





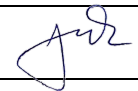
LOW VOLTAGE ELECTRIC METERING REQUIREMENTS

EI-29

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			Jac Vanderbaan, P.Eng.		
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			Jac Vanderbaan, P.Eng.		
Eric Cameron, P.Eng	R13/August 2022	All Added metric equivalents Clarified mounting heights to	Hassan El-Madhoun, P.Eng		January 2027

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		<p>finished grade</p> <p>Included applicable codes and standards</p> <p>Removed mention of FIT installations</p> <p>1.3 Added Temporary Services Section</p> <p>1.4 Added Removal or Jumpering of Meters Section</p> <p>1.5.2 Clarified parallel conductor installations</p> <p>1.5.3 Clarifications on the use of bar type CTs</p> <p>1.6 Clarified approved standards organizations</p> <p>Added requirement for Lamacoids on outdoor installations</p> <p>Removed "Interval Style Revenue Metering Systems" subsection due to redundancy</p> <p>1.8 Updated contact information</p> <p>2.1.2 Added Measurement Canada requirement for CT approval</p> <p>3 Clarified ownership and contractor requirements</p>	Jac Vanderbaan, P.Eng		

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1 GENERAL

1.1 Electrical Safety Authority Inspection

The Electrical Safety Authority is the Inspection Authority for all wiring in a customer's premises. It is the responsibility of the customer to apply for an Inspection and to correct all deficiencies noted by the Electrical Safety Authority. The customer's service will not be connected until it has been inspected and approved.

1.2 Location of Meters

The customer must provide a convenient and safe location for the installation of meters and auxiliary equipment. A clear working space of not less than 1 metre (36") but preferably 1.5 m (60") in front of the entire installation and a minimum ceiling height of 2.2 m (84") is required. The spaces provided for meters must be kept clear of foreign material and the meter equipment must not be boxed in or have the access restricted without the approval of London Hydro.

No water, steam, gas, sewer or other pipes or equipment are permitted to encroach on the safe working space requirements in front of the metering installation. Where a meter room is provided, no other equipment is permitted within the room. Violations will be reported to the Electrical Safety Authority and may result in fines or disconnection of electricity service.

Specifically in regards to electrical equipment near combustible gas equipment, the minimum clearance between gas equipment and electrical equipment, i.e. meter bases, cabinets and other ancillary devices (sources of ignition), shall be in accordance with the requirements within CSA B149.1:

Fuel	Clearance
Natural Gas with OPCO or OPSO	0.3 m
Natural Gas	1 m
Propane	3 m

Electricity meters mounted on free standing structures – wooded or metal pedestals need to be mounted at L.H. standard metering height of 1.75 m (68") from finished grade. They must be mounted a minimum of 1 metre from road ways to prevent damage to the equipment, and for health and safety of the public and utility maintenance workers.

If at any time the elevation of the work area surrounding the metering installation (meter base, cabinet or Main service entrance switchgear) is altered the service location must be changed at the customers expense to bring the elevation of the meter base, cabinet or Main service entrance switchgear back to London Hydro approved heights.

Examples would be:

- Stair wells being installed under the metering equipment
- Decks or other structures built under or around the metering equipment that changes the elevation and or the minimum clearance surrounding the equipment

1.2.1 Outdoor Residential Meters

Residential meters must be installed outdoors because of the difficulty London Hydro has in gaining access to

residential dwellings to read or maintain meters. If a residential meter or meters cannot be placed outside in an approved location, the Engineering Department must be consulted (D 519-661-5800 Ext. 5564).

Under some circumstances, parallel stacks may be permitted to accommodate outdoor residential meters but additional charges will apply.

All meters must be installed in an approved location. The centre of the meters must be $1.75 \text{ m} \pm 0.1 \text{ m}$ ($68'' \pm 4''$) from finished grade. Where meters are installed near driveways, the meters and conduits must be protected from moving vehicles. Finished grade levels must be maintained as per 1.2.

1.2.2 Indoor Polyphase Meters

All polyphase meters must be installed indoors. An indoor location provides the greatest protection for polyphase meters and London Hydro generally has less difficulty in gaining access to the commercial/industrial establishments where polyphase meters are used.

All indoor meters must be on the load side of the service fused switch or breaker, which isolates the meter and load.

For new installations, all meters must be installed so that the centre of the meter is at $1.75 \text{ m} \pm 0.1 \text{ m}$ ($68'' \pm 4''$) above the finished floor. Any number of meters and sub-services may be installed if all meters can be installed at the required 68" height. This will be strictly enforced. The installation of metered load centres is also acceptable and recommended. All meters must be in one location at the main service entrance, unless otherwise agreed to by the London Hydro Metering Department.

1.2.3 Service Upgrades and Modifications

When the service to an existing residential meter is modified or upgraded and where the upgrade requires a modification to the service mast or service wires, the installation must be brought up to current London Hydro and Ontario Electrical Safety Code, and other applicable standards. For example, indoor meters must be reinstalled outdoors and recessed meter bases must be removed and replaced. The customer will be responsible for installing a meter base.

When the service to an existing installation having a round meter base is modified and this modification affects the meter base (new load wires or conduit), the round meter base must be removed and replaced with an approved meter base.

Contractors involved in residential service upgrades or modifications should also obtain a copy of London Hydro's Engineering Instruction EI-28, *Disconnection & Reconnection of Residential Meters and Service Cables*, available from London Hydro's Dispatch Department (D 519-661-4749). This document is also included as Appendix B within London Hydro's *Conditions of Service* publication.

1.3 Temporary Services

During all new construction the temporary service must be planned in a manner to ensure that all construction power will be metered.

1.4 Removal or Jumpering of Meters

All electric meters are sealed and belong to London Hydro. Electric meters can only be removed by London Hydro personnel.

Jumpers installed to provide power in the absence of a meter is not allowed under any circumstances. Jumpers found on any type of service will be removed without notice.

During all new construction the temporary service must be planned in a manner to ensure that all construction power will be metered.

1.5 Metering Cabinets

1.5.1 General

Wherever metering cabinets are required, the Electrical Contractor is required to provide and install the cabinet. Refer to Section 2 for specific requirements. Problems may arise in using the specified size of cabinet particularly in rewiring older buildings. Approval for cabinet size or wiring deviations from the standard shall be obtained prior to installation.

Minimum distance from floor to bottom of cabinet ↓ 0.6 m (24")

Maximum distance from floor to top of cabinet ↓ 2 m (78")

Metering cabinets must have double doors with the first opening door on the right hand side when facing the cabinet and must be designed to latch closed with a locking mechanism included to accommodate London Hydro's standard padlock and seal (8 mm inside diameter minimum).

Cabinets must be equipped with removable steel back panels (back-plates) to facilitate shop work and to allow the entire back panel to be removed for testing at other locations.

Metering cabinets mounted outdoors shall be approved by the Metering Department before installation. They shall also be weather proof (NEMA 4X) with a drip shield.

The Electrical Contractor must allow for a minimum of 10 working days from the date of the instrument transformer pickup and backplate drop-off at London Hydro's Meter Shop, to the date of metering installation energization.

1.5.2 Conductors

Line and load wires must enter and exit the lower left and lower right sides of the meter cabinet. London Hydro uses 'Window' Style current transformers. In this type of installation, the contractor will be required to run the phase wires through the corresponding current transformer. London hydro will make the potential terminations to the conductors.

Mineral insulated, solid or hard drawn wire conductors are not acceptable for meter loops.

There shall be no more than two conductors per phase (parallel runs) within the metering cabinet. Where parallel runs are used, the customer is responsible to ensure that each pair of conductors on each phase is the same length. Parallel conductors shall be measured by the Contractor. Parallel conductors must be identified and marked with corresponding phasing tape.

Neutral conductors can be run straight through the metering cabinet without being cut. London Hydro will install an insulated piercing connector for the neutral.

During Service upgrades bar type current transformers will be used if conductor sizes are changing or number of conductors are different on 'load and line' sides

1.5.3 Installations Involving Switchgear

Switchgear must be at a minimum of 410 mm (16") in depth to be able to accommodate London Hydro's

supplied current transformers. Any clarifications regarding equipment specifications may be directed to London Hydro's Electric Meter Department.

Bar type (in-line) CTs are not permitted in low voltage switchgear so it is essential to have sufficient lead-time ↓ consult London Hydro's Electric Meter Department.

The conduit from the instrument compartment to the remote metering cabinet must be continuous with no breaks or LB junctions.

The conduit must not pass through any area in the switchgear that contains conductors which are connected to the line side of the main switch or breaker.

The conduit cannot exceed 15 m (50 ft.) in length without special arrangements being made with the Meter Department. The instrument transformer compartment must be lockable with London Hydro's standard padlock.

1.6 Meter Bases

A meter base is to be supplied and installed by the Electrical Contractor to London Hydro's specifications and approved by an approved standards organization (CSA) and the Ontario Electrical Safety Authority.

All meter bases must be fitted with a screw-type sealing ring.

All residential meter bases fed off of overhead services for polyphase and single phase indoor-located must be at least 7-1/2" wide and 9" high.

All residential meter bases fed from underground service must be 200 amps rated for single meter position.

Multi-Ganged residential meter bases must be minimum of 100 amps per meter position. A blank lockable position must be available for line side connections located at one end of the cluster.

Round meter bases are not permitted.

Bypass meter sockets are not permitted.

All polyphase meter bases must be equipped with a full sized isolated neutral block for proper metering.

Services with two or more meters must be clearly identified with labels indicating the customer's unit. The labels must be attached to a permanent section of the meter base. All switches feeding meter bases installations must be clearly identified. For outdoor installations, lamacoid labels shall be installed. The meter will not be installed until these labels have been properly installed.

London Hydro supports Meter Bases that are part of external backup generator switchgear. The meter base enclosure must be no smaller than a CSA approved oversize meter base. All line side cable must be secured within sealable raceways or conduit. External backup generators shall only be connected through a disconnecting device at the connection point with the distribution system which will prevent back-feed in the event of an outage on the distribution system. The disconnecting device shall provide a visible indication of the open main current-carrying path that isolates the generator from the distribution system.

1.7 Remote Interrogation Metering

Any new or upgraded customer with an anticipated average monthly peak (over a 12-month period) of 50 kW or greater is required to make provisions for Remote Interrogation Metering. This is a means London Hydro uses to access metering information remotely.

Retail customers with loads below this threshold may also request the installation of an interval-style revenue

metering system.

Please see Engineering Instruction EI-22 *Guidelines for Supplying Interval-Style Revenue Metering Systems*; Section 3.2 for available communications options.

To notify London Hydro of the communications option, please see online form:

<http://communications.london-hydro-metering-services.com/>

At the time of meter installation, if no communications options are installed and working, the default option will be London Hydro provided and managed cellular. This option has monthly fees charged to the regular bill. The customer will then have 1 year to request the communications change, without being billed for labour.

1.8 Billable Services - Electric Meter Department

Billable services requested, by the electrical contractor or customer are outlined below.

- Customer requested relocation of existing meters and meter related equipment, including removals and reinstallation of the meters and meter equipment.
- Customer requested additions and removals of meters to an existing metered service, including bulk to individual and individual to bulk metering conversions.
- Customers requesting to change their installed means of meter data retrieval outside of a London Hydro maintenance visit, and after 1 year since initial install.

In these cases, the cost of the meter is not billed. The cost associated with labour, trucking and materials will be billed on an hourly basis to the contractor that has requested and is named on the ESA inspection, or customers normal monthly bill depending on who requests the service. The duration of the work (number of hours) is dependent on the metering situation. An estimate is available upon request.

In all cases the Electrical Contractor is encouraged to contact the Meter Department for all questions regarding billable electric metering services. London Hydro's hours of operation are: Monday to Friday - 7:30 am till 4:00 pm.

Contacts are:

Leading Electric Meter Technician (Primary)
Phone: 519-661-5800, Ext. 5574

Electric Meter Supervisor (Secondary)
Phone: 519-661-5800, Ext. 6406

2 METERING DETAILS

2.1 Single-Phase 120/240 V

2.1.1 Up To 200 Amp

Meters must be located outside. Meters used are 4-jaw, self-contained units. Electrical Contractor must supply and install a rectangular meter base measuring 7-1/2" wide x 9" high minimum for services feed overhead.

Meter bases for underground single-phase services must be 200 Amp rated per position, self-contained lugs with Allen screw connections for the line side cables that are large enough to accommodate up to 4/0 stranded cable. To prevent tampering, London Hydro's service cables must not pass through any other boxes, compartments or LBs before terminating in the meter base. If the meter base is part of a combined unit, or is mounted directly

adjacent to a disconnect switch or other electrical compartment, there must be a solid barrier between the meter base and the adjacent compartment. The neutral connector block must be located in the meter base compartment to facilitate future troubleshooting and repairs. The following meter bases (or equivalent) are acceptable:

- Micro Electric BS2-TCV
- Murray Jensen EK400 RO
- Commander LM2
- Hy-Del SC24-EXP
- Hy-Del H22R (2 gang, 200 Amp for microFit installations)

2.1.2 400 Amp Residential

Electrical contractor must supply and install a 508 mm (36") combination enclosure current transformer and meter socket enclosures with lift-off covers to house CSA and Measurement Canada approved bar type current transformers. The contractor shall supply termination lugs. If the enclosure is supplied with a current transformer, it shall be Measurement Canada approved. London hydro will install the appropriate meter.

The following meter bases (or equivalent) are acceptable:

- Eaton TCC5-4 Specialty Meter Sockets
- Hydel CT4 Series Meter Socket

2.1.3 400 Amp Commercial

Electrical Contractor must supply and install a 914 mm W x 914 mm H x 254 mm D (36" x 36" x 12") meter cabinet. A meter base is not required. London Hydro will install CTs and a meter inside the cabinet. Engineering Department may require the installation of a 120V receptacle for Remote Interrogation Metering.

2.1.4 120/208Y V Network Service

Meters must be located indoors on the load side of the main switch. Meters used are 5-jaw, with the 5th jaw in the 9 o'clock position. The Electrical Contractor must supply and install a rectangular meter base or a metered load centre, where appropriate, complete with the 9 o'clock add on jaw. The Contractor must also install an isolated neutral block in the meter base.

3 THREE-PHASE 120/208Y V METERING

3.1 Up To 200 Amp

Electrical Contractor shall install a main isolation switch upstream from the revenue meter. Meters must be located indoors. Where there is no building available (i.e. temporary services, sports fields), an approved weatherproof lockable enclosure (NEMA 4X complete with rain cap) is acceptable. Meters used are 7-jaw, with the 7th jaw in the 6 o'clock position. The Electrical Contractor must supply and install a rectangular meter base or metered load centre where appropriate complete with the 6 o'clock add on.

3.2 400 Amp

The Electrical Contractor must supply and install a 914 mm W x 914 mm H x 254 mm D (36" x 36" x 12") meter cabinet indoors on the load side of the main switch. The Electric Meter Department installs current transformers and meters as required in the cabinet. Engineering Department may require the installation of a 120V receptacle for Remote Interrogation Metering.

3.3 600 Amp

The Electrical Contractor must supply and install a 914 mm W x 914 mm H x 254 mm D (36" x 36" x 12") meter cabinet to accommodate London Hydro's current transformers and meters.

If the Electrical Contractor prefers to install secondary switchgear, London Hydro will supply CTs to the electrical contractor for installation. In this case a remote metering cabinet measuring 914 mm W x 914 mm H x 254 mm D (36" x 36" x 12") is adequate complete with a 1-1/4" conduit from the switchgear to the cabinet. (See Section 1.5.3). A 120V dedicated receptacle with a breaker lock is required inside the cabinet.

All meters and metering transformers (CTs and PTs) and the corresponding wiring and attachments (test switch block) are the property of and are supplied by London Hydro.

Switchgear shall be a minimum of 410 mm (16") in depth to be able to accommodate London Hydro's supplied current transformers. Any clarifications regarding equipment specifications may be directed to London Hydro's Electric Meter Department.

3.4 **800 Amp**

The Electrical Contractor is responsible to have current transformers installed in the secondary switchgear and must provide a 1-1/4" conduit from the switchgear to a remote metering cabinet measuring 914 mm W x 914 mm H x 254 mm D (36" x 36" x 12"). London Hydro will supply CTs to the electrical contractor. A 120V dedicated receptacle with a breaker lock is required inside the cabinet.

All meters and metering transformers (CTs and PTs) and the corresponding wiring and attachments (test switch block) are the property of and are supplied by London Hydro.

Switchgear shall be a minimum of 410 mm (16") in depth to be able to accommodate London Hydro's supplied current transformers. Any clarifications regarding equipment specifications may be directed to London Hydro's Electric Meter Department.

3.5 **1000 to 3000 Amp**

The Electrical Contractor is responsible to have current transformers installed in the secondary switchgear and must provide a 1-1/4" conduit from the switchgear to a remote metering cabinet measuring 914 mm W x 914 mm H x 254 mm D (36" x 36" x 12"). London Hydro will supply CTs to the electrical contractor. A 120V dedicated receptacle with a breaker lock is required inside the cabinet.

All meters and metering transformers (CTs and PTs) and the corresponding wiring and attachments (test switch block) are the property of and are supplied by London Hydro.

Switchgear shall be a minimum of 410 mm (16") in depth to be able to accommodate London Hydro's supplied current transformers. Any clarifications regarding equipment specifications may be directed to London Hydro's Electric Meter Department.

4 **THREE-PHASE 347/600Y V METERING**

4.1 **Up To 200 Amp**

Meters must be located indoors and on the load side of the main switch. Where there is no building available (i.e. temporary services, sports fields), an approved weatherproof lockable enclosure (NEMA 4X complete with rain cap is acceptable. Meters used are 7-jaw self-contained units with the 7th jaw in the 6 o'clock position. Electrical Contractor must supply and install a rectangular meter base or metered load centre where appropriate complete with the 6 o'clock add on jaw.

4.2 **400 and 600 Amp**

The Electrical Contractor must provide a 1219 mm W x 1219 mm H x 254 mm D (48" x 48" x 12") meter cabinet to accommodate London Hydro's CTs, PTs, meters and accessories. A 120V dedicated receptacle with a breaker lock is required inside the cabinet.

If the Electrical Contractor prefers to install secondary switchgear, London Hydro will supply window or donut type CTs and PTs to the electrical contractor for installation. In this case a 914 mm W x 914 mm H x 254 mm D (36" x 36" x 12") remote metering cabinet is adequate complete with a 1-1/4" conduit from the switchgear to the communications and meter equipment cabinet. (See Section 1.5.3).

All meters and metering transformers (CTs and PTs) and the corresponding wiring and attachments (test switch block) are the property of and are supplied by London Hydro.

Switchgear shall be a minimum of 410 mm (16") in depth to be able to accommodate London Hydro's supplied current transformers. Any clarifications regarding equipment specifications may be directed to London Hydro's Electric Meter Department.

4.3 **800 Amp**

The Electrical Contractor must arrange to have current and potential transformers installed in the secondary switchgear and must provide a 1-1/4" conduit from the gear to a remote metering cabinet measuring 914 mm W x 914 mm H x 254 mm D (36" x 36" x 12"). London Hydro will supply CTs and PTs to the electrical contractor. Communications equipment is also required. (See Section 1.5 & Section 1.7). A 120V dedicated receptacle with a breaker lock is required inside the cabinet.

All meters and metering transformers (CTs and PTs) and the corresponding wiring and attachments (test switch block) are the property of and are supplied by London Hydro.

Switchgear shall be a minimum of 410 mm (16") in depth to be able to accommodate London Hydro's supplied current transformers. Any clarifications regarding equipment specifications may be directed to London Hydro's Electric Meter Department.

4.4 **1000 to 3000 Amp**

As above except the remote metering cabinet must measure 914 mm W x 914 mm H x 254 mm D (36" x 36" x 12) to accommodate a remote interrogation meter. Communications equipment is also required. (See Section 1.5 & Section 1.7). A 120V dedicated receptacle with a breaker lock is required inside the cabinet.

All meters and metering instrument transformers (CTs and PTs) and the corresponding wiring and attachments (test switch block) are the property of and are supplied by London Hydro.

Switchgear shall be a minimum of 410 mm (16") in depth to be able to accommodate London Hydro's supplied current transformers. Any clarifications regarding equipment specifications may be directed to London Hydro's Electric Meter Department.