Engineering Instruction EI-29

Low-Voltage Electric Metering Requirements

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Overview

This Engineering Instruction describes London Hydro's procedures and accepted practices for the design and installation of low-voltage revenue metering equipment.

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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 36" but preferably 60" in front of the entire installation and a minimum ceiling height of 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.

Electricity meters mounted on free standing structures – wooded or metal pedestals need to be mounted at London Hydro standard metering height of 68". 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 (☎ 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 68" ± 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 in a dedicated electrical room indoors. The 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. This room is to be free of clutter, no storage, and not fit for human dwelling to ensure safety to all whom enter.

All indoor meters must be on the load side of the 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 68" ± 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. The intent of this requirement is to ensure that for a given size electrical room, the customer has as much space as possible for future expansion.

After a new installation has been in service for a year or more, additional sub-services may be installed with the bottom of the meter and related switching equipment no lower than 24" and the top no higher than 74" above finished floor. This corresponds to the height of meters in a metered load centre. Additional sub-services and meters installed within a year of initial installation must meet the 68" requirement.

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 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 rectangular 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 a rectangular meter base.

In addition to the above requirements, when a new meter is installed in a parallel metering configuration to accommodate FIT or microFIT generation, ganged 200 Amp meter bases are required. Contact the Dispatch Office (☎ 519-661-4749) to request a Residential Service Layout for all overhead meter base changes.

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 (☎ 519-661-4749). This document is also included as Appendix B within London Hydro's *Conditions of Service* publication.

1.2.4 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 will not be 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.

1.3 Metering Cabinets

1.3.1 General

Wherever metering cabinets are required, the Electrical Contractor is required to provide and install the cabinet. London Hydro will supply and install any current and potential transformers required with the exception of current and potential transformers being mounted in switch gear and that is the responsibility of the electrical contractor. Section 2, Metering Details below, provides details on the size of cabinet required for various service sizes.

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 **MUST** be obtained prior to installation.

Minimum distance from floor to bottom of cabinet — 24"

Maximum distance from floor to top of cabinet — 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 for mounting locations outdoors must be approved by the Metering Department before installation. They must 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.

1.3.2 Conductors

Line and load wires must enter and exit the lower left and lower right sides of the meter cabinet and sufficient conductor length must be provided. Both the load and line side conductors must be long enough to reach the opposite side of the cabinet. Any deviation from this requires approval from the Meter Department.

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

Where two conductors per phase (parallel runs) are used, the customer is responsible to ensure that each pair of conductors on each phase is the same length. Parallel conductors should be measured by the Contractor and cut inside the metering cabinet with both the load and line sides long enough to reach the opposite side of the cabinet. Parallel conductors must not be looped through the cabinet without cutting, and must be identified and marked with corresponding phasing tape.

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

1.3.3 Installations Involving Switchgear

Whenever switchgear is used in the service entrance, a 36"W x 36"H x 12"D remote metering cabinet will

be required. All instrument transformers will be incorporated into the switchgear. London Hydro will supply instrument transformers (i.e. PTs and CTs) and will make available to the electrical contractor for installation. Bar type (in-line) CTs are not used so it is essential to have sufficient lead-time — consult the Meter Department.

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

The Contractor will be required to install a 1-1/4" conduit to connect directly from the section containing the instrument transformer compartment (cell) to the metering cabinet which must be located in the same room as the main service.

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 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.

1.4 Meter Bases

A meter base is to be supplied and installed by the Electrical Contractor to London Hydro's specifications and approved by 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 off of underground service must be 200 amps rated per meter position.

Round 100 amp single phase 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 lamicoid style labels indicating the customer's unit. The labels must be attached to a permanent section of the meter base. All switches feeding meter bases for both 1 phase and 3 phase installations must be clearly identified with lamicoid or P touch style labels. 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.

1.5 Remote Interrogation Metering (General Service > 50kW)

Any new or upgraded commercial 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 and interval-Style revenue meter. This is the means London Hydro uses to access metering information remotely.

For additional details reference Engineering Instructions EI-22, *Guidelines for Supplying Interval-Style Revenue Metering Systems*.

1.6 Interval-Style Revenue Metering Systems

The OEB's Distribution System Code and London Hydro's policy dictate that retail customers with loads above a defined threshold must have interval-style revenue metering systems installed. 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*, for further details on the installation of these types of meters. This document is also included as Appendix C within London Hydro's *Conditions of Service* publication which can be obtained from the Engineering Department.

1.7 Billable Services - Electric Meter Department

The type of metering service work that must be paid for by the electrical contractor is 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.

In both 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**.** 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
Phone: 519-661-5800, Ext. 5574
Fax: 519-661-5812

Electric Meter Supervisor
Phone: 519-661-5800, Ext. 6406
Fax: 519-661-5812

2 METERING DETAILS

All meters and metering transformers (CTs and PTs) and the corresponding communication equipment, wiring and attachment, including test switch blocks, are the property of and are supplied by London Hydro, unless otherwise specified. Any damaged or missing equipment will be billed to the customer at replacement value.

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 36" x 36" x 12" meter cabinet on the load side of the main switch indoors to contain a current transformer and test facilities. A self-shorting meter base must be installed outdoors and connected by means of a 3/4" conduit not exceeding 50 ft. in length without J.B or L.B to the meter cabinet.

Meter base must be a Murray Jensen type CTS409PW with a SW090M add on, or approved equivalent.

2.1.3 400 Amp Commercial

Electrical Contractor must supply and install a 36" x 36" x 12" meter cabinet. A meter base is not required. London Hydro will install CTs and a meter inside the cabinet.

2.2 120/208Y 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 meter block in the meter base.

2.3 Three-Phase 120/208Y V Metering

2.3.1 Up To 200 Amp

Meters must be located indoors 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, 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.

2.3.2 400 Amp

The Electrical Contractor must supply and install a 36" x 36" x 12" meter cabinet indoors on the load side of the main switch. Inside the cabinet shall be a120V dedicated receptacle and circuit breaker, complete with breaker lock. The Electric Meter Department installs current transformers and meters as required in the cabinet.

2.3.3 600 Amp

The Electrical Contractor must supply and install a 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 36" x 36" x 12" is adequate complete with a 1-1/4" conduit from the switchgear to the cabinet. (See Section 1.3.3). A 120V dedicated receptacle and circuit breaker, complete with breaker lock, is required inside the cabinet.

2.3.4 800 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 36" x 36" x 12". London Hydro will supply CTs to the electrical contractor. A 120V dedicated receptacle and circuit breaker, complete with breaker lock, is required inside the cabinet.

2.3.5 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 36" x 36" x 12". London Hydro will supply CTs to the electrical contractor. A 120V dedicated receptacle and circuit breaker, complete with breaker lock, is required inside the cabinet.

2.4 Three-Phase 347/600Y V Metering

2.4.1 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.

2.4.2 400 and 600 Amp

The Electrical Contractor must provide a 48" x 48" x 12" meter cabinet to accommodate London Hydro's CTs, PTs, meters and accessories. A 120V dedicated receptacle and circuit breaker, complete with breaker lock, is required inside the cabinet.

If the Electrical Contractor prefers to install secondary switchgear, London Hydro will supply CTs and PTs to the electrical contractor for installation. In this case a 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 1.3.3, *Installations Involving Switchgear*, and Engineering Instructions EI-22 for further details on the communication options available.

2.4.3 800 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 36" x 36" x 12". London Hydro will supply CTs and PTs to the electrical contractor. A 120V dedicated receptacle and circuit breaker, complete with breaker lock, is required inside the cabinet. Communications equipment is also required, See Engineering Instructions EI-22 for further details on the communication options available.

2.4.4 1000 to 3000 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 36" x 36" x 12". London Hydro will supply CTs and PTs to the electrical contractor. A 120V dedicated receptacle and circuit breaker, complete with breaker lock, is required inside the cabinet. Communications equipment is also required, See Engineering Instructions EI-22 for further details on the communication options available.

2.5 Three-Phase Above 600 V Metering

For further details on this class of service see Appendix D Engineering Instruction EI-4, *Design and Interconnection Requirements for Customer-Owned Electric Power Substations*.

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