to a wooden building, screw the service entrance wire holders to the building studs or other structural support.

f. ***Keep Area Around Service Clear***
No structure or object shall be placed underneath the service without permission from the City.

4.3 Commercial & Industrial Services – Underground

a. ***City Work Paid by Customer***
The City shall design, furnish, and energize all primary underground system extensions necessary to provide desired service including the transformer. The Customer bears all costs involved of such installation including but not limited to materials, labor, vehicles, inspection, and engineering.

b. ***City Supplied Subsurface Structures***
The Customer or contractor shall install all City supplied subsurface structures required for the primary including conduits and vaults. See *Drawings 10 and 11*.

c. ***Customer Supplied Items***
The Customer supplies and installs all service cable and conduits from the transformer to the premises in accordance with the NEC.

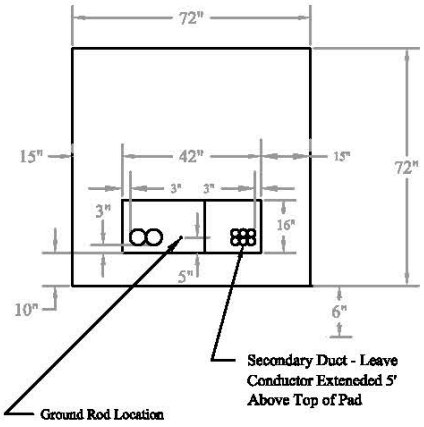
d. ***Demarcation Point***
The Customer owns and maintains the service from the transformer to the building except the meter and associated equipment. The City will not provide locating services for the Customer's service, except that portion of the Customer's service line located in City-owned property.

e. ***Underground Service Installations***
For details on installing underground services, refer to *Section 5 – Trenching and Cable Handling* and *Section 8 - Clearances*.

THREE PHASE TRANSFORMER INSTALLATION

45-750KVA PAD

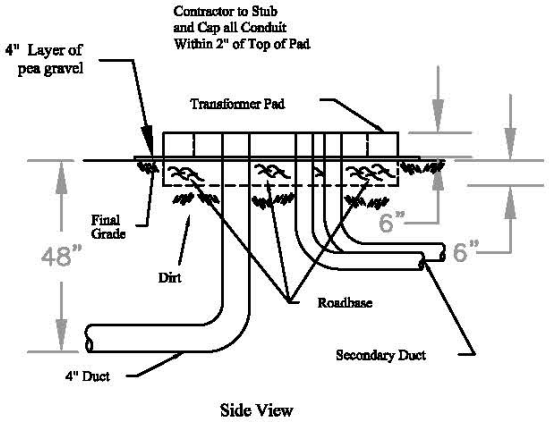
Transformer Pad Dimensions



NOTE:

1. Concrete transformer pad provided by city.

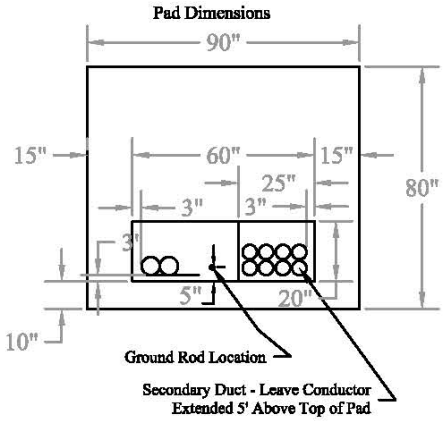
DETAIL A



Side View

1000-2500KVA PAD

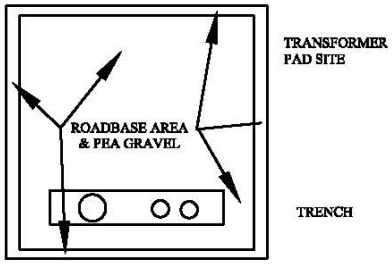
Pad Dimensions



NOTE:

1. Concrete transformer pad provided by city.

DETAIL B



TOP VIEW

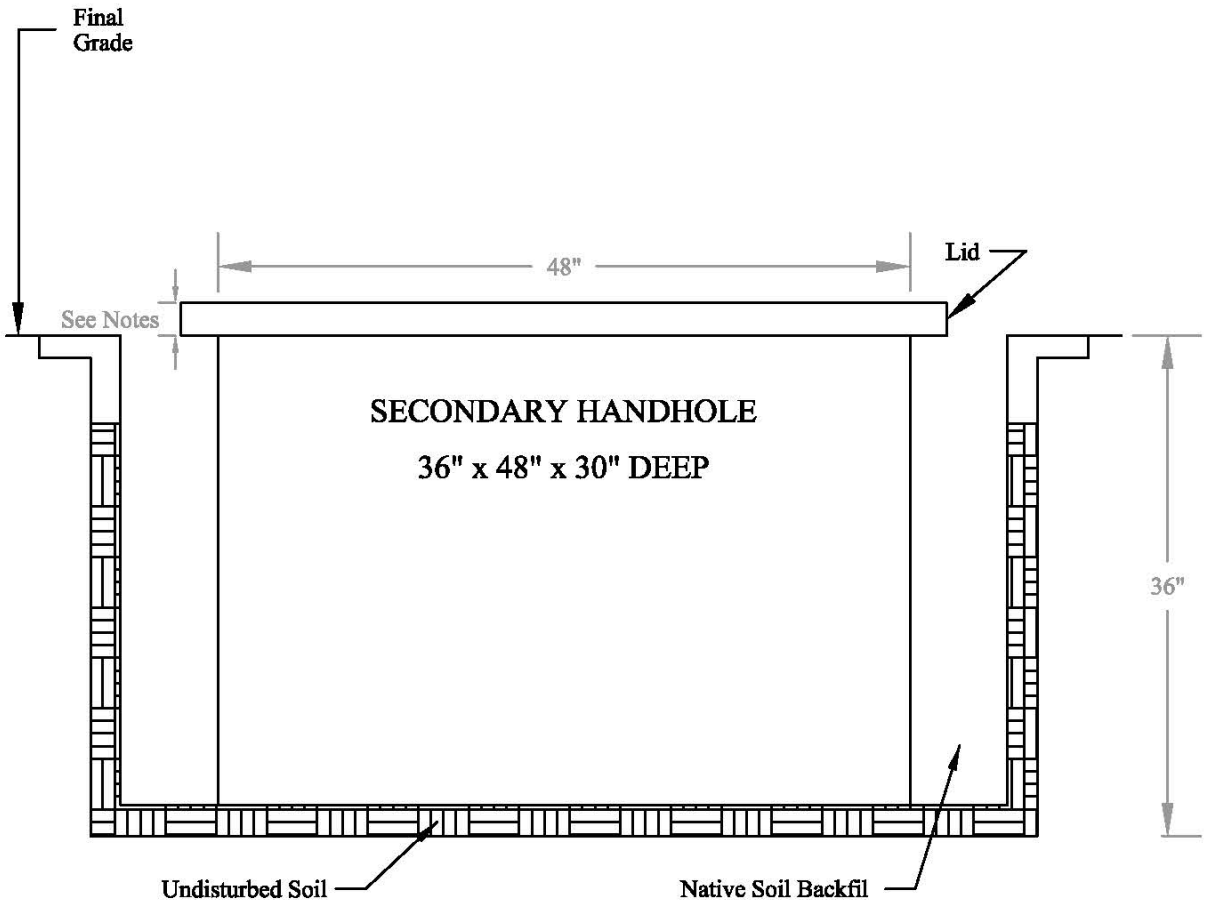
NOTES:

1. Flowable fill or concrete is not allowed beneath the transformer pad in lieu of compaction tests.
2. Three (3) compaction tests are required one in front, one in back, and one designated by construction inspector.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June, 2013	10	Three Phase Transformer Installation

COMMERCIAL HANDHOLE



NOTES:

1. If located in grassy area - height 2" above grade.
2. If located in alleyway or sidewalk, the handhole shall be flush with final grade.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June, 2013	11	Commercial Hand Hole

SECTION 5 - TRENCHING AND CABLE HANDLING

5.1 Trenching - General

a. ***Minimum Separation from Other Utilities***
Minimum separation (outside conduit wall to outside conduit wall) from primary power conduit and other utilities is required. The following shall apply:

Water / Sewer / Storm lines	6 ft.
Natural gas lines	3 ft.
Communications / Other electric utilities	3 ft.

b. ***Minimum Separation for Multiple Conduits***
Multiple conduits shall have a minimum separation of 3 inches (outside wall to outside wall) from the trench wall and to other conduits. Spacers shall be used. Three or more 6 inch conduits require concrete encasement.

c. ***Trench Specifications***
For Trench Specifications see *Drawings 12, 13 and 14.* Trenches in multifamily areas of three of more units per building are 42 inches deep. The conduit will be direct buried unless it is located underneath parking spaces and driving areas including, but not limited to, driveways, entrances, and loading/unloading areas. When it crosses underneath the parking and driving areas, it will be concrete encased 3 inches on top and on both sides of the conduit. Fill above the concrete shall be compacted to 95% of maximum density. Maximum density is designed by ASTM specification D698, the Standard Proctor. Flowable fill to sub grade may be used instead of concrete encasement. All street crossings shall be flow filled. Joint trench with cable TV and telephone are permitted providing City clearances can be met.

d. ***Excavation Requirements***
All excavation work shall conform to standards and codes set forth in the OSHA and City regulations.

e. ***Trench Variances***
Trenching shall not vary more than 6 inches from the centerline designated on the plans. The City will not accept trenching outside of the right-of-way or easement lines.

f. ***Trench Width***
See *Drawings 12, 13 and 14.*

g. ***Trench Bottoms***
Trench bottoms should be level and smooth with well-tamped earth. There should not be sharp rises or drops in elevation. Trenches shall be free of sharp rocks, other sharp objects, and foreign material.

h. ***Trench Cover***
See *Drawings 12, 13 and 14.*

i. ***Backfill Materials***
Backfill material shall be finely divided and free from debris and organic material. The first lift shall contain no rocks larger than 1 inch in the greatest dimension. Subsequent lifts shall contain no rocks larger than 3 inches in the greatest dimension.

j. ***Trench Backfill***

Trench backfill at all depths shall be compacted to not less than 90% of maximum density or to that of the surrounding undisturbed earth, whichever is less. Backfill for trenches traversing sub-grades of roads, parking areas, underground piping street crossings and other facilities subject to damage by settlement shall be compacted to not less than 95% of maximum density. Maximum density is defined by ASTM specification D698, the Standard Proctor. All street crossings shall be flow filled.

k. ***Compaction Methods***

Backfill material shall be placed in uniform layers not exceeding 18 inches in un-compacted thickness and mechanically compacted using platform type tampers. Compaction by rolling will be permitted for the second lift provided the first lift has been adequately consolidated. Water inundation is not allowed as a method of compaction; however, soil may be dampened prior to backfilling.

l. ***Compaction Tests***

Compaction tests are the responsibility of the developer for substructure installation. The location and depth of all compaction tests will be designated by the inspector and performed in the presence of the inspector unless excused by the inspector. These tests must be conducted by a certified laboratory and signed by a professional engineer registered in the State of Colorado. Test results must be supplied to the Inspector and Field Engineer prior to final acceptance.

The frequency of the tests is as follows:

- At least one test for every 300 feet of trench.
- At least one test at each transformer location.

m. ***Trench Inspection***

A mandrel with a diameter ¼" less than the inside diameter of the duct and a jetline must be passed through each empty duct at the time of installation in the presence of the City inspector.

5.2 Flow Fill and Concrete Encasement

a. ***Areas Requiring Flow Fill***

Flow fill shall be required under all streets, parking lots and alley ways.

b. ***Flow Fill Specifications***

Flow fill shall meet the specification of the Colorado Department of Transportation.

c. ***Concrete Encasement***

The concrete encasement shall meet the specifications of the City of Loveland Water and Power Department.

5.3 Cable Handling

a. ***Unloading Cable Requirements***

Unloading of cable shall be accomplished without contacting the cable or outer covering or supporting the weight of the reel on the cable or covering. This precludes the use of a web sling or inappropriate use of a fork lift or crane.

b. ***No Dropping Cable Reels***

Under no circumstances shall reels be dropped from the delivering vehicle to the ground.

c. ***Cable Reel Storage Requirements***

- Reels shall be stored on a hard surface in the upright position. Do not allow the flanges of the reel to sink into a soft surface allowing the weight to be supported on the cable.
- Do not store cable where it can come in contact with chemicals or petroleum products.
- Cable shall be stored where it cannot be damaged by construction equipment and flying debris.

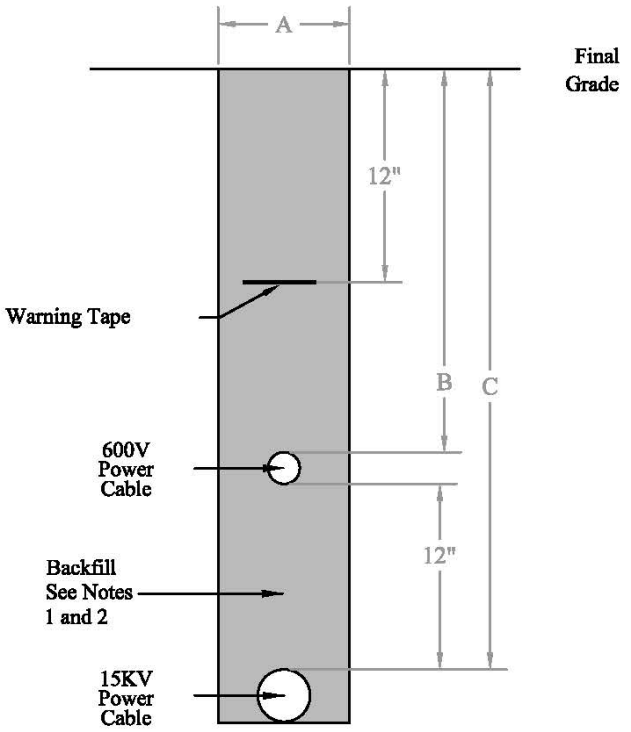
d. ***Rolling Cable Reel Requirements***

When rolling reels, clear the path of any objects that could come in contact with the cable.

e. ***Seal Cable Ends***

Open cable ends shall be sealed to prevent moisture to enter the cable.

TRENCH DETAIL



	Min	Max
A	6"	24"
B	30"	36"
B (Streetlight)	24"	30"
C	42"	48"

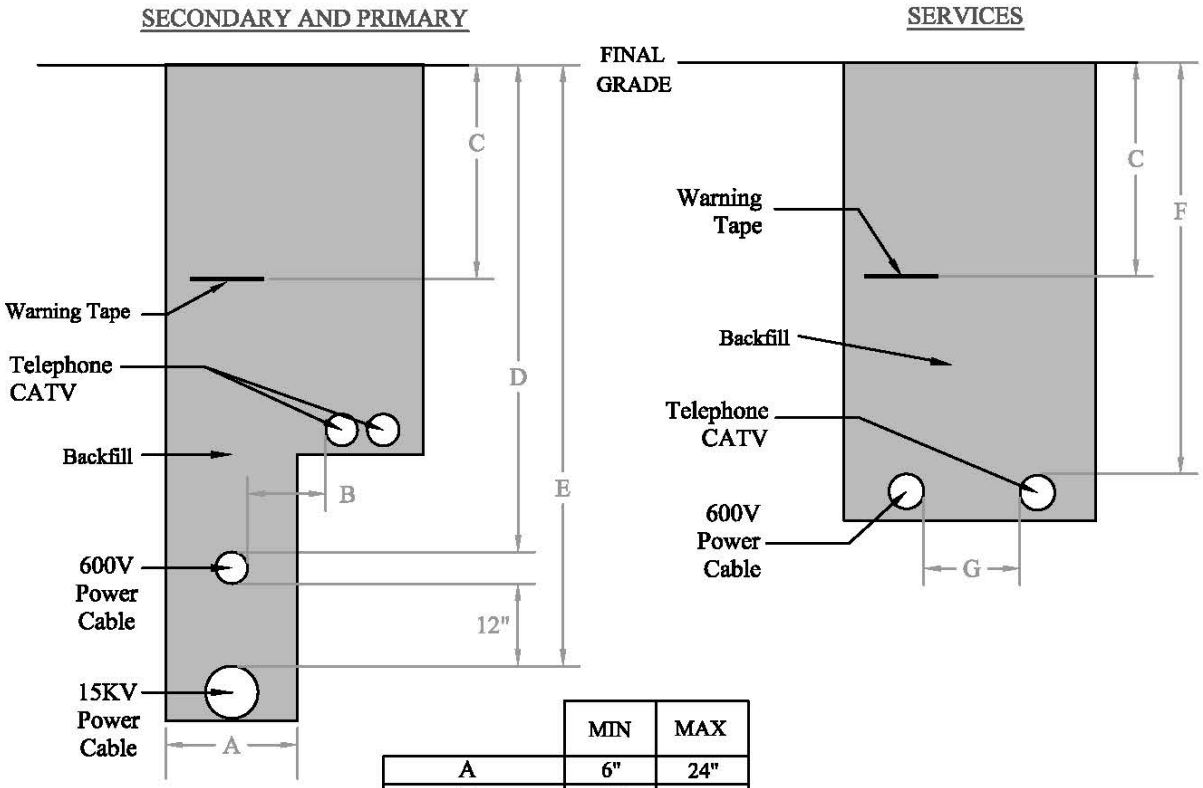
COMPACTION NOTES:

1. Trenching in subgrades of roads, parking areas, underground piping, street crossings and other facilities subject to damage by settling shall be flow filled or concrete encased with 3" on all sides with compacted backfill of 95% of minimum.
2. All other areas my be filled with backfill and shall be compacted to 90% minimum.
3. All street crossings shall be flow filled.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June, 2013	12	Standard Trench

JOINT TRENCH DETAIL (WHERE ALLOWED)
WITH TELEPHONE AND/OR CABLE



	MIN	MAX
A	6"	24"
B	12"	--
C	12"	12"
D	30"	36"
D (Streetlight)	24"	30"
E	42"	48"
F	24"	30"
G	12"	--

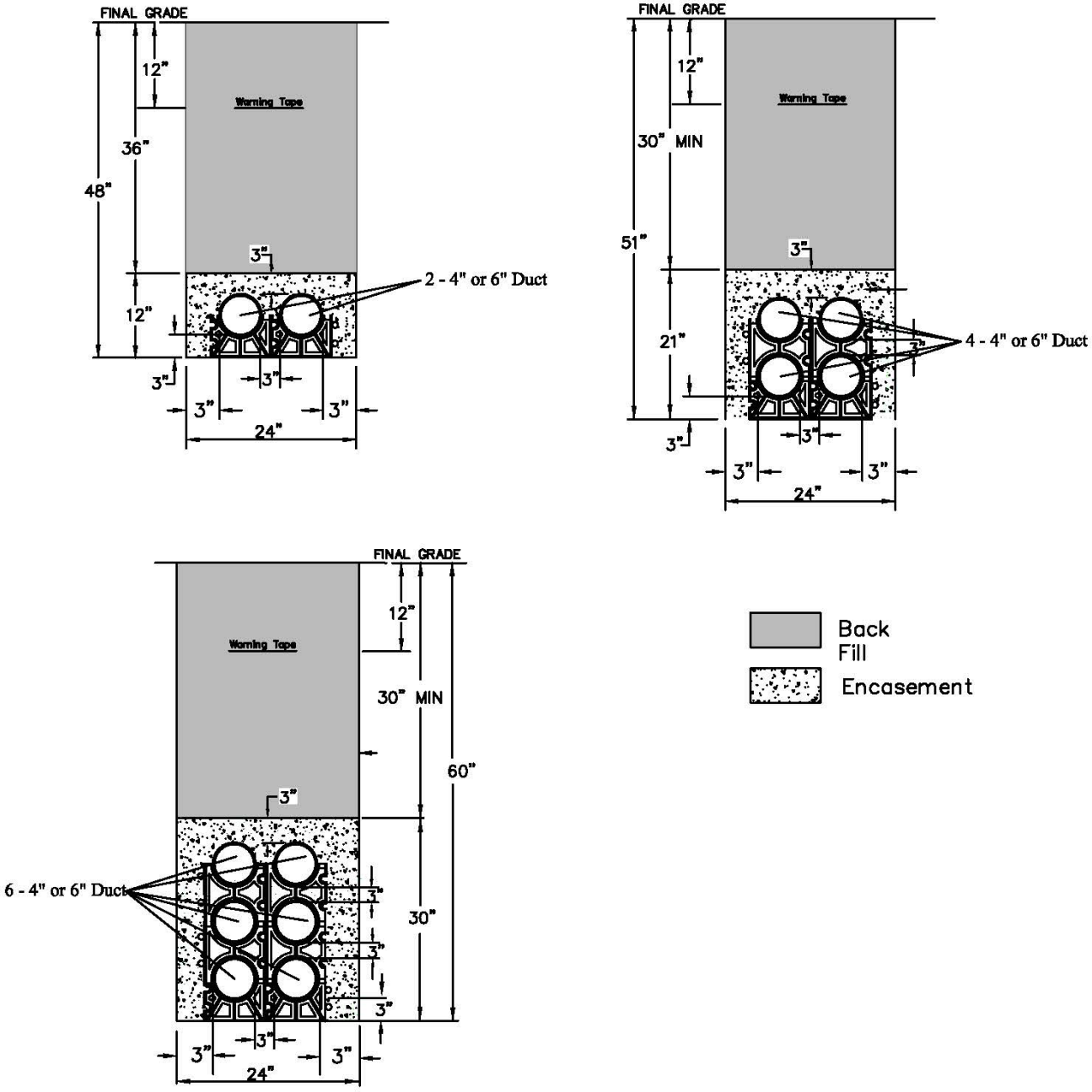
NOTES:

1. Joint trench not permitted in 3 phase residential trenches.
2. Gas, Sewer, Water, and Storm water are not allowed in the same trench with Electric.
3. Trenching in subgrades or roads, parking areas, underground piping, street crossings, and other facilities subject to damage by settling shall be flow filled.
4. All other areas shall be compacted to 90% minimum.
5. Joint use with gas is allowed with minimum 18" separation when gas and electric are required to be positioned on the same side of the house due to limited side set backs.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
July, 2013	13	Joint Trench

TRENCH DETAIL
MULTIPLE CONDUITS

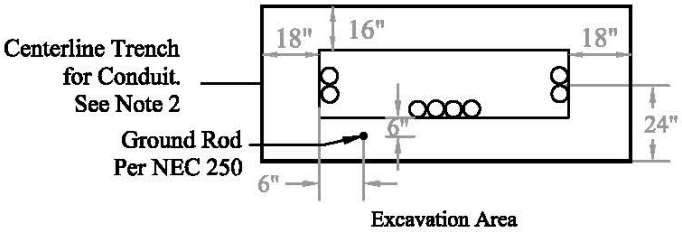


CITY OF LOVELAND WATER & POWER

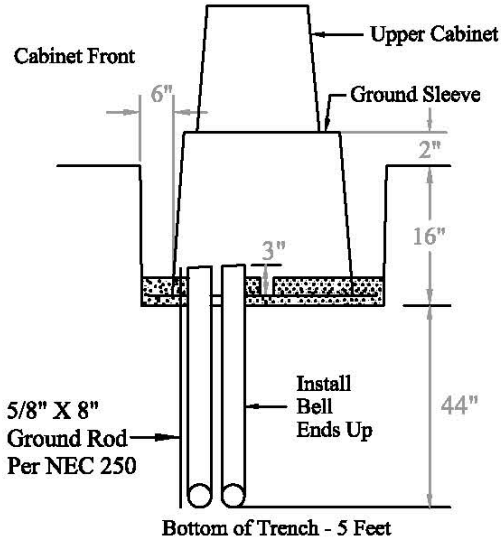
Date:	Drawing No.	Requirements for Electric Service
June, 2013	14	Trench Detail - Multiple Conduits

SECTIONALIZING CABINET

SECTIONALIZING CABINET INSTALLATION



Cabinet Front



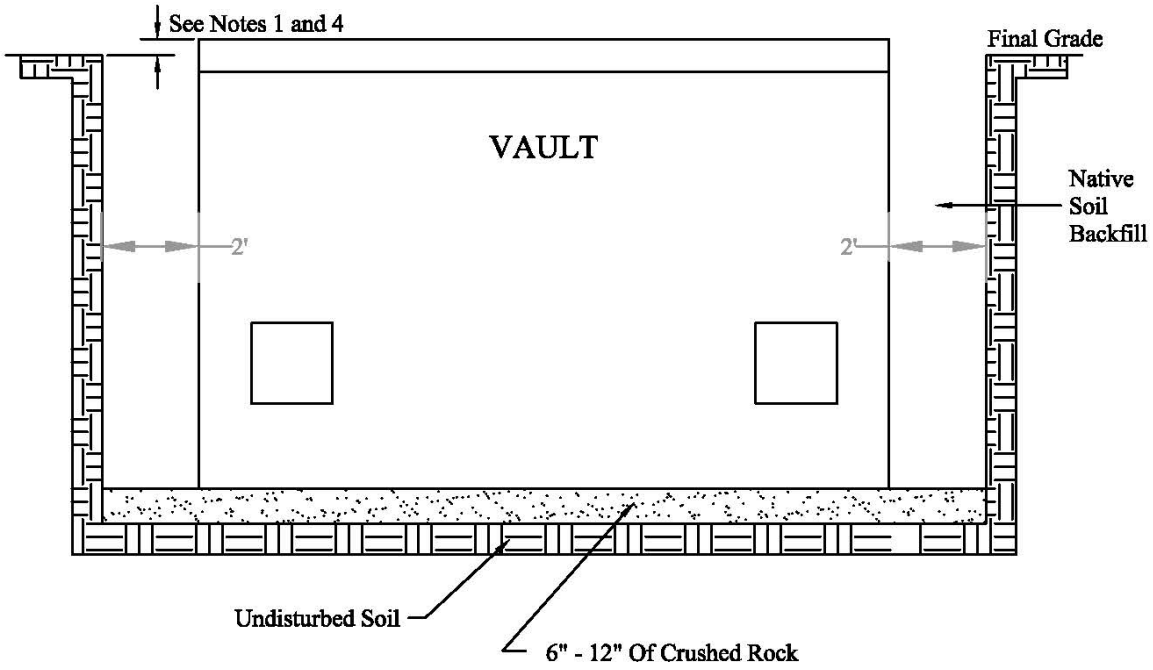
NOTES:

1. Transition the depth from 4' to 5'. Depth twenty feet each side of cabinet.
2. 2"-4" PVC if three phase and 1"-4" for single phase

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June, 2013	15	3 Phase Sectionalizing Cabinet

VAULT DETAILS



NOTES:

1. If vault is to be placed near sidewalk, along curb or other paved areas, keep top of lid level with top or curb, walk, or asphalt.
2. Excavations shall exceed the outside vault wall dimensions by two (2) feet on all sides to provide for tamping.
3. Excavation backfill at all depths shall be compacted to not less than 90% of maximum density as defined by ASTM spec. D698, otherwise known as standard proctor.
4. Top of lid shall be 6" above final grade when installed in non-paved locations
5. See 8.1 for landscaping clearance.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June, 2013	16	Vault Burial Details

SECTION 6 - METERS AND METER CONNECTIONS

6.1 Metering Requirements – General

a. ***Meter Installation Requirements***
Metering installations must meet all City requirements in effect at the time a new meter is requested. This includes requests to install a new meter in existing equipment not currently being used. Meters will not be set if all requirements are not met. Contact the Electric Metering Supervisor with any questions you might have regarding metering requirements.

b. ***Electric Service Delivered to a Single Point***
All electric service to a dwelling/Customer space shall be delivered at a single point and measured with a single electric meter. Building renovations that consolidate multiple Customer spaces typically require consolidation of corresponding electric meters to ensure the space is metered at a single point. In certain situations, the City may grant an exemption to allow multiple meters serving a single commercial space. Refer to *Section 6.8 - Commercial Flex Space Metering* for details.

c. ***Upgrading Equipment/Service to an Existing Building***
If upgrading equipment/service to an existing building, the site must meet current standards and guidelines set forth by the City and other national codes. Customers may not add an additional meter to accommodate increased load. The existing meter/service must be upgraded to the appropriate size to handle the new load. The cost of upgrading is the responsibility of the Customer.

d. ***Building Use Changes***
Any building use other than original plans may require re-designed metering to accommodate a change in load characteristics at the Customer's expense. For information, please contact Electric Metering Supervisor.

e. ***Compromised or Unauthorized Changes to Meter/Meter Equipment***
If any meter/metering equipment or City requirement is found to be compromised by changes to existing building installation without the documented approval of the City, the Customer will pay the cost to correct the deficiencies.

f. ***Electronic Load Data Collection***
The City reserves the right to install and collect various electronic load data from its Customers. Such data remains the sole property of the City of Loveland.

g. ***City to Install Locks & Seals***
Only City of Loveland locks and seals shall be installed on metering equipment. Customers may not install their own locks on any metering equipment. The City has the authority to remove any unauthorized locks. The City reserves the right to install locking devices on Customer-owned equipment, as necessary to ensure safety and eliminate potential revenue losses.

h. ***City to Cut Locks & Seals or Remove Meters***
Only authorized and qualified City of Loveland electric utility personnel shall cut seals/locking mechanisms, and remove or install meters. All metering equipment belongs to the City of Loveland and shall not be removed or taken.

i. ***No Jumpered Sockets***
Under no circumstances shall an electric meter socket be jumpered to provide temporary power. This includes jumpering the permanent meter socket out while the temporary power pole is providing power. If the socket is found to be jumpered, the socket will have to be replaced at Customers' expense before a meter can be installed.

j. ***Replace Damaged Meter Socket Lids***
If the meter socket lid is damaged or will not provide the safety and protection that was originally intended the cover shall be replaced at the Customer's expense before the meter can be re-installed.

k. ***No Paint & No Obstructions of Meter Covers***
No painting or obstruction of the glass meter cover is allowed. Altered meter covers will be replaced at the Customer's expense.

l. ***Approved Meter Sockets***
All meter sockets shall be approved for applied voltage, current and number of wires.

m. ***Self-Contained Meter/Main Breaker Enclosures***
All self-contained meter/main breaker enclosures shall have a permanent divider between the meter and the Customer's breaker and a separate cover over each section, so that the meter cannot be accessed from the Customer's side of the enclosure.

6.2 Meter Location*s*

a. ***Meter Location Approval***
Meter location is subject to City approval. All meters and equipment, including service disconnects, must be outside of the building and continuously accessible, at a location approved by the City. An exception is allowed for internal mounting of disconnects for fire pumps as required by *NFPA 20, Appendix A.3*.

b. ***Prohibited Meter Locations***
Meters shall not be installed over window wells, in stairwells or under stairways.

c. ***Access to Meter Equipment Required by City***
The City requires the right to enter Customers' premises and to freely access metering equipment for the purposes of reading, maintenance and emergencies.

d. ***Keep Meter Access Clear***
The Customer must keep the meter access clear of fences, building additions, shrubbery, or other blockage within 3 feet of the front and 2 feet from the top and sides of the meter. A minimum 3 foot wide access path to all metering equipment must also be maintained by the Customer. If such blockage is present, the City will notify the Customer to permanently remove the blockage. Failure to clear any blockage may result in disconnection of service. The City is not responsible for damage to trees, shrubs,grass, fences and/or other landscaping due to inadequate access. See *Drawing No. 17* and *Section 8 - Clearances*.

e. ***Sloped/Uneven Final Grades Around Meter***
When the final grade around the meter is sloping or uneven, a 3 foot radius level area is required in front of the meter or meter equipment.

f. ***Parking Bollards (Posts)***
When metering equipment is prone to vehicular damage, the City may require additional protection such as parking bollards (posts) at the Customers' expense.

g. ***Protective Enclosures***
Where damage to metering equipment occurs or is anticipated, the City may require the Customer to install fencing or a protective metal enclosure with locking provisions to protect the equipment. The City will determine when protective enclosures are required.

h. ***Repeated Damage to Metering Equipment***
In cases of repeated damage to metering equipment, the Customer will be charged for repair or replacement of said equipment. Failure to provide adequate protection to metering equipment and/or the service entrance may result in disconnection of service.

6.3 Meter Equipment Mounting

a. ***Who Installs & Supplies Metering Equipment***
Contractors install all metering equipment except the meter in most situations. Overhead primary metering and some special metering applications will be built by qualified City personnel. The City supplies and owns all 600-volt CTs, PTs, transformer rated meter sockets, and meters. The City does not supply or maintain self-contained meter sockets.

b. ***Meter Mounting***
Metering equipment must be mounted securely on a rigid surface. Metering equipment not mounted to a building structure may be installed on:

- A freestanding concrete wall, or similar.
- An approved metering pedestal. See *Drawing No. 19.*
- The side of a pad-mounted CT cabinet, switchgear, or equipment cabinet, provided the proper clearances and mounting heights are maintained.

c. ***Prohibited Meter Mounting Locations***
Meters shall not be mounted on the inside or outside of pad mounted transformers or on City utility poles.

d. ***Mounting Heights***

- *Individual or Horizontally Adjacent Meters* - Individual meter sockets, or meters adjacent to each other horizontally shall be mounted so that the center line is between 6 feet and 4 feet.
- *Vertically Stacked Meters* - Vertically stacked multiple metering shall be mounted so that the bottom of the lowest meter is at least 3 feet above final grade and the top of the highest meter is no more than 6 feet. See *Drawing No. 9 and 18.*

e. ***CT Mounting Requirements***
Wall-mounted CT cabinets shall be installed so that the bottom of the cabinet is at least 12 inches above final grade. Potential transformers (if used) shall be installed within the CT compartment at a maximum mounting height of 6 feet. Refer to *Section 6.10 – CT Rated Metering* for detailed requirements. The CT cabinet and meter socket shall be installed so that the meter socket is not obstructed with the cabinet door in the full open position.

f. ***Service Conduit Requirements***
Service conduit shall have no access or cover point of access between the metering equipment and the power transformer.

g. ***Metering Clearances***
Metering clearances must comply with *Section 8 - Clearances* of this book.

6.4 Sequence of Meter, Service Entrance and Customer Equipment Connections

a. ***Cold Sequencing***
No cold sequencing is allowed. The only exception is when there are more than 6 meters in a single metering location. Then NEC prevails and there shall be a main service disconnect ahead of the meters. Individual meter disconnects shall be after the meters.

b. ***No Customer Equipment Ahead of Electric Metering***
No Customer equipment is allowed to be connected ahead of the electric metering. Any Customer-owned equipment must be connected after the CT compartment or meter socket.

c. ***No Separately Derived Power Source Ahead of City Metering***
No separately derived power source shall be ahead of the City metering string. For any self-generation, please refer to *Section 9 - Interconnection Requirements for Customer Generation – Interconnection Requirements* for specifications and approval procedure, prior to purchase or installation of equipment.

d. ***No Junction Boxes at Meter Sockets or CT Cabinets***
Meter sockets or CT cabinets shall not be used as a junction box under any circumstance.

6.5 Residential (Single Family Homes or Duplexes)

a. ***Approved Meter Sockets***
For all residential, self-contained service installations the Customer will furnish and install an approved meter socket with a sealing mechanism. Ring-type meter sockets are not allowed. Two-piece lids are not allowed, unless combination meter-main equipment is being used. See approved Meter Socket Specifications. Contact the Electric Metering Supervisor with any question you might have.

b. ***Demarcation Point***
- *Underground Services* - The point of demarcation for underground residential service is the line side jaws of the meter socket. The Customer owns and is responsible for maintenance of the meter socket.
- *Overhead Services* - The point of demarcation for overhead services is the connection at the Customer's weatherhead. The City provides, owns and installs the service wire up to that point. The Customer owns and is responsible for maintenance of all wire and equipment past that point, with the exception of the City's metering equipment.

c. ***Replacing Meter Pedestals***
Existing meter pedestals will be replaced with a meter on the house whenever repairs (City expense) or upgrading (Customer expense) are required.

d. ***Multi-Family Dwellings with Three or More Meters***
Multi-family dwellings with three or more meters are considered commercial services and are covered in *Section 6.7 - Commercial and Industrial* and *Section 6.9 - Multiple Metering*.

e. ***Residential Services 400 Amps & Larger***
Residential services 400 amps (class 320 meter) and larger are considered commercial services and are covered in *Section 6.7 - Commercial and Industrial*.

6.6 Mobile Home Parks

a. ***Service Wire Source & Ownership***
Ownership of the service wire belongs to the City from the power transformer to the line side connections of the meter socket, or wire gutter, if applicable. The wire will be specified and installed by the City.

b. ***Terminations***
Terminations will be made by the City to the load side of the power transformer and line side of the meter socket or gutter. The load side wire connections and wire leading to the mobile home will be the owner's responsibility. This includes both overhead and underground services.

c. ***Demarcation Point***
The main line to and between the meter pedestal in the responsibility of the City.

d. ***Meter Pedestal Approvals & Ownership***
Metering pedestals must be approved by the Electric Metering Supervisor before purchase and installation. Ownership and maintenance of these pedestals will not be the responsibility of the City of Loveland. See *Drawing No. 19.*

6.7 Commercial and Industrial (Includes Multi-Family Housing with Three or More Dwellings & Residential Services 400 Amps & Larger)

a. ***277/480 Volts up to 200 Amp Services***
277/480 volt services up to 200 amps will be metered with self-contained metering. When the load is greater than 200 amps PTs with CTs are required.

b. ***Self-Contained Meters***
All commercial self-contained metering shall have manual bypass meter sockets. Bypass lever must supply clamping action on meter spades and also operate continuous duty bypass device. This includes both single-phase and three-phase applications.

c. ***Single-Phase 3-Wire, 240 Volts, 400 Amp Services***
Single-phase 3-wire 240 volts, 400 amp services utilize a class 320 meter and require the installation of an approved CL320 meter socket. The CL320 meter socket must include a jaw-clamping lever bypass that can operate as a 320-amp continuous duty bypass device.

d. ***Three-Phase Services Greater than 200 Amps & Single-Phase Services Greater than 400 Amps***
All three-phase services greater than 200 amps and single-phase services greater than 400 amps will utilize CTs. PTs are required when service voltage is greater than 240 volts and the load is greater than 200 amps. See *Section 6.10 - CT Rated Metering* for complete requirements.

e. ***Address Posting at Entrance Doors & Meter Sockets***
All commercial locations shall have the City-assigned address permanently displayed on or above the entrance door. The same address shall be imprinted on brass tag permanently attached to the meter socket cover using pop-rivets or self-tapping screws. The address shall also be permanently labeled inside the meter socket. Meters will not be installed until addresses are correctly displayed.

f. ***Address Labeling of Meters***
Address labeling of meters shall correspond to building permit scheme. These addresses that are given by Land Records Management or the Building Division are not to be changed by the Customer. Customer re-addressing of the meters by changing number designation is strictly prohibited. If changes need to be made, contact the Building Division.

g. ***Troughs, Gutters, & Raceway Requirements***
All troughs, gutters and raceways shall have a provision for a tamper-proof (lockable) sealing mechanism. Troughs, gutters, and raceways shall be constructed so that removable bolts or screw heads are not accessible from the outside. Pop rivet construction is preferred.

h. ***Temporary Meter Design for Services Greater than 200 Amps***
Temporary metering design for any loads over 200 amps shall be approved by electric metering prior to installation.

i. ***Sub-Metering***
Sub-metering is allowed beyond the City of Loveland metering point. Customer will provide all equipment, including electric meter(s), and such metering will be installed, maintained and billed by the Customer. No re-sale of power provided by the City of Loveland is allowed.

j. ***Demarcation Point***

- *Underground Services* - The demarcation point for underground commercial service is the secondary terminals of the power transformer. The Customer owns, installs and maintains at their expense all wire and equipment past that point, with the exception of the City's metering equipment.
- *Overhead Services* - The point of demarcation for overhead services is the connection at the Customer's weatherhead. The City provides, owns and installs the service wire up to that point. The Customer owns, installs and maintains at their expense all wire and equipment past that point, with the exception of the City's metering equipment.

k. ***Site/Parking Lot Lighting***
A separate electric meter will not be installed for site/parking lot lighting that is fed from the same service as the "house meter". Site/parking lot lighting shall be connected to the house panel, unless it is being fed from a separate service.

6.8 Commercial 'Flex Space' Metering

Multiple meters serving a single commercial rental 'flex space' may be allowed, if all conditions below are met.

a. ***Exemption/Revision Form***
An *Exemption/Revision Form* must be submitted to the City, requesting an exemption to *Section 6.1.b – Metering Requirements – General*. The Electric Metering group will make the final determination whether multiple meters will be allowed.

b. ***Six Meter Max per Single Customer Space***
No more than six meters may serve a single Customer space. Each meter shall have a main disconnect immediately adjacent to it. All meters and disconnects shall be grouped in a single location.

c. ***Disconnect Plaques***
The Customer shall install a permanent red mylar plaque with white lettering next to each disconnect to identify that there are multiple meters serving a single Customer space, using wording specified by the City. The plaques must be permanently fastened with rivets or screws - adhesive backing will not be accepted.

d. ***Distribution Panel Plaques***
The Customer shall install a permanent mylar plaque on each distribution panel within the Customer space that indicates which meter the panel is fed from. Wording shall be specified by the City.

e. ***Meter Address Tags***
The Customer shall install new brass address tags next to each meter, with the revised City-assigned meter designation.

f. ***Electric Billing Schedule***
Electric billing will be in accordance with City of Loveland Schedule of Rates, Charges and Fees.

g. ***Requirements for Changing Back to Original Multiple Units***
Should the space once again be divided to original multiple units, the Customer shall have a certified electrician perform a complete point to point inspection to avoid mixed metering plus re-label each meter and electrical panel to the appropriate address or unit number. Upon completion of the inspection and re-labeling, the electrician shall submit a completed City of Loveland Contractor License Application to the Building Department along with a copy of a current State Electrical License and a copy of a current Master Electrician License.

6.9 Multiple Metering

a. ***Address Posting at Entrance Doors & Meter Sockets***
All multi-metered locations shall have the City-assigned address permanently displayed above or on the entrance doors. The same address shall be imprinted on a brass tag permanently attached to the meter cover using pop-rivets or self-tapping screws. The address shall also be labeled inside the meter socket with permanent marker, so that it is visible with the meter installed. Meters will not be installed until addresses are correctly displayed.

b. ***Address Labeling of Meters***
Address labeling of meters shall correspond to building permit scheme. These addresses that are given by Land Records Management or the Building Division are not to be changed by the Customer. Customer re-addressing of the meters by changing number designation is strictly prohibited. If changes need to be made, contact the Building Division.

c. ***Liability for Mis-Wiring or Incorrect Labeling***
Electricians will be held liable for any mis-wiring or labeling at multiple dwellings resulting in billing inaccuracies. Any costs for the City to correct labeling and/or billing errors will be charged to the electrician. Repeated failure to adhere to accurate meter labeling may result in a petition to have the right to continue to work in Loveland revoked.

d. ***House Meter for Multiple Tenant Buildings***
All multiple tenant buildings shall have a meter to measure common electrical usage that is not billable to a single tenant or entity. The meter shall be labeled "house meter".

e. ***Multi-Occupancy Buildings with Individual Tenant Meters***
Individual tenant meters in multi-occupancy buildings will not be installed until such time that the individual units are being finished and permanent demising walls are constructed. 'Core & Shell' buildings will only be issued the house meter until individual tenant finishes are performed.

f. ***Meter Equipment Approval***
Any pre-manufactured multiple metering equipment must be approved by the electric metering group. Multiple metering equipment must be bus-type construction. Cable-connected multi-metering will not be accepted. Submit cut sheets to electric meter supervisor for approval, prior to purchasing.

g. ***Meter Sockets in Multiple Meter Locations with Three or More Meters***
All meter sockets in multiple meter locations with three or more meters must include lever-operated bypasses.

h. ***120/208 Volts Single-Phase Multiple Metering Equipment***
All 120/208 volts single-phase multiple metering equipment requires a three-phase main, with factory balanced phases.

6.10 CT Rated Metering

a. ***Three-Phase Services Greater than 200 Amps & Single-Phase Services Greater than 400 Amps***
All three-phase services greater than 200 amps and single-phase services greater than 400 amps will utilize Current Transformers (CTs). Potential Transformers (PTs) are also required when service voltage is greater than 240 volts and the load is greater than 200 amps.

b. ***277/480 Volt Services Greater than 200 Amps***
277/480 volts services greater than 200 amps require Potential Transformers (PTs). A CT cabinet with integral PT mounting provisions is the preferred equipment (See *Table 6-4* for minimum dimensions). External PT enclosures are not allowed. If the CT cabinet does not have integral PT mounting provisions, it must be upsized to permit mounting of the PTs within the same compartment as the CTs (See *Table 6-3* for minimum dimensions). An unobstructed space, 8x8x23 inches (minimum) must be maintained at the top or bottom of the CT compartment for PT mounting. PT mounting height must not exceed 6 feet. No electrical conductors may be in front of PTs. Refer to *Drawing No. 21*.

c. ***Approved CT Cabinets***

CTs and PTs shall only be installed in approved NEMA Type 3R CT cabinets with a hinged door, lockable hasp and fasteners that cannot be removed from the exterior of the cabinet. The cabinet shall be of sufficient size for load and voltage conditions. See *Tables 6-1 through 6-4* for minimum dimensions. Keyed door locks are not allowed. The CT cabinet and meter socket shall be installed so that the meter socket is not obstructed with the cabinet door in the full open position.

d. ***Main Disconnects or Main Distribution Panels***

All CT rated services will require a single main disconnect or main distribution panel with rated bus size. This requirement supersedes NEC Code 230-71 six handle rule.

e. ***Prohibited Installation Locations***

Under no circumstances will CTs or PTs be installed on secondary overhead lines, in pad-mount transformers or inside gutters or raceways.

f. ***CT-Rated Metering Request Submittals***

All CT-rated metering requests require that a one-line diagram be submitted to the Electric Metering Supervisor for approval prior to installation. This shall include the main disconnect or main distribution panel bus rating and service voltage. If switchboard or combo CT/main equipment will be used, submit cut sheets for equipment approval prior to purchasing.

g. ***Switchgear CT Compartment Requirements***

For Switchgear CT compartments, barriers shall be installed on all 4 sides of compartment. The compartment shall have hinged sealable doors. All panels providing access to unmetered conductors shall have fasteners that cannot be removed from either the exterior or the Customer compartment. No conductors, other than those serving the CT compartment and the ground bus shall be installed in or routed through the compartment. 277/480 volts switchgear shall be manufactured with provisions for unobstructed mounting of PTs inside the same compartment as CTs.

h. ***Wall-Mounted Cabinet Requirements***

Wall-mounted CT cabinets shall be installed so that the bottom of the cabinet is at least 12 inches above final grade. Potential transformers (if used) shall be installed within the CT compartment. CTs and/or PTs shall be installed at a maximum mounting height of 6 feet.

i. ***Pad-Mounted Cabinet Approvals***

Pad-mounted CT cabinets may be used, with approval from the Electric Metering Supervisor.

j. ***No Pull Boxes/Junction Boxes at Meter Sockets or CT Cabinets***

CT cabinets and meter sockets may not be used as a pull-box or junction box. No connections shall be made in the CT compartment or meter socket to supply another meter, more than one load circuit, or Customer equipment. For multiple loads, a wiring gutter, switchboard or combination CT/multi-main equipment must be used.

k. ***Conduit Requirements***

The conduit from the CT cabinet to the meter box shall be of a single piece, minimum 1 1/2 inch diameter, and no greater than 10 feet in length. No 90-degree hard corners or LB condulet with plate covers are allowed. The total bends of conduit shall not exceed 180 degrees. All conduit shall remain visible for inspection at all times.

l. ***Ground Bonds***

Ground bonds must be made from the CT can to the meter box by means of continuous #6 solid or stranded copper. No mechanical bonds are to be solely relied upon. At least one grounding bushing shall be installed on the conduit between meter box and CT can. Plastic end caps are to be installed on each end of conduit. Grounding provisions must be available in the CT/PT can and meter box.

m. ***City Furnished Materials & City Installations***

The City will furnish the necessary CTs, PTs and meter socket for all CT rated metering installations under 600V. The City will provide and install the wiring between CTs/PTs and the meter.

6.11 Primary Metering

a. ***Primary Metering Instrument Transformers***

The Customer shall purchase and install all primary metering instrument transformers, which then will be owned and maintained by the City. The City requires the factory test results for all primary metering instrument transformers. Contact electric metering for specifications prior to purchasing.

b. ***Vaults Under Primary Metering Cabinets***

Any underground primary metering shall have a vault underneath the primary metering cabinet. Contact electrical engineering for specifications. The Customer is responsible to purchase and install the vault and primary metering cabinet.

c. ***Meter Sockets & Meter Installations***

The City will provide the meter socket, which the Customer will install on the side of the metering cabinet. The electric metering group will then wire the metering circuit and install a meter.

d. ***Overhead Primary Metering***

Overhead primary metering is typically not allowed. The City will determine whether overhead primary metering will be allowed. Overhead primary metering installations will be built by the City.

e. ***Primary Meter Testing & Certification***

The City must test and certify the primary meter installation prior to energizing the service.

f. ***Replacing Primary Metering Equipment***

Any replacement of the primary metering equipment enclosure due to mechanical failure or acts of nature will be coordinated by the City and billed actual cost to the Customer. If, during routine testing, the primary CTs or PTs are found to need replacing, then replacement of items shall be at the City's cost.

6.12 Load Pulse Outputs

See *Drawing No. 22.*

a. ***Load Pulse Outputs***

Load pulse outputs will be provided when a Customer submits a completed 'Load Pulse Request Form', found in the City's Web site and pays the applicable charges. Pulse metering charges can be found in the City of Loveland Schedule of Rates, Charges and Fees.

b. ***Pulse Output Meters***

Upon receipt of the completed request form and fee payment, the City will install a pulse output meter, isolation relay and wire between the meter and relay inputs, then notify the contact person when completed. The Customer will purchase and maintain the relay's weatherproof enclosure and the conduit and wiring from the relay to their Energy Management System (EMS).

c. ***Energizing Requirements***

After completing their connection between the relay output and their EMS, the Customer will notify the Electric Metering Supervisor at (970) 962-3000 and the City will energize the relay, verify relay pulse output and seal the relay enclosure.

d. ***Energy Management System Configuration***

The City will provide the Customer with the pulse value, based on the standard pulse rate of the meter. It will be the Customer's responsibility to configure their EMS to utilize the pulse value, as provided.

Tables of Minimum Dimensions for CT Cabinets

NOTE: CT Type = Bar (B) or Window (W). When ordering a cabinet for window-type CTs, Customer is required to supply bars and mounting brackets.

- All dimensions are in inches -

Table 6-1: Single-Phase 120/240V

Amps	Height	Width	Depth	CT Type
400[1]	N/A	N/A	N/A	N/A
600	40	24	9	B
800	48	30	11	B
1200[2]	60	33	13	B
1600	60	33	13	B

[1] Class 320 socket used for 400A single-phase

[2] 48x48x12 may also be used

Table 6-2: 3-Phase 4-Wire 120/208V (or 240V)

Amps	Height	Width	Depth	CT Type
400	30	30	9	B
600	40	30	9	B
800	48	30	11	B
1200	48	33	11	B
1600	60	33	11	B
2000	60	39	15	W
3000	75	39	24	W

Table 6-3: 3-Phase 4-Wire 277/480V
(PTs mounted inside CT Compartment)

Amps	Height	Width	Depth	CT Type
400	40	30	9	B
600	48	30	11	B
800	48	36	11	B
1200	60	33	11	B
1600	60	39	15	B
2000	75	39	24	W
3000	90	39	24	W

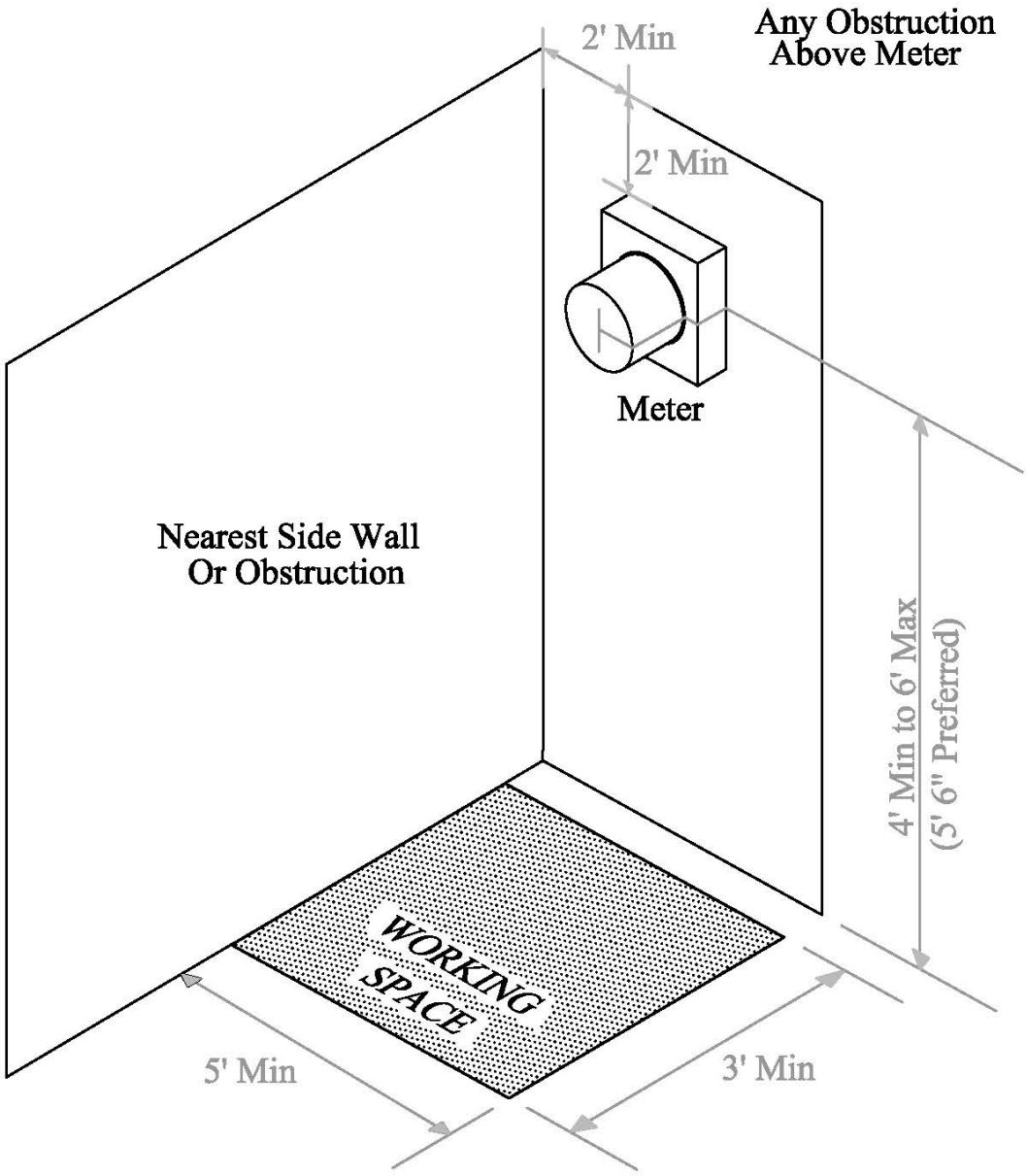
Table 6-4: 3-Phase 4-Wire 277/480V
with dedicated PT mounting provisions

Amps	Height	Width	Depth	CT Type
400	48	36	15	B
600	48	36	15	B
800	48	36	15	B
1200	60	51	24	B
1600	75	63	24	B
2000	75	63	24	W
3000	75	63	24	W

Switchgear Metering Notes:

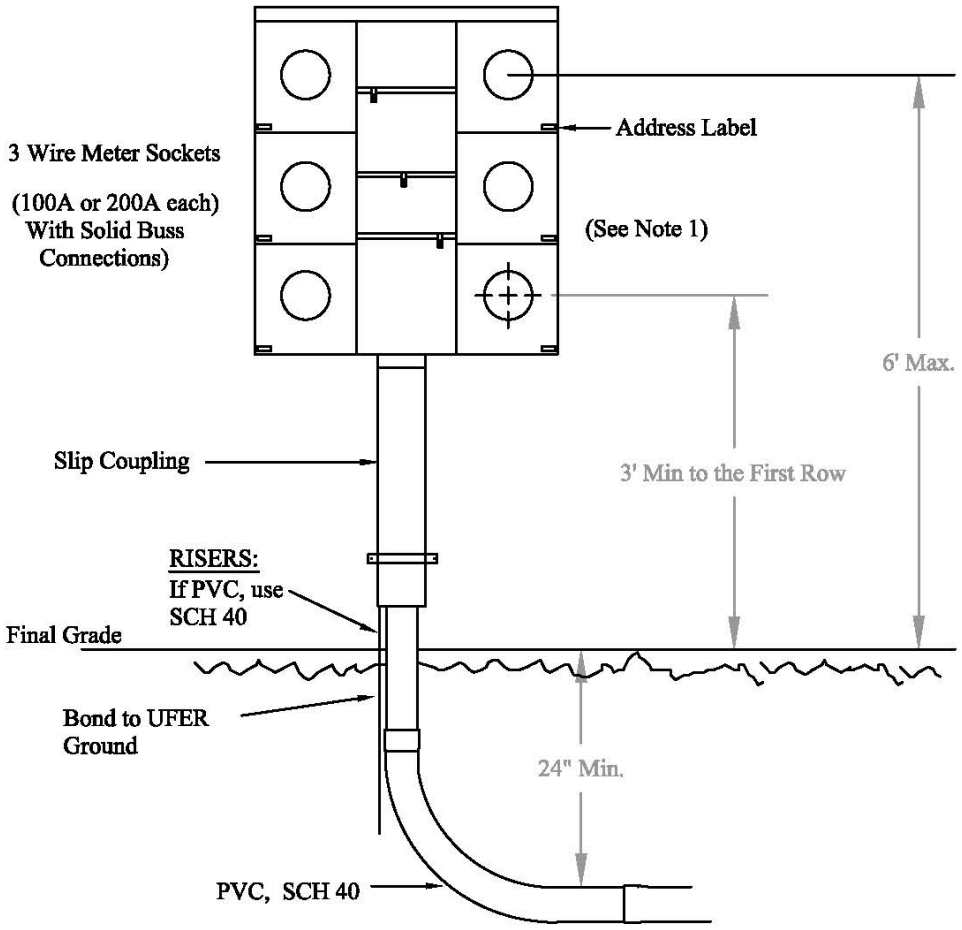
1. Whenever switchgear metering is desired, cut sheets must be submitted to the Electric Meter Supervisor for approval prior to purchase. Unapproved switchgear will not be accepted.
2. Switchgear CT compartments must have barriers on all 4 sides of compartment and hinged sealable doors. All panels providing access to unmetered conductors shall have fasteners that cannot be removed from the exterior.
3. 277/480V switchgear shall be manufactured with factory-installed provisions for unobstructed mounting of PTs inside the same compartment as CTs.

METER CLEARANCES



CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	17	Meter Clearances



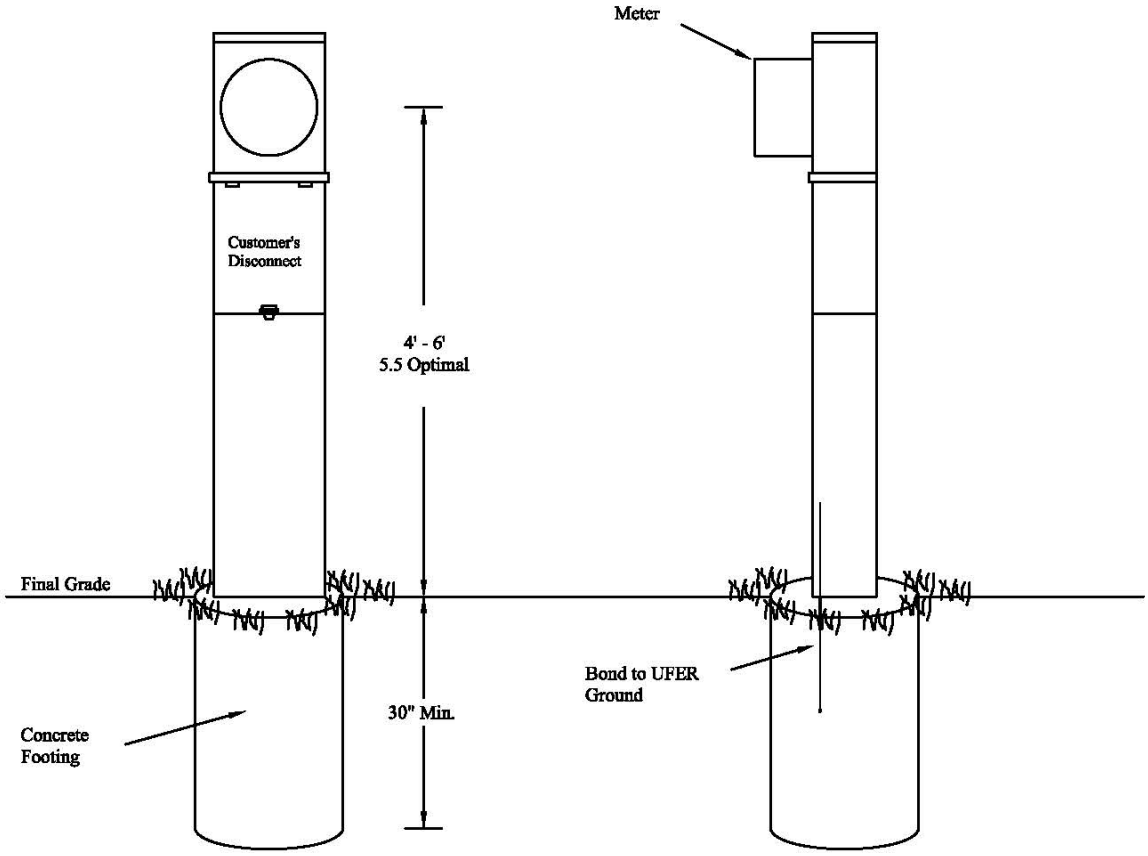
NOTES:

1. The multiple meter package furnished should have solid bus bar connections.
2. All non-current carrying metallic parts must be effectively grounded.
3. Include grounding lug for communications ground.
4. All self-contained metering shall have manual bypass lever meter sockets.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	18	Underground Multiple Meter

MANUFACTURED METER PEDESTAL

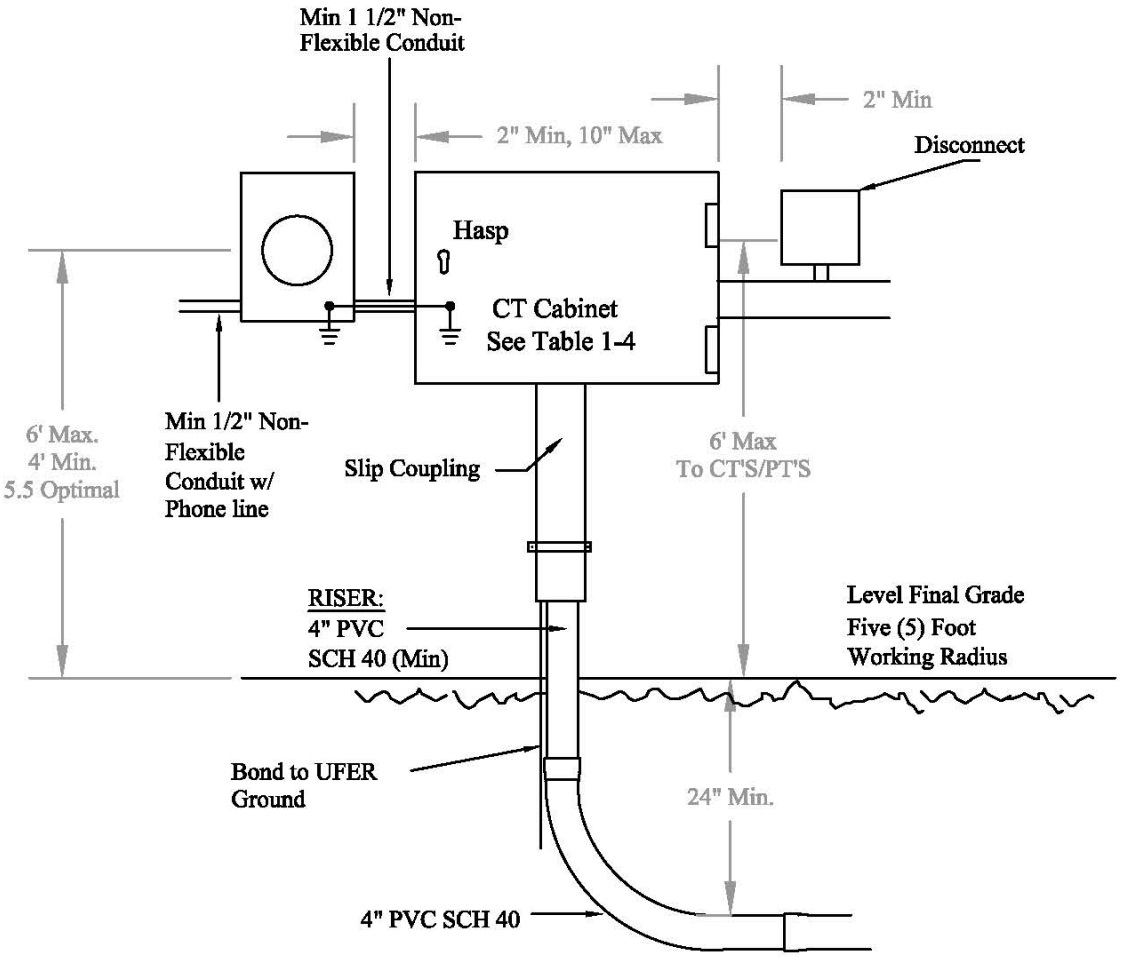


NOTES:
1. Must meet all requirements of NEC.
2. Footing - 30" Min. set in concrete from base of hole to finished grade.
   Concrete must also completely surround the pedestal.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	19	Manufactured Meter Pedestal

CT RATED METERING



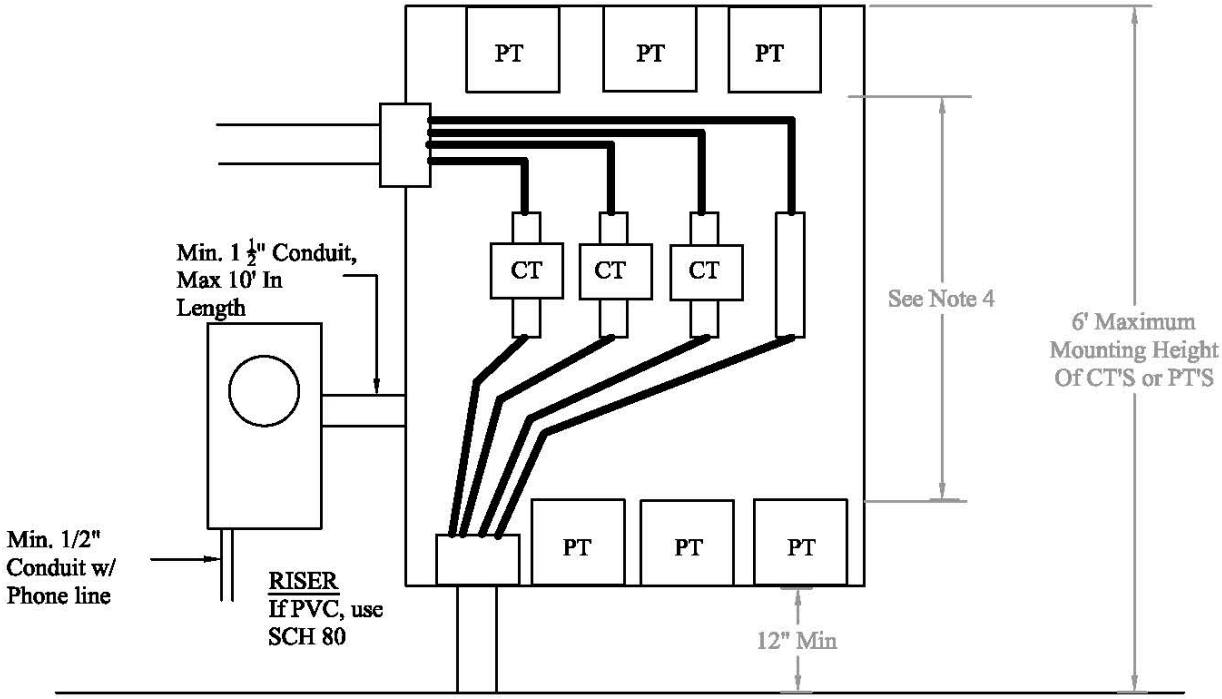
NOTES:

1. Bond meter box ground to CT cabinet with approved copper wire. Install bonding bushings on either end of conduit. Mechanical bonds are not allowed.
2. Include grounding lug for communications ground.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	20	CT Metering

CT RATED METERING, 277/480 V, STANDARD CABINET INTERIOR VIEW



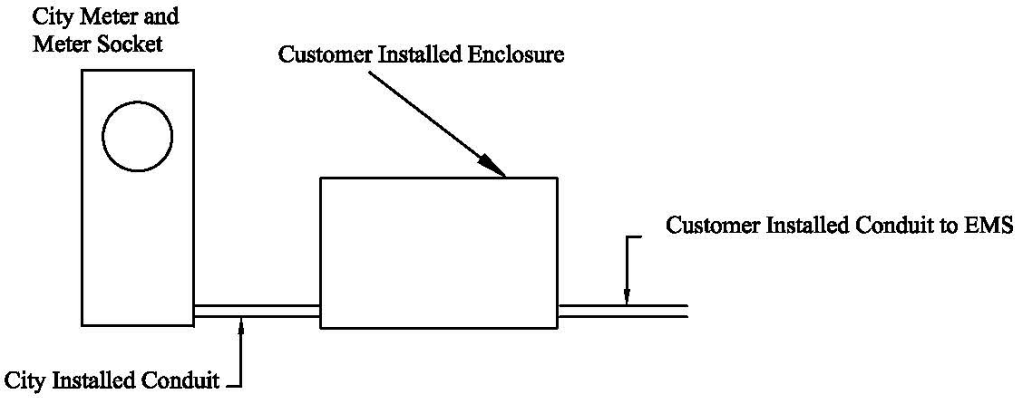
NOTES:

1. Bond meter box to CT cabinet with #6 copper wire.
2. Include grounding lug for communications.
3. No height restriction to top of cabinet. Max 6' to CT or PT mounting height.
4. Minimum 8x8x23" PT mounting space (at either top or bottom of cabinet) shall not be obstructed by any conductors.
5. Refer to Table 6-3 for minimum cabinet dimensions.

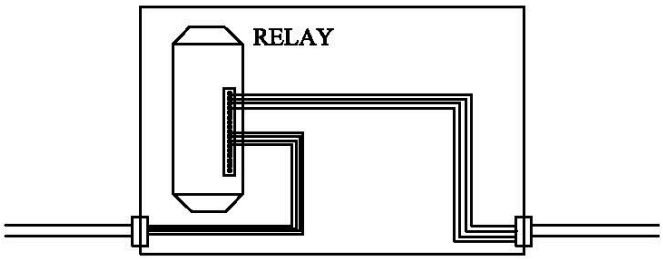
CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	21	CT METERING CABINET

LOAD CONTROL PULSE OUTPUT



RELAY ENCLOSURE INTERIOR (TYPICAL)



NOTES:

1. The customer will determine the location and perform the mounting of the relay enclosure, typically within 18" of the meter socket.
2. Customer installed conduit is required from relay enclosure to customer equipment.
3. No additional customer equipment is allowed inside relay enclosure.
4. The power feed to the relay will be fused inside the meter socket. The city will energize the relay after the customer's wiring is completed. The relay feed shall not be used to power any other equipment.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	22	LOAD CONTROL PULSE OUTPUT

SECTION 7 - METER SOCKET CONNECTIONS

METER SOCKET TERMINAL ARRANGEMENT

Type of Service	Self Contained	With Current Transformer
Single-Phase 120V, 2-Wire	Figure 1	Figure 2
Single-Phase 120/240V, 3-Wire	Figure 1	Figure 3
Single-Phase 120/240V, 3-Wire		
Single-Phase 120/208V, 3-Wire	Figure 2	Figure 4
Three-Phase 120/208V, 4-Wire	Figure 6	Figure 5
Three-Phase 120/240V, 4-Wire	Figure 6	Figure 5
Three-Phase 277/480V, 4-Wire		Figure 5
Three-Phase 240V, 3-Wire	Figure 2	Figure 6
Three-Phase 480V, 3-Wire	Figure 2	Figure 6

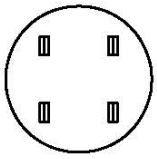


Fig. 1

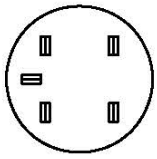


Fig. 2

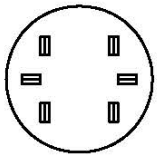


Fig. 3

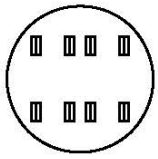


Fig. 4

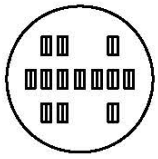


Fig. 5

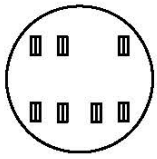


Fig. 6

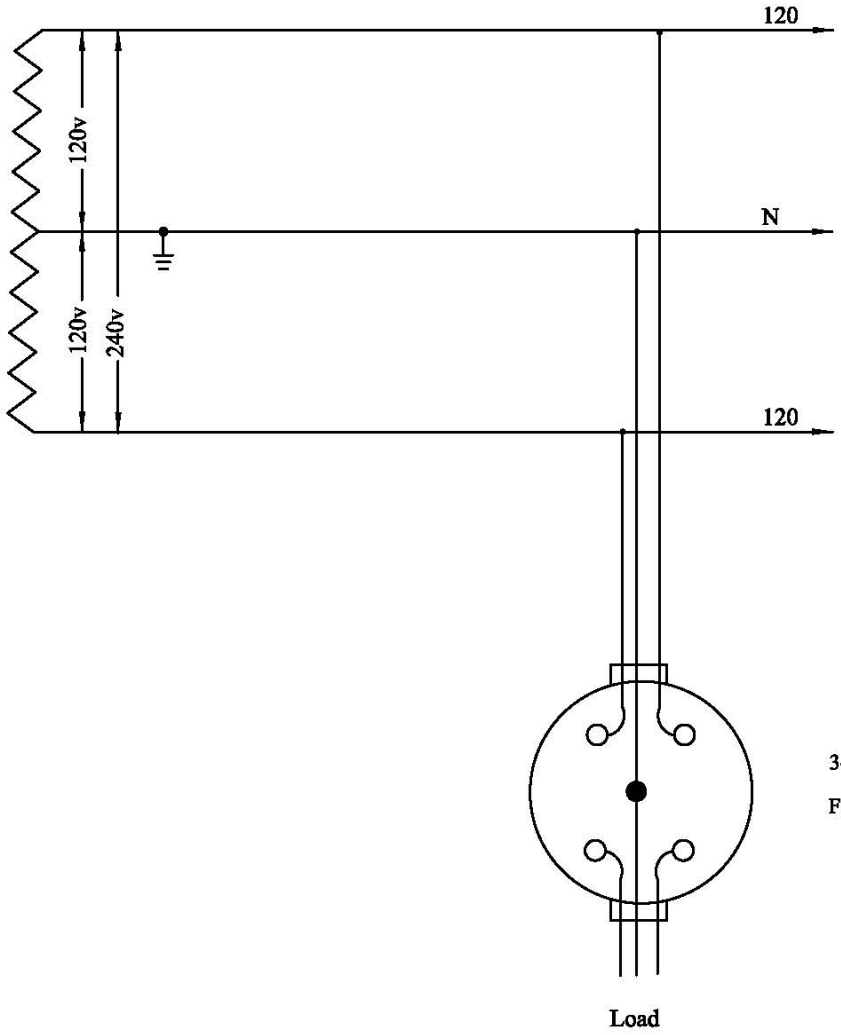
NOTES:

1. All 208 wild-leg installations shall be mounted on the far right of the meter socket and color tape labeled.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	23	Meter Socket Terminal Arrangement

SINGLE PHASE 120/240 VOLTS
THREE WIRE

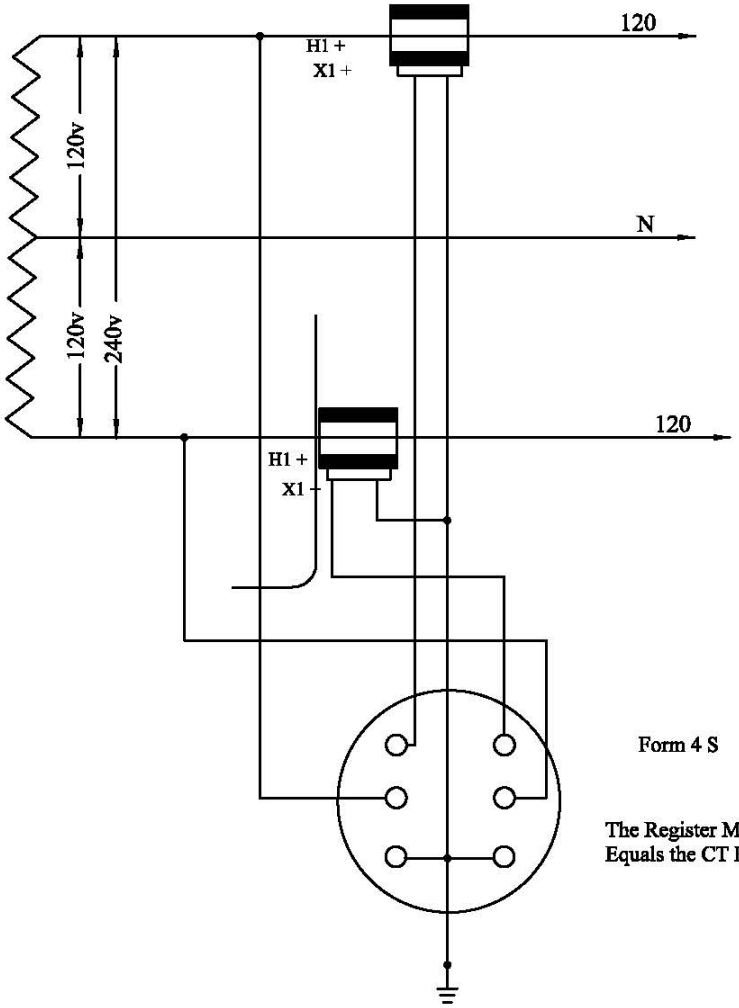


Socket Viewed From the Front

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June, 2013	24	Meter Connections

SINGLE PHASE 120/240 VOLTS
WITH TWO CTS

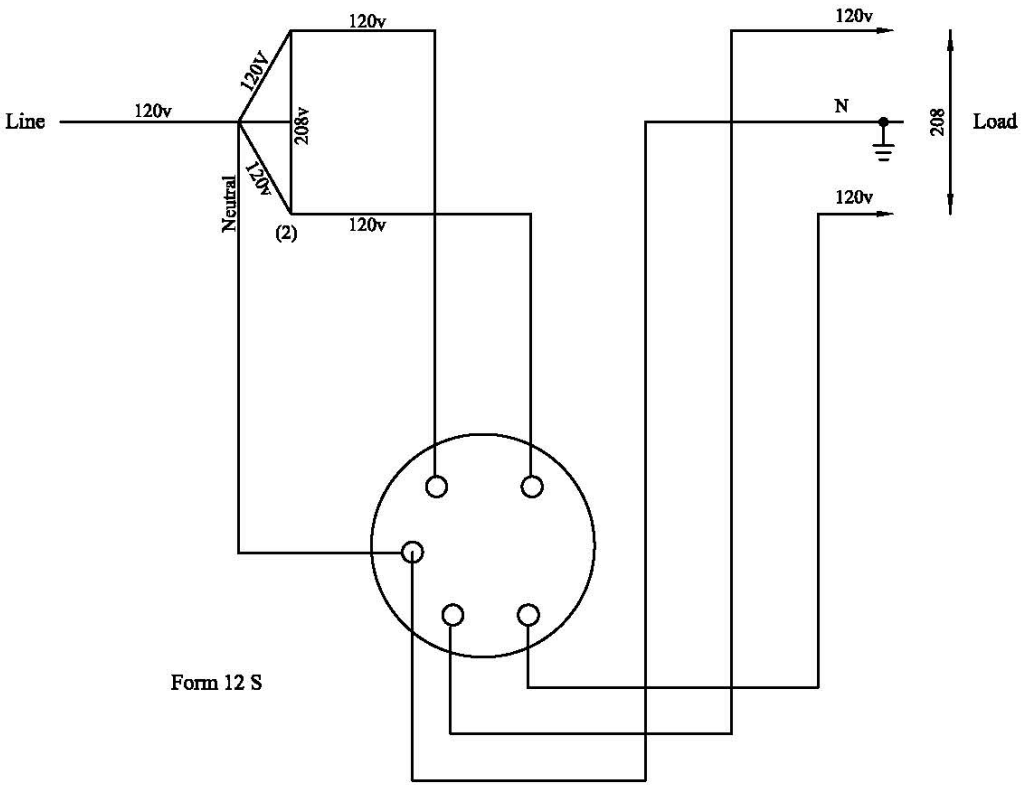


Socket Viewed From the Front

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June, 2013	25	Meter Connections

THREE WIRE 120/208 VOLTS WYE
TWO STATOR METER AND FIVE TERMINAL SOCKET

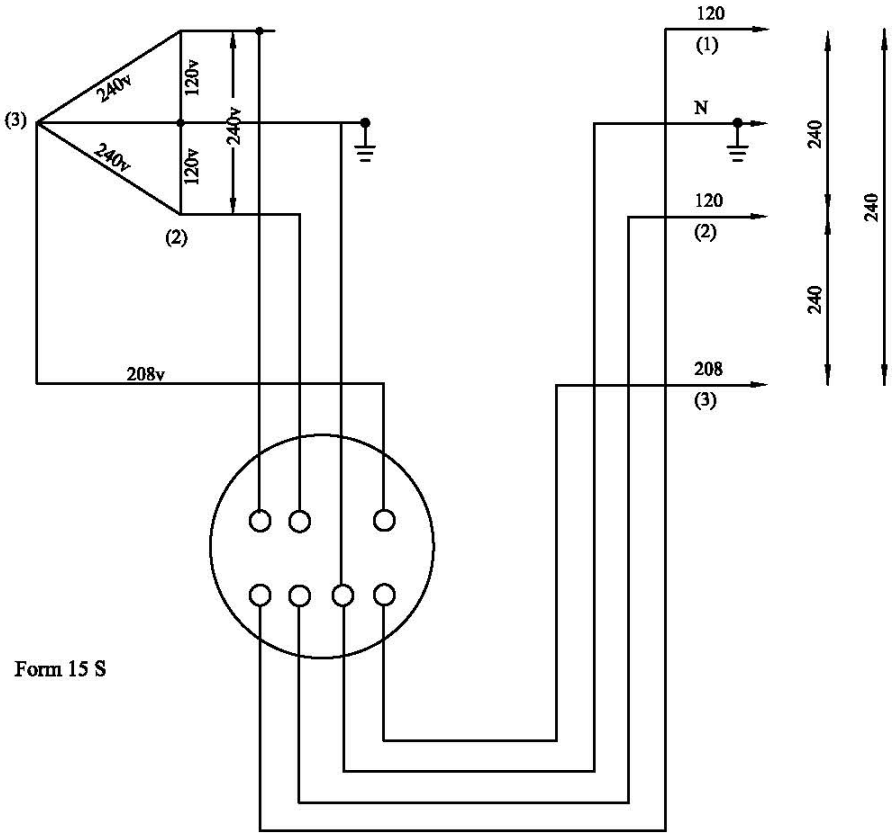


Socket Viewed From the Front

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	26	Meter Connections

THREE PHASE FOUR WIRE DELTA
SELF CONTAINED 2-STATOR METER



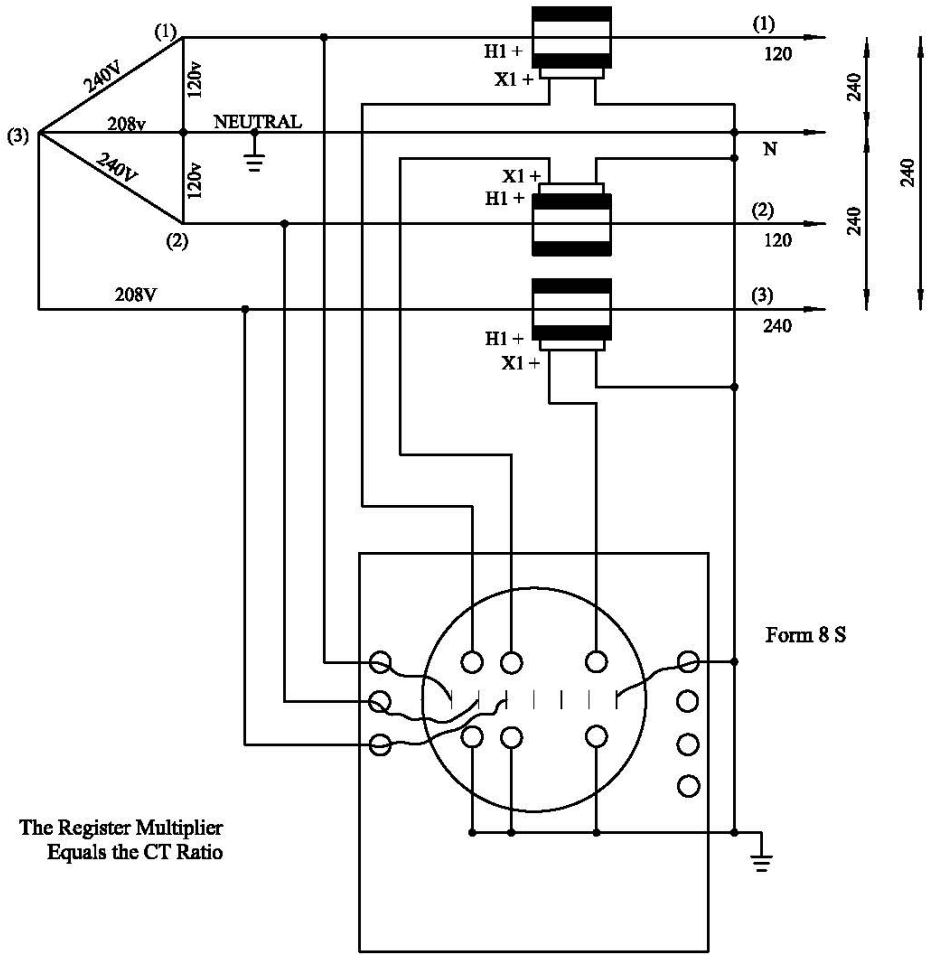
Form 15 S

Socket Viewed From the Front

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
April, 2002	27	Meter Connections

THREE PHASE FOUR WIRE DELTA
THREE CTS AND TWO STATOR METER



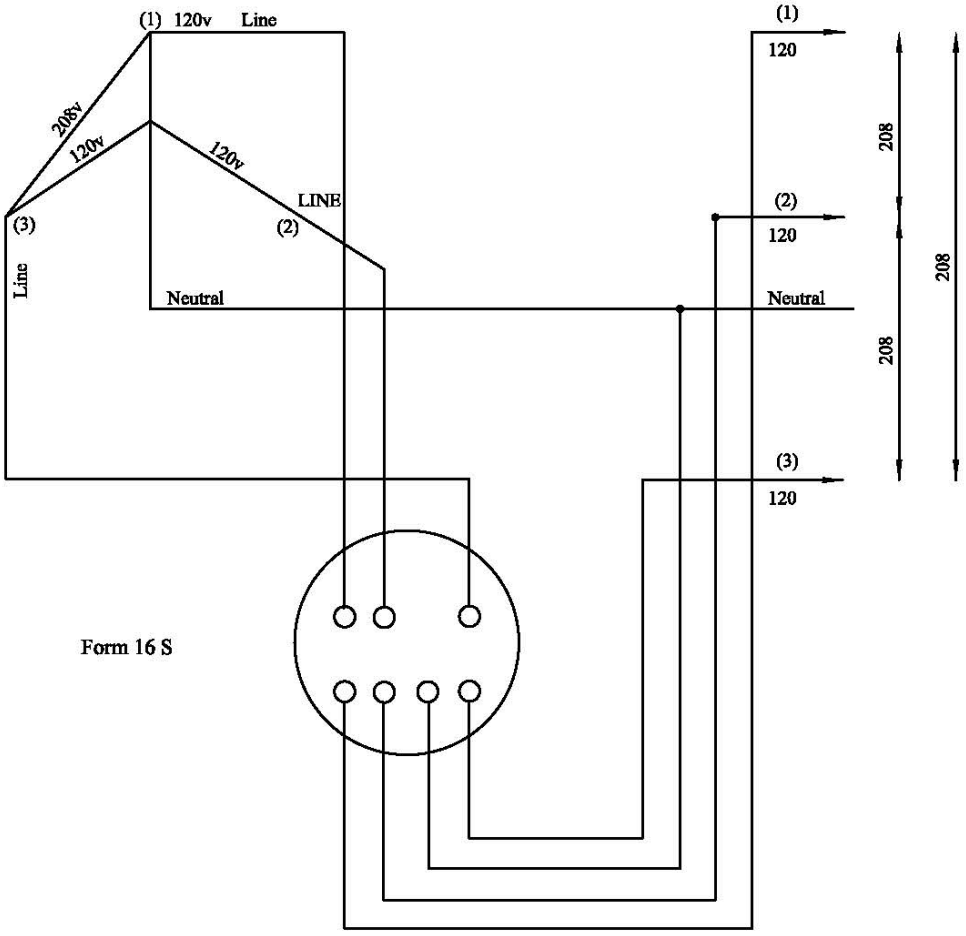
NOTE: Wild leg must be installed on the far right side terminal of meter socket.

Socket Viewed From the Front

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	28	Meter Connections

THREE PHASE FOUR WIRE WYE
THREE STATOR - 120 VOLT METER

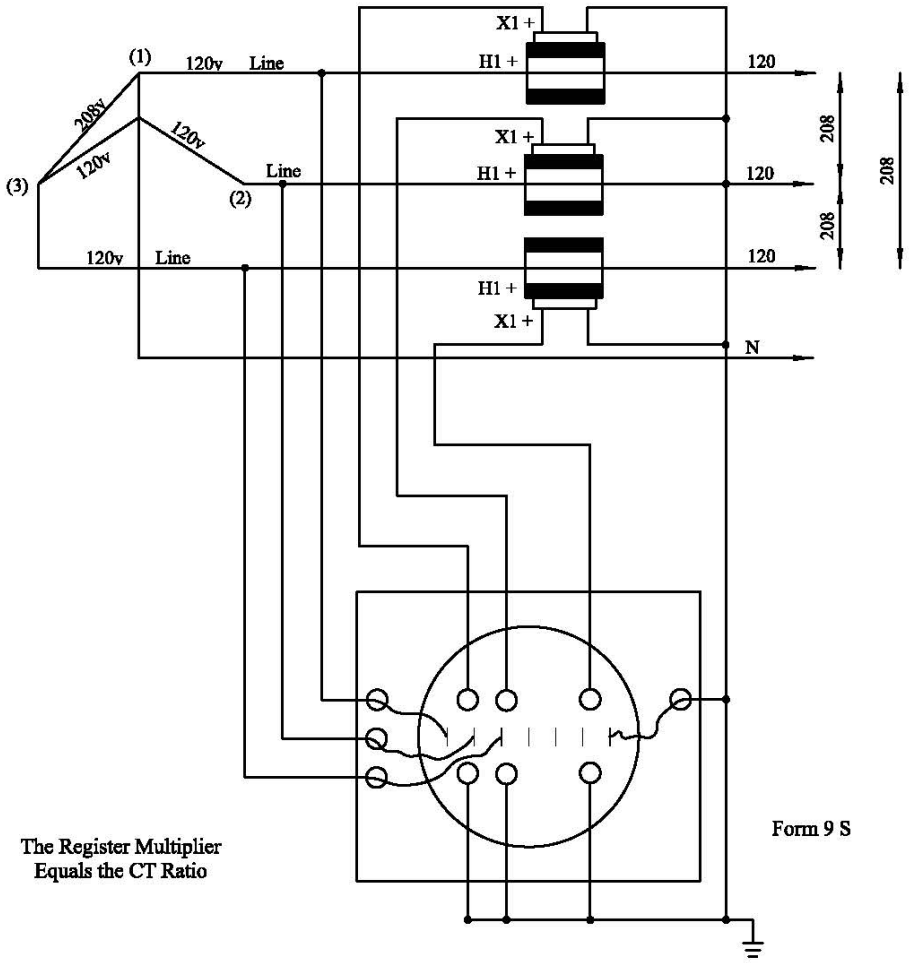


Socket Viewed From the Front

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	29	Meter Connections

THREE PHASE FOUR WIRE WYE
THREE CTS AND THREE STATOR METER



Socket Viewed From the Front

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	30	Meter Connections

SECTION 8 - CLEARANCES

8.1 General Clearances

a. ***Pad-Mounted Equipment Clearances***
No bushes, shrubs or trees where mature growth as outlined below and shown in *Drawing No. 31*:

- *Vault Clearances:* 10 feet of the short sides of vaults
- *Switchgear Clearances:* 10 feet of the sides of the switchgear
- *Transformer Clearances:* 5 feet of any side of the transformer
- *Metering Equipment:* 3 feet of metering equipment

Full growth diameters of bushes, shrubs and trees will be the determination of where they are planted in relation to the distances in relation to the distances from the equipment. A clear path shall be provided from a roadway or parking area to the access point of the equipment.

b. **Damage Due to Inadequate Access**
The City is not responsible for damage to or replacement of trees, shrubs and/or grass if cause of damage is due to inadequate access to any of our equipment or facilities.

c. ***Parking Bollards (Posts)***
When City-owned equipment is prone to damage or vandalism, the City may require the Customer to install additional protection such as parking bollards (posts), protective enclosures or fencing at the Customer's expense.

d. ***Clearances from Windows & Doors***
Refer to *Drawing No. 34* for clearances from walls, openings, and overhangs.

8.2 Overhead Clearances

a. ***Overhead Clearance Table***
Refer to *Table 8-1* for clearances for service drops and drip loops.

8.3 Underground Clearances

a. ***Underground Clearances Drawing***
Refer to Note 3 in *Drawing No. 32* for underground clearances.

b. ***Pad-Mounted Equipment Clearances***
For all pad-mounted equipment, the City requires a minimum of 10 feet of clear space in front of all access doors to allow for hot-stick operation. Refer to *Drawing No. 31*.

c. ***Permanent Structures Not Permitted Above Underground Conductors***
No permanent structure shall be constructed over any existing underground conductor. Permanent structures shall have 5 feet horizontal clearance from any existing underground conductor. Temporary structures may be required to be relocated at the owner's expense if requested by the City.

8.4 Swimming Pools or Hot Tubs/Spas

a. ***Swimming Pool or Hot Tubs/Spas Clearances***
Refer to *Drawing No. 33* for clearances from swimming pools or hot tubs/spas.

8.5 Flammable Gases or Liquids

a. ***Tanks of Flammable Gases or Liquids Clearances***
Refer to *Drawing No.35* for clearances from tanks containing flammable gases or liquids.

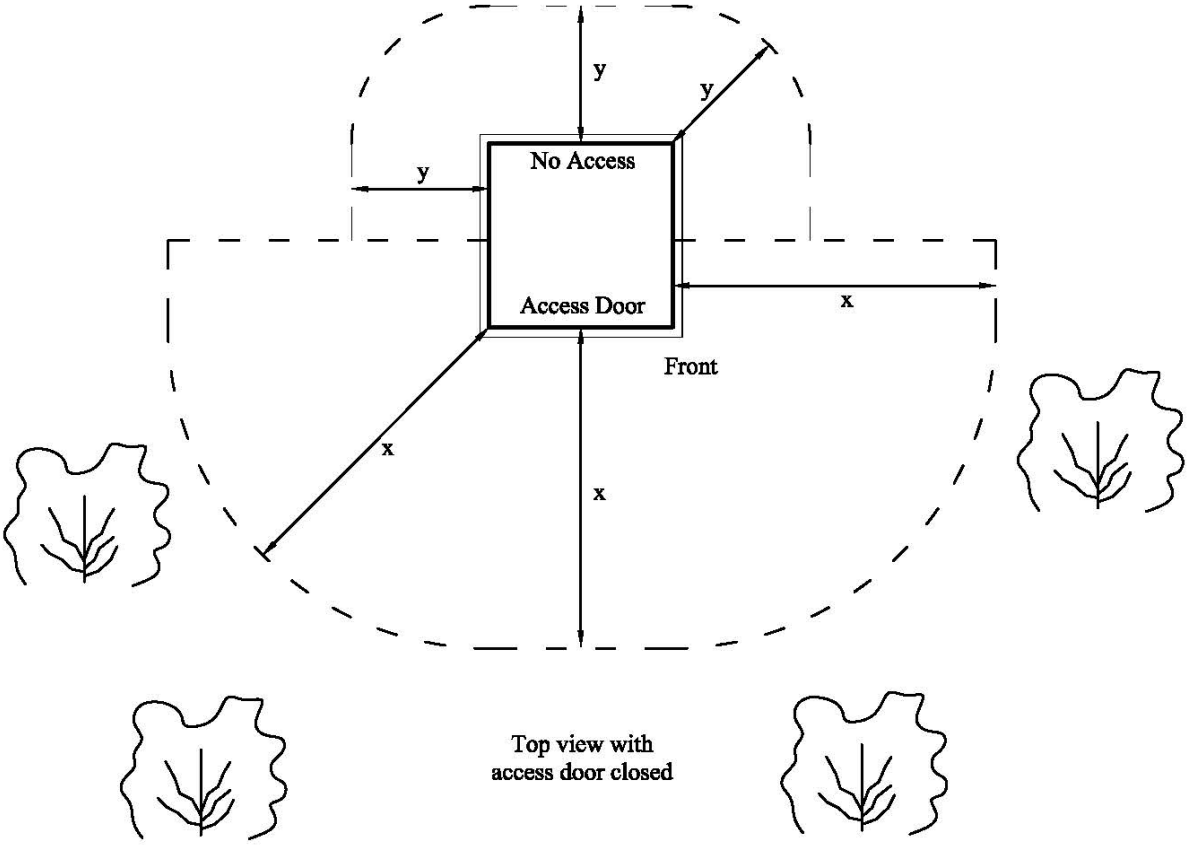
Table 8-1 – Clearances for Service Drops and Drip Loops

750 Volts and Below (Distances in Feet)

The Customer shall provide a point of attachment which allows NESC minimum clearances to be met in all conditions. A two-foot addition to certain NESC values is required by the City to ensure minimum clearances are met in extreme conditions and after conductor sag. These required heights are noted as "clearance required at time of construction" in the table below. Long services or other special cases (i.e. services crossing uneven or sloped terrain) may require clearance additions greater than two feet. References to applicable codes (NEC, NESC) are *italicized*.

	NESC Minimum Clearance	Clearance Required at Time of Construction
Service drop clearance (*NESC Table 232-1, NEC clearance for this section is 18' – Art.230.24(B)(4)*)		
Over roads, streets, and other areas subject to truck traffic	16'	18'
Over or along alleys, parking lots, and nonresidential driveways	16'	18'
Over land travelled by vehicles	16'	18'
Clearances over residential driveways (*NESC Table 232-1*)		
If height of building or installation will permit	16'	18'
If height of building or installation will not permit and is not subject to truck traffic:		
-For service drops 120/240 & 208Y/120 volts	12'	14'
-For drip loops of service drops 120/240 & 208Y/120 volts	10'	12'
Clearances over spaces and ways subject to pedestrians/restricted travel only (*NESC Table 232-1*)		
If height of building or installation will permit	12'	14'
If height of building or installation will not permit, drip loop clearances may be reduced:		
-For 480Y/277 volts (*Note 8-b of NESC Table 232-1*)	10.5'	10.5'
-For 120/240 & 208Y/120 volts (*Note 8-d of NESC Table 232-1*)	10'	10'
Clearances from buildings for service drops not attached to the building (*NESC Table 234-1*)		
Vertical clearance over or under balconies and roofs:		
-Accessible to pedestrians, if cabled with a grounded bare neutral	11'	13'
-Accessible to pedestrians, if open wire or cabled with an insulated neutral	11.5'	13.5'
-Not accessible to pedestrians, if cabled with a grounded bare neutral	3.5'	5.5'
-Not accessible to pedestrians, if open wire or cabled with an insulated neutral	10.5'	12.5'
Horizontal clearance to walls, projections, windows, balconies and areas accessible to pedestrians:		
-If cable with grounded bare neutral	5'	5'
-If open wire or cabled with an insulated neutral	5.5'	5.5'
Clearances for service drops attached to a building or other installation (over or along the installation to which they are attached; service cable with an effectively grounded bare neutral, *NESC 230.C*)		
From the highest point of roofs, decks or balconies over which they pass:		
-If readily accessible (*NESC 234.C.3.d.1, NEC 230.24(A), Exception No. 1*)	10'	12'
-If not readily accessible (*NESC 234.C.3.d.1, exception 1, NEC 230.24(A), Exception No. 2*)	3'	5'
-Above a not-readily accessible roof and terminating at a (through-the-roof) service conduit or approved support, the service and its drip loops set no less than eighteen inches above the roof. No more than six feet of the service cable passes over the roof or within four feet of the roof edge (*NESC 234.C.3.d.1, NEC 230.24(A), Exception No. 3*)	1.5'	1.5'
-In any direction from windows designed to open (does not apply to service cable above the top level of a window; *NESC 234.C.3.d.2, NEC 230.9(A)*)	3'	3'
-In any direction from doors, porches, fire escapes, etc. (*NESC 234.C.d.2, NEC 230.9(A)*)	3'	3'

PADMOUNTED EQUIPMENT CLEARANCES



Top view with
access door closed

MINIMUM DISTANCE REQUIRED FROM PAD

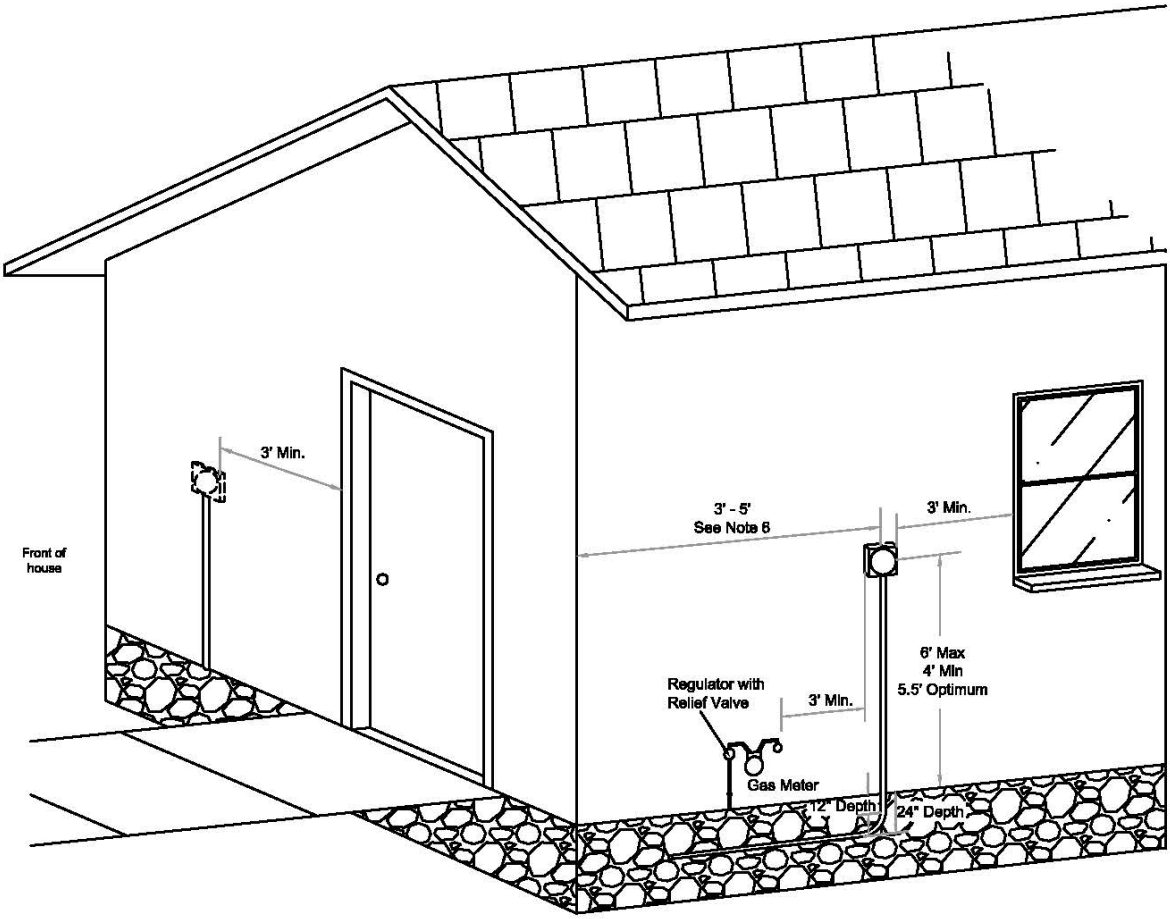
x = 10' clear area in front of any equipment access door or opening to allow the use of hot sticks

y = 10' for short side of vaults and sides of padmounted switchgear
5' for padmounted transformers
3' for padmounted metering equipment
These clearances are also listed in section 8.1 a - d.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	31	Padmounted Equipment Clearances

MINIMUM CLEARANCE REQUIREMENTS



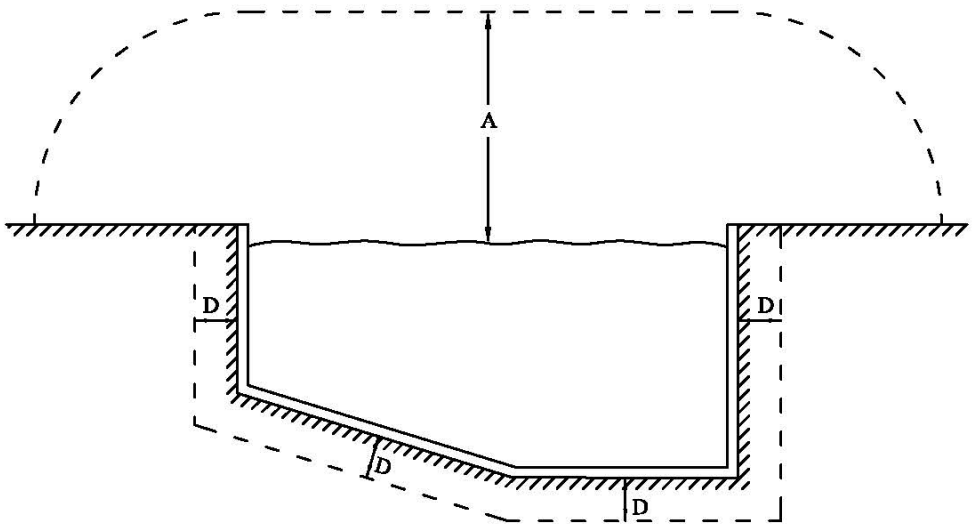
NOTES:

1. Risers must be 2" GRC minimum
2. All meter sockets shall be ringless
3. Through roof fiser-mast shall be within 4' of eave guying of the mast may be required
4. Under eave-attachment clevis must be secured to the stud
5. All non-current carrying metallic parts must be effectively grounded
6. Meter locations shall be 3'-5' from front corner of house. Shorter or longer distances allowed when approved by city.
7. No meters shall be located above or below obstructions (including window wells, stairs, etc.)

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	32	Residential Overhead Service

CLEARANCE FROM SWIMMING POOLS



D = Five (5) Feet Minimum
A = Twenty Two and A Half (22.5') Feet Minimum.

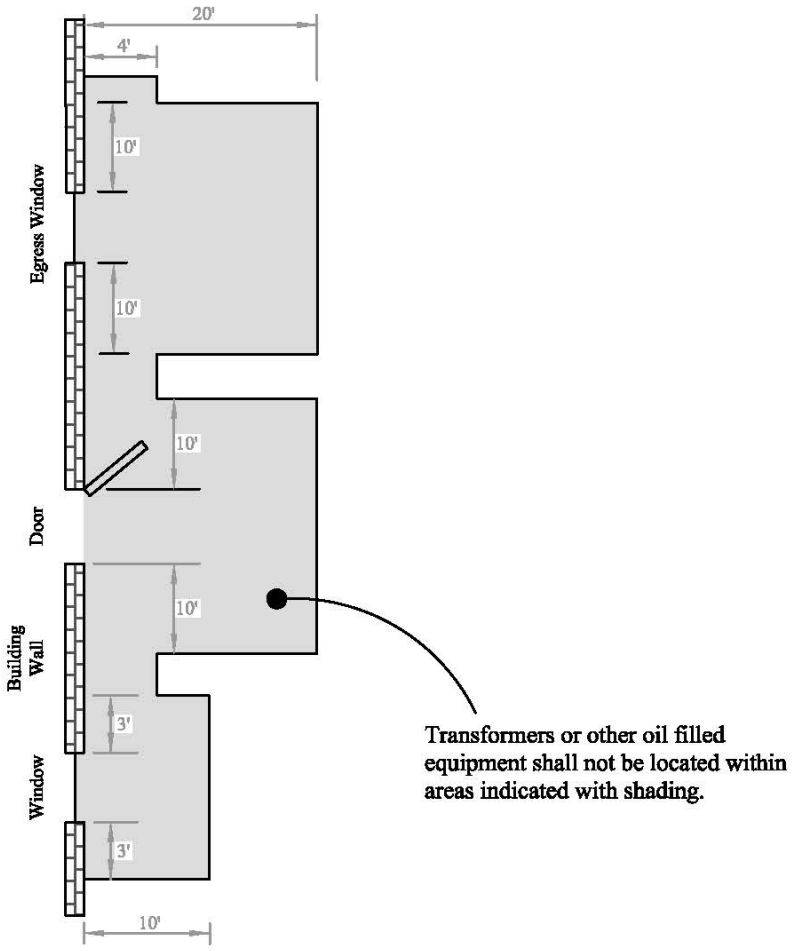
NOTES:

1. No underground conductors shall be installed within five (5) feet of a swimming pool or its auxiliary equipment.
2. If five (5) feet is not attainable, supplemental mechanical protection shall be provided.
3. Clearance of overhead services in any direction from swimming pools or its auxiliary equipment shall be 22.5'.
4. It is highly recommended to not put an overhead conductor directly over any swimming pool, or hot tub.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June 2013	33	Swimming Pool Clearances

MINIMUM CLEARANCES FROM WALLS, OPENINGS AND OVERHANGS

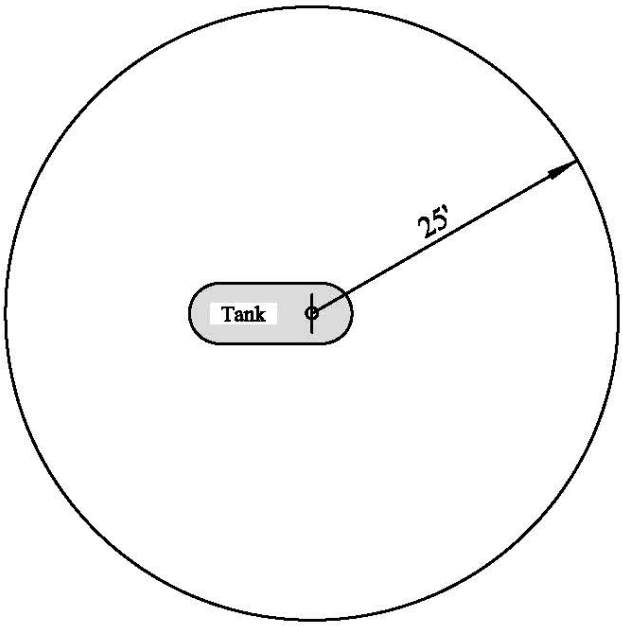


NOTES:

1. All padmounted equipments must have a minimum of ten (10) feet clear area on the door(s) side for hot stick operation.
2. Doors shall face away from building walls, fences, etc.
3. Mechanical protection shall be provided.

CITY OF LOVELAND WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June, 2013	34	Clearances for Building Openings



NOTES:

1. No padmounted equipment shall be installed within twenty-five (25) feet of the refill valve of a tank containing flammable gas or liquid.

CITY OF LOVELAND - DEPARTMENT OF WATER & POWER

Date:	Drawing No.	Requirements for Electric Service
June, 2013	35	Clearances from Flammable Gas or Liquid

SECTION 9 - INTERCONNECTION REQUIREMENTS FOR CUSTOMER GENERATION

9.1 Interconnection Requirements for Customer Generation - General

a. ***Distributed Resources***
Distributed Resources (DR) include but are not limited to generators (including emergency and standby generators), energy storage technologies, synchronous machines, induction machines, power invertors/convertors, static power, or photovoltaic systems that are permanently connected to the customers electrical system. If the distributed resource does not parallel with City of Loveland Electrical Power System for more than 100 ms, the distributed resource does not need to meet the requirements set forth in this section.

b. ***Net Metering***
All metering will be administered with bi-directional net metering. Net metering measures the difference between the power consumed by the customer and the power delivered by the customer. The metering will be performed at the point of common coupling (PCC).

c. ***Maximum Distributed Resource***
The maximum allowable aggregate distributed resource allowed at a single PCC is 2 MW. Any distributed resource with an aggregate capacity of 500 KW or more shall have provisions for monitoring the connection status by the City.

9.2 Requirements Prior to Connecting a Distributed Resource

The following is a list of requirements the Customer needs to complete before connecting their distributed resource to the City:

a. ***Contact the City***
The Customer shall contact the City with intent and plans to connect (a) distributed resource(s). All pertinent information shall be shared between the Customer and the City prior to carrying out the Customer's plans.

b. ***Receive Signed Authorization to Connect***
The Customer shall not interconnect their distributed resource to the City until the Customer has a signed authorization to connect from the City.

c. ***Obtain Electrical Building Permit***
The Customer shall obtain an electrical building permit from the City or Larimer County prior to constructing the distributed resource.

d. ***Complete Interconnection Agreement***
The Customer and the City must complete the Interconnection Agreement "Agreement for Interconnection and Parallel Operation of Small Distributed Resource System" on the City's website.

e. ***Customer's Assumption of Responsibility***
The City will assume no responsibility for the protection of the Customer's facility or any portion of the Customer's electrical equipment. The Customer is fully responsible for protecting their equipment from damage caused by faults or other disturbances on the City.

f. ***Design Acceptance***

The City will review the Customer's design for interconnection acceptance only. The City will not review or approve the reliability or adequacy of the Customer's design.

g. ***Emergency or Standby Generator Requirements***

- A closed transition switch ("make-before-break") may be approved by the City for this type of installation, but the requirements for parallel generation shall be met. Written approval and operating agreements from the City shall be obtained prior to installation.
- City of Loveland Building Department or Larimer County Building Department must approve all transfer switches and/or transfer operating schemes.
- The Customer shall not connect portable generators to a permanent wiring system unless the interconnection uses a permanently installed transfer switch ("break-before-make") or a code-approved secure inter-lock scheme. Failure to use this type of switch could create a hazardous situation for the City or other service personnel.

h. ***Meet Technical Specifications & Requirements***

The Customer shall ensure the system being attached meets all technical specifications and requirements found in *City of Loveland Interconnection Standards*.

i. ***Meter Labeling Requirements***

The customer shall install a sign or placard at the meter indicating the attachment of distributed resource. All signs or placards shall be weatherproof, durable, and permanently (screws or rivets) attached to the meter socket

j. ***Meter Disconnect Device Standards***

The DR system must have a visible disconnect device that meets NEC Std. 705.22 located on the outside of the building adjacent to the meter.

k. ***Meter Installation***

The City shall install and maintain the net-metering meter at the City's expense.

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