CHAPTER 11

Metering

Electricity meters are required on the customer's premises for all Seattle City Light (City Light) electrical services so the Utility can accurately determine customer usage for accurate billing and for maintaining appropriate distribution to our customers.

City Light provides and installs all electricity meters into customer-installed meter bases. This chapter will describe the requirements for metering equipment and installations.

City Light's Technical Metering Unit will provide the customer with specific information on metering requirements for individual projects after they have reviewed plans submitted by the customer. Prints or drawings of the metering equipment shall be submitted and approved by City Light prior to manufacture when the equipment is to be installed in switchgear. The drawings need to show the sequence of compartments, dimensions of the gear and manufacturer information. Drawings shall also be submitted and approved for customer-designed pedestals or other structures on which the customer is proposing to mount metering or service entrance equipment. All drawings or prints submitted to City Light must be engineering or architectural grade.

Meter Sockets: Construction Guidelines

All services shall be metered in accordance with the Electrical Utility Service Equipment Requirements Committee (EUSERC) Standards. Refer to http://www.seattle.gov/light/electricservice/default.asp to contact an Electric Service Representative or Electric Service Engineer if you have any questions regarding EUSERC standards.

While City Light provides and installs the meter, the customer is responsible for providing and installing the meter socket and current transformer equipment, if applicable. All meter sockets shall meet ANSI C12 and UL414 Standards for Meter Sockets. All current transformer enclosures (CT cans) and metering switchgear must meet EUSERC and City Light standards.

It is important to refer to Appendix 2 – Meter Base Arrangements at the end of this manual for the correct meter socket for your application in order to avoid delays to receiving service.

Commercial services require block by-pass or safety sockets. Safety sockets are required where the service voltage is 277V to neutral or 480V phase to phase.

Residential services do not require block by-pass sockets, however they are strongly recommended.

> *Exception:* Residential services rated at 400 amps and served with a Class 320 self-contained meter will require a block by-pass.

City Light does not allow automatic, lever type, or slide-link socket bypass devices.

Only metering taps are allowed in meter sockets. Examples of metering taps are the 5th and 7th terminal connections to the neutral and a 5th terminal connection to the unmetered leg as in existing three phase, three-wire Delta services. 5th terminals shall not be installed in 120/240V sockets.

The line side conductors are connected to the top terminals of the meter socket. The load side conductors are connected to the bottom terminals.

> *Exception*: Production meter sockets shall be wired with the line side conductors connected to the bottom terminals, and the conductors from the generation source on the top terminals.

Unused threaded or knockout openings must be closed with an approved plug locked in place from the inside. Metering equipment enclosures shall be weatherproof if they are located outside.

Meter rings will be provided by Seattle City Light.

Temporary Totalization Metering

At City Light's discretion, Temporary Totalized Metering may be utilized to capture a customer's total consumption for billing purposes. This temporary metering will generally apply to a project during initial construction, but may be used when a customer is altering or upgrading their service entrance equipment. All required equipment for this metering will be the sole responsibility of City Light, and all metered consumption will be billed in accordance with the appropriate rate schedule.

If a customer completes a Temporary Totalized Metering Agreement Form with the assistance of the appropriate Electric Service Representative or Electric Service Engineer, they will be allowed to shunt self-contained meter sockets prior to installation of the permanent metering.

Once the facility is ready for permanent meter installation, it is the responsibility of the property owner to contact City Light, and ensure that all metering facilities are prepared according to City Light's specifications, including the Multi-Unit Pre-metering Checklist. Failure to meet these requirements may result in fines, additional trip charges, and installation delays.

Communication Provisions for Large Metered Loads are in no way altered or impacted by the requirements of the Temporary Totalized Meter specifications."

Metering Voltages

All services shall be metered at the service voltage. The exception would be 480Y/277 volt three-phase services transformed to 120/208 volts or 120/240 volts for distribution in multi-unit buildings.

All high voltage services, 601 volts and above, shall be metered at the service voltage in accordance with the Electric Utility Service Equipment Requirements (EUSERC) standards and Seattle City Light Construction Guidelines.

Where voltages are over 600 volts, contact the Electric Service Engineer for high voltage metering requirements.

Service Entrance Conductors for Metered Loads

a. Unmetered service conductors and metered load conductors shall not be run in the same conduit, raceway, or wiring gutter.

b. Metering equipment and enclosures containing unmetered service conductors, wire troughs, and busing shall be sealable and lockable as determined by City Light.
c. Metered load conductors shall not pass through sealable sections, including current transformer enclosures.
d. Service conductors shall be continuous from the service connection point to the meter socket or current transformer enclosure, or in a main disconnect for group installations. The conductors shall not pass through any junction box or "T" condulets. This does not prohibit the use of buses or wire troughs on the line side of multi-meter installations if the enclosures are locked and sealed.

Conductor Connections:

For Aluminum: An oxide inhibitor is used for all aluminum conductors and connections. The meter socket shall have lugs approved for aluminum.
For Copper: When copper is used as conductor, meter terminals, and/or socket jaws, an oxide inhibitor must not be used.

Service Entrance Equipment Sequencing

For Single Meters Self-Contained:

a. The sequence of service equipment with self-contained metering shall first be meter socket and next the fused disconnect/circuit breaker. A switch cannot precede the meter except in certain multi-unit installations (described below).
b. Pedestal metering shall not contain the customer's main disconnect.

For Multi-Unit Installations

a. A main disconnect may be installed ahead of the meters in multi-unit installations involving more than six individual sockets provided that all equipment ahead of the meters has sealing provisions.
b. In multiple meter socket installations, which have a switch or breaker ahead of the meters, the breaker shall be the common trip type i.e., must open or close all ungrounded conductors simultaneously. The breaker must be constructed to prevent being changed to a non-trip type.

Master Metering

City Light shall not supply electricity for any new service to a duplex or multiple dwelling building for the purpose of master metering the energy usage of the dwelling units, a central space heating system, or a central domestic water heating system. City Light will not supply electricity for any upgraded service to an existing duplex or multi-unit building for the purpose of master metering new central or individual space heating systems.

Master metering is required for boat moorages but prohibited for houseboats.

Special Metering Requirements for Multi-Unit Buildings

a. Prior to meter installation all meter sockets must be identified with permanent labeling by final space or unit number, letter designation, and/or street address. Meter bases shall have

engraved phenolic nameplates installed on the cover of the meter socket.
NOTE: Felt-tip pens and label maker tape are not considered permanent marking.

b. Permanent numbering of the separately metered spaces or units is required. If it is not practical before meter installation, the customer shall provide temporary identification at the main entrance of the space for the purpose of performing space checks.
Please see Appendix 7: "Contractor's Pre-Installation Checklist Multi-Unit Metering" for more information.

c. All multi-unit buildings shall have at least one meter for each unit. Where common load exists, an additional house meter is required.

d. The sockets in meter banks shall be so arranged that the minimum vertical distance between socket centers is 9 inches and the minimum horizontal distance is 8 inches. Additional clearance requirements are described in Appendix 5 – Clearances for Residential Multiple Metering Installations.

e. City Light conducted space checks are required for all new and rewired multi-unit buildings to verify socket-to-unit panel wiring.

f. All auxiliary dwelling units without separate metering, and/or units found to have mixed or common loads will be billed in the owner's name.

g. After the initial service installation, all additional space checks, address changes, and mixed-load checks will be charged to the owner or person making the request.

h. Load determination shall be based upon the greatest aggregate nameplate ratings of each fused disconnect or circuit breaker.

Metering Equipment Location

a. Single meter sockets shall be installed in an accessible location outside the building. Multiple socket installations may be located inside the building.

b. City Light may post a Utility logo on the outside of meter room doors.

c. City Light shall inspect and approve the customer's choice of location for meter sockets and metering equipment prior to beginning equipment installation. The location must be readily accessible without risk of bodily harm to City Light employees and free from vibration, corrosive atmosphere, and extreme temperatures.

d. Inside meter locations shall have sufficient lighting to read meters and maintain equipment.

e. The area around and access to all City Light equipment shall be free from vegetation.

f. Meter rooms shall be for the sole purpose of electrical switchgear and metering equipment. Under no circumstances shall gasoline, diesel fuel, propane, paints, or any other noxious or hazardous materials be stored in a meter room.

g. Metering equipment shall not be installed over stairs, stairwells, steps, or public walkways. If mounted on a balcony or platform, a permanent stairway to the area is required. Ship's ladders are not allowed.

h. Meter locations must not be under or over any structure which might be enclosed or removed in the future, such as a porch, deck, carport, or stairway.

i. The number of meter centers in apartment buildings shall not exceed one for every three floors.

j. All current transformer enclosures will be installed in an accessible location outside the building or in an approved electric meter room. For residential services the current transformer enclosures shall be outdoors and accessible during normal Utility working hours.

k. Electric meter bases shall be installed a minimum of three feet from the closest point of a natural gas meter installation. The natural gas meter installation shall not be within the required working space as specified in "**Access to Metering Equipment** – paragraph f."

Meter Height

a. The meter height is measured from grade or the floor to the center of the meter.
b. The preferred meter height for single meter sockets is 5 feet.
c. All meter sockets shall be mounted plumb and be securely fastened.

Table 11-1		
Meter Height Requirements		
Type of Installation	**Minimum Height**	**Maximum Height**
Single meter Socket	4 feet	6 feet
Multi-Unit Installations	2 feet	6 feet

Access to Metering Equipment

a. City Light reserves the right to access the customer's premises during normal business hours (Monday through Friday, 8 AM to 4 PM) for meter reading, testing, installation, removal, inspection, and/or maintenance of City Light's equipment.
b. Access shall not be blocked by either permanent or portable materials.
c. Any fenced/enclosed areas and/or metering cabinets/enclosures shall be made accessible with a double locked padlock and/or a key box. Where metering equipment is located inside the building, City Light reserves the right to install a key box. The customer shall provide keys and/or key cards.
d. All metering equipment covers shall be readily accessible They may not be plastered, caulked, or built in, in any way, so as to impede the opening of the meter cover or metering equipment covers including current transformer enclosure covers or doors.
e. All metering equipment doors shall open a minimum of 90° from the front of the enclosures. Outdoor equipment enclosure doors must have a hold open device.
f. The width of the working space shall permit access to the metering equipment and in no case shall be less than 3 feet. The height of the working space shall be in no case less than 7 feet, 1 inch from grade, platform or floor. The working space shall extend at least 3 feet out from the face of the meter. A level working space no less than 3 feet by 3 feet shall be provided and maintained in front of all meter equipment with no obstructive vegetation.
g. Single meter sockets shall be installed with a preferred 18 inch clearance from the center of the socket to the nearest side wall or obstruction and in no case shall be less than 10 inches.

Protection of Metering Equipment

a. Where damage of metering equipment has or is likely to occur from vandalism, vehicles or other causes, City Light may require the customer to install protective devices such as bollards, barriers, or enclosures at the customer's expense.
b. Metering equipment enclosures installed in outside locations shall be weatherproof.
c. Pedestal metering equipment shall be sturdy enough for reasonable installation or removal of a meter without damage to the pedestal.

d. Indoor spaces housing metering equipment shall have the ambient air temperature maintained below 30 degrees C (86F). The customer is responsible for cost of maintenance, repairs and replacement of meter equipment resulting from ambient temperature.

Ownership of Metering Equipment

City Light installs and maintains meters, instruments, transformers and associated equipment which are on the City Light side of the meter. The Utility has ownership of this equipment. The customer's equipment includes: meter sockets, enclosures, landing pads, lugs, conduit, and conductors. These are installed and maintained by the customer who is the owner of this equipment.

City Light shall determine the specific metering equipment requirements after reviewing customer plans and or drawings.

Current Transformer-Rated Metering

Current transformers and/or voltage transformers are required on all services that exceed 225 amps. The two exceptions to this case are residential services with 400 amps services that use class 320 metering and remote metering with services under 225 amps.

All transformer-rated meter sockets shall have test switch provisions.

Current Transformer Landing Pads and Enclosures

Current transformer enclosures shall contain only service conductors, metering equipment, and meter conductors. They shall not be used as a junction box, gutter, or raceway for the purpose of making taps.

> *Exception:* Taps shall be allowed on the load side of the customer's landing pads to accommodate emergency services, fire pumps, and/or elevator ventilation systems as allowed by local/national fire codes.

a. All services rated at 800 amps or less that use current transformer landing pads having mechanical lug provisions for termination of line and load conductors. Landing pads shall be centrally mounted in the current transformer enclosure and the conductors will enter and leave near the corners. **NOTE:** If terminations cannot be made in accordance with manufacturer requirements and/or equipment listing, a bus gutter will be required to accommodate additional taps.
b. All services rated over 800 amps shall be installed in manufactured metering switchgear per EUSERC specifications.
c. The minimum size of current transformer enclosures shall be as follows:
   a. Single phase 400 amps or under: 24 inches wide x 48 inches high x 11 inches deep.
   b. Single phase over 400 amps: 36 inches wide x 48 inches high x 11 inches deep.
   c. Three phase: 36 inches wide x 48 inches high x 11 inches deep.
   NOTE: Larger current transformer enclosures may be necessary depending on the National Electric Code (NEC) requirements for conductor bends.
d. All landing pads shall be of heavy-duty type with minimum (AIC) fault duty rating of 50,000 amps RMS symmetrical. They shall be UL labeled and built to EUSERC standards.
e. The cover of the current transformer enclosure or switchgear shall be side-hinged, and have provisions for locks and seals. Hinges must be built so that they cannot be disassembled from

the outside of the enclosure. All metering equipment doors shall open a minimum of 90˚ from the front of the enclosures.

f. The top of the current transformer enclosure shall not be higher than 7 feet and the bottom shall not be lower than 6 inches from the finished grade or floor.
g. Connection to the grounded service conductor (neutral) shall not be used to bond current transformer enclosures. Bonding shall be derived from the service main grounding point.

Secondary Wiring for Transformer-Rated Meters

a. The customer shall provide a 1 inch minimum conduit between the current transformer enclosure and the meter socket. A maximum of 360 degrees of bends is allowable. For metering runs over 75 feet a 1-1/4 inch minimum conduit is required.
b. Junction boxes and condulets are not allowed in conduit runs for secondary metering conductors.
c. The customer shall provide metering secondary conductors, leaving 8 feet of wire in the current transformer enclosure and 2 feet of wire in the socket enclosure.

    Exception: City Light will provide the metering secondary conductors when the socket is within ten (10) feet of the current transformer enclosure.

d. All secondary conduit runs over 75 feet shall have prior approval by City Light's Technical Metering Unit. Conduit runs beyond 250 feet are not permitted.
e. The conductor colors for CT metering secondary runs are as follows:

Single Phase:	1 black, 1 red, #12 solid conductor (voltage)
	1 black, 1 red and 1 white #10 solid conductor (current)
	1 green #12 solid conductor (bonding)
Three Phase:	1 black. 1 red, 1 blue, 1 white, #12 solid conductor (voltage)
	1 black, 1 red, 1 blue, 1 white #10 solid conductor (current)
	1 green #12 solid conductor (bonding)

For secondary runs over 75 feet the current conductors need to be sized as follows:

- #8 stranded conductors for current circuits from 75' to 150'.
- #6 stranded conductors for current circuits from 150' to 250'.

Metering on Switchboards

a. Multiple self-contained metering: the clear space around each meter socket will not be less than one inch at the top and the sides, and not less than 2 inches at the bottom.
b. All side clearances will meet City Light standards.
c. Metering section panels on switchgear will open a full 90° to the switchgear.
d. Customer equipment that requires servicing shall not be installed in current transformer metering compartments. For further information contact the ESR or ESE.
e. Permanent switchboard metered services shall not have the electric meter located on the switchboard door adjacent to the current transformer compartment. The meter shall be located in a remote single meter base with a test switch provision on the nearest possible wall.
NOTE: Permanent engraved phenolic unit or equipment designation labeling is required at both the meter base and the switchboard.

Net Metering

City Light allows net metering on approved customer generation installations of up to 100kw in most areas of the service territory. Installations over 25kw will require City Light engineering review. Net Metering is not allowed in network service areas. However, customer generation is allowed in network areas if it meets certain requirements, chief among which is that the installation be precluded from feeding back onto the network grid. For more information, see Chapter 14 – Customer Generation

Communications Provisions for Large Metered Loads

Where totalized metering is permitted, the customer shall install the totalizing circuitry. Meter totalizing shall meet the Utility's criteria and be approved by City Light before metering equipment will be installed. The customer shall provide and maintain a phone line that meets City Light requirements.

New or enlarged commercial/industrial services served by a single meter with loads that are expected to reach 1 megawatt or more, or that will be totalized, are required to have a phone line or communication line at the point of metering. The customer shall own, install, and maintain the phone/communication line.

For all internal meter rooms, the customer shall install Schedule 40, 1½-inch conduit from the interior of the room to the exterior of the building for automated meter reading. The conduit shall extend 4 inches at each end and be capped.

Revision Date	Revision
April 2, 2013	Added Section "g" to "Current Transformer Landing Pad Enclosures" – restriction on bonding to the neutral.
April 10, 2013	Clarified net metering provisions
October 10, 2013	Added section "d" in "Metering on Switchboards"; added EUSERC drawing 325 (See Appendix Six)
December 20, 2013	Further clarified language on Net Metering, added provisions for Temporary Totalized Metering on certain loads.
October 20, 2015	Maximum meter height reduced to 6 feet. Electric meter bases shall be installed a minimum of three feet from the closest point of a natural gas meter installation. All permanent switchboard metered services shall have remote single socket enclosures. Engraved phenolic labels required on all multi-unit building sockets prior to meter installation. An 18 inch clearance from obstructions to the center of single meter sockets. Removal of requirement for bus gutters or common mainline switch on 800 amp or less transformer rated services with provision that landing pads with mechanical lugs are used within manufacturer specifications. Single phase current transformer enclosures over 400 amp to be 36 inches wide. Drawings for metering in switchgear shall be submitted prior to construction.