



Low-Voltage Electrical Service

Standard E.21-10

10th Edition
June 2014



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Introduction

The conditions governing electrical service are laid out in the document *Conditions of Electricity Service* as approved annually by the Régie de l'énergie.

Standard E.21-10 (this document) covers low-voltage electricity supply and is based on the document above and on the Hydro-Québec Distribution standards in effect.

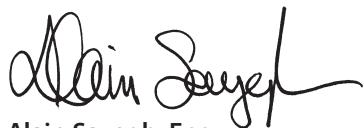
It takes into account the conditions of application stipulated in the *Québec Construction Code, Chapter V – Electricity* (C22.10, latest edition), hereinafter the "Code".

The following three standards are also based on the above documents:

- E.21-11, *Service d'électricité en basse tension à partir des postes distributeurs (low-voltage electrical service from distribution substations) – in French only;*
- E.21-12, *Service d'électricité en moyenne tension (medium-voltage electricity service) – in French only;*
- F.22-01, *Electricity Metering for Medium- and High-Voltage Installations.*

This 10th edition of Standard E.21-10 went into effect on June 30, 2014. It is designed to provide employees, master electricians, consulting engineers and manufacturers with information on implementing or modifying low-voltage installations. It is also meant to facilitate relations between Hydro-Québec and its customers regarding such matters.

Québec regulations take precedence over this Standard in case of conflicting interpretations, and the French version takes precedence over the English version in the event of discrepancies.



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0

General Information

0.1 Application

The purpose of this Standard is to describe the technical characteristics and requirements applicable to low-voltage service supplied directly from a line anywhere within the territory served by Hydro-Québec Distribution. It also describes the technical characteristics and requirements for metering electricity at a rated ampacity not exceeding 6,000 A. The requirements herein are applicable to new installations as well as to any modification of a customer's service entrance.

A master electrician finding it impossible to comply with this Standard must, before carrying out work, contact a Hydro-Québec representative at 1 877 COURANT (1 877 268-7268) to agree on a solution. The list of products accepted by Hydro-Québec Distribution can be found on the Web site for master electricians (www.hydroquebec.com/cmeq). A copy can also be obtained by calling 1 800 ENERGIE (1 800 363-7443).

If no provision covers a given modification, the requirements for a new installation apply.

0.2 Units of measure

In this Standard, the following units of measure are used:

active power	kilowatt (kW)
angle	degree (°)
apparent power	kilovoltampere (kVA)
conductor size	American wire gauge (AWG) thousand circular mils (kcmil)
force	newton (N)
length	metre (m) millimetre (mm)
rated ampacity	ampere (A)
voltage	volt (V)

Dimensions in drawings are given in millimetres unless stated otherwise.

0.3 Definitions

The most common terms are defined below. Other concepts explained in the reference documents referred to earlier must be considered in applying this Standard.

backup generator

A stand-alone generator designed to supply emergency circuits during a power failure (called an “emergency generator” in the *Conditions of Electricity Service*).

Code

The Québec Construction Code, Chapter V – Electricity (C22.10, latest edition).

Conditions of Electricity Service

The conditions governing the provision of electrical service by Hydro-Québec, as established by the Régie de l’énergie.

connection box for flat-rate service

A metal box containing the connections for supplying a customer who has a flat-rate contract with Hydro-Québec. **(See Figure 3.10)**

customer pole

A pole that belongs to the customer and is part of the customer’s electrical installation starting at the connection point. **(See Figure 0.04)**

disconnect device

A device, group of devices or other means for cutting off the flow of current through conductors in a circuit.

fixed grounding point

A metal part with a round head, hexagonal base and threaded stem, for temporarily connecting the grounding cable. **(See figures 8.02 and 8.03)**

grouped supply

A customer’s service entrance that supplies more than one delivery point. **(See Figure 0.01)**

handhole

A concrete underground structure, generally circular and fairly small, used to connect a customer installation. Workers reach into but do not enter a handhole.

junction box

A metal enclosure containing the connections between the underground distribution service loop cables and the service entrance conductors.

(See figures 3.05 to 3.09)

load side

The part of the line or electrical installation located between a given point and the load.

master electrician

A member of the Corporation des maîtres électriciens as defined in the *Master Electricians Act* (CQLR, c. M-3). For purposes of application of this Standard, the term also covers any holder of an owner-builder's licence (subclass 16) from the Régie du bâtiment du Québec.

mains hum

An abnormal level of noise due to mechanical vibration of the service conduit or accessories.

manhole

An underground concrete civil structure, large enough for workers to enter, that is used for joining cables from one or more underground conduits.

metal-clad substation

A metal enclosure with separate metal compartments housing disconnect devices, protective equipment, metering transformers, busbars and other components.

(See figures 8.02 and 8.03)

meter room

A room designed to house meter sockets and/or transformer enclosures and their service boxes, and complying with the provisions herein.

meter socket

A device equipped with a metal housing and metal jaws into which the blades of a plug-in meter can fit. The meter socket may be single or part of a multiple-meter mounting device or metering centre.

meter support

A device for installing a plug-in meter, equipped with a test-terminal block and a mechanism for affixing a seal.

(See Figure 7.02)

metering centre

A metal enclosure used to house a service box, protective devices or switches, and meter sockets. Each meter socket must have a mechanism for affixing a seal.

(See Figure 0.01)

multiple supply

An arrangement whereby several service entrances are supplied from a single connection point.

(See Figure 0.02)

multiple-meter mounting device

A device containing a number of meter sockets interconnected by busbars.

(See Figure 0.01)

multiplex cable

A cable consisting of insulated conductor strands twisted around a neutral messenger or neutral support.

overhead-underground service entrance

An underground service entrance connected to an overhead power line.

(See figures 2.23 to 2.25)

padlockable

A term describing any device having means specifically designed for affixing a padlock, thus prevent tampering.

pole

A structure supporting the conductors and other electrical hardware needed for overhead and overhead-underground distribution of low- or medium-voltage electricity.

(See Figure 0.04)

pole-mounted substation

A transformer substation consisting of one or more overhead transformers mounted on a pole.

power system

Unless otherwise stated, the electricity distribution system as defined in the *Act respecting the Régie de l'énergie*.

premises

A building, site or structure with an electrical installation to which Hydro-Québec can supply power.

protective device

A device that protects against overcurrent by automatically tripping open an electrical circuit under specified overload or short-circuit conditions, either electromechanically or by melting a metal fuse.

pullbox

An indoor metal enclosure used to pull underground distribution service loop cables to the metering equipment without splicing. (See Figure 3.03)

readily accessible location

An area that can be accessed without having to step over or remove obstructions, nor use a fixed or portable ladder or any other such means. Snow is not considered an obstruction. Any passageway leading to this location must be at least 600 mm wide and 2 m high and kept clear at all times. An indoor location must have adequate lighting.

rooftop support structure

A metal support structure fitted with insulators and installed on the roof of a building.

(See Figure 2.14)

row house

A building belonging to a row of several adjacent buildings connected to each other by common walls.

sag

In an overhead power line span, the maximum vertical distance between a conductor and a straight line between its two points of attachment. Practically, over flat terrain, sag occurs at the midpoint of the span, and is therefore called the “mid-span sag”.

saline environment

1.6-km strip of land along the shoreline or coast of any saltwater body. Saline environments include the land along the Fleuve Saint-Laurent east of the Rivière Saguenay on the north shore and east of Trois-Pistoles on the south shore, along with the Gaspé Peninsula and the Îles-de-la-Madeleine.

self-generation

Power generated by a customer, by means of a facility owned and operated by the customer, with the aim of meeting all or part of the customer's own electricity needs. The facility may include generators, wind turbines, micro-turbines, photovoltaic solar panels, or other means.

semidetached building

A building that is flanked on one side only by another building from which it is separated by a common or blank wall.

service entrance equipment

All equipment located between the connection point and the point immediately on the load side of Hydro-Québec's metering equipment or the service box if the latter is on the load side. Service entrance equipment includes the transformer enclosure, splitter trough, service box, disconnect device, meter socket and meter support.

service entrance modification

Any change in conductor size or capacity of a customer's service entrance, or relocation of any metering equipment. Excludes the replacement of a faulty or obsolete service entrance component by another with the same characteristics.

service pole

The pole bearing the conductor that runs from the supply point to the connection point and that meets one of the following conditions:

1. Supplies only one connection point;
2. Supplies several connection points on the same lot; or
3. Supplies several connection points on adjacent lots belonging to the same person or entity. **(See Figure 0.04)**

splitter trough

A metal enclosure containing feeder connections.

(See Figure 0.01)

spool rack

A metal fixture with one or more insulators that is used to attach distribution service loop or service entrance conductors to a wall, pole, service mast or support connecting such masts. **(See figures 2.01, 2.03 and 2.06)**

street address

An address with a number issued by the municipality and used to identify the exact location of a building or structure.

supply side

The part of the line or electrical installation located between a given point and the source of supply.

Synonym: line side

transformer enclosure

An indoor metal enclosure used to house voltage and current transformers and other Hydro-Québec equipment, and above which one or more meters are mounted. **(See Table 11 and Figure 0.03)**

unanticipated event

A weather event, catastrophe (fire, flood, etc.) or incident caused by a third party or the customer.

underground conduit system

A system of one or more conduits, laid in a trench and sometimes encased in concrete, through which Hydro-Québec cables are run.

utility pole

A joint-use pole belonging to Hydro-Québec or a third party, and used to deliver utility services including the delivery of low- or medium-voltage electricity up to the supply point. **(See Figure 0.04)**

1

Administrative and Technical Information

1.1 Administrative information

The request submitted to Hydro-Québec for electrical service must contain all the information required under the *Conditions of Electricity Service* in effect.

1.1.1 *Demande d'alimentation et déclaration de travaux* form

This form is submitted by a master electrician or consulting engineer acting as a duly authorized representative of the customer who is or will be the contract holder, or of such customer's proxy holder.

1.1.1.1 *Request for supply*

A written request for low-voltage supply must be submitted to Hydro-Québec during the planning phase, by means of the *Demande d'alimentation et déclaration de travaux* (request for supply and statement of work) form. It must be accompanied by the documents required according to the nature of the work to be done, along with the information required under the *Conditions of Electricity Service* and this Standard.

1.1.1.2 *Statement of work*

The statement of work must be sent to Hydro-Québec, once the installation is ready for connection, by means of the *Demande d'alimentation et déclaration de travaux* form duly completed and signed; the date on which the installation is actually ready for connection must be indicated in the appropriate box. If a form has already been submitted to request supply for the same installation, it can be reused.

1.1.1.3 *Required information*

The following information must be provided on the *Demande d'alimentation et déclaration de travaux* form:

- Name and address of the customer's representative;
- Rated ampacity of the service box (specifying if there is continuous service at 100% of that rating);
- Clearance, service entrance type and metering method;
- If requested, the cadastral plan, building layout and desired connection point;

- For flat-rate contracts, breakdown of load by equipment type, number of equipment units connected, installed load of each unit, maximum power demand and technical drawings and specifications in order to estimate power for new equipment. Such data is also required for additions or changes to a unit, or when adding or removing a unit.

Note that customers need not give their social insurance number to their duly authorized representative, but must disclose it to Hydro-Québec in the case of a request for service at a residential rate.

1.1.1.4 *Transmission of documents*

The master electrician must submit the completed *Avis de déclatement* (by phone or in writing) or *Demande d'alimentation et déclaration de travaux* form within 48 hours of starting the work. For work done on weekends or holidays, the documents must be sent to Hydro-Québec as soon as its offices open on the next business day, or within the prescribed limit. Documents may be sent by e-mail, fax or postal mail, to the address indicated in the site for master electricians at www.hydroquebec.com/cmeq.

1.1.2 *Charges*

The customer must assume all costs set out in the *Conditions of Electricity Service* and tariffs in effect.

1.1.3 *Responsibilities of the master electrician*

Before installing, modifying or renovating a customer's service entrance, the master electrician must:

- check the availability of electrical service and the applicable conditions,
- inform the customer of the steps to be taken in order to obtain service at the desired date, and
- inform the customer that connection charges or charges may be applied for extending or modifying the power line, and suggest that the customer contact Hydro-Québec for further information.

1.1.3.1 *Breaking of seals*

a) *Breaking of metering equipment seals*

The master electrician must obtain Hydro-Québec's consent before breaking any metering equipment seal. In the case of an unanticipated event, consent may exceptionally be given after

completion of the work, before the *Demande d'alimentation et déclaration de travaux* form is submitted. He must enter the date on which the seal was broken and the authorization number (*numéro de dossier*) on the form.

b) Breaking the seal of a component on the supply side of metering equipment

The master electrician must inform Hydro-Québec of any work requiring that the seal be broken on one or more components installed on the supply side of the metering equipment. He must enter the date the work was done on the *Avis de descellement* (available on the Web site of the Corporation des maîtres électriciens du Québec, www.cmeq.org, under “Documents techniques” in the Documentation section) or on the *Demande d'alimentation et déclaration de travaux* form, or convey the information by phone.

1.1.3.2 *New customer's service entrance*

The master electrician is not authorized to connect a new customer's service entrance or a subdivision of a customer's service entrance to the distribution service loop or to the power line.

1.1.3.3 *Requirements for connection*

Only Hydro-Québec can connect a customer's service entrance to the power line.

For the connection to be made, the master electrician must do the following:

a) Demande d'alimentation et déclaration de travaux form

Send Hydro-Québec a completed copy of the above form as prescribed in 1.1.1 above or instead, for exclusions under the *Building Act* or the *Code*, a document certifying that the installation is safe and in accordance with good engineering practice.

b) Identification of premises

Clearly display, on the outside of the customer's service entrance and optionally on the front of the building, the civic number or Hydro-Québec project reference number. Any other reference number found on the *Demande d'alimentation et déclaration de travaux* form may be used, except the permit number.

In the case of an underground service entrance where the conduit is not visible from outside, the premises must be clearly identified on the front of the building.

c) *Identification of components*

Identify each service box, transformer enclosure and distribution panel, as well as the fixed part of each meter socket, in accordance with 5.14.

d) *Seal*

Install components that have sealing mechanisms when they allow access to energized conductors or devices.

Such components include service boxes, protective devices and switches, transformer enclosures, meter sockets, pullboxes, junction boxes, flat-rate connection boxes and splitter troughs that are on the supply side of the metering equipment.

It must also be possible to affix self-adhesive seals to C, LB, LL and LR conduit bodies installed indoors. **(See Figure 3.02)**

e) *Service box*

Place the switch or circuit breaker of the service box in the open position.

1.1.3.4 Reconnecting after a disconnection

If electrical service is resumed more than 12 months after a disconnection, or if Hydro-Québec so requires, the master electrician must submit the *Demande d'alimentation et déclaration de travaux* form and comply with the rules set out herein.

Subject to the preceding paragraph, if electrical service is resumed less than 12 months after disconnection, Hydro-Québec will connect a customer's electrical installation that does not comply with the requirements herein, provided that

- doing so does not compromise safety,
- no modification has been made between the connection point and the service box, and
- no modification to the building or structure has made the electrical installation noncompliant.

1.1.3.5 Reconnection by a master electrician

When modifying or renovating a customer's service entrance, the master electrician may disconnect the overhead distribution service loop if it is 120/240 V, 200 A or less, and may relocate it, shorten it, and reconnect it to the same connection point or to another point on the same

building or on the same customer pole, subject to Section 2.4.4. For all such work, the master electrician must obtain Hydro-Québec's prior consent except in the case of an unanticipated event, in which case consent may be given after the work is completed, before the *Demande d'alimentation et déclaration de travaux* form is submitted.

1.1.3.6 *Modification or subsequent work*

For service entrance modifications or any other work to be done after initial installation of the distribution service loop (adding a meter or conducting repair, maintenance or other work), the master electrician may break the seal on any metering equipment and de-energize and remove it, subject to Section 1.1.3.1.

The master electrician must then ensure that the metering equipment is in good condition and leave it in view near the electrical installation with the seal, so Hydro-Québec can recover it.

The master electrician must not reconnect metering equipment that includes metering transformers, regardless of the supply voltage.

1.1.3.7 *Temporary supply circuits*

If a modification entails transferring load from an existing to a new service entrance, Hydro-Québec will refuse to connect more than one service entrance of the same voltage, even temporarily, in accordance with Section 1.2.3.1 a). In such a case, temporary supply circuits connected to permanent installations or generator sets must, without exception

- have received Hydro-Québec's prior authorization,
- comply with the *Code*, specifically Section 76, *Temporary Wiring*, and with requirements regarding warnings to be displayed,
- be connected to the existing connection point if necessary, provided it has a distribution service loop conductor,
- not be interconnected with the existing meter socket, transformer enclosure or service box,
- be installed in a way that ensures public safety and complies with any required clearance, and
- be installed with the protective equipment and tools needed to connect the temporary cabling safely.

Once the above provisions have been met, the master electrician may connect supply to the new parts of the installation from the existing parts. Supply is connected in the following way:

- For installations supplied at 120/240 V, 200 A or less, install to *Code* an outdoor temporary service conductor between the existing connection point and the connection point of the new installation.
- For other installations, install to *Code* a temporary service conductor between the load side of the existing service box and the load side of the new service box.

(See Figure 1.01)

Under no circumstances is the master electrician authorized to lengthen, shorten or move the existing distribution service loop to connect a temporary circuit in order to supply an existing installation. Furthermore, he must take the necessary measures to ensure that the installation complies with the *Code*, specifically regarding the ampacity of the existing distribution service loop, until such time as Hydro-Québec installs the new conductor. Once the new service is in place, the material (such as temporary cabling and connectors) must, to the extent possible, be left on site or in a predetermined location so the owner can recover it. Finally, the master electrician must then ensure that the metering equipment is in good condition and leave it in view near the electrical installation with the seal, so Hydro-Québec can recover it.

1.2 Technical information

1.2.1 General

1.2.1.1 Standards

a) *Compliance of customer's installation*

On receiving the *Demande d'alimentation et déclaration de travaux* form, Hydro-Québec will connect the customer's electrical installation, provided it complies with the requirements herein. Hydro-Québec will not verify the customer's installation, notably with respect to parts of the building, blank walls, firewalls or any other specific requirement. It will assume that the master electrician or consulting engineer submitting the form has done the work according to accepted industry practice and as specified in the *Code*. For any deviation from the *Code*, of any nature, there must be an appropriate modification or written approval by the Régie du bâtiment of a *Demande de mesure différente*, and the master electrician must submit a copy of the approval letter to Hydro-Québec before the connection is made.

If the Hydro-Québec representative charged with performing the hookup knows that an installation on the load side of the connection point is faulty or presents a safety hazard, he must ask the competent authorities to provide written confirmation of the installation's compliance before proceeding with the connection.

b) Safety precautions

The master electrician must make the necessary arrangements with Hydro-Québec to ensure that the work is carried out in compliance with the *Safety Code for the construction industry* (CQLR, c. S-2.1, r. 4), which applies to all work on a construction site as defined in the *Act respecting occupational health and safety* (RSQ, c. S-2.1), and with the *Regulation respecting occupational health and safety* (CQLR, c. S-2.1, r. 13), which applies to all institutions unless indicated otherwise.

Under the *Safety Code for the construction industry*, the master electrician must ensure that no one carries out work that could result in a part, load, scaffolding, machinery component or individual coming within the specified minimum approach distance of a power line, i.e., 3 m for conductors with a phase-to-phase voltage of less than 125 kV. However, Section 5.1.2 of the *Safety Code* states that the minimum distance does not apply to

- a neutral conductor;
- an insulated multiplex cable rated less than 750 V;
- a customer's service entrance cable; or
- work performed near a power line rated 750 V or less, provided that there is insulation between the worker and the non-insulated live parts.

Throughout the job, when approaching any of these components, the master electrician must take care not to come into contact with them.

Hydro-Québec may take certain measures to secure a job site, thus enabling workers to come within 3 m of live conductors. The brochure *Travaux à proximité des lignes électriques – Aide-mémoire pour l'entrepreneur*, available on the company's Web site in French only, explains these measures in detail.

1.2.1.2 Electricity generation

Hydro-Québec's written consent must be obtained before any electricity generating equipment is connected in parallel with the

Hydro-Québec power system. The connection and use of such equipment must at all times comply with conditions set by Hydro-Québec and with the standards in effect.

a) Backup generator

Hydro-Québec will allow connection of a backup generator on condition that the transfer switch has a mechanical interlock system making it impossible for the generator to couple with the power system (open transition).

However, if the transfer switch allows coupling of the generator with the power system (closed transition), or does not have a mechanical interlock system, the customer must provide Hydro-Québec with a connection study before bringing the generator into service and preferably before starting construction on the installations. See Standard E.12-08 – *Exigences relatives à la mise en parallèle momentanée d'équipements de production d'urgence avec le réseau de distribution d'Hydro-Québec* (specific requirements for momentary paralleling of emergency generators to the Hydro-Québec distribution system), available on the company's Web site.

The transfer switch may be manual or automatic and may be built into the distribution panel or not, in accordance with Hydro-Québec requirements. It may consist of one or more distinct devices installed so as to allow load transfers between the normal power supply and the backup generator.

Backup generators must always be installed on the load side of the metering equipment. The backup generator must not be able to energize the metering equipment. Safety precautions are covered in Section 5.16.

(See Figure 1.02)

b) Self-generation

A customer who owns power generation equipment may sign up for either the Net Metering rate option or the Self-Generation Without Compensation plan. General and technical information are available to the public at www.hydroquebec.com/self-generation.

Safety measures taken by the customer must include installing a padlockable disconnect switch for isolating the power generation equipment from the Hydro-Québec power system. The disconnect switch must be installed on the load side of the metering equipment.

1.2.1.3 *Quality of service*

Under the *Conditions of Electricity Service*, the customer's electrical installation must be designed, built, connected, protected, used and

maintained in such a way that it does not cause disturbances on the power system. Disturbances can be caused by a number of phenomena: voltage and current fluctuations, flicker, harmonics, etc.

In order to maintain power quality, Hydro-Québec must ensure that disturbances on its power system remain within the established limits. Based on the information provided on the form *Demande d'alimentation et déclaration de travaux* regarding load type, Hydro-Québec may ask the customer to conduct any necessary studies.

Even if no studies are required by Hydro-Québec, the customer must meet the following requirements:

a) Voltage fluctuations and flicker

Customers supplied at low voltage directly from the power line must not, without Hydro-Québec's written consent, connect a load (motive or other) that is apt to cause an inrush current of 100 A or more. Such consent is not required for low-voltage inrush currents of less than 100 A, such as those drawn by 2-hp 120-V motors, 5-hp 240-V motors, 15-hp 347/600-V motors and 15-hp 600-V motors. Consent is required for any load with a higher rating.

b) Unbalanced loads

Unless Hydro-Québec has provided written authorization, customers with a three-phase supply must limit the phase-to-phase current imbalance to 10% of the rated ampacity. The imbalance must not, however, exceed 50 A if the service box rating exceeds 600 A and the customer has undertaken not to exceed a demand current of 500 A (or 600 A during the winter period for a dual-energy system). This limit is 60 A for service supplied from a 600-A pole-mounted distribution substation. In buildings with multiple metering points, phase imbalance is measured at the connection point.

1.2.1.4 Protection coordination

The type, features and settings of the customer's protection equipment must enable coordination between customer installation protection and transformer substation protection.

The electrical installation's protective device must ensure a minimum 22-kA interrupting capacity.

However, the customer must install a protective device with a higher interrupting capacity if so requested by Hydro-Québec.

For service boxes rated higher than 600 A, the customer must send Hydro-Québec the following additional documented information as soon as possible after submitting a request for service:

a) Primary protection specifications

Type of switch or circuit breaker, manufacturer, model, rated ampacity, breaking capacity and rated voltage.

b) Primary protection settings

Relay settings, fuse rating and time-amperage curves.

The customer's primary installation protection may be lowered to coordinate it with the protection at the Hydro-Québec transformer substation.

For protection using a circuit breaker with an adjustable trip point, the setting can be lowered to 125% of the available power.

For protection using fuses, fuse size must be limited to 125% of the calculated continuous load or 100% of the calculated noncontinuous load as specified in Section 8 of the *Code*.

If coordination is impossible at the first level of protection, Hydro-Québec will accept coordination with each element at the second level of protection to comply with the *Code*. The instantaneous trip on the primary protection must be set to an amperage lower than the interrupting capacity of second-level protective devices. The conductors supplying such devices must extend no more than 7.5 m from the primary protection. The customer must then provide the load calculation, the information listed above for the elements making up the second level of protection, and a document illustrating the coordination curve with the slowest protection element of each type. The customer must also indicate the length of the conductors between this second level of protection and the primary protection.

When the conductors between second-level elements and the primary protection are more than 7.5 m long, ground-fault protection can be used to ensure coordination with the first level, even though it is not required by the *Code*. A protective device may also be added at the beginning of the branch circuit. (See Figure 1.03)

1.2.2 Available voltages and limits on supply from power line

Low-voltage supply is offered as single-phase 120/240 V or three-phase 347/600 V, wye-connected, solidly grounded neutral. Allowed voltage variations are shown in Table 2. (See Table 2)

Subject to the preceding paragraph, low-voltage supply is provided directly from the line when the total rated ampacity of the service boxes is

- 600 A or less; or
- over 600 A and maximum demand current on the distribution service loop does not exceed 500 A or 600 A during the winter period for a dual-energy system.

For a multiple-meter mounting device at 120/240 V, the nameplate capacity may be used instead of the sum of the service box ratings.

For any other low-voltage service, the master electrician or applicant must write to Hydro-Québec. Hydro-Québec will then determine the conditions of application and inform the master electrician or applicant, as the case may be.

1.2.2.1 Existing installations with 600-V supply

Subject to Section 1.2.2, in cases where the power line is underground and where 347/600-V, wye-connected, solidly grounded neutral supply is not available, Hydro-Québec may provide 600 V, three-conductor supply.

An addition or change can be made to an existing 600-V, three-conductor installation as long as it does not involve any modification between the connection point and the service box, or to the service box itself. In such cases, however, a neutral conductor must be installed as stipulated in sections 1.2.2.2 and 7.4 b). The neutral is connected to the distribution service loop only when the voltage is converted to 347/600 V, solidly grounded neutral.

1.2.2.2 Installations with 347/600-V supply

The neutral must always be electrically continuous, from the connection point to the first component on the load side of the metering equipment.

1.2.2.3 Existing installations with 120/208-V supply

Subject to Section 1.2.2, an addition or change can be made to an existing 120/208-V, wye-connected, grounded neutral supply as it does not involve any modification between the connection point and the service box, or to the service box itself.

When an addition or change involves a modification to the customer's service entrance, the master electrician may supply the existing 120/208-V installation from a 347/600-V, wye-connected distribution service loop with a solidly grounded neutral. In that case, all installation of equipment on the load side of the connection point, including step-down transformers, is at the customer's expense.

However, adding a transformer to measure the voltage at 120/208 V is prohibited if there is no metering facility at that voltage on the customer's premises. For any other addition to an existing installation, metering must be at 120/240 V or 347/600 V. **(See Figure 1.04)**

1.2.3 Supply over one or more distribution service loops

1.2.3.1 Service loops from the power line for a single building

Hydro-Québec installs a single distribution service loop per building, subject to paragraphs a), b) and c) below.

a) *Supply at different voltages*

Hydro-Québec will accept the presence of more than one distribution service loop at different voltages for the same building. However, it will not connect a 347/600-V installation if there is already a 120/208-V service loop for that building. (See Figure 2.05)

b) *Fire pumps and life safety systems*

Hydro-Québec may agree to an additional distribution service loop with a separate metering point for a fire pump or a life safety system. In such cases, an additional distribution service loop may be provided from the power line if the main service loop is connected to the power line or is a medium-voltage service loop. Any equipment that is part of a life safety system (as defined in the *Code*) may be supplied over this additional distribution service loop.

The additional service loop dedicated to the life safety system is supplied in most instances from the same transformer as the main service loop. The building load can be interrupted by disconnecting the main service loop. If clearly identified with color coding, the dedicated service loop will be kept energized, thus maintaining power to the life safety systems.

When circumstances so require, however, Hydro-Québec can interrupt power to this service loop. (See Figure 2.06)

c) *Industrial plants, other complex structures and completely self-contained occupancies*

Hydro-Québec may agree to an additional distribution service loop with a separate metering point in the case of an industrial plant, complex structure or completely self-contained occupancies. As stated in Section 1.2.1.1 a) above, Hydro-Québec will not check whether the customer's building complies with the *Québec Construction Code*. It may, however, ask the customer for a written attestation stating that the facility is an industrial plant, complex structure or completely self-contained occupancy within the meaning of the *Code*. (See Figure 2.06)

If more than one distribution service loop is installed for a single building, all services boxes must be grouped, if possible. If two or more service boxes are not grouped, a permanent drawing must be posted on or near each service box to show where all other service boxes are located.

1.2.3.2 *Service loops from the power line for units considered separate buildings*

According to the Québec Construction Code, any unit separated from adjacent units by firewalls is considered a separate building; in that case, there can be a service loop for each unit, since each is deemed to be a separate building. Please see the Code for the applicable definitions, in particular the difference between *firewall* and *fire separation*.

As stated in Section 1.2.1.1 a), Hydro-Québec will not check building compliance with the Québec Construction Code.

1.2.3.3 *Service loops from one or more distribution substations*

Please refer to Standard E.21-11, *Service d'électricité en basse tension à partir des postes distributeurs* (low-voltage electrical service from distribution substations).

1.2.3.4 *Distribution service loops – Termination of special rate*

Customers who are no longer entitled to a special rate, or who elect to forgo it, may keep the distribution service loop, provided that

- it allows for the appropriate metering method; and
- the capacity of the building's service boxes is not increased.

The installation connected to such a service loop is covered by a separate contract and is subject to the applicable rate for the intended use.

If any of the service boxes must be modified, all service boxes must be grouped on a single service loop.

Hydro-Québec reserves the right to modify the substation serving such a service loop.

1.2.4 *Metering equipment*

Subject to Section 1.2.4.2, all electrical installations supplied by Hydro-Québec must be metered.

1.2.4.1 *Number of metering points*

At a given location and voltage, only one metering point is authorized per customer, except

- when the intended uses and applicable rates differ,
- when service is from more than one distribution substation, or
- in the cases set out in Section 1.2.3.1 b).

1.2.4.2 *Unmetered installations*

Hydro-Québec may agree to connection without metering of consumption, if the installation meets one or both of the following conditions:

- The safety or integrity of metering equipment cannot be assured.
- The location for metering equipment is not secure or is very difficult to access.

Hydro-Québec may also agree to connection without metering of consumption for the following:

- Telecommunications equipment: cellular, landlines (including telephone booths), cable, optical fibre, etc.
- Monitoring and recording equipment: traffic cameras, seismographs, etc.
- Signal lights: traffic lights, flashers, marine beacons, railway crossing lights, etc.
- Other urban amenities: bus shelters, public lighting, etc.

In all cases covered by this clause, the master electrician must indicate, on the *Demande d'alimentation et déclaration de travaux* form, the nature of the installation and of the loads connected, in addition to the information required under Section 1.1.1.3.

2

Overhead Service

2.1 Number of service entrances per building

2.1.1 New service entrance

The number of low-voltage service entrances that may be connected to an overhead distribution service loop supplying a building is limited by the following conditions:

- The total load calculated in accordance with the *Code* must not exceed 600 A;
- The number of conductors connected to the service loop conductor must not exceed four.
(See Figure 0.02)

2.1.2 Service entrance modifications

If a service entrance must be modified and has more than four conductors connected to a Hydro-Québec conductor, the conductors may be replaced provided their number remains unchanged and the total load calculated in accordance with the *Code* does not exceed 600 A.

2.1.3 Total load and conductor size

The total load, calculated in accordance with the *Code* as mentioned in 2.1.1 and 2.1.2, is usually less than the sum of the rated ampacities of the service boxes or multiple-meter mounting devices.

The size of the service loop conductors is based on the sum of the service box ratings or, in the case of a 120/240-V multiple-meter mounting device, on its nameplate rating.

2.2 Spool rack

2.2.1 Supply and installation

The master electrician shall, at the customer's expense, supply and install a spool rack in accordance with the *Code* and with the recommendations of the Régie du bâtiment du Québec, in particular to prevent mains hum. The customer retains ownership of the spool rack.

2.2.2 Location

The spool rack may be attached to an exterior wall of a building or to a customer pole, service mast or other support structure. The master electrician shall ensure that the spool rack, service mast and service loop are secured firmly to the building in a location not conducive to vibrations, and shall reinforce the installation, as needed, at the customer's expense. The service entrance must also be located so as to allow the meter to be installed in a readily accessible location.

2.2.3 Clearances

The location of the spool rack must allow compliance with the clearances prescribed in the *Code* for the service loop conductors, which are shown in Table 14 of this Standard. **(See figures 2.15 and 2.22 and Table 14)**

The service loop must never run above a customer's building or an appurtenant structure, unless both of the following conditions are met:

- The conductors running above the building also enter it; and
- They run along the eaves no farther than 1 m from the edge of the roof, without going past the end of the adjacent wall.

(See Figure 2.17)

Except in the case of an installation on existing rooftop support structures, no portion of the service entrance conductors located on the supply side of the service head and overhanging the outside walls of a building may be run as exposed wiring (within the meaning of the *Code*). **(See Figure 2.14)**

This excludes any outbuilding that is less than 13 m² and can be moved at any time at Hydro-Québec's request. The minimum vertical clearance between the highest point of the outbuilding and the service loop conductor must then be 2.5 m. However, in the case of areas that are normally inaccessible—i.e., that can only be accessed using a ladder or some other means not permanently attached—and cannot easily be walked upon, the minimum clearance may be 1 m.

2.2.4 Distance between spool rack and service head

The spool rack must be attached 150 to 300 mm below where the customer conductors exit the service head.

If the spool rack is attached to a wall, it must be the same wall that the service head is on.

The spool rack must be no farther than 300 mm from the nearest conduit. If there are additional conduits, the minimum length of conductors exiting the service head must be increased by the distance between the conduit nearest the spool rack and the conduit in question. The distance between the spool rack and the farthest conduit must not exceed 750 mm.

(See figures 2.01 to 2.06)

2.2.5 Common spool rack

2.2.5.1 *Semidetached buildings and row houses*

For semidetached buildings and row houses, two service entrances can share a single spool rack mounted between their respective service conduits or at their common wall. (See Figure 2.03)

2.2.5.2 *Two-conduit service entrances*

For service entrances with two metal conduits, a common spool rack can be installed between the two, provided they have a diameter of 53 mm or more as stipulated in the *Code*. (See Figure 2.04)

2.2.6 Distance between two spool racks

When spool racks for different voltages are installed side by side on an exterior wall or on masts and the required 450-mm vertical separation is not feasible, a minimum 1-m horizontal separation is required. If the spool racks are at different heights, the one for the higher voltage must be installed above the one for the lower voltage. (See Figure 2.06)

2.2.7 Mechanical strength

The spool racks must be bolted in place at two or more anchor points. However, in the case of modifications where there is no problem with mains hum, the spool rack may be attached to a solid wooden structural member using lag screws at least 9 mm in diameter. The threaded part of the lag screws must penetrate the solid wooden structural member to a depth of at least 75 mm, as specified in the *Code*.

A service mast must be installed using three mast clamps as specified in the *Code*. (See Table 3)

2.2.8 Height of spool rack

2.2.8.1 *Minimum height*

For adequate clearance above grade, the spool rack must be at the minimum height specified in Section 2.7 and Table 4 for service loops of different lengths. (See figures 2.01 to 2.06 and Table 4)

2.2.8.2 *Maximum height*

The spool rack must be no higher than 8 m above grade, except in the case of an existing installation according to the provisions in Section 2.7.3.1 b). **(See figures 2.01 to 2.06)**

2.2.8.3 *Special cases*

The master electrician shall consult a Hydro-Québec representative for any case not covered by Table 4 and for the following cases:

(See Table 4)

a) *Slope*

If the spool rack support is lower than the utility pole or if the service loop crosses a street, Hydro-Québec might have to install a pole on the same side of the street as the service entrance to meet the requirements in Table 5. **(See Table 5)**

b) *Clearance above obstacles*

If the service loop passes over a pool, appurtenant structure or other obstacle.

2.2.9 Conductor clearance above roofs

2.2.9.1 *Mast-mounted spool rack*

A mast-mounted spool rack must be at least 915 mm above the roof, and the bottom of the drip loop must be at least 600 mm above the roof. **(See figures 2.01, 2.02, 2.04 and 2.05)**

2.2.9.2 *Gable-roofed buildings*

When the service mast enters through the roof, the spool rack must be positioned such that there is 915 mm of clearance between the eave and the service loop along its entire length, and 600 mm between the eave and the bottom of the drip loop. **(See Figure 2.07)**

2.2.10 Distance between spool rack and telecommunications wires

In residential areas, up to two telecommunications drop wires may be attached to a mast. When one or more telecommunications wires are attached to a service mast or exterior wall, the minimum distance between the drip loop and the highest telecommunications wire must be 300 mm.

(See Figure 2.01)

2.2.11 Ice fenders above conductors

Ice fenders or their equivalent must be installed on smooth roofs to prevent ice from falling on service loop conductors.

Metal, plastic, slate and other such roofs are considered smooth.

(See Figure 2.08)

2.2.12 Common support

If a common support is shared by two spool racks for service loops at different voltages, the requirements below must be met:

a) Mechanical strength

The support must withstand the sum of the stress limits for both service loops. The mechanical strength at each service loop attachment point must be equal to the value given in Table 3 for that type of service loop. **(See Table 3)**

b) Distance between spool racks

There must be a vertical separation of at least 450 mm between the two spool racks. **(See figures 2.05 and 2.06)**

c) Placement of spool racks

The spool rack for the higher voltage must be installed above the one for the lower voltage. **(See figures 2.05 and 2.06)**

d) Service box ratings

The rated ampacity of each service box must not exceed 400 A.

e) Type of service loop conductors

Only triplex or quadruplex conductors are authorized.

2.3 Service entrance

2.3.1 Length of conductors at service head

Conductors exiting the service head must be of adequate length, never less than 750 mm, and free of splices and connectors. In saline environments, conductors must be at least 1 m long. **(See figures 2.01 to 2.06)**

2.3.2 Service mast

Acceptable service masts are prefabricated metal masts and rigid steel conduits at least 63 mm in diameter, in accordance with the Code.

(See figures 2.01, 2.02, 2.04, 2.05 and 2.07)

In this Section, an angle iron is considered a type of mast when the spool rack is attached to it. "Angle iron" denotes a right-angled metal section whose mechanical strength meets the requirements given in Table 3.

(See Table 3)

Wooden structures are not allowed for use as service masts in new installations, modifications or replacements.

2.3.3 Length of service mast

If the mast rises above the roof, the distance from the upper mast clamp to the spool rack must not exceed 1.5 m, unless the mast is guyed.

(See Figure 2.01)

2.3.4 Metal conduit with PVC section

Metal conduits or prefabricated service masts that are electrically isolated from the service box or meter socket by a section of PVC conduit must be connected to the neutral conductor with a ground-wire clamp approved for this use.

A PVC section may not be used vertically above a roof unless it is supported by an angle iron or attached to a service mast over its entire length.

(See figures 2.01 and 2.02)

2.3.5 Insulation of neutral conductor

In a saline environment or when a tingle voltage filter is used, the service entrance neutral must be compliant with the *Code* and with paragraph 6.2 j) of this Standard.

2.4 Service entrance modification

In cities that have programs or agreements for power system relocation and/or undergrounding, the master electrician should contact a Hydro-Québec representative before determining any new connection point.

2.4.1 One connection point

Any modification to one of the service entrances in a multiple supply arrangement must allow for connection to the existing connection point, provided that point meets the conditions in this Standard.

If the existing connection point does not meet the requirements of this Standard, a new connection point will be determined. The master electrician must then supply the unmodified entrance(s) from the new point.

(See Figure 2.09)

2.4.2 More than one connection point

2.4.2.1 Unchanged number of connection points

If more than one service loop supplies a building at the same voltage, modifications to one or more service entrances must not result in an increased number of service loops.

(See Figure 2.13)

2.4.2.2 *Single connection point*

All modified service entrances must be connected to a single point in accordance with this Standard.

2.4.2.3 *Selection of connection point*

If only two connection points comply with the requirements herein and there is only one service entrance at each point, the modified entrance must be supplied from the unmodified one.

If two or more connection points comply with the requirements herein, the modified service entrance must be supplied from the point with the greatest number of compliant service entrances.

(See figures 2.10 to 2.13)

2.4.3 Service entrances on existing rooftop support structures

2.4.3.1 *Rooftop support structure not more than 8 m above grade*

The connection point is located at the top of the rooftop support structure, provided it is no more than 8 m above grade. Hydro-Québec will connect its service loop there, provided there is at least 1 m of clearance between the loop and parapet wall and at most 1 m horizontally between the connection point and the edge of the roof.

(See Figure 2.14)

2.4.3.2 *Rooftop support structure more than 8 m above grade*

If the rooftop support structure is more than 8 m above grade, the connection point is located at either

- a) *a spool rack*,
if the spool rack is attached in accordance with Section 2.2.8; or
- b) *the supply point*,
if, based on prior agreement with a Hydro-Québec representative, the customer provides the connection to the supply point in accordance with Section 2.6.

2.4.4 Reconnection by a master electrician

As part of the work provided for in Section 1.1.3.5, the master electrician may disconnect and reconnect a service loop rated 120/240 V, 200 A or less, on condition that the following steps are taken:

- a) Check that the service loop does not cross a public thoroughfare and, if it does, keep in place the tension clamp attaching it to the customer's spool rack during disconnection and reconnection.

- b) Check, when disconnecting and reconnecting, that the service loop consists of insulated conductors whose ampacity is at least that of a 2-AWG aluminum conductor (if this is not the case, refer to Section 1.1.3.7).
- c) Make sure that, once the work is completed, the connection point is located on the service loop (120/240 V, 200 A or less).
- d) Avoid lengthening the service loop (if lengthening is necessary, the new service entrance must be supplied temporarily from the existing connection point, in accordance with Section 1.1.3.7).
- e) Observe the instructions set out under "Work at the Connection Point" in the Job Aids section at the end of this Standard; specifically, keeping the service loop conductors off the ground, or disconnecting them from the customer's spool rack if they are not subject to such requirements.
- f) Do not relocate the service loop from one building to another or from a building to a customer pole or vice versa, nor modify a temporary connection to make it permanent or vice versa.
- g) Take the precautions needed to ensure public safety and to maintain the clearances required under the *Code* and this Standard.
- h) Ensure that the final tension of the installation is between 300 N (31 kg) and 450 N (46 kg), and that the sag of the service loop is roughly the same after the job as before.
- i) Make sure that the service loop never comes in contact with telecommunications wires and cables. A minimum clearance of 300 mm must be kept between the service loop and telecommunications wires and cables over the entire length of the span and at the customer connection point (including at the drip loops).
- j) Ensure that the spool rack of the modified connection is, to within 300 mm, at the same final height as that of the initial connection, in accordance with Section 2.2.8.2.
- k) Comply with Section 2.2.7 concerning the mechanical strength of the spool rack.
- l) Comply with the requirements in Tables 12 and 13.
- m) Always use a service entrance tension clamp as specified in "Work at the Connection Point" in the Job Aids section at the end of this Standard if the service loop is moved or shortened.
- n) Ensure that the final customer installation is compliant with the requirements in the *Code* and in this Standard.

If at any time the master electrician notes that the connection point connectors are damaged, he is authorized to repair them. However, if an unanticipated event affects an installation and damages the service loop, the master electrician is not authorized to repair the service loop nor to work on the supply point or the Hydro-Québec line.

A third party or a customer who must undertake urgent or unforeseen repair work as a result of an unanticipated event may be held liable for damage to the distributor's line, including the service loop, and will be billed accordingly as provided for in the *Conditions of Electricity Service*.

2.5 Service loop

2.5.1 Supply and installation

Hydro-Québec supplies and installs a service loop extending to the connection point on the customer's spool rack, and retains ownership thereof. If Hydro-Québec is not authorized to run an overhead line across a public thoroughfare, it must provide an underground crossing at the customer's expense, in accordance with the requirements in Section 3.

2.5.2 Clearance

A customer who installs a pool, appurtenant structure, platform or stand below or beside the service loop must ensure it complies with Section 2.2.3.

2.6 Service loop provided by customer

2.6.1 Supply and installation

A customer may elect to provide the service loop up to the connection point determined by Hydro-Québec. **(See Figure 2.16)**

2.6.2 Conditions

A service loop provided by a customer must not cross a public thoroughfare unless such crossing is permitted under municipal bylaws and transportation regulations and the clearances comply with the *Code*. For the purposes of this Section, lanes where there are no homes with a street address are not considered public thoroughfares.

If necessary, Hydro-Québec may extend its line according to the conditions set out in Table 5.

When the service loop provided by the customer is overhead or overhead-underground, the metering equipment must be installed no more than 30 m from the line in accordance with this Standard.

This requirement does not apply to

- a residence;
- an overhead connection fully visible from the connection point; or
- an overhead connection partly visible from the connection point if the remaining part is visible from the metering point.

A customer-provided service loop must not put excessive mechanical stress on the power line. Stress must be between 300 N (31 kg) and 450 N (46 kg) at the time of installation. For the service loop to remain within these limits, the span closest to the power line must not exceed the length given in Table 6. If spans farther away exceed these values, the pole closest to the line must be guyed and the customer may have to install one or more additional poles.

(See Figure 2.16 and tables 5 and 6)

2.7 Connection point

2.7.1 Access to connection point

The connection point must be accessible using a ladder resting on the ground or a bucket truck, and must

- be located no more than 1 m from the edge of the roof;
- not be over another building;
- be clear of any snowbanks or ice, for safety reasons; if the way is blocked by snow, it is the customer's responsibility to clear it enough to allow safe access prior to any work carried out by Hydro-Québec;
- be at a sufficient distance from the nearest trees.

To be accessible by bucket truck, the connection point must be no farther than 3 m from a passable road. It must be possible to operate the bucket truck in a space free of such obstructions as trees and fences.

(See figures 2.17 and 2.18)

It is recommended that the connection point be located as close as possible to one end of the building to facilitate landscaping or pool installation, and for aesthetic reasons.

(See Figure 2.19)

For access by ladder, the area where the ladder is used between the property line and the edge of the roof or the wall against which the ladder leans must be free of any obstructions, allowing use in accordance with the *Safety Code for the Construction Industry*.

Section 3.5.6 d) of the *Safety Code* stipulates that "any ladder shall [...] when not permanently fastened, be so inclined [...] that the horizontal distance between the base of the ladder and the vertical plane of its top support is approximately between 1/4 and 1/3 of the length of the ladder between its supports. Under that provision, the ladder base must be located on a solid, flat and nonslippery surface". It must also be located on the customer's property or in a road or lane. Both ladder risers must be firmly supported at the base and at the top.

Access to the connection point on a service loop may differ from access to the meter.

(See Figure 2.20 and Table 8)

2.7.2 Location

2.7.2.1 *On the nearest wall*

The connection point may be located on the wall nearest the power line, either directly or on a mast, provided that the requirements in Table 4 are met.

(See Figure 2.17 and Table 4)

2.7.2.2 *On an adjacent wall*

The connection point may be on a wall adjacent to the wall nearest the power line and no more than 3 m from that wall, provided the service loop conductors form at least a 5° angle with the adjacent wall. The distance may be greater if the service loop conductors form a 15° or greater angle with the wall. For clearances, refer to Table 7.

(See Figure 2.17 and Table 7)

2.7.2.3 *On a mast mounted on an adjacent wall*

When the connection point is on the spool rack attached to a service mast on an adjacent wall, the service loop must not run above the roof but may run above the eaves over the wall on which the mast is mounted.

(See figures 2.17 and 2.18)

2.7.2.4 *Above an appurtenant structure*

The service loop may run above an appurtenant structure adjoining a building, but must remain 1 m or less from the edge of the roof and must not cross the entire width of the structure.

(See Figure 2.17)

2.7.2.5 *On a customer pole*

The connection point may be located on a customer pole, provided that the pole

- is no farther than 3 m from a passable road (including a driveway) and is accessible at all times from a bucket truck;
- is no farther than 30 m from the power distribution line or the property line, whichever is to the customer's advantage;
- is Class 7 or better under CAN/CSA-O15-05, Wood Utility Poles and Reinforcing Stubs;
- is buried to a depth of at least 1.7 m;
- if located less than 10 m from the low-voltage distribution line, is long enough to allow the spool rack to be installed at the same height as the line (give or take 1 m), but no higher than 8 m;
- is installed such that the service loop complies with the heights given in Table 4; and **(See Table 4)**
- is guyed if stress from the service entrance could destabilize the line, as indicated in Table 6. **(See Figure 2.21 and Table 6)**

2.7.2.6 *On the power line*

If the customer provides the service loop up to the power line, the connection point is located at the supply point and the customer retains ownership of and responsibility for the service loop.

(See Figure 2.16)

2.7.3 Clearance around parts of a building

The connection point must be located so that the service conductors comply with the following clearances: **(See Figure 2.22 and Table 14)**

2.7.3.1 *Windows, doors and porches*

a) *Clearance*

Exposed service conductors must be at least 1 m away from all windows, doors and porches, unless the conductors are higher than them.

b) *Exceptional height of spool rack*

For an existing installation where it is impossible to maintain the clearance set out in paragraph a) with the spool rack at a height of 8 m or lower, the *Code* allows the spool rack to be at a height of up

to 9 m if this will ensure the required clearance. In such a case, the customer will provide the service conductors up to the connection point determined by Hydro-Québec.

c) *Barrier*

For an existing installation where the solution set out in paragraph b) still does not enable compliance with the clearance required in a), a barrier meeting the *Code* requirements must be installed and placed so as to make the exposed conductors permanently inaccessible to persons from a window, door or porch.

2.7.3.2 *Verandas, terraces, balconies and stairways*

There must be 1 m of horizontal clearance between the service conductors and any veranda, balcony, terrace or stairway for which a vertical clearance of 2.5 m is not feasible.

2.7.4 **Connectors**

Service entrance connectors must be lower than the service head, except in the case of an overhead-underground service entrance or connection of equipment on a utility pole; in such cases, the connectors must be installed so as to prevent water intrusion into the service entrance conductors.

(See figures 2.01 to 2.06 and 2.23 to 2.26)

2.8 **Overhead-underground service entrance**

When the power line is overhead and the service entrance is overhead-underground, the service entrance will preferably be on a utility pole if the following conditions are met:

a) *Authorization required*

The customer must obtain written authorization from the pole owner.

b) *Compliance with standards*

The work must be done by a master electrician at the customer's expense and in accordance with standards set out by Hydro-Québec, the pole owner (Bell Canada, Bell Aliant, Télécab or Telus) and government bodies.

c) *Preliminaries*

Before starting the work, the master electrician must always check with a Hydro-Québec representative to see what requirements apply to the installation location.

The pole owner will systematically reject any request for an overhead-underground service entrance on a pole that already has underground risers or electrical equipment other than street lights (including transformers).

d) Clearance and space on the pole

The pole must have enough free space to accommodate the conduits, and the clearances prescribed in figures 2.23 to 2.25 must be observed at all times. To this end, Hydro-Québec may, at the customer's expense, raise the low-voltage conductors on the utility pole to accommodate the service entrance conduits. This procedure is required in most cases, since Hydro-Québec's low-voltage conductors are usually located just above the neutral zone and the service head must be installed so that its top is at least 300 mm above the neutral zone.

No meter socket, protective device or disconnect switch may be mounted on the pole. **(See figures 2.23 to 2.25)**

e) Crossing of public thoroughfares

The overhead-underground service entrance must never cross a public thoroughfare unless the customer obtains authorization from the municipality or the Ministère des Transports.

f) Requirements

The overhead-underground service entrance must be installed in accordance with technical, safety and operating requirements.

The master electrician must ensure that fill around the pole is restored to its initial condition.

Excavation at the foot of the pole must not exceed 600 mm in depth over half the perimeter of the pole, and the metal conduit must be buried to a depth of at least 300 mm.

g) Identifier

A metal plate bearing installation identifiers (civic number or equipment code) must be nailed or riveted to the pole near the corresponding conduit at a height between 2 and 3 m above grade.

The identifiers must be engraved or permanently glued digits and letters at least 38 mm high. For service entrances, only the civic number for each service entrance is required. In the case of pole-mounted equipment, the plate must indicate the owner's name and the type of equipment along with the civic number of the building closest to the equipment. Any other information is at the customer's discretion, subject to Hydro-Québec approval.

h) Expense

Installation of the overhead-underground service entrance is at the customer's expense. Any subsequent relocation of the service entrance at the pole owner's request is also at the customer's expense.

If these conditions cannot be met, the customer must install, at his expense, his own pole and conduits in accordance with the *Code* and other applicable standards.

2.8.1 Technical requirements

2.8.1.1 *Number and types of conduits*

No more than two service conduits may be installed on a pole. The remaining space is reserved for telephone and cable distribution companies, which can each install one riser.

The conduits must be rigid metal and must be installed according to the *Code*.

The *Code* allows the use of rigid nonmetallic conduits on the customer pole. However, in locations where there is a risk of damage from machinery, such as lanes and driveways, nonmetallic conduits must be protected to a height of 2 m above grade by steel guards or appropriate raceways. **(See figures 2.23 to 2.25)**

2.8.1.2 *Distance between conductors and service head*

There must be at least 150 mm between the service loop conductors and the service head.

It is important to maintain a minimum vertical separation of 1,000 mm (neutral zone) between the conductors (including drip loops) and the telecommunication cables. The master electrician must reach a prior agreement with a Hydro-Québec representative to ensure this requirement is met when installing the service head.

(See figures 2.23 to 2.25)

2.8.1.3 *Conductors*

The conductors exiting the service head must be at least 1.5 m long if the line consists of separate conductors, and 750 mm long if it consists of multiplex conductors. **(See figures 2.23 to 2.25)**

The overhead-underground service entrance must consist of a conductor that is continuous from the connection point to the service box.

2.8.1.4 Metal conduit

The metal conduit must be connected to the neutral by means of an approved ground-wire clamp. **(See figures 2.23 to 2.25)**

2.8.2 Connection point

The connection point is located at the supply point or on the customer pole in accordance with sections 2.7.2.5 and 2.7.2.6. **(See figures 2.23 to 2.25)**

2.9 Connection of equipment

With overhead lines, the connection of pole-mounted equipment (apart from street lights) must meet the conditions below. Such equipment may include cable television or telecommunications equipment, amplifiers, boosters, sign lights or traffic lights.

Public lighting (including decorative lighting) is not covered by this provision, as it is subject to specific standards. In certain situations and for reasons of public safety, Hydro-Québec may authorize the installation of public lighting on poles where there is already power system apparatus such as transformers.

a) Compliance with standards

Installation is at the customer's expense and must comply with Hydro-Québec standards.

b) Preliminaries

Before starting the work, the master electrician must always check with a Hydro-Québec representative to see what requirements apply to the installation location.

c) Space on the pole

The pole must have enough free space to install one or more conduits.

d) Requirements

The equipment must be connected in accordance with technical, safety and operating requirements.

e) Identification

Refer to Section 2.8 g).

2.9.1 Technical requirements

2.9.1.1 *Number and types of conduits*

Refer to Section 2.8.1.1.

(See Figure 2.26)

2.9.1.2 *Distance between conductors and service head*

Refer to Section 2.8.1.2.

(See Figure 2.26)

2.9.1.3 *Conductors*

Refer to Section 2.8.1.3.

(See Figure 2.26)

2.9.1.4 *Grounding*

Pole-mounted equipment must be grounded by means of an approved ground-wire clamp in accordance with the instructions for the equipment in question.

(See Figure 2.26)

2.9.2 Connection point

Refer to Section 2.8.2.

(See Figure 2.26)

3

Underground Service

For underground service, the customer must contact a Hydro-Québec representative to find out about connection methods and any contributions required.

3.1 Service entrance

3.1.1 Individual meter socket

Only one meter socket may be connected to the service loop and only one service entrance to that socket. **(See figures 3.01 to 3.03)**

In accordance with paragraph 6.2c) herein, the socket must be equipped with bolts to accommodate one-hole NEMA terminal lugs. **(See Figure 3.01)**

3.1.2 Multiple-meter mounting device

Only one multiple-meter mounting device may be connected to the service loop. **(See Figure 3.04)**

In accordance with paragraph 6.2c) herein, the connection box must be equipped with bolts to accommodate one-hole NEMA terminal lugs. The underground service conduit must terminate in the connection compartment.

3.1.3 Junction box

Each service loop conductor may connect to a maximum of two service entrance conductors. A transformer enclosure is not considered a junction box.

(See figures 0.02 and 3.05 to 3.07)

3.1.4 Connection box for flat-rate service

For flat-rate service, only one connection box may be connected to the service loop.

For connection to the underground service loop, the connection box must be equipped with bolts to accommodate one-hole NEMA terminal lugs. **(See Figure 3.10)**

This box may be physically separate from or built into the equipment receiving the electricity supply. Any equipment having a built-in connection box, such as pad-mounted telecommunications equipment, must meet Hydro-Québec's requirements and must be approved by Hydro-Québec before the service request is submitted.

3.2 Connection point

Depending on the installation, the connection point may be located in the meter socket, in a dedicated compartment of the multiple-meter mounting device, in the junction box or in the connection box for flat-rate service.

(See figures 3.01 to 3.07 and 3.10)

Alternatively, it may be in a structure belonging to the customer (manhole or handhole). For certain installations supplied at 120/240 V and subject to a special agreement, it may be in a Hydro-Québec structure. In that case, a Hydro-Québec representative must supervise connection of the service entrance at the customer's expense.

If the connection point is located in a structure belonging to the customer or to Hydro-Québec, the cable size must be between 2 AWG and 750 kcmil to ensure compatibility with Hydro-Québec's multiway connector.

3.2.1 In the meter socket

The connection point may be indoors or outdoors, provided that the meter socket is on the supply side of the service box. (See figures 3.01 to 3.03)

3.2.2 In the multiple-meter mounting device

The connection point is located outdoors, on the supply side of the service boxes. (See Figure 3.04)

3.2.3 In the junction box

The connection point is inside the junction box in the following cases:

a) Indoors

- On the supply side of one or two service boxes, two meter sockets or one of each, located indoors. (See Figure 3.05)
- On the supply side of one or two individual meter sockets or one or two multiple-meter mounting devices, located outdoors.

(See Figure 3.06)

b) Outdoors

- On the supply side of the service conduit.
- On the supply side of two individual meter sockets, two multiple-meter mounting devices or one of each. (See Figure 3.07)

For the purpose of undergrounding an overhead line, a type-3R junction box may be installed outdoors to facilitate connection of an existing customer installation. Such a junction box may be used for service entrances rated up to 600 A.

3.2.4 In the connection box for flat-rate service

The connection point is located on the bolts for one-hole NEMA terminal lugs in the compartment reserved for Hydro-Québec use. (See Figure 3.10)

3.2.5 In the customer structure

The connection point may be located in a structure belonging to the customer (manhole or handhole).

3.3 Underground conduit system

The underground conduit system must be built by the customer at his own expense. A manhole or handhole, if necessary, must be provided on the customer's property and at his own expense. The customer retains ownership of and responsibility for these items.

The conduit containing the service loop cables must be covered with 750 mm or more of fill, according to Hydro-Québec specifications.

3.4 Conduits

3.4.1 Description

A rigid conduit at least 75 mm in diameter, approved by Hydro-Québec, must be supplied and installed by the master electrician at the customer's expense to link the meter socket, pullbox or junction box to the underground conduit system.

If the service box ratings total 600 A or more and the conduit system has type-L conduit bodies, the rigid PVC conduit must be at least 100 mm in diameter.

A 100/75-mm reducer bushing is then installed, if needed, between the rigid PVC conduit and the rest of the underground conduit system.

To facilitate cable pulling, bends with a minimum radius of 900 mm should be used on the entire underground conduit system.

(See figures 3.01, 3.02, 3.04 and 3.07 to 3.10)

3.4.2 Conduit entrance

3.4.2.1 General requirements

To avoid drainage problems, the conduit should enter the building through a wall above grade at the most suitable location for the electrical installation. (See figures 3.02, 3.03, 3.08 and 3.09)

3.4.2.2 Conduit entrances below grade

If, contrary to 3.4.2.1 above, the customer decides to have the conduit enter the building below grade, Hydro-Québec accepts no responsibility for any water infiltration problems. After installing or replacing service entrance conductors, the customer must have the conduit sealed at his own expense and in the presence of a Hydro-Québec representative. The customer must supply and use a product approved for this purpose and must not damage the conductors.

The customer bears sole responsibility for the design and construction of the underground conduit system, and must take the necessary steps to prevent water from leaking into the building.

3.4.3 Conduit compatibility

Subject to Section 3.4.1, the customer conduit must have the same diameter as the distribution conduit, whether encased in concrete or buried directly.

3.4.4 Riser conduit on an exterior wall

A riser conduit may be mounted on an exterior wall provided the sum of bends does not exceed 180°, not counting the bend beneath the service entrance equipment. If the sum of bends exceeds 180°, the conduit run must first be approved by Hydro-Québec, which will determine whether the installation is feasible based on cable-pulling calculations. The bend joining the conduit at the foot of the wall to the rigid riser conduit must have a minimum radius of 900 mm. **(See figures 3.01 to 3.04 and 3.07 to 3.09)**

3.4.5 Expansion joint and adapter

The master electrician must install an expansion joint and adapter

- on an outdoor riser conduit connected directly to an individual meter socket or to the connection compartment in a multiple-meter mounting device; **(See figures 3.01 and 3.04)**
- on a conduit entering the building above grade; **(See figures 3.02, 3.03, 3.08 and 3.09)** and
- on a conduit entering a junction box outdoors. **(See Figure 3.07)**

3.4.6 Inspection and cleaning

Once work is completed, the master electrician shall, with a Hydro-Québec representative present, inspect and clean the conduits with a brush and steel wire joined to a mandrel. This requirement applies to all 347/600-V connections; it applies to 120/240-V connections only at Hydro-Québec's request.

3.4.7 Cable-pulling rope

For cable pulling, an industrial-grade polypropylene rope 6 mm or more in diameter must be inserted into every conduit that the master electrician must inspect and clean under Section 3.4.6.

3.4.8 Conduit sealing

Inside the customer's building, the end of the conduit containing the service loop cables must be sealed by Hydro-Québec personnel after any cable installation work done by the distributor, except in the cases provided for in Section 3.4.2.2.

(See figures 3.01 to 3.10 except 3.05)

3.4.9 Repair of above-grade conduit systems

Repairs may be carried out on a conduit system located above grade, in accordance with the *Code* and the job aid "Repairing an Existing Aboveground Conduit" at the end of this Standard.

3.5 Pullbox and junction box

3.5.1 Use

3.5.1.1 Pullbox

A pullbox may be used for underground cables supplying an individual meter socket with a maximum rating of 320 A at 120/240 V and installed indoors as provided for in Section 6.4.2.2.

(See Figure 3.03)

A transformer enclosure is not considered a pullbox.

3.5.1.2 Junction box

In all cases not covered by Section 3.5.1.1, a junction box is required. A junction box allows connection of the service loop to one or two service entrances. The service entrance conductors inside the junction box must be at least long enough to go once around the box.

3.5.2 Location of pullbox or junction box

3.5.2.1 Pullbox

The pullbox must be installed indoors at the spot where the service conduit enters the building. The bottom of the box must be at least 600 mm above the floor. The top of the box must be at least 200 mm below the ceiling and at most 2 m above the floor. (See Figure 3.03)

3.5.2.2 Junction box

The junction box must be installed as follows:

a) Indoors

In the place where the service conduit enters the building.

In cases where the sum of the service box ratings is less than 600 A, the bottom of the junction box must be at least 600 mm above the floor; the top must be at least 200 mm below the ceiling and at most 2 m above the floor. **(See figures 3.05, 3.06 and 3.08)**

In cases where the service box ratings total 600 A or more, the junction box must be installed at a height such that the conduit penetrating the wall arrives in a corner of the junction box.

(See Figure 3.09)

b) Outdoors

On the supply side of the customer service conduit, with the top of the box 1.5 to 2 m above grade. **(See Figure 3.07)**

3.5.3 Specifications

The doors of pullboxes and junction boxes must have welded hinges with non-removable pins and a mechanism for affixing a seal.

Table 9 specifies the size of the junction box or pullbox, the number of mechanisms for affixing a seal and the thickness of the box walls.

(See Figure 3.05 and Table 9)

3.5.4 Supply and installation

The pullbox or junction box and the conduit joining it to one or two service boxes, one or two individual meter sockets, or one or two multiple-meter mounting devices must be supplied, installed and grounded by the master electrician at the customer's expense and in accordance with the *Code*.

Bonding must be done by the master electrician by means of a conductor separate from the neutral connecting the junction box or pullbox to the service box or meter socket.

3.5.5 Access and clearance

The pullbox or junction box must be installed in a readily accessible location. Clearance of 1 m in front of the box is required for at least the full width of the box. **(See figures 3.06, 3.08 and 3.09)**

3.5.6 Placement of conduits

3.5.6.1 *Where the conduit enters the building*

a) *Sufficient clearance on wall*

If the building has two services at different voltages, the conduit entrance must be placed so that a pullbox or junction box can be installed for each one.

b) *Insufficient clearance on wall*

If the conduit entrance into the basement does not allow sufficient clearance above grade or installation of two boxes close together, a type-LB conduit body can be used, provided the distance between the conduit entrance and the pullbox or junction box is as short as possible, given the location.

3.5.6.2 *In the pullbox or junction box*

The inlet conduit for service loop cables may terminate at the back, at one side or at the bottom of the pullbox or junction box but must be no farther than 200 mm from a corner. It may also terminate on the top of the pullbox or junction box if the conduit system drains toward outdoors. **(See Figure 3.08)**

In cases where the service box ratings total 600 A or more, the inlet conduit must terminate in the back of the box, less than 200 mm horizontally and vertically from one of the corners of the box.

(See Figure 3.09)

The outlet conduits must not be farther than 200 mm from a corner when installed in a side of the box. They may be installed one behind the other. However, this distance may be increased to 300 mm when the service box ratings total 600 A or more. **(See Figure 3.05)**

In all cases, the conduit must be as close as possible to a corner of the box. The inlet and outlet conduits must never be installed in the same corner of the pullbox or junction box.

(See figures 3.03, 3.05 and 3.07 to 3.09)

3.5.7 Buildings with no basement

When a building has no usable basement and outdoor installation is prohibited by the competent authorities, the pullbox or junction box can be installed in a crawl space, provided it is kept dry, the clearances are as specified in Section 3.5.5 and the area is accessible at all times through a 685 x 760 mm or larger trapdoor and down a fixed vertical ladder.

The trapdoor must be large enough to allow installation or replacement of a pullbox or junction box of the type required for the installation's rating. Thus, the pullbox or junction box must fit through the trapdoor if there is no other opening.

Metering equipment must not be installed in this crawl space, however.

3.5.8 Plan required for special cases

If the conditions above cannot be met, a proposed alternative arrangement must be submitted to a Hydro-Québec representative for approval before the service entrance is modified or the underground line is built.

3.6 Connection box for flat-rate service

3.6.1 Use

The connection box for flat-rate service is used exclusively for unmetered installations connected to an underground 120/240-V line, as defined in Section 1.2.4.2.

3.6.2 Supply and installation

A customer who has a flat-rate contract must provide the connection box and have it installed outdoors by a master electrician. The underground service loop can then be connected in this box. **(See Figure 3.10)**

3.6.3 Specifications

The connection box for flat-rate service must be weatherproof, with a Hydro-Québec compartment 300 mm high by 200 mm wide by 150 mm deep. The customer compartment must have an adequate protective device and bus-bars connecting it to the Hydro-Québec compartment. Each compartment must open separately and have a mechanism for affixing a seal.

The bottom of the box must be at least 100 mm above grade.

(See Figure 3.10)

3.7 Service loop

3.7.1 Supply and installation

Hydro-Québec supplies, installs and retains ownership of the service loop up to the point of connection to the customer's electrical installation.

3.7.2 Customer's handhole

The connection point may be located in a handhole belonging to the customer. The master electrician must leave an extra 3-m length of cable in the handhole. The customer retains ownership of and responsibility for customer installations.

The master electrician must contact a Hydro-Québec representative to find out about the applicable requirements.

3.7.3 Customer's manhole

In the manhole, the master electrician must leave enough cable to go around the manhole once, so that the connection point can be located wherever determined by Hydro-Québec.

3.7.4 Service loop beneath or inside a building

Hydro-Québec will not supply a service loop beneath or inside a customer's building or appurtenant structure unless the following three conditions are met:

1. The service conduit must be encased in concrete at least 50 mm thick.
2. The service loop must consist of a single span of cable running from the Hydro-Québec manhole or handhole to the connection point.
3. The sum of bends in the conduit must not exceed 180°, not counting the bend beneath the customer service equipment. If the sum of bends exceeds 180°, the master electrician must obtain Hydro-Québec's prior approval for the proposed conduit route. Hydro-Québec will determine whether the installation is feasible based on cable-pulling calculations.

3.7.5 Clearances

A customer who installs a pool, appurtenant structure, platform or other permanent structure near the service loop or distribution line must ensure that the clearances (given in Table 10 herein) are compliant with the *Code*.

(See Figure 3.11 and Table 10)

3.8 Connection

3.8.1 Lugs

Hydro-Québec provides the lugs or multiway connectors needed to connect the customer's installation, provided the conductors are one of the following gauges: 8, 6, 2, 1/0, 2/0, 3/0 or 4/0 AWG; or 250, 300, 350, 400, 500 or 750 kcmil.

Under Section 7.4 d), however, cables in a metering transformer enclosure must not exceed 500 kcmil. **(See Figure 0.02)**

4

Temporary Service

4.1 Application

This Chapter specifies the conditions for connecting an overhead or underground service loop for temporary service. It covers temporary electrical installations for buildings or structures under construction or demolition, as well as temporary experimental or test installations.

4.2 Service requirements

The customer's temporary installation must be compliant with the *Code* and this Standard. Before building such an installation, the master electrician or customer must contact a Hydro-Québec representative to reach an agreement on the points below:

a) Location

A temporary service entrance must never be installed on a pole or in an underground conduit for service loops.

b) Service entrance equipment shelter

If the connection is three-phase or if metering transformers are used, the equipment must be installed in a weatherproof shelter.

4.3 Overhead service

The service attachment point must meet the requirements in Table 3. Overhead conductors must be supported by poles or other acceptable structures, as specified in the *Code*, spaced so as not to exceed the maximum allowable span for the type of conductor used. **(See Table 3)**

a) Distance between meter and power line

The meter must be attached to the customer's installation, which must be located no more than 30 m from the Hydro-Québec line or from the line between the customer's property and the adjacent public thoroughfare. This requirement does not apply in the following cases:

- service to a residence;
- if the entire service entrance is visible from the connection point; or

- if only part of the service entrance is visible from the connection point but the remaining part is visible from the metering equipment.

b) Supply and installation of service conductors

For an installation to be connected to the Hydro-Québec line, the master electrician must supply the conductors up to the line in accordance with Tables 4 and 6. The customer retains ownership of and responsibility for the conductors.

However, the connection must be done by Hydro-Québec.

(See figures 4.01 to 4.03 and tables 4 and 6)

If the service entrance conductors are longer than necessary, the master electrician must roll the excess cable around the spool rack and move the tension clamp so that the sag between the customer's spool rack and the utility pole meets the minimum clearances in the *Code*. If the excess cable is not rolled up, it can be cut when the service entrance is connected.

c) Crossing of public thoroughfares

Where municipal bylaws permit, the temporary overhead service entrance can cross public thoroughfares as long as the requirements in Table 4 are met.

(See Table 4)

4.4 Underground service

Hydro-Québec provides its service loop cables and installs them through the customer's underground conduit up to the connection point. Hydro-Québec retains ownership of and responsibility for its service loop and removes the cables when the contract is terminated. The customer is billed for the costs in accordance with the *Conditions of Electricity Service*.

If there is a Hydro-Québec handhole less than 5 m from the spot where the temporary service entrance support is to be installed, the service entrance may be connected in that handhole, subject to prior authorization by the Hydro-Québec representative, depending on the location, the space required, and the voltage and capacity available. In that case, Hydro-Québec will equip the handhole with a raised cover for running the cables to the temporary service entrance.

The master electrician must install adequate mechanical protection that will be permanent for the duration of the temporary service, including a sturdy grating at least 1.8 m high enclosing the handhole, the wiring (TECK90 or ACWU90 armoured cable installed with connectors approved for this use) and the temporary service entrance infrastructure, so as to ensure public safety

by preventing anyone from entering the perimeter. Panels warning of the presence of live cables must be permanently attached to the grating at 2-m intervals and clearly visible.

Only Hydro-Québec may connect service entrance conductors to the service loop conductors. **(See Figure 4.04)**

5

Metering

5.1 Types of metering

Hydro-Québec uses two types of metering: self-contained metering and instrument transformer metering.

5.2 Choice of metering equipment

Metering equipment is selected based on service box ampacity, installed load and delivery point voltage.

5.3 120/240-V delivery point

5.3.1 Current rating of 320 A or less

Self-contained metering is used. A meter socket must be installed as specified in Chapter 6.

5.3.1.1 *Exception*

A transformer enclosure meeting the requirements in Chapter 7 and Table 11 must be put in place for an electrical installation of more than 200 A supporting dual energy.

5.3.2 Current rating of more than 320 A

Instrument metering with a current transformer is used. Either a transformer enclosure or a metal-clad substation compartment houses the equipment. Specifications for installing transformer enclosures and metal-clad substations are given in Chapter 7 and Chapter 8, respectively.

5.4 120/208-V delivery point

5.4.1 Current rating of 200 A or less

Subject to Section 1.2.2.3, self-contained metering is used. A meter socket must be installed as specified in Chapter 6.

5.4.2 Current rating of more than 200 A

Subject to Section 1.2.2.3, instrument metering with a current transformer is used. A current transformer enclosure must be installed as specified in Chapter 7.

5.5 347/600-V delivery point

5.5.1 Current rating of 200 A or less

Subject to Section 5.5.1.1, self-contained metering is used. A meter socket must be installed as specified in Chapter 6.

The service box must have a ampacity of 200 A or less.

5.5.1.1 *Exceptions*

A transformer enclosure meeting the specifications in Chapter 7 and Table 11 must be installed in case of the following:

- electrical installations with dual-energy capability,
- metering equipment read through a telephone line.

5.5.2 Current rating of more than 200 A

Instrument metering with voltage and current transformers is used. Either a transformer enclosure or a metal-clad substation compartment houses the equipment. Specifications for installing transformer enclosures and metal-clad substations are given in Chapter 7 and Chapter 8, respectively.

5.6 600-V delivery point

Subject to Section 1.2.2.1, instrument metering with voltage and current transformers is used. Either a transformer enclosure or a metal-clad substation compartment houses the equipment. Specifications for installing transformer enclosures and metal-clad substations are given in Chapter 7 and Chapter 8, respectively.

5.7 Service entrance equipment clearances

5.7.1 General

All service entrance equipment must be installed in a readily accessible location with a working clearance of at least 1 m from all temporary or permanent obstructions in front, including to the finished grade/floor level. Installations of 1,200 A and over must meet the special requirements of the *Code*. In addition, in case of outdoor installations, the same clearance must be maintained between the equipment and the property line.

(See figures 5.01 and 5.02)

5.7.2 Disconnect devices

When a disconnect device is part of the service entrance equipment, a working clearance of at least 1 m must be maintained on the side where the operating point is located. In the case of a front-operated disconnect, the clearance may be to the left or right of the switch, provided the operating point is less than 200 mm from the side.

To operate the disconnect, the operator may stand in front of the transformer enclosure, metering compartment, splitter trough, another disconnect or similar equipment. **(See Figure 5.02)**

5.7.3 Transformer enclosure

Minimum clearance of 600 mm must be maintained above the transformer enclosure, even if the meter is installed outdoors. **(See Figure 0.03)**

When the doors cannot open to 180°, the clearance specified in Section 5.7.1 must be increased by a distance equal to the width of the doors.

5.7.4 Combustible gas exhausts or vents

There must be at least 3 m of clearance between the meter socket or meter support and any combustible gas vent or exhaust duct. However, in case of a natural gas vent or exhaust duct, minimum clearance is only 1 m.

5.8 Grouped or outdoor metering equipment

5.8.1 Grouping of equipment for different voltages

Metering equipment for different voltages is normally grouped. However, an agreement can be reached with Hydro-Québec to have the equipment separated for the following reasons:

- to avoid excessive voltage drops,
- to facilitate connection to the line,
- lack of space in the existing meter room when a new electrical installation is added.

5.8.2 Enclosures or equipment assemblies approved for outdoor use

The location of metering equipment must meet the specifications in chapters 6 to 8. Exceptionally, if the location and equipment comply with sections 5.8.2.1 and 5.8.2.2, respectively, Hydro-Québec may accept the

installation of metering equipment in an enclosure or equipment assembly approved for outdoor use under the *Code* in the following cases:

- Metering equipment not approved for outdoor use is installed in a cabinet 400 mm deep with a mounting plate and approved for its location. **(See Figure 5.05)**
- The equipment assembly is approved for outdoor use by the Régie du bâtiment du Québec following a special evaluation and is accepted by Hydro-Québec.

5.8.2.1 Location criteria

Metering equipment may only be installed in an enclosure or equipment assembly approved for outdoor use if one of the following conditions is met:

- The metering equipment must be installed at a maximum of 30 m from the line, as specified in Section 2.6.2, and no building served by the low-voltage electrical service can accommodate the measuring equipment at less than that distance.
- A security perimeter must be respected, as described in Section 6.3 or 7.1.

5.8.2.2 Equipment criteria

All metering equipment, including enclosures and equipment assemblies approved for outdoor use, must be:

- an installation covered by Section 6.6.2 or Chapter 7 that complies with all relevant requirements;
- in a readily accessible location;
- installed on the level and solidly secured to a wall, one or more customer-owned poles of class 7 or better (see Section 2.7.2.5) or any other support with equivalent characteristics;
- identified in accordance with Section 5.14.

A meter support must not be used with this type of installation.

5.9 Equipment on supply side of metering equipment

All equipment installed on the supply side of metering equipment must have a mechanism for affixing a seal.

The following equipment may be installed on the supply side of metering equipment:

a) Customer instrument transformers

Customers must obtain Hydro-Québec's prior approval to install on the supply side of metering equipment any transformer or other such device designed to protect their electrical installation. Only customer transformers used for electrical protection or indicating electrical installation voltage may be installed on the supply side of Hydro-Québec metering equipment. Only a single voltage transformer and a single current transformer per phase are permitted, and the box containing this equipment must have a mechanism for affixing a seal. Customer equipment exclusively for electrical load management and metering must be installed on the load side of Hydro-Québec metering equipment.

b) Auxiliary services in a distribution substation in an annex

In compliance with standard E.21-11, *Service d'électricité en basse tension à partir des postes distributeurs* (the "Green Book"), auxiliary services (lighting, electrical outlets, ventilation and life safety systems) in a distribution substation in an annex must be connected on the supply side of metering equipment.

5.10 Protection of metering equipment

For mechanical protection, Hydro-Québec may require that metering equipment not inside the meter room be protected by guard posts. Guard posts are not considered obstructions under Section 5.7, but at least 500 mm of clearance must be maintained between the guard post and the metering equipment. In addition, the doors of the box in which the metering equipment is placed must open completely.

5.11 Permanent platform and fixtures

When the provisions herein so require, a permanent platform must be installed. This platform and its fixtures must meet the following requirements:

a) Width and depth

The platform must be at least 1.2 m wide and deep enough to allow 625 mm of clearance accounting for the depth of the enclosure and the width of a door opened to 90°.

b) Guardrail

A guardrail at least 1 m high is required if the platform is 600 mm or more above finished ground/floor level.

c) Top rail of guardrail

The mechanical strength of the top rail must comply with effective Québec laws and regulations.

d) Stairway

The platform must have a stairway with steps at least 200 mm deep, uniform risers at most 200 mm high and a handrail beginning above the bottom step and 900 mm above that step's nosing.

(See Figure 5.03)

5.12 Customer-owned low-voltage transformers

Metering of a three-phase supply at the 120/240-V secondary voltage from a customer's transformer is acceptable.

5.13 Fire pump

As specified in the *Code*, no device capable of interrupting the circuit may be placed between the service box and a fire pump switch or controller, other than a circuit breaker lockable in ON position or a nonfused switch lockable in OFF position.

(See Figure 5.04)

To determine the metering method for fire pumps and the capacity of the metering equipment, the ampacity of the disconnect on the load side of the metering equipment must be considered.

5.14 Permanent identification of service entrance equipment

The master electrician must identify service entrance equipment as specified in sections 5.14.1 and 5.14.2. Distribution panels located outside the premises receiving service must also be identified. However, a single meter socket that is an electrical installation's only meter socket need not be identified.

5.14.1 Identification marking

The street address of the building or the unit number is used for identification and, for all service entrances, must appear on every service box, transformer enclosure and distribution panel as well as on the fixed part of every meter socket.

If there is no street address, all components mentioned above must bear the same inscription.

If there is more than one meter per unit or customer, the specific use of each (e.g., fire pump) must be indicated. **(See figures 3.04, 6.06, 6.07 and 6.09)**

5.14.2 Methods of identification

The following methods of identification are allowed:

a) Embossed metal tag

A metal tag pinned to the fixed part of the front of the meter socket or a nonremovable tag if the detachable part is in place. The embossed inscription must be at least 5 mm high.

b) Engraved tag

A permanent glued, riveted or screwed-down tag bearing an engraved inscription at least 5 mm high. Chisel-engraved metal tags are permitted. For outdoor use, only glued nonmetallic tags are authorized.

c) Adhesive tape

Indoors, a permanently glued label (from an electronic labeler) bearing a black, red or blue inscription at least 5 mm high on a white background. Vinyl embossing tape is not permitted.

5.15 Identification of service entrance conductors

In addition to being identified as specified in the *Code*, the phase conductors of polyphase installations must be color-coded with adhesive tape at the connection point, in the service box and in the transformer enclosure: red for phase A, black for phase B, blue for phase C and white for neutral. The phase conductors must be arranged from left to right (A, B, C) in the service box.

In addition to being identified as specified in the *Code*, parallel conductors of single-phase installations must be color-coded with adhesive tape at the connection point, in the service box and in the transformer enclosure: red for line 1, black for line 2 and white for neutral.

5.16 Safety precautions

This section applies to all installations other than those covered by sections 5.3.1 and 5.4.1. **(See figures 6.10, 6.11, 7.04 and 7.05)**

5.16.1 Padlocking

Service boxes and the first disconnects on feeders must be padlockable and located in the same room as metering equipment. Distribution panel main breakers must also be padlockable. If the main breaker of the distribution

panel cannot be padlocked, the door of the distribution panel or all of the breakers in the panel must be lockable by means of a device approved for this use.

5.16.2 Zero-voltage testing

A disconnect or service box on the supply or load side of the metering equipment, or an approved splitter trough immediately on the load side of the metering equipment that has a door with manufacturer-designed pivots, must allow zero-voltage testing with a multimeter.

6

Self-Contained Metering

This Chapter lays down requirements for self-contained metering.

6.1 Meter socket supply and installation

The meter socket is an integral part of the customer's service entrance and must comply with the requirements of the *Code* and Section 6.2. The opening in the socket for the meter is reserved for the exclusive use of Hydro-Québec.

The master electrician installs and connects the meter socket at the customer's expense in accordance with Hydro-Québec standards and ensures that all metering equipment is grounded as specified in the *Code*.

The line-side conductors are connected to the upper jaws of the meter socket.

(See figures 3.01 to 3.03 and 6.02 to 6.05)

6.2 Meter socket specifications

Only meter sockets on the list of products accepted by Hydro-Québec (found on the Web site for master electricians at www.hydroquebec.com/cmeq) are allowed. The meter socket must meet the following requirements:

a) Type of meter socket

Only a square or rectangular meter socket complying with CSA C22.2 No. 115-M (latest edition) is authorized for individual or grouped supply.

(See figures 6.02 to 6.05 and 6.08)

b) Outdoor use

Only a meter socket designed for outdoor use that complies with effective standards may be used. The meter socket may include other devices or mechanisms, which must be accepted by Hydro-Québec.

(See figures 6.02, 6.03 and 6.05)

c) Meter socket for underground service

The meter socket must be equipped with bolts to accommodate one-hole NEMA terminal lugs whenever the connection point for the underground supply service is on the meter socket terminals.

The bottom of the meter socket must accommodate a conduit with a diameter of 75 mm or more for the underground supply service.

(See Figure 6.03)

d) Bypass mechanism

For a 320-A individual meter socket, a manual bypass mechanism for the exclusive use of Hydro-Québec must be installed. Installation of a bypass mechanism is prohibited in all other cases.

e) Screw clamp

It must be possible to attach to the meter socket a screw clamp designed for affixing a seal. The list of accepted screw clamps can be found on the Hydro-Québec Web site for master electricians (www.hydroquebec.com/cmeq).

f) Temporary cover

Until the meter is installed, the opening on the front of the meter socket must be protected by a temporary rigid watertight cover held in place by the screw clamp. The cover must have a dielectric strength appropriate for this use.

g) Jaws

The meter socket jaws must ensure adequate electrical and mechanical contact with the meter blades at all times. The number of socket jaws depends on the measured voltage of the electrical installation:

- 120/240-V installations – four jaws;
- two-phase 120/208-V installations – five jaws;
- three-phase 120/208-V installations – seven jaws;
- 347/600-V installations – seven jaws.

h) Jumpers

When modifying customer service entrances, master electricians may temporarily install Hydro-Québec approved jumpers between socket jaws. The use of any other device is prohibited. Jumpers are strictly prohibited in all other circumstances. Master electricians may obtain jumpers (SAP 1018874) from Customer Services (1 877 COURANT).

i) Removable part

The removable front part of the meter socket cover must be secured by a bracket fastened by studs welded from the inside. The bracket must not be visible or accessible from the outside once the meter is installed and secured by the sealed screw clamp. Substitution of another device meeting these requirements must first be accepted by Hydro-Québec. **(See Figure 6.01)**

The socket may include other devices or mechanisms, which must be accepted by Hydro-Québec. In this case, the removable part giving access to the conductors must have a mechanism for affixing a seal. **(See Figure 6.05)**

j) *Insulation of neutral conductor*

The full length of the neutral conductor inside an individual meter socket must be insulated with a white jacket; if the jacket is of a different color, it must be marked with white tape. If the neutral conductor is bare, the master electrician must cover it with white insulating tape to prevent accidental contact with live parts inside the metering equipment. **(See figures 6.02 to 6.05 and 6.08)**

In self-contained metering installations in a saline environment or when a tingle voltage filter is used, the insulated neutral conductor must be continuous and must not be connected to any part of the metering equipment. The master electrician must then run another conductor from the ground terminal block in the service box to the one in the meter socket to ensure bonding. **(See Figure 6.02)**

k) *Neutral conductor continuity*

In installations with individual sockets located in a saline environment or equipped with a tingle voltage filter, the meter socket's insulated neutral conductor must be continuous and not connected to another part of the metering equipment. The master electrician must therefore run another conductor between the ground terminal block of the service box and that of the meter socket to ensure bonding. **(See Figure 6.02)**

In installations with a multiple-meter mounting device that are located in a saline environment, customer service entrance conductors must be connected using one-hole NEMA compression terminal lugs.

6.3 Location of meter sockets

Meter sockets must be installed on the level in a readily accessible location and must be firmly secured to a wall of the building served, a customer-owned pole (if wood, class 7 or better, as specified in Section 2.7.2.5) or any other support with equivalent characteristics.

If access to the customer's installation is restricted by a security perimeter, the meter socket must be installed outside this perimeter. This may be the case with a farm building, for example, or a building where access is restricted to certain hours or activities in the building require special clothing.

6.3.1 Height of meter socket

a) Individual meter socket or multiple-meter mounting device

The meter socket must be installed with the centre of its opening 1.2 m to 1.6 m above finished floor level or above a permanent platform meeting the requirements in Section 5.11.

(See figures 3.02 to 3.04, 4.01 to 4.04, and 5.01)

b) Grouped supply

The centre of the meter socket opening must be 600 mm to 1.6 m above finished floor level or above a permanent platform meeting the requirements in Section 5.11. (See Figure 6.06)

When the meter socket is installed indoors, there must be at least 300 mm between the top of the meter socket and the finished ceiling or the bottom of the joists. (See Figure 5.01)

c) Metering centre

The centre of the opening of the highest meter socket must be no more than 2 m from finished floor level, and the centre of the opening of the lowest meter socket must be at least 600 mm from finished floor level. (See figures 6.07 and 6.09)

6.4 120/240-V delivery point

6.4.1 Accepted meter sockets

Only a meter socket meeting the requirements in Section 6.2 is accepted for 120/240-V installations.

6.4.2 Individual meter sockets and multiple-meter mounting devices

Individual meter sockets and multiple-meter mounting devices are installed outdoors, except under the circumstances specified in Section 6.4.2.2.

The meter socket or multiple-meter mounting device must always be installed between the connection point and the service box or boxes, except in case of grouped supply.

6.4.2.1 Outdoor installation

Individual meter sockets and multiple-meter mounting devices installed outdoors must be located in a place that meets the following criteria: (See Figure 6.02)

a) Access

The meter socket must be installed in a readily accessible location at ground level, ground-floor level, or higher-floor level.

b) Grouping of meter sockets

When there is more than one meter socket, it is best to group the meter sockets and install them with multiple-meter mounting devices. However, when adding a single delivery point to the customer's service entrance of an existing installation, an additional individual meter socket can be used, subject to the provisions of sections 2.1.1 and 3.2.

To minimize quantity and length of conduits in the building and meet the integration requirements specified in paragraph 6.4.2.1 c), the master electrician should preferably use a meter socket or multiple-meter mounting device with a combined circuit breaker.

c) Integration

Meter sockets are best located following the guide for visual integration (*Guide des bonnes pratiques – Intégration visuelle des installations de branchement aux bâtiments résidentiels*) accessible from the Hydro-Québec Web site at www.hydroquebec.com/cmeq.

d) Îles de la Madeleine

A type 4X meter socket must be used.

6.4.2.2 Indoor installation

Individual meter sockets may be installed inside a building only under the following conditions:

a) Polyphase service

The building has polyphase service, as provided in Section 5.8, in which case the individual meter socket must be installed in the building's meter room.

b) Existing grouped supply

The number of meter sockets of an existing grouped supply is increased to optimize the capacity of the main service box.

c) Change on the load side of the service box

A change is made between the service box and the disconnect device on the supply side of the meter socket.

d) Îles de la Madeleine

The meter socket must be installed indoors if it is not a type 4X meter socket.

(See figures 3.02 and 3.03)

When individual meter sockets are installed indoors, a disconnect device must be located in the same room on the load side of each meter socket. All electrical cabling from the meter socket to the corresponding disconnect on the load side must be visible.

(See Figure 6.04)

6.4.3 Grouped supply

When the meter socket is installed indoors under paragraph 6.4.2.2 b) or c), it must be placed between the service box and the corresponding disconnect device and in the same room as that equipment.

(See Figure 6.06)

6.4.4 Metering centre

Use of a metering centre is authorized when there are more than six delivery points and a multiple-meter mounting device is not used. The metering centre must always be installed indoors, in the meaning of the *Québec Construction Code – Chapter I, Building*.

The disconnect device must be placed on the load side of the meter socket in the metering centre.

(See Figure 6.07)

6.5 120/208-V delivery point

6.5.1 Accepted meter sockets

Only a meter socket meeting the requirements in Section 6.2 is authorized for 120/208-V installations.

6.5.2 Meter socket location and installation

All 120/208-V meter sockets must be located indoors and installed as specified in Section 6.3.

6.6 347/600-V delivery point

6.6.1 Accepted meter sockets

Only a meter socket meeting the requirements in Section 6.2 is authorized for wye-connected 347/600 V installations, solidly grounded neutral, with insulated neutral terminal.

6.6.2 Meter socket location and installation

Subject to Section 5.8.2, the meter socket must be located indoors and installed as specified in Section 6.3. In addition, the meter socket must always be located on the load side of the corresponding service box.

(See Figure 6.08)

6.6.3 Metering centre location and installation

All meter sockets must be installed as specified in Section 6.3. In addition, Hydro-Québec authorizes use of a metering centre at 347/600 V. All meter sockets must be located on the load side of the corresponding disconnect device.

(See Figure 6.09)

6.7 Zero-voltage testing

As specified in Section 5.16.2, there must be an arrangement for zero-voltage testing on either the supply or load side of the meter socket.

If a disconnect device or a breaker-type service box is used on the supply side, a zero-voltage testing device must be installed on the load side of the meter socket. All electrical cabling between the meter socket and the zero-voltage testing device must be visible.

(See figures 6.10 and 6.11)

7

Metering Equipment with Transformer Enclosures

This chapter describes requirements for metering equipment with a transformer enclosure.

7.1 Supply and location of metering equipment

Subject to Section 5.8.2, all metering equipment, with the exception of single-phase meters and their supports, must be installed in a readily accessible location in a single room of the building served. Single-phase meters and their supports must be installed outdoors in a readily accessible location.

The transformer enclosure is an integral part of the customer's electrical installation and must meet the requirements of the *Code* and Section 7.2. The transformer enclosure is for the exclusive use of Hydro-Québec.

A dedicated disconnect device for the transformer enclosure must be installed immediately on the supply side of the enclosure at a distance of at least 100 mm. The entire length of the conduit between the disconnect device and the transformer enclosure must be visible. **(See figures 7.01 and 7.03)**

Metering equipment must be installed outside any security perimeter restricting access to the customer's installation. This may be the case, for example, with a farm building, a building where access is restricted to certain hours or a building where activities require special clothing.

7.1.1 Master electrician's responsibilities

The master electrician installs the conduits, the meter support and the transformer enclosure at the customer's expense and as specified in the *Code* and Hydro-Québec standards.

In addition, the master electrician ensures that all metering equipment and all removable metal parts are bonded to ground as per the manufacturer's installation instructions and the requirements of the *Code*.

7.1.2 Hydro-Québec's responsibilities

Hydro-Québec supplies the metering equipment and installs and connects meters, current and voltage transformers, the test-terminal block, secondary conductors and any connection lugs—provided the gauge of the conductors is 4, 3, 2, 1, 1/0, 2/0, 3/0 or 4/0 AWG; or 250, 300, 350, 400 or 500 kcmil.

Hydro-Québec ensures bonding to ground between the meter support and the transformer enclosure when the conduit connecting them is not metal. However, the ground terminals must be supplied and installed by the master electrician.

7.2 Transformer enclosures

7.2.1 Accepted transformer enclosures

The list of accepted transformer enclosures is posted on the Hydro-Québec Web site for master electricians (www.hydroquebec.com/cmeq).

7.2.2 Transformer enclosure specifications

Table 11 gives requirements (dimensions, number of bolts, number of mechanisms for affixing a seal and gauge of metal) for the three types of transformer enclosures. **(See Figure 0.03 and Table 11)**

7.2.3 Transformer enclosure location

Subject to Section 5.8.2, transformer enclosures must be in a readily accessible location of the building served and firmly secured to a wall that is not subject to excessive vibrations. If the surface of the wall is not of wood, it must be covered, where the enclosure is to be installed, with a 19-mm plywood panel the width of the enclosure and extending at least 600 mm above the enclosure. In the case of a noncombustible building, the plywood must be protected as specified in the *Code*. **(See figures 7.01 and 7.03)**

7.2.4 Transformer enclosure height

The transformer enclosure must be installed so that its top is level and between 1.2 and 1.6 m above finished floor level. **(See figures 7.01 and 7.03)**

If the top of the transformer enclosure is more than 1.6 m from finished floor level, a permanent platform meeting the requirements specified in Section 5.11 must be installed.

7.3 Conduits

There must be no conduit inlets or outlets on the top or back of the transformer enclosure. Supply-side and load-side conduits must be on opposite sides. The conduits must be as close as possible to the corners of the enclosure. **(See figures 7.01 to 7.03)**

7.3.1 Power conductor conduits

The conduits must not be more than 200 mm from a bottom corner of the transformer enclosure with a service box of less than 600 A and not more than 300 mm from the bottom corner with a service box of 600 A or more.

7.3.2 Conduit for metering conductors

The conduit running from a transformer enclosure to a meter support must be installed in a side of the box and no more than 200 mm from a top corner.

This conduit must

- enter the support from below, a side or the back;
- exit the building at least 300 mm above finished grade level, with the portion of the conduit on the outside wall of the building always at or above this level;
- not be buried, nor may any part of the conduit be buried;
- not be over 30 m long and have a minimum diameter of 27 mm for runs of up to 15 m and 35 mm for runs exceeding 15 m;
- not have more than two 90° bends without an accessible pulling point;
- have pulling points equipped for affixing self-adhesive seals and be readily accessible; and
- have a rope or wire for pulling the conductors, inserted by the master electrician.

7.4 Service entrance conductors

Service entrance conductor requirements for instrument transformer metering are as follows:

a) Phase conductors

Conductors connected to current transformers must be sufficiently long, free of splices and looped across the entire width of the transformer enclosure. **(See Figure 7.01)**

b) Neutral conductor

The master electrician must run the neutral conductor of single- and three-phase installations along the bottom of the transformer enclosure. **(See Figure 7.01)**

c) *Insulated terminal*

For wye-connected 120/208-V or 347/600-V installations with grounded neutral, a 10-AWG or thicker copper conductor with white or gray insulation must connect the service box neutral terminal to an insulated terminal inside the transformer enclosure on the side wall closest to the service box. **(See Figure 7.01)**

d) *Size and number of conductors*

The size of the conductors must not exceed 500 kcmil. There must be no more than three conductors per phase in parallel.

(See Figure 7.01)

7.5 Meter

7.5.1 Location of single-phase meter

Subject to Section 5.8.2, the meter must be installed on an accepted meter support in a readily accessible location on an outside wall of the building served. The list of accepted meter supports can be found on the Web site for master electricians at www.hydroquebec.com/cmeq. **(See Figure 7.02)**

7.5.1.1 Height of meter support

The meter support must be installed so that the centre of the meter opening is between 1.2 m and 1.6 m from finished grade level or from a permanent platform that meets the requirements of Section 5.11.

(See Figure 7.02)

7.5.2 Location of three-phase meter

Three-phase meters must be installed indoors.

(See Figure 7.03)

7.6 Zero-voltage testing

As specified in Section 5.16.2, a device for zero-voltage testing must be installed on either the supply or the load side of each transformer enclosure and in the same room as the enclosure.

If a breaker-type disconnect device or service box is used on the supply side, or if part of the electrical cabling on the supply side of the transformer enclosure is not visible, the zero-voltage testing device must be installed on the load side of the enclosure. All electrical cabling between the transformer enclosure and the zero-voltage device must be visible.

(See figures 7.04 and 7.05)

8

Metering Equipment with Metering Compartment

This chapter describes requirements for metering equipment with a metering compartment in a metal-clad substation.

8.1 Supply and location of metering equipment

The metering equipment must be in a readily accessible location.

If the metal-clad substation is indoors, the meter must be installed in the same room. A transformer enclosure must also be installed as specified in Section 7.2

If the metal-clad substation is outdoors, it must be in a metal enclosure designed by the same manufacturer and approved for this use. The meter can then be installed inside this enclosure, and a transformer enclosure must be installed as specified in Section 7.2. If the meter is installed outside the metal enclosure of the metal-clad substation, it must be placed in an outdoor cabinet, as specified in Section 8.5.

The metering compartment is an integral part of the customer's electrical installation and must comply with the requirements of the *Code* and Section 8.2. The compartment is reserved for the exclusive use of Hydro-Québec.

A dedicated disconnect device for the metering compartment must be placed immediately on the supply side of the compartment.

Each feeder on the load side of the metering compartment must have at least one disconnect device. Feeders with a fire pump must comply with Section 5.13.

If access to the customer's installation is restricted by a security perimeter, the metering equipment must be installed outside this perimeter. This may be the case with a farm building, for example, or a building where access is restricted to certain hours or activities in the building require special clothing.

(See figures 8.01 to 8.03)

8.1.1 Responsibilities of the master electrician

The consulting engineer or master electrician must submit to the Hydro-Québec representative three copies of the shop drawings and circuit diagrams for the metal-clad substation and disconnect equipment to be installed. Hydro-Québec must accept those documents before the substation is built.

The master electrician, at the customer's expense, supplies the metal-clad substation and all fittings (including fixed grounding points), installs or has the manufacturer install the current transformers and connects the primary windings. The master electrician also supplies and installs the conductors, the fittings needed to connect the primary windings and the ducts or conduits needed for voltage and current transformer secondary conductors.

In addition, the master electrician ensures that all measuring equipment and all removable metal parts are bonded to ground as per the manufacturer's installation instructions and the requirements of the *Code*.

8.1.2 Hydro-Québec's responsibilities

Hydro-Québec supplies the metering equipment and installs and connects the meters, voltage transformers, test-terminal block, connection blocks and metering transformer secondary conductors. Hydro-Québec connects only the secondary conductors of current transformers.

Hydro-Québec ensures bonding to ground between the metering compartment and the transformer enclosure or outdoor cabinet, as applicable, when the conduit connecting them is not metal. However, the ground terminals must be supplied and installed by the master electrician.

8.2 Metering compartment

The metering compartment must be arranged so that temporary grounds can be adequately installed on the fixed grounding points.

The transformers must be arranged in the compartment so it is easy to inspect and maintain them and to connect secondary conductors.

(See figures 8.01 to 8.03)

8.2.1 Applicable standards

The compartment containing the metering transformers must meet all requirements of CAN/CSA-C22.2 No. 31 (latest edition), *Revenue Metering Equipment in Switchgear Assemblies*; CAN/CSA-C71-1 (latest edition), *Insulation Co-ordination – Part 1: Definitions, Principles and Rules*; CAN/CSA-C71-2 (latest edition), *Insulation Co-ordination – Part 2: Application Guide*; and any applicable new standard. This compartment is reserved for the exclusive use of Hydro-Québec.

8.2.2 Metering compartment specifications

a) Height and width

- Under 2,000 A
Minimum height and width of the metering compartment is 750 mm.
- 2,000 A or over
Minimum height and width of the metering compartment is 850 mm.

b) Clearance

At least 50 mm of clearance must be left between the door of the compartment and the transformers.

c) Access

A panel must provide access to the metering transformers from the front of the compartment. The panel must have welded hinges and nonremovable pins on one side and bolted hinges on the other, and it must have a mechanism for affixing a seal.

d) Connection block mounting plate

So Hydro-Québec can install the connection block, the manufacturer or master electrician must attach a metal mounting plate as follows:

- The plate must have a usable surface area at least 75 mm wide by 300 mm long, a minimum thickness of 1.5 mm and be raised by 15 mm.
- The plate must be placed on the same side as the conduit running from the metering compartment to the transformer enclosure or the outdoor cabinet to make it easier to install the connection block and connect the secondary conductors.

e) Connection of primary transformers

A copper or brass slotted round or Robertson head 10-32 bolt must be installed on the supply side of the busbars so Hydro-Québec can easily connect the transformer primary conductors. This bolt is not required for 120/240-V installations.

f) Fixed grounding points

The fixed points are of tinned copper and the threaded rod of steel; all parts must be zinc-plated. The threaded rod must be 13 mm in diameter and include a bolt, a flat washer and a lock washer.

Fixed grounding points accepted by Hydro-Québec must be installed on busbars in the metering compartment, on the load side of the current transformers of all phases as well as on the ground bar. Sufficient clearance for attaching a temporary ground must be left around each fixed point.

8.2.2.1 *Current transformers*

a) Polarity

Transformers must be arranged such that the polarity shown on the equipment is on the supply side.

b) Height

The bottom of the transformers in the compartment must be at least 300 mm above finished floor level and the top of the transformers not more than 1.6 m.

c) Window-type transformers

Any window-type transformer supplied by Hydro-Québec must be secured with the centre of the window aligned with the busbars. Identification marks on the secondary terminals must be visible.

d) 120/240-V delivery point

Hydro-Québec provides a two-phase current transformer.

8.2.2.2 *Voltage transformers*

Heights of support structures for installing voltage transformers must meet the requirements for current transformers set forth in paragraph 8.2.2.1 b).

8.3 Conduit from metering compartment to transformer enclosure or outdoor cabinet

Conduit requirements are as follows:

- Minimum diameter: 41 mm for runs of up to 20 m and 63 mm for runs exceeding 20 m
- Maximum length: 140 m
- Diameter if buried: 75 mm
- No more than two 90° bends without an accessible pulling point
- Must enter the box within 200 mm of a corner
- Must have a rope or wire for pulling conductors (installed in the conduit by the master electrician) **(See Figure 8.01)**

- Pulling points must be in readily accessible locations and equipped for affixing self-adhesive seals.

8.4 Transformer enclosures

If a transformer enclosure is used, it must be Type A and comply with Section 7.2.
(See Figure 8.01 and Table 11)

8.4.1 Height of transformer enclosures

If the top of the transformer enclosure is more than 1.6 m from finished floor level, a permanent platform meeting the requirements in Section 5.11 must be installed.

8.5 Outdoor enclosures

8.5.1 Location of outdoor enclosures

Outdoor enclosures must be in a readily accessible location and firmly secured to a structure not subject to excessive vibration.

8.5.2 Specifications of outdoor enclosure

a) Size

Outdoor cabinets must be at least 750 mm x 750 mm x 250 mm.

b) Sealing mechanism

Outdoor cabinets must have at least one mechanism for affixing a seal that makes it impossible to open the door once the seal is in place. If there is more than one sealing mechanism, this requirement applies to each. The sealing mechanism may be built into the lock.

c) Mounting plates

The metering equipment must be installed on a mounting plate of minimum 14-gauge metal. The mounting plate must be screwed onto the back of the box leaving about 50 mm clearance between the edge of the plate and the walls of the enclosure.

d) Doors

Doors must have welded hinges with pins that cannot be removed when the door is closed.

e) Types of protection

Outdoor enclosures must be Type 3R, except in saline environments, in which case they must be Type 4X.

f) *Locks*

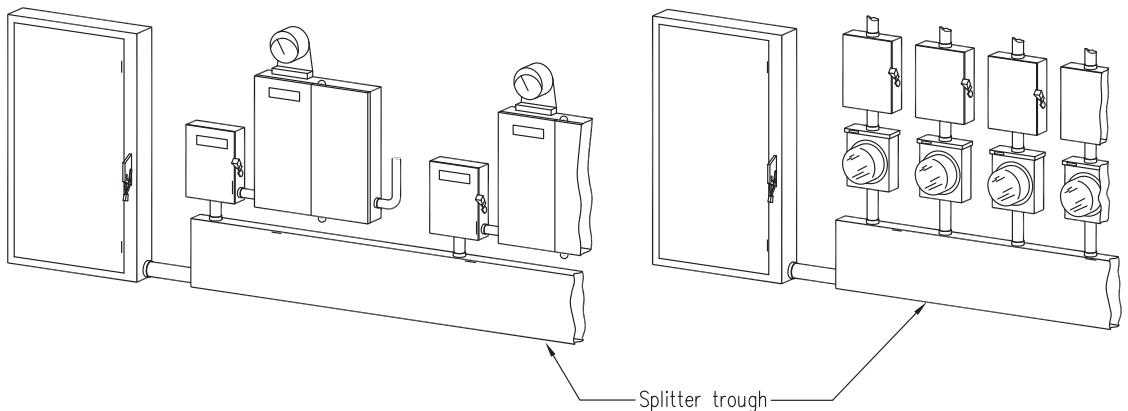
All doors with handles must have at least two locks.

8.6 Zero-voltage testing

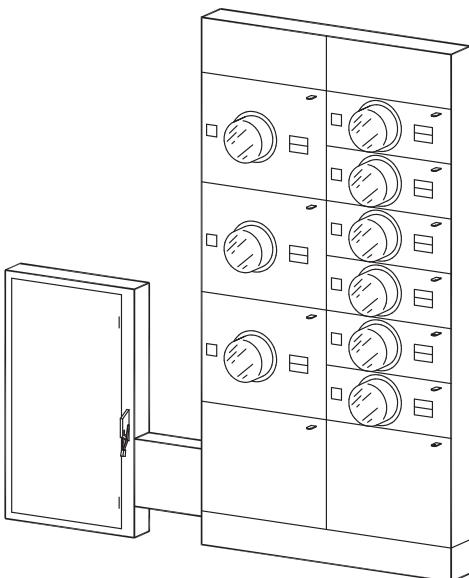
The metering compartment must be arranged so that Hydro-Québec can perform a zero-voltage test using a multimeter. (See figures 8.02 and 8.03)

Figures

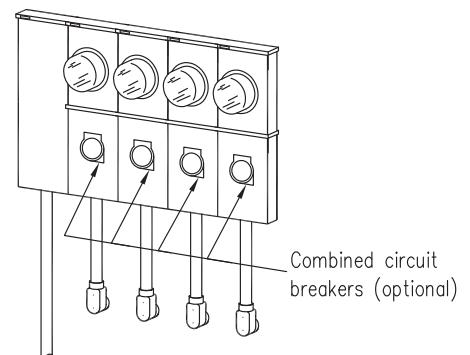
A: Grouped supply with splitter trough



B: Metering centre



C: Multiple-meter mounting device



Ref.: Section 0.3

Engineer's seal:



2015-07-16

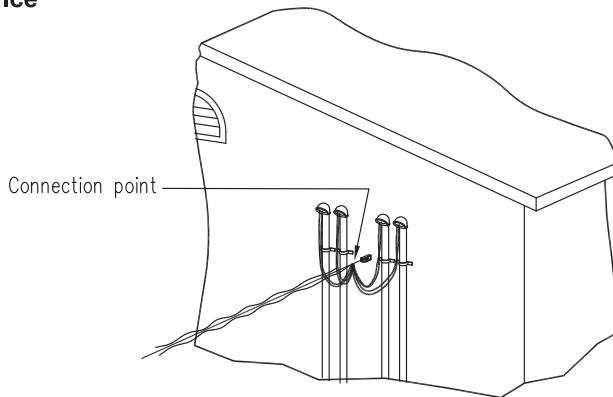
GROUPED SUPPLY

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Québec**

Standard E.21-10,
 10th edition

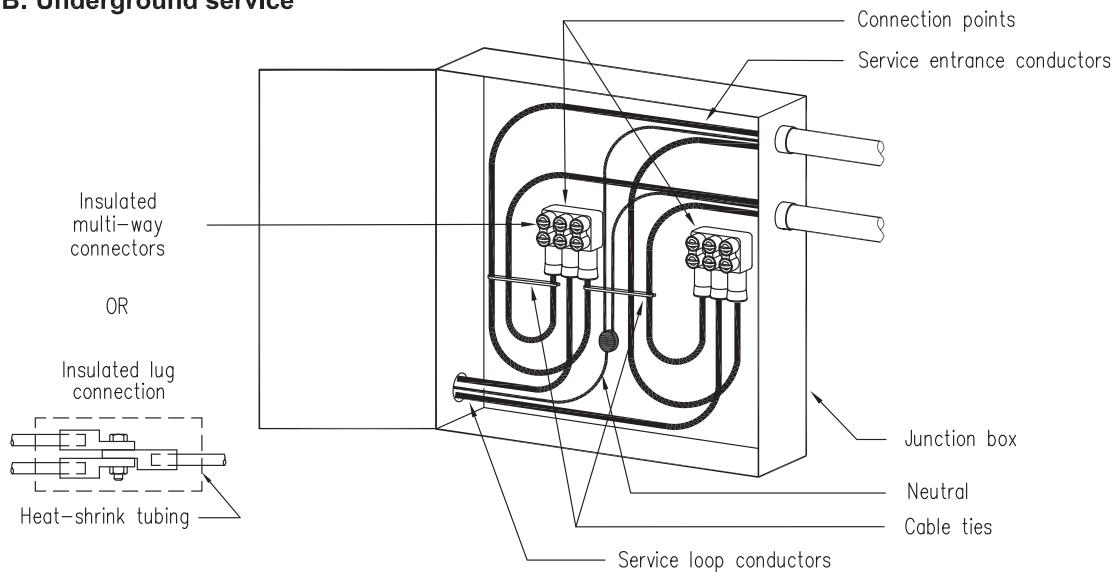
Figure 0.01

A: Overhead service



Note: Maximum of four service entrance conductors per service loop conductor.

B: Underground service



Notes:

- Bonding (as required under Section 3.5.4) is not illustrated.
- Maximum of two service entrance conductors per service loop conductor.

Ref.: Sections 0.3, 2.1.1, 3.1.3 and 3.8.1

Engineer's seal:

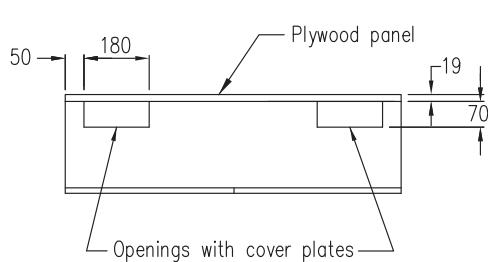
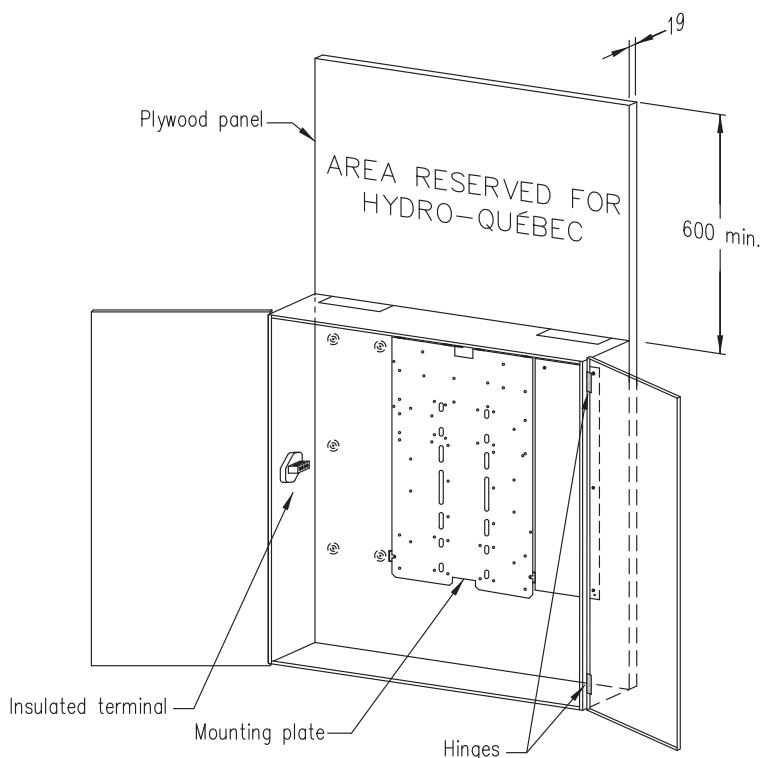


MULTIPLE SUPPLY

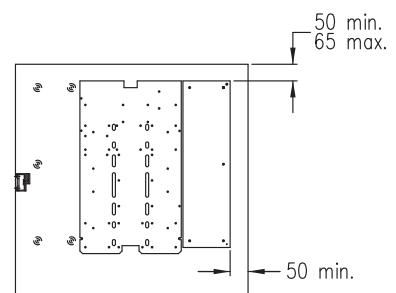
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Figure 0.02



Plan view



Clearance around mounting plate

Ref.: Sections 0.3, 5.7.3, 7.2.2 and Table 11

Engineer's seal:

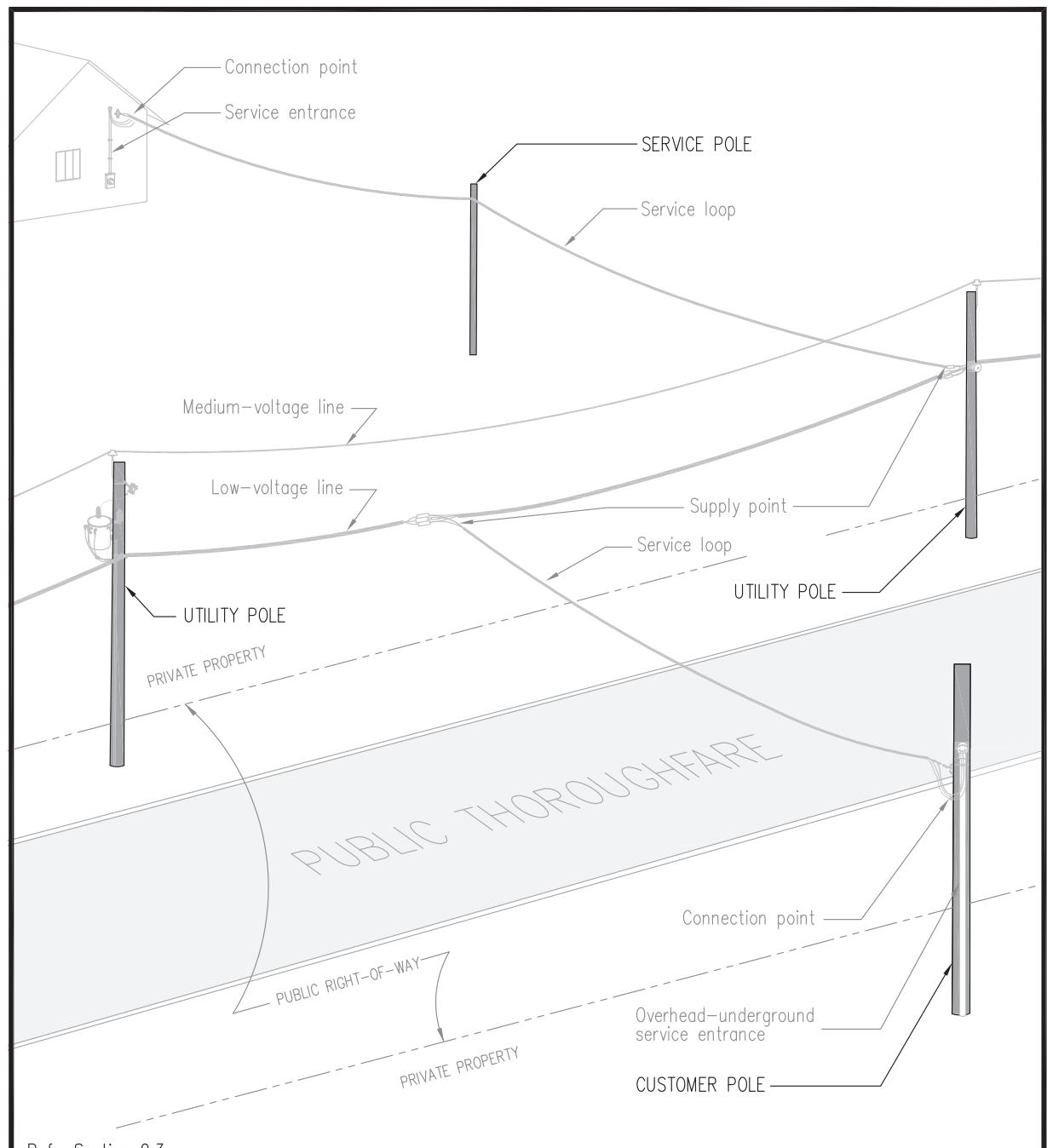


TRANSFORMER ENCLOSURE

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Figure 0.03



Ref.: Section 0.3

Engineer's seal:



TYPES OF POLE

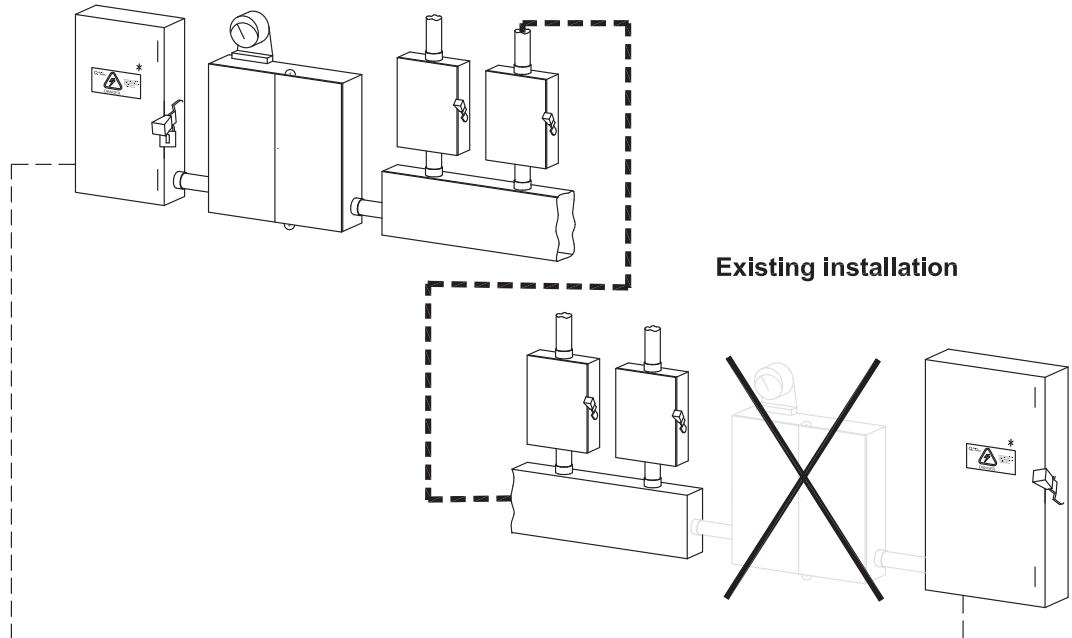
Hydro Québec

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Figure

0.04

New installation supplied from existing connection point



- * Signage must be compliant with the *Code* (Section 76, Temporary Wiring) and with requirements regarding warning signs.

----- Temporary connection of new installation

----- Link between new and existing installations

Procedure:

- Except for an installation supplied at 120/240 V, 200 A or less, install a temporary conductor between the load side of the existing service box and the load side of the new service box, in accordance with the *Code*.
- The temporary supply circuit must not be connected to the existing meter socket, the metering transformer enclosure or service box.
- The master electrician must ensure that metering equipment is in good condition and left in view, with the seal intact, near the electrical installation so the Hydro-Québec representative can recover it.

Ref.: Section 1.1.3.7

Engineer's seal:



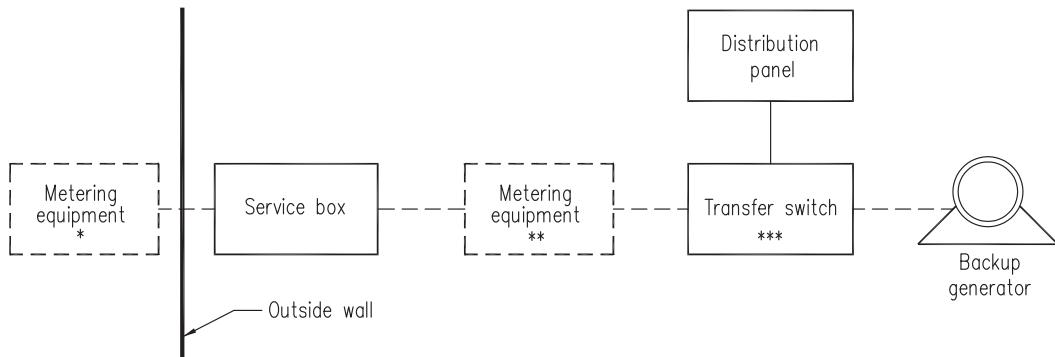
**TEMPORARY SUPPLY CIRCUIT LINKED
TO AN EXISTING CONNECTION POINT
(EXAMPLE)**

**Hydro
Québec**

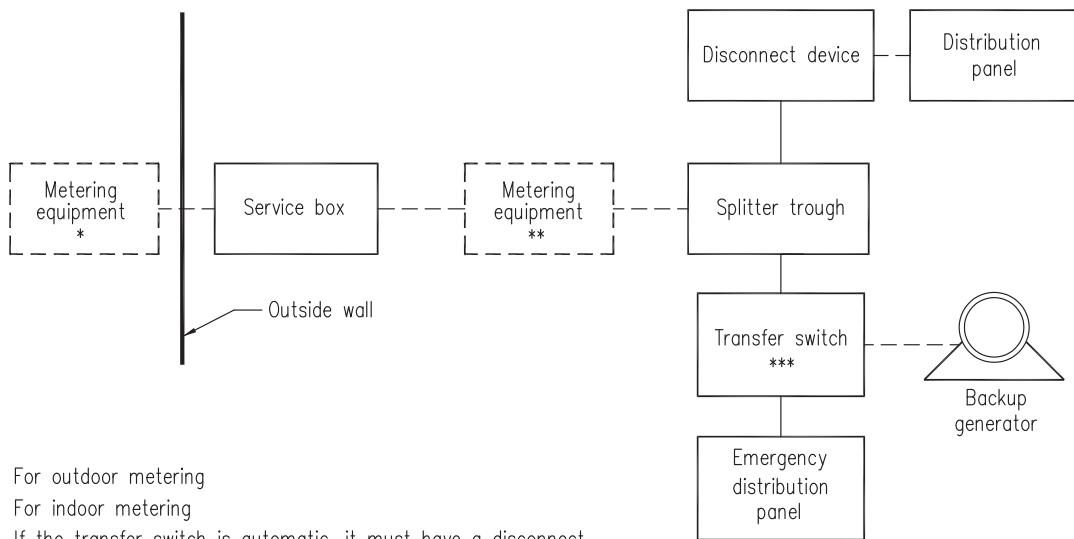
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 10th edition

Figure 1.01

A: Backup generator supplying entire load



B: Backup generator supplying part of load



* For outdoor metering

** For indoor metering

*** If the transfer switch is automatic, it must have a disconnect device on its supply side. The disconnect device may be built into it.

Note: Block diagrams do not show electrical protection devices.

Ref.: Section 1.2.1.2 a)

Engineer's seal:

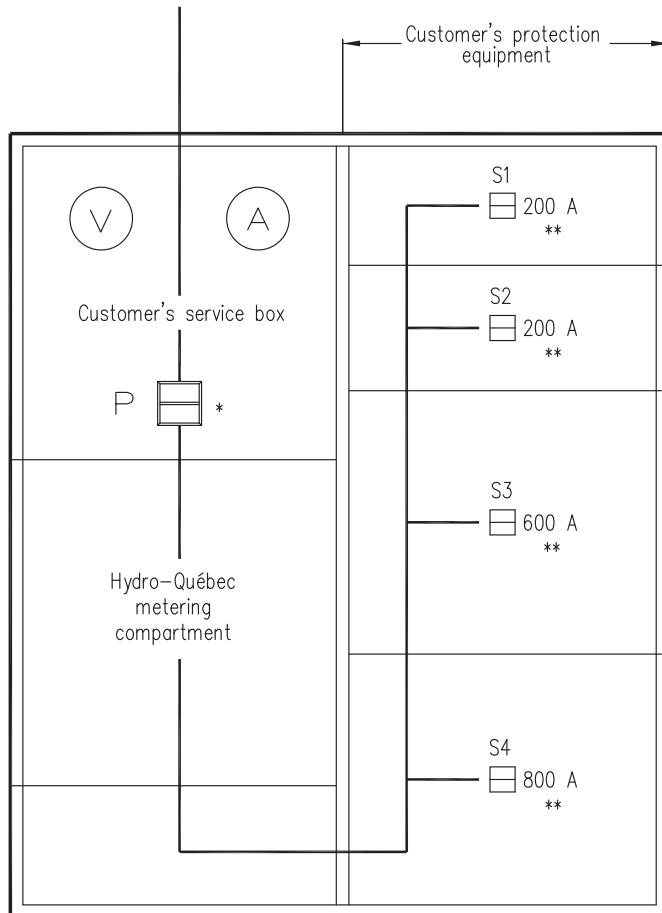


ELECTRICAL INSTALLATION WITH BACKUP GENERATOR

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Québec**

Standard
E.21-10,
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Figure
1.02



P: Primary protection

S: Branch circuit protection

* First level of protection coordination

** Second level of protection coordination

Note: Primary protection must have a breaking capacity of at least 22 kA. However, the customer will have to install protection with a higher rating if requested by Hydro-Québec.

Ref.: Section 1.2.1.4

Engineer's seal:



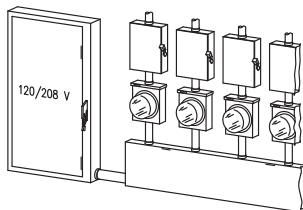
PROTECTION COORDINATION (EXAMPLE)

**Hydro
Québec**

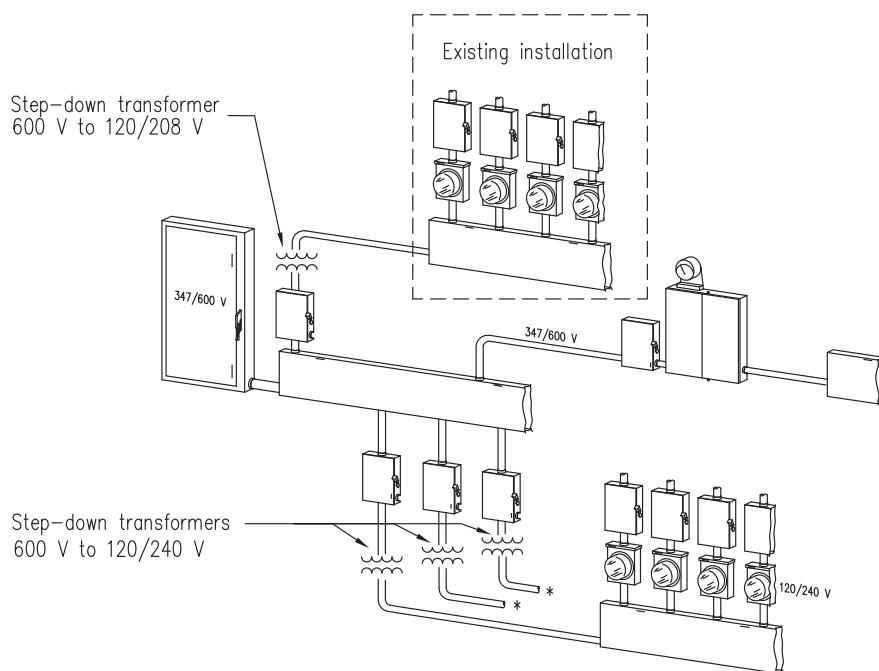
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Figure 1.03

Existing installation



New installation



* Required for phase balancing when single-phase load exceeds 25 kW.

Note: Equipment installed on the load side of the connection point, including step-down transformers, is at the customer's expense.

Ref.: Section 1.2.2.3

Engineer's seal:

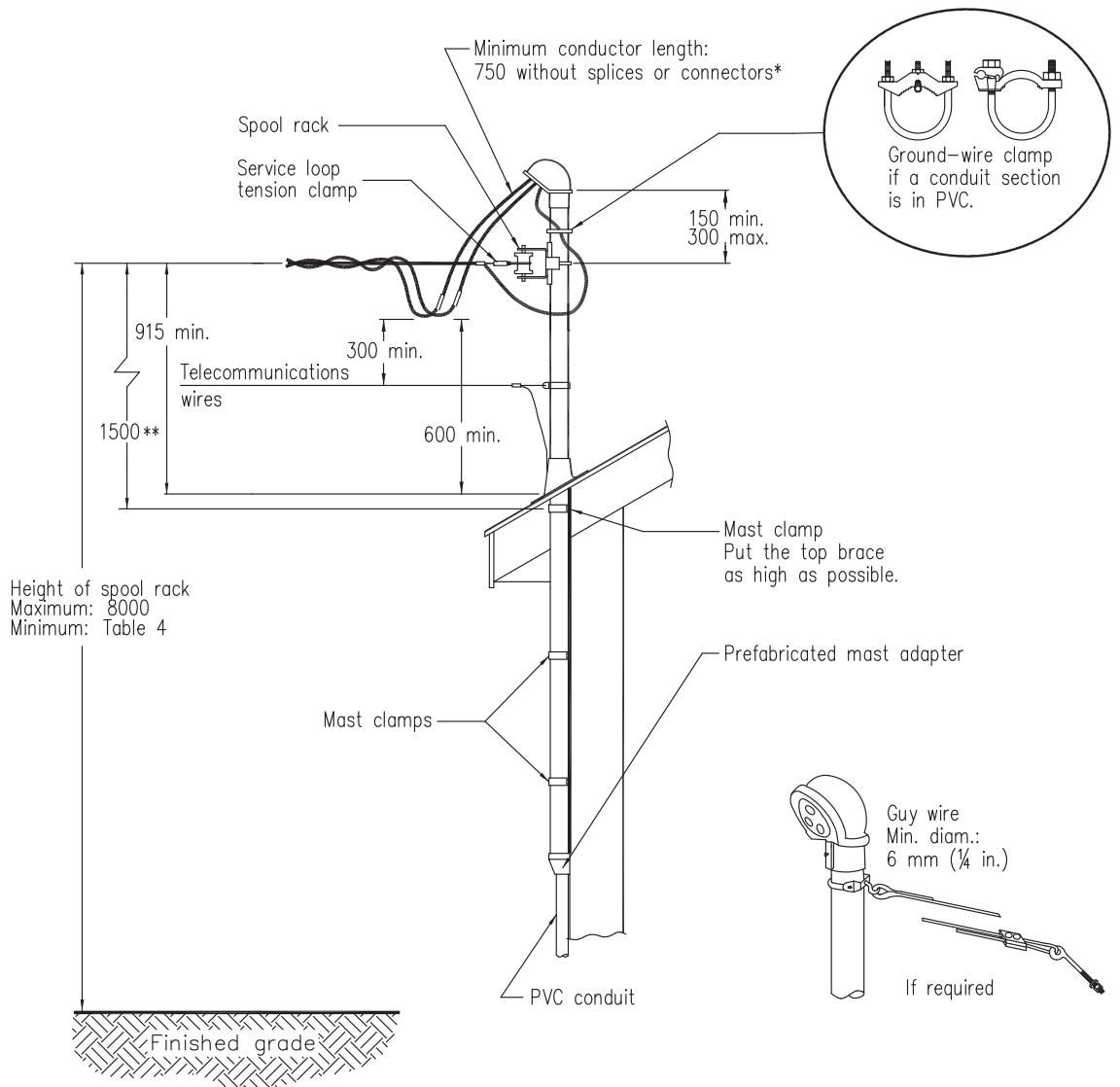


SUPPLY TO AN EXISTING 120/208-V INSTALLATION FROM A 347/600-V INSTALLATION

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Québec**

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10th edition

Figure
1.04



* Minimum length in saline environments: 1000 mm

** If length exceeds 1500 mm, the mast must be guyed.

Ref.: Sections 0.3, 2.2.4, 2.2.8.1, 2.2.8.2, 2.2.9.1, 2.2.10, 2.3.1 to 2.3.4 and 2.7.4

Engineer's seal:

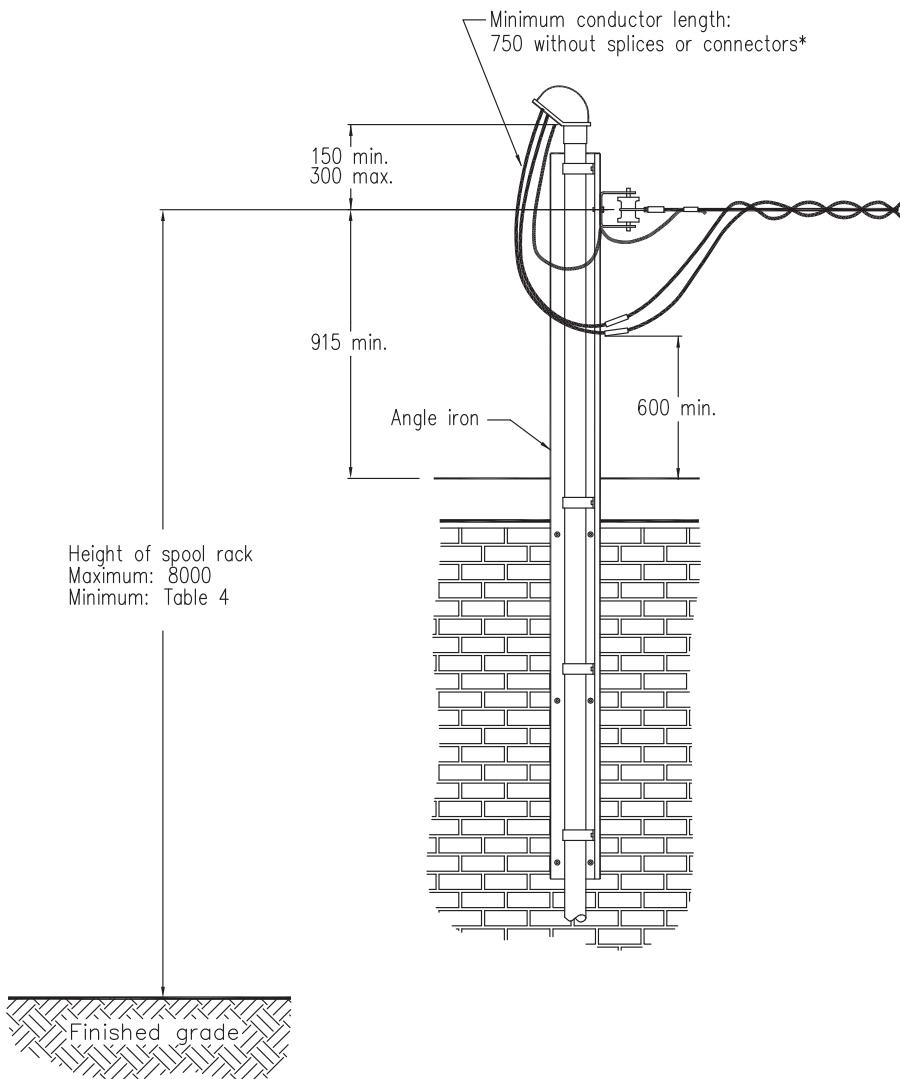


PREFABRICATED SERVICE MAST
OR RIGID STEEL CONDUIT
120/240-V SUPPLY

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Figure 2.01



* Minimum length in saline environments: 1000 mm

Ref.: Sections 2.2.4, 2.2.8.1, 2.2.8.2, 2.2.9.1, 2.3.1, 2.3.2, 2.3.4 and 2.7.4

Engineer's seal:



2015-07-16

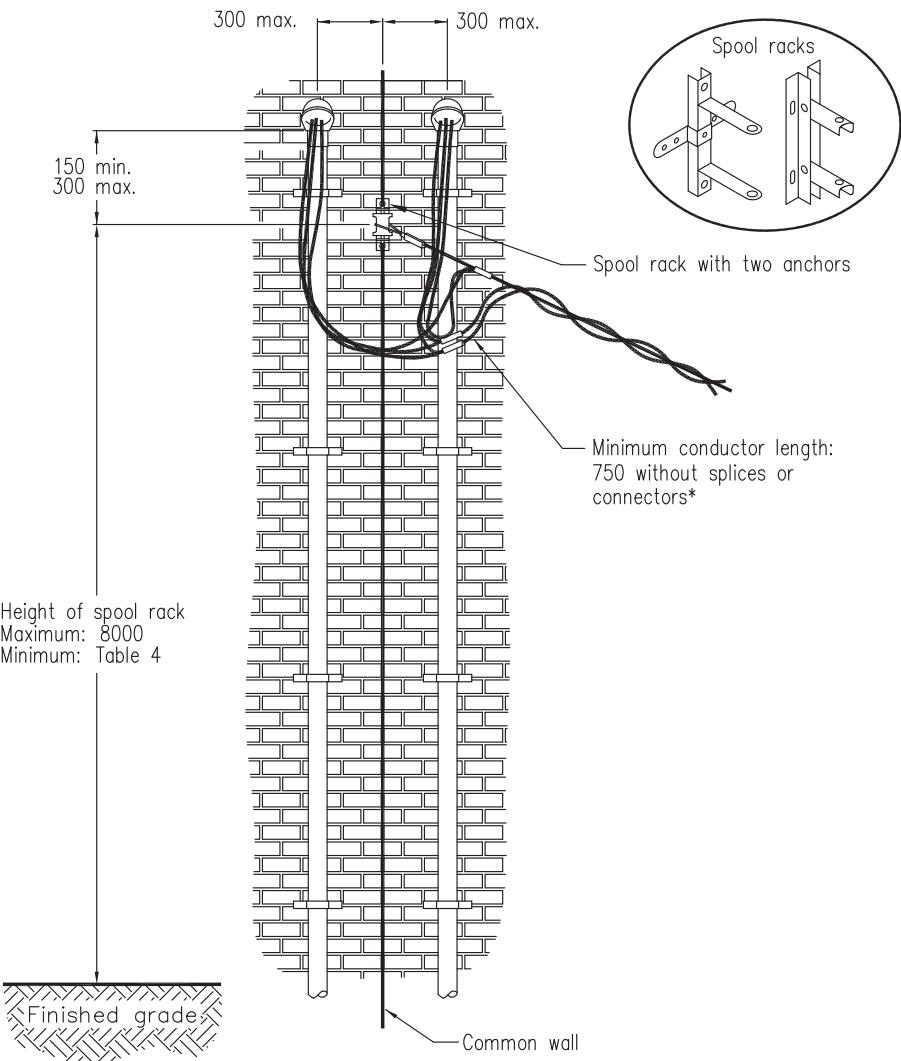
SERVICE MAST
WITH ANGLE IRON SUPPORT
120/240-V SUPPLY

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Figure

2.02



* Minimum length in saline environments: 1000 mm

Ref.: Sections 0.3, 2.2.4, 2.2.5.1, 2.2.8.1, 2.2.8.2, 2.3.1 and 2.7.4

Engineer's seal:

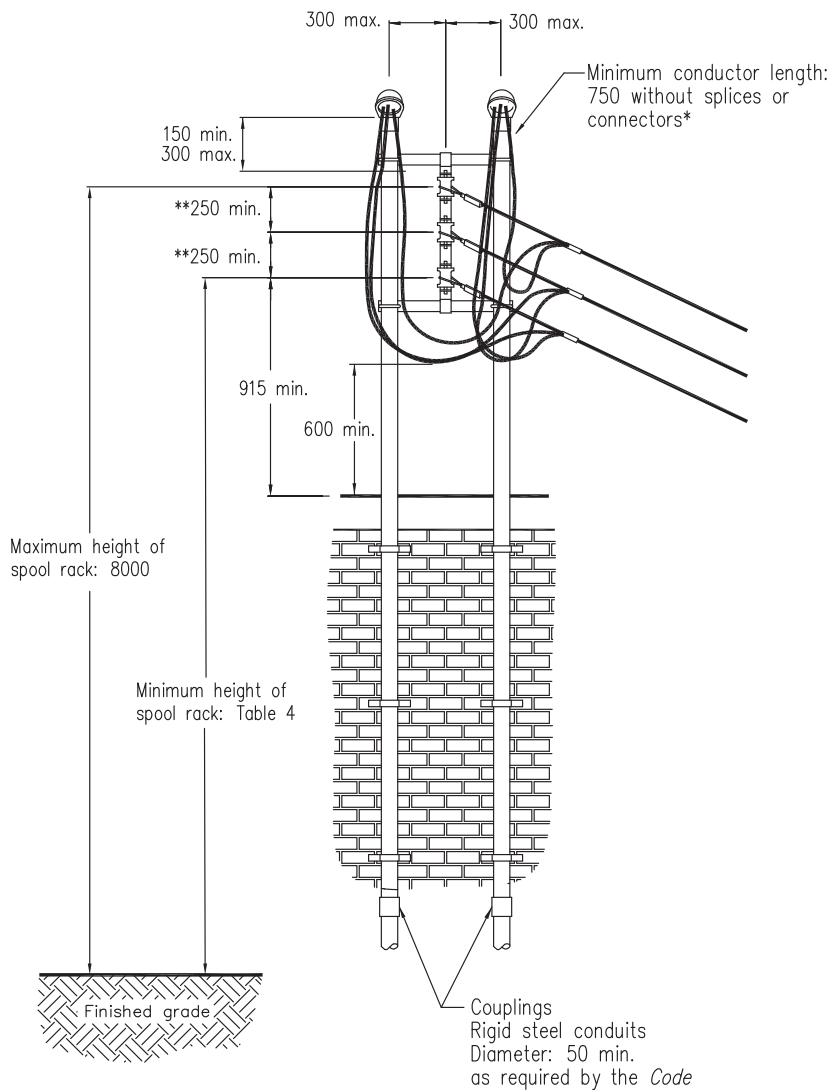


TWO SERVICE ENTRANCES
WITH A COMMON SPOOL RACK
(SEMITDETACHED OR ROW HOUSES)

Hydro
Québec

Standard
E.21-10,
10th edition

Figure
2.03



* Minimum length in saline environments: 1000 mm

** Min. 300 for bare service conductors

Ref.: Sections 2.2.4, 2.2.5.2, 2.2.8.1, 2.2.8.2, 2.2.9.1, 2.3.1, 2.3.2 and 2.7.4

Engineer's seal:



2015-07-16

TWO RIGID STEEL CONDUITS
WITH A COMMON SPOOL RACK
120/240-V SUPPLY

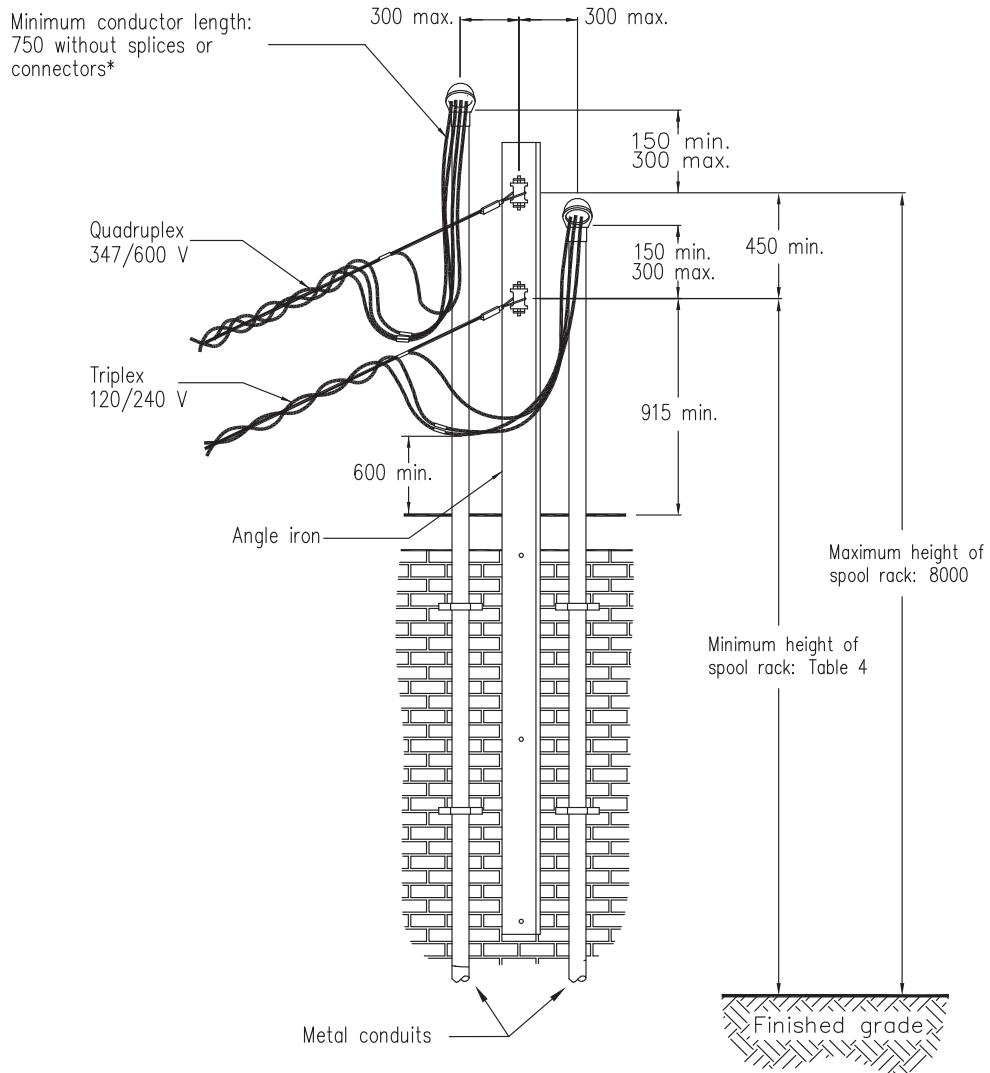
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Figure

2.04

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* Minimum length in saline environments: 1000 mm

Ref.: Sections 1.2.3.1 a), 2.2.4, 2.2.8.1, 2.2.8.2, 2.2.9.1, 2.2.12 b), 2.2.12 c), 2.3.1, 2.3.2 and 2.7.4

Engineer's seal:



TWO SERVICE LOOPS
AT DIFFERENT VOLTAGES ON
A COMMON SUPPORT

**Hydro
Québec**

Standard E.21-10,
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Figure 2.05

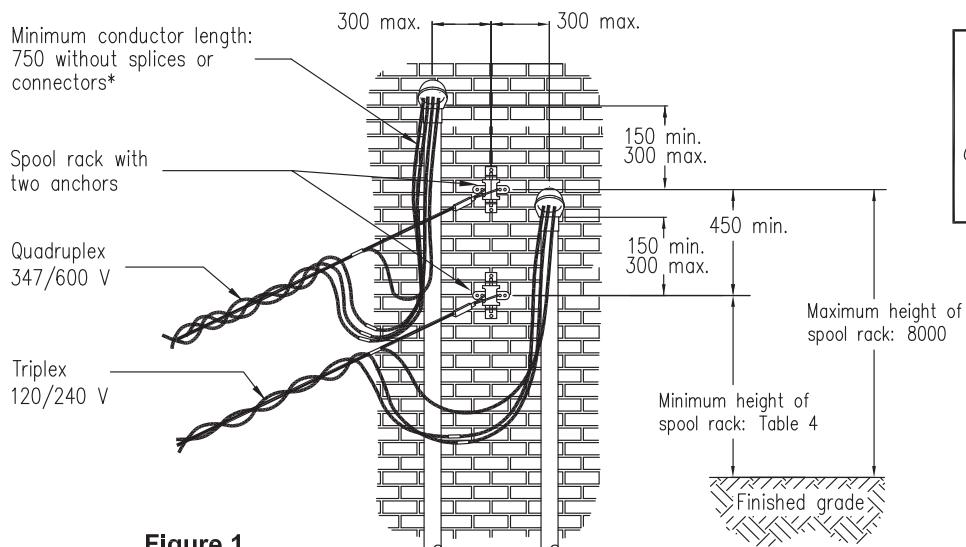


Figure 1

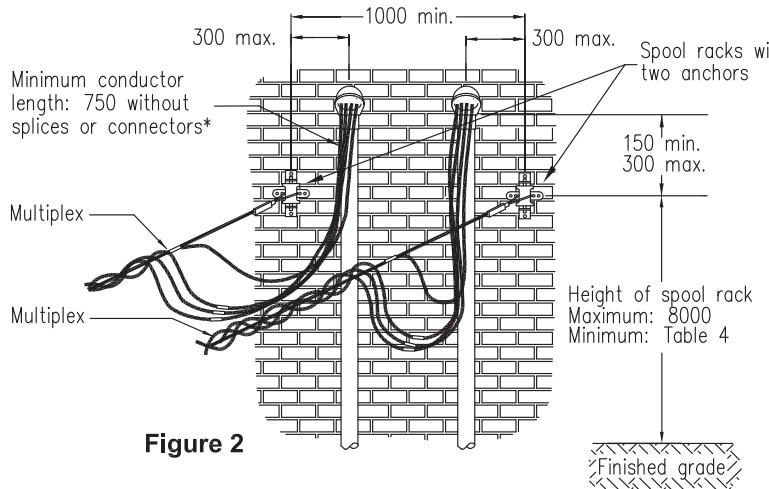


Figure 2

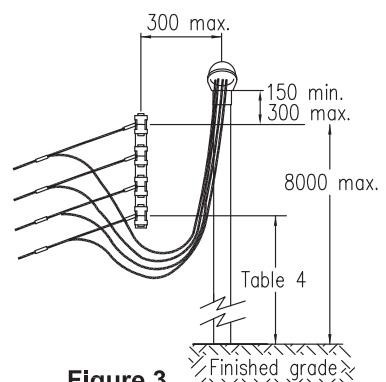


Figure 3

* Minimum length in saline environments: 1000 mm

Notes:

- Arrangement 1 is allowed for service loops at the same or different voltages.
- Arrangement 2 is allowed only for service loops at the same voltage.
- Arrangement 3 shows a service loop with separate conductors.

Ref: Sections 0.3, 1.2.3.1 b), 1.2.3.1 c), 2.2.4, 2.2.6, 2.2.8.1, 2.2.8.2, 2.2.12 b), 2.2.12 c), 2.3.1 and 2.7.4

Engineer's seal:

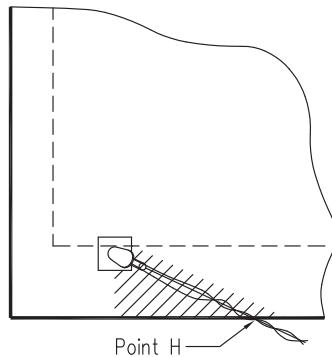


MULTIPLE SERVICE LOOPS

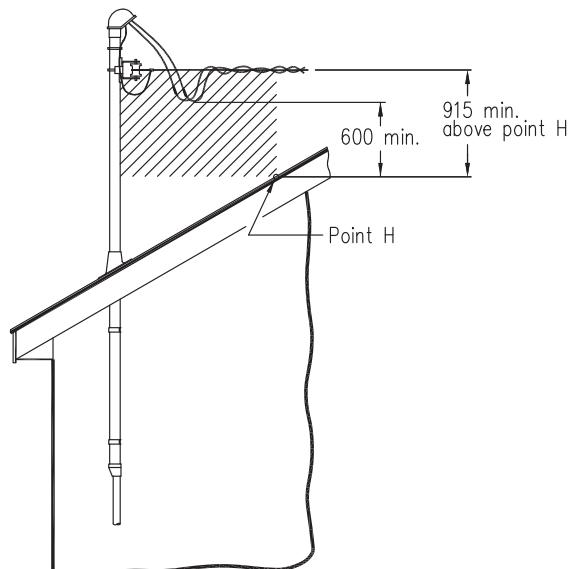
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Figure 2.06



Plan view



Elevation view

Ref.: Sections 2.2.9.2 and 2.3.2

Engineer's seal:



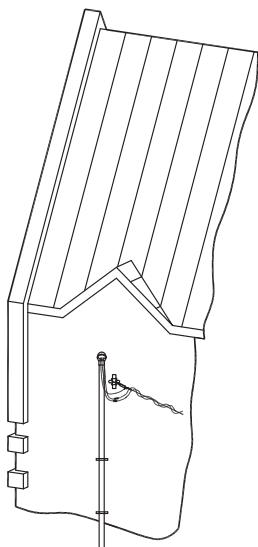
**MINIMUM CLEARANCE BETWEEN
SERVICE LOOP AND EAVE**

**Hydro
Québec**

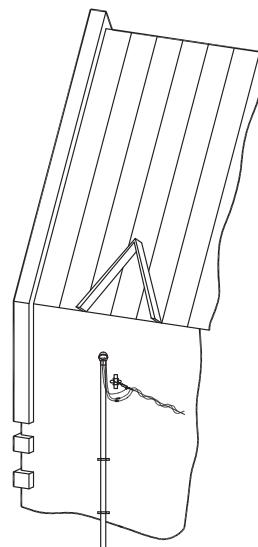
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Figure 2.07

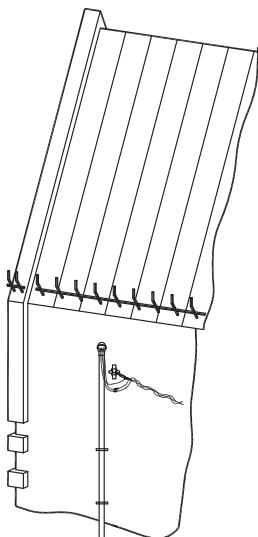
A:



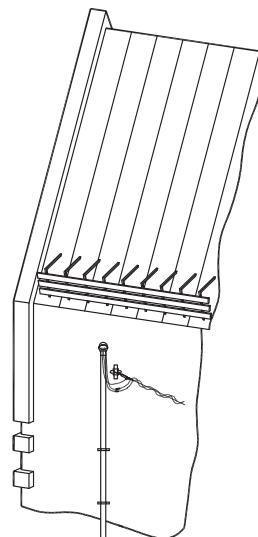
B:



C:



D:



Ref.: Section 2.2.11

Engineer's seal:



2015-07-16

ICE FENDERS FOR SMOOTH ROOFING

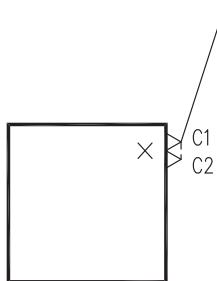
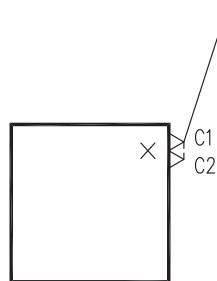
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Figure

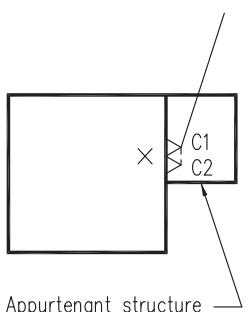
2.08

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Before**After**

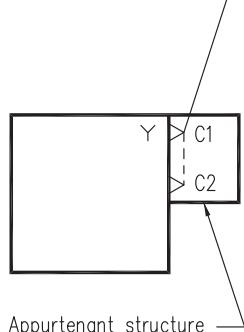
- Point X in compliance

- C1 or C2 modified.
- Point X remains unchanged.

Before

Appurtenant structure

- Point X not in compliance

After

Appurtenant structure

- C1 or C2 modified.
- Y: New point

- Service loop
- - - Service entrance
- ▷ C1, C2 Service head
- X, Y Connection points

Ref.: Section 2.4.1

Engineer's seal:

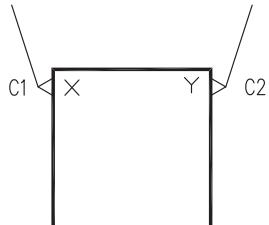


SERVICE ENTRANCE MODIFICATION

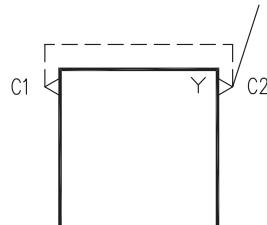
**Hydro
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Standard E.21-10,
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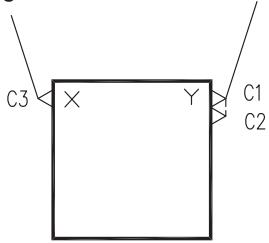
Figure 2.09

Before

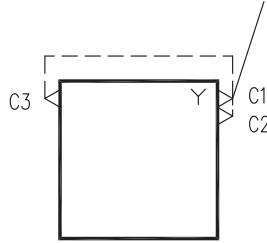
- Points X and Y in compliance

After

- C1 modified
Point X grouped with point Y.
- C2 modified
Point Y grouped with point X

Before

- Points X and Y in compliance

After

- C3 modified
Point X grouped with point Y.
- C1 or C2 modified
Points X and Y may remain unchanged.

— Service loop

- - - - Service entrance

▷ C1, C2, C3 Service head

X, Y Connection points

Ref.: Section 2.4.2.3

Engineer's seal:



2015-07-16

SERVICE ENTRANCE MODIFICATION

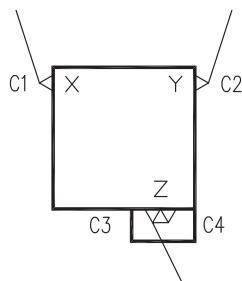
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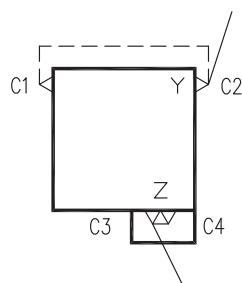
Figure

2.10

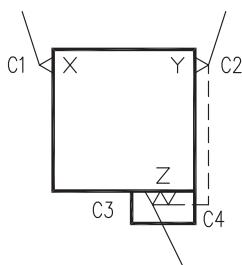
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Before

- Points X and Y in compliance
- Point Z not in compliance

After

- C1 modified
- Point X grouped with point Y.
- Point Z remains unchanged.



- C3 or C4 modified
- The modified service entrance must be supplied from point X or Y and the other service entrance from point Z.

—	Service loop
-----	Service entrance
▷ C1, C2, C3, C4	Service head
X, Y, Z	Connection points

Ref.: Section 2.4.2.3

Engineer's seal:

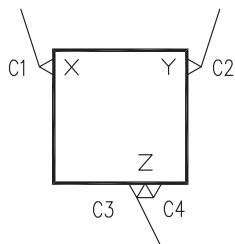


SERVICE ENTRANCE MODIFICATION

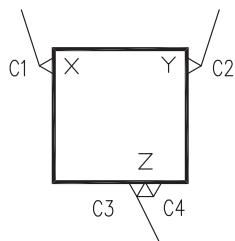
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Standard E.21-10,
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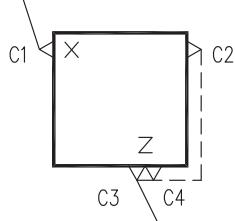
Figure 2.11

Before

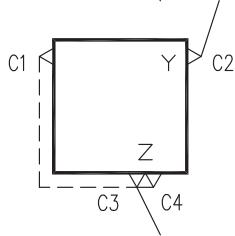
- Points X, Y and Z in compliance

After

- C3 or C4 modified
Point Z remains unchanged



- C2 modified
Point Y grouped with point Z.



- C1 modified
Point X grouped with point Z.

— Service loop

---- Service entrance

▷ C1, C2, C3, C4 Service head

X, Y, Z Connection points

Ref.: Section 2.4.2.3

Engineer's seal:



2015-07-16

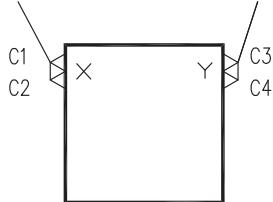
SERVICE ENTRANCE MODIFICATION

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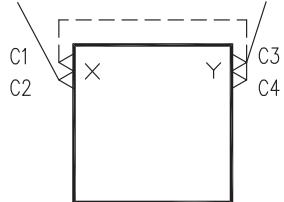
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Figure

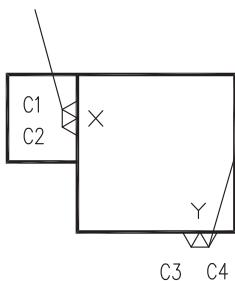
2.12

Before

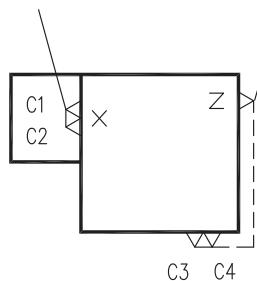
- Points X and Y in compliance

After

- C1 or C2 modified
The modified service entrance must be supplied from point Y.
- C3 or C4 modified
The modified service entrance must be supplied from point X.

Before

- Points X and Y not in compliance

After

- Z : New point
- C3 or C4 modified
Both service entrances must be supplied from point Z.
- C1 or C2 modified
Both service entrances must be supplied from point Z.

—	Service loop
-----	Service entrance
▷ C1, C2, C3, C4	Service head
X, Y, Z	Connection points

Ref.: Sections 2.4.2.1 and 2.4.2.3

Engineer's seal:

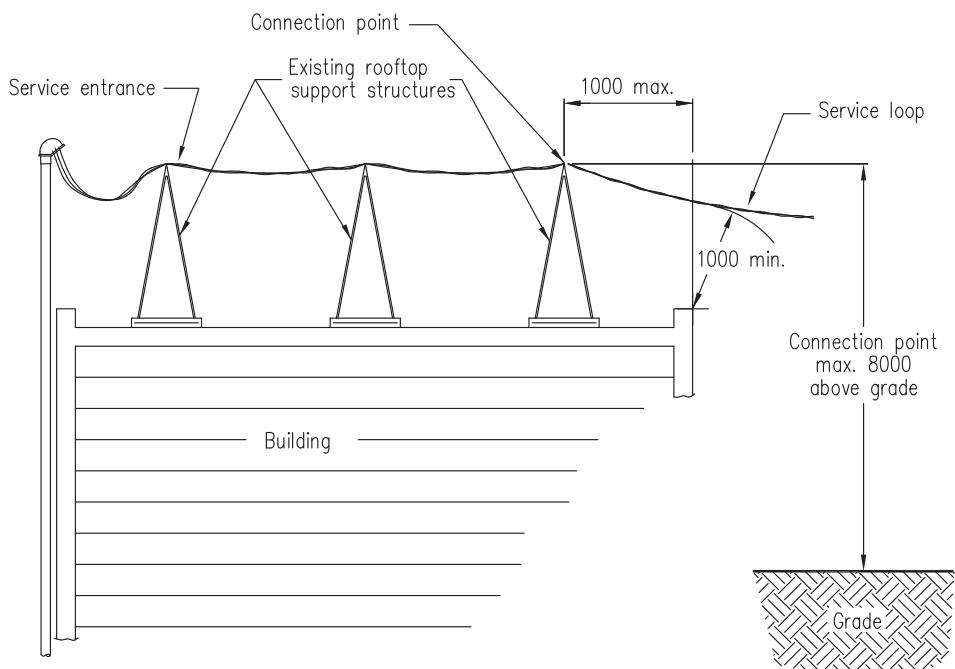


SERVICE ENTRANCE MODIFICATION

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Figure 2.13



Ref.: Sections 0.3, 2.2.3 and 2.4.3.1

Engineer's seal:



2015-07-16

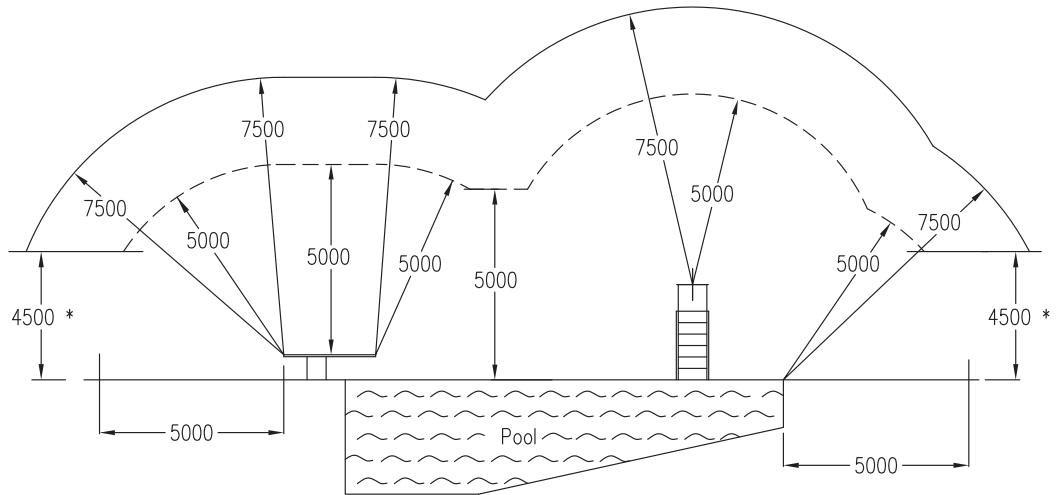
SERVICE ENTRANCE ON EXISTING ROOFTOP SUPPORT STRUCTURES

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E.21-10,
10th edition

Figure

2.14



- — — Minimum clearance of 5000 mm from twisted conductors (750 V or less) and insulated telecommunications cables
- Minimum clearance of 7500 mm from other types of conductors (up to 50 kV phase-to-phase)
- * Minimum clearance of 4500 mm above finished grade

Note: Clearances must be in accordance with the *Code*.

Ref.: Section 2.2.3 and Table 14

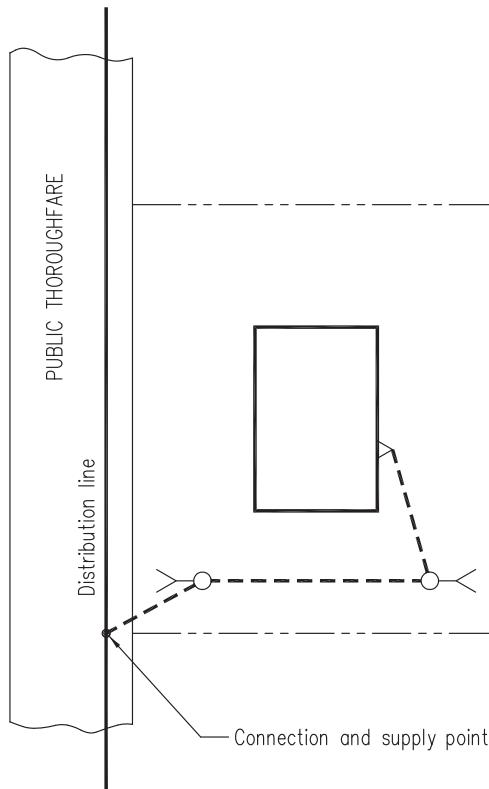
Engineer's seal:



MINIMUM CLEARANCES BETWEEN CONDUCTORS AND A POOL AND ITS ACCESSORIES

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Figure	2.15



Note: If span length exceeds the maximum given in Table 6, the pole nearest the line must be guyed.

Ref.: Sections 2.6.1, 2.6.2, 2.7.2.6 and Table 6

Engineer's seal:



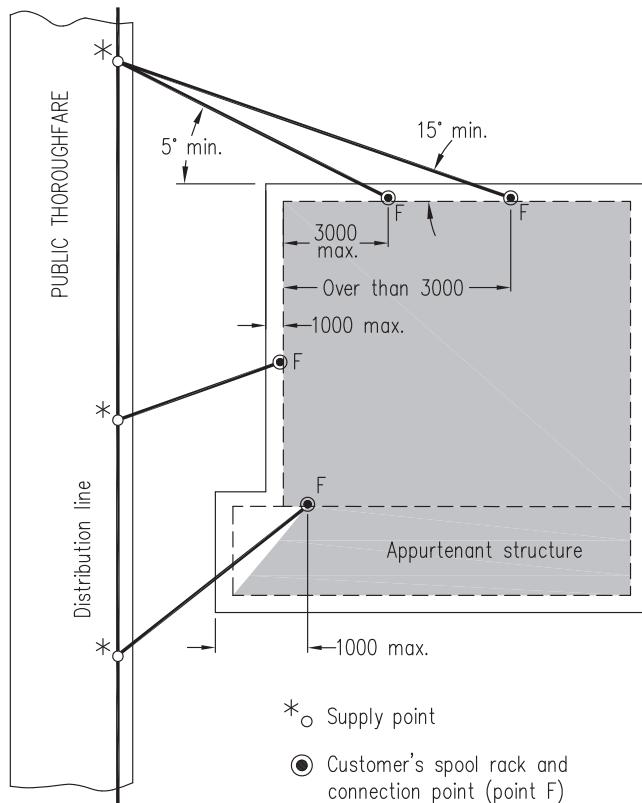
CONNECTION POINT LOCATED
ON DISTRIBUTION LINE
(CUSTOMER-PROVIDED SERVICE LOOP)

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10th edition

Figure

2.16



Note: A service loop connected at point F to a mast above the roof must not overhang the gray area.

Ref.: Sections 2.2.3, 2.7.1, 2.7.2.1 to 2.7.2.4 and Table 7

Engineer's seal:

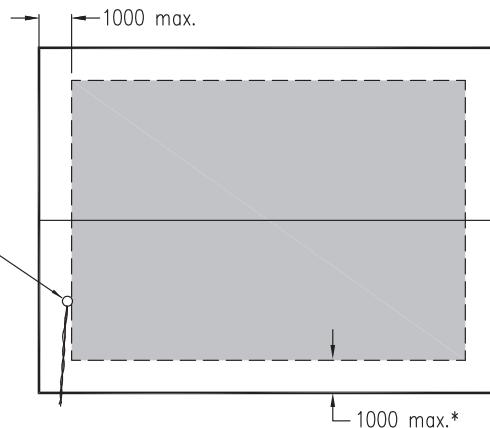
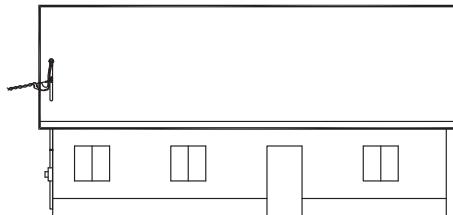
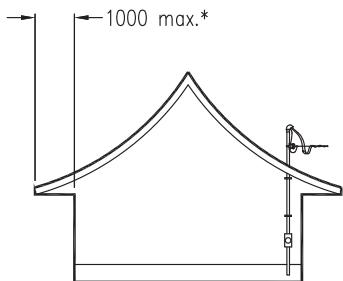


CONNECTION POINT AND SERVICE LOOP

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Figure 2.17



* The 1000-mm maximum distance for access to the connection point is measured from the edge of the eave to the spool rack. If the distance exceeds 1000 mm, the mast cannot be mounted on that wall.

** The service loop must not overhang the gray area.

Ref.: Sections 2.7.1 and 2.7.2.3

Engineer's seal:

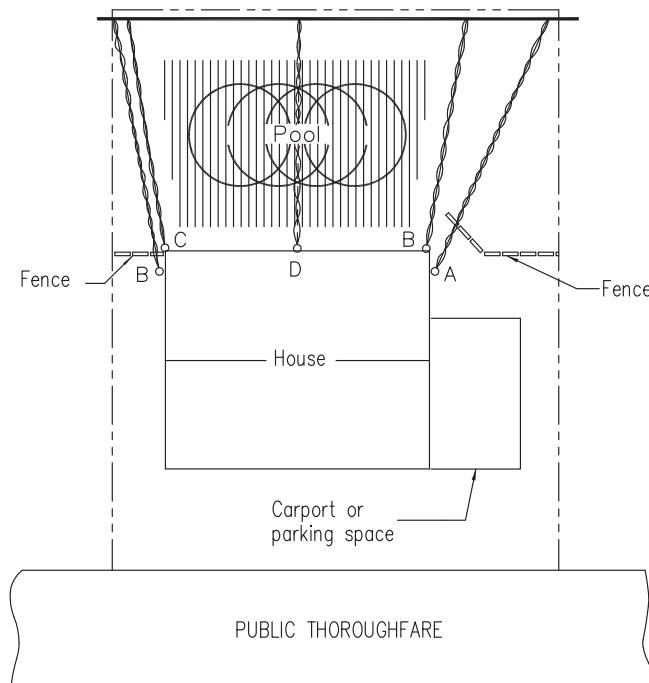


MAXIMUM DISTANCE BETWEEN CONNECTION POINT AND EAVE

**Hydro
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Figure
2.18



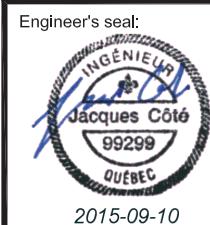
Location:

- A: Recommended
- B: Accepted
- C: Tolerated
- D: To be avoided

Legend:

- ||||| Probable location of pool. The service loop must not overhang the pool unless clearance requirements are met.
- Service entrance with outdoor meter
- Property line
- Distribution line
- ~~~~ Service loop

Ref.: Section 2.7.1

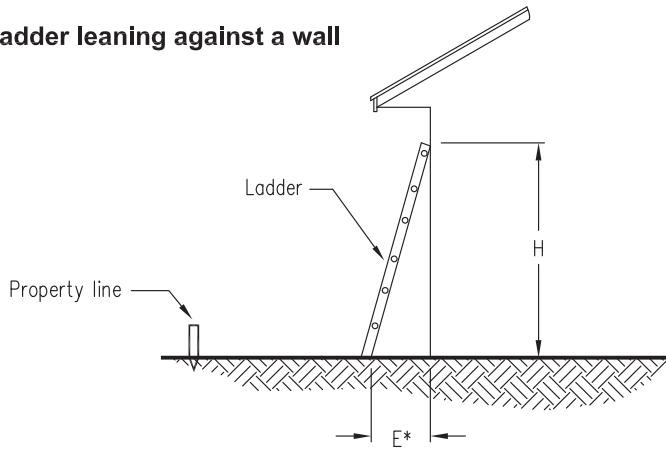


**LOCATION OF SERVICE ENTRANCE WITH
OUTDOOR METER TO ALLOW FOR POOL
INSTALLATION (EXAMPLE)**

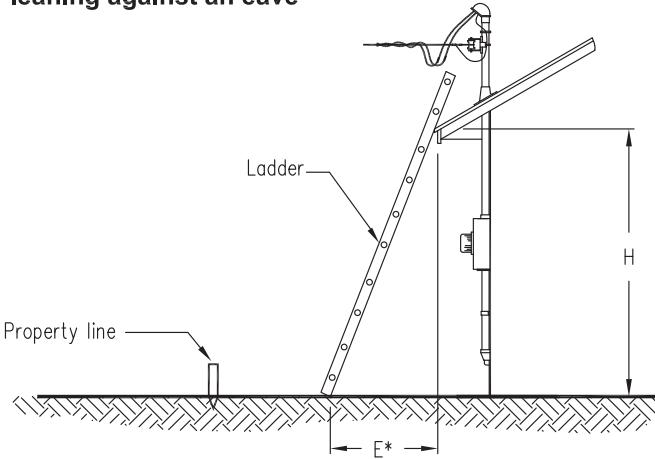
**Hydro
Québec**

Standard	E.21-10, 10th edition
Figure	2.19

A: Ladder leaning against a wall



B: Ladder leaning against an eave



* The height-to-base ratio (H/E) must not be more than 4:1 or less than 3:1.

Note: The ladder may also rest on a public thoroughfare (street or lane) that is clear of obstructions.

Ref.: Section 2.7.1 and Table 8

Engineer's seal:



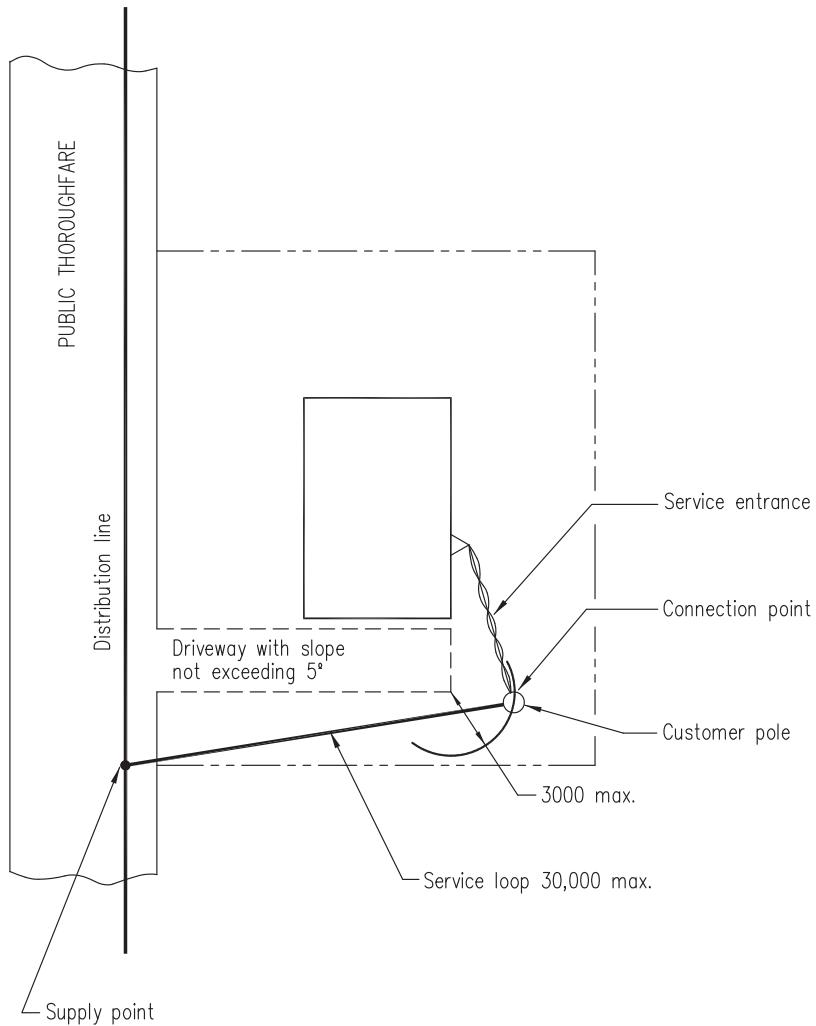
**ACCESS TO CONNECTION POINT
USING A LADDER**

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Figure

2.20



Ref.: Section 2.7.2.5 and Table 6

Engineer's seal:



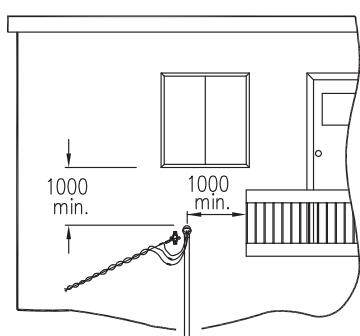
CONNECTION POINT ON CUSTOMER POLE

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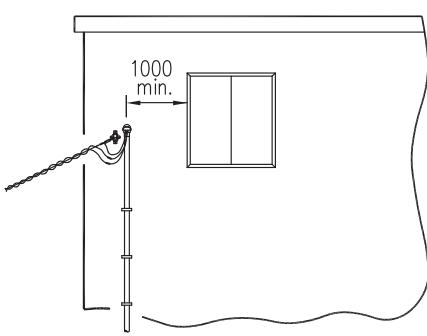
Standard E.21-10,
 10th edition

Figure 2.21

A: Near a window, balcony, door or porch



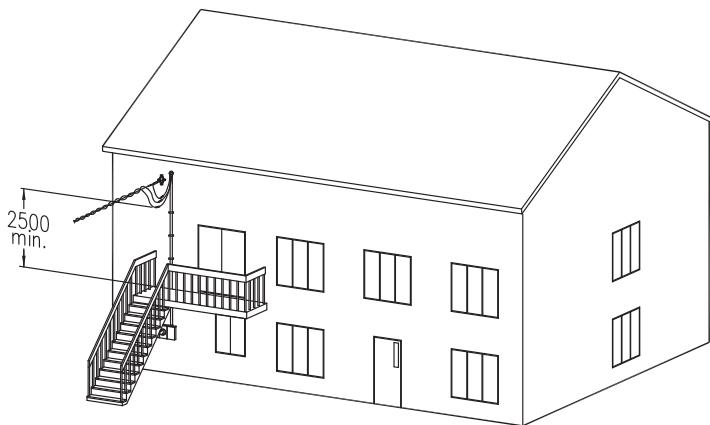
Near a balcony



Near a window

Note: No vertical clearance above the window is required. However, the conductors (including drip loops) must be at a sufficient distance from the window. The spool rack must be positioned accordingly. A distance of at least 400 mm between the spool rack and the top of the window should provide clearance for the drip loops.

B: Above a balcony, veranda, terrace or stairway



Above an uncovered balcony or stairway

Note: The connection point must remain accessible by means of a ladder or a bucket truck, in accordance with Section 2.7.1.

Ref.: Sections 2.2.3 and 2.7.3

Engineer's seal:



2015-07-16

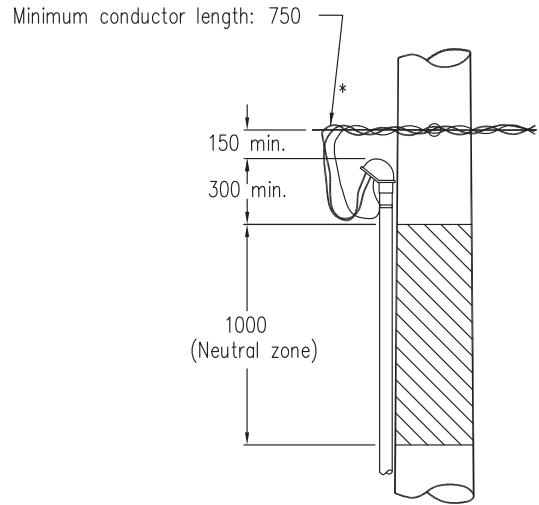
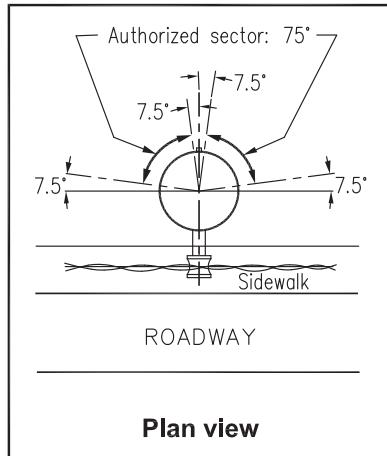
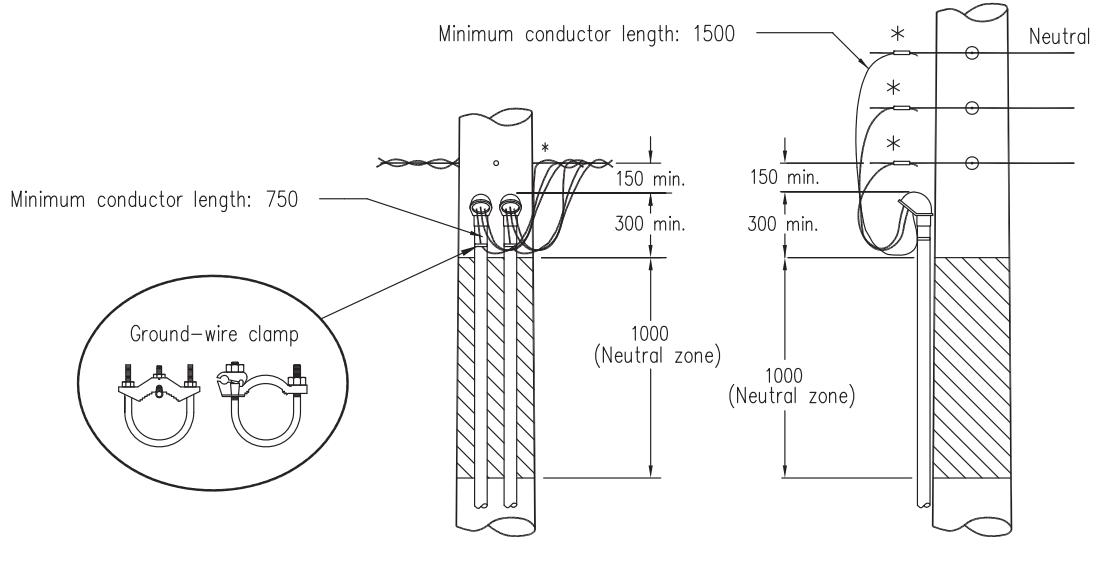
MINIMUM CLEARANCE FOR CONDUCTORS

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Figure

2.22



* Connection points

Note: Conduits must be installed in the authorized sector, opposite the roadway.

Ref.: Sections 0.3, 2.7.4, 2.8 d), 2.8.1.1 to 2.8.1.4 and 2.8.2

Engineer's seal:

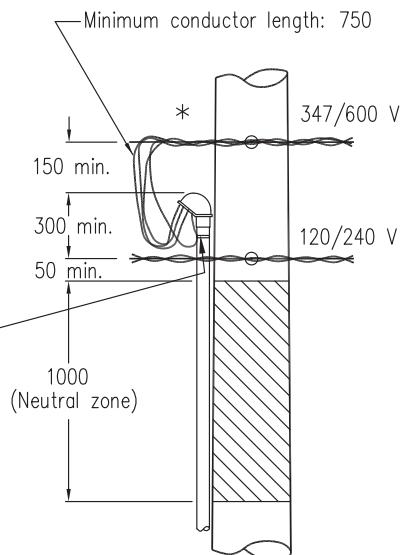
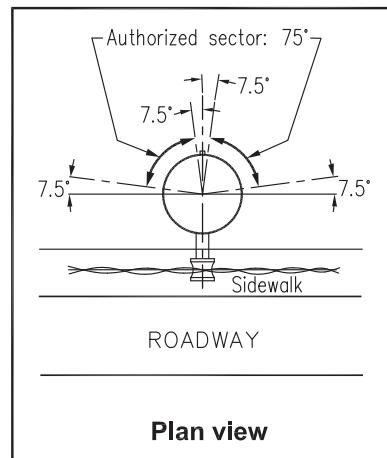
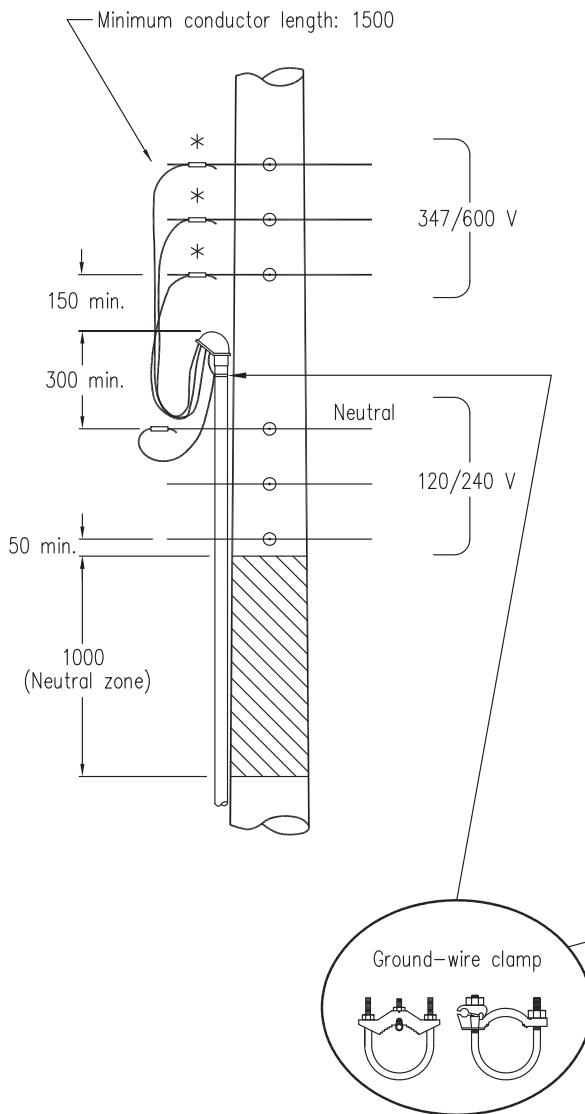


CONNECTION OF
OVERHEAD-UNDERGROUND
SERVICE ENTRANCE TO
120/240-V OVERHEAD LINE

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10th edition

Figure 2.23



* Connection points

Note: Conduits must be installed in the authorized sector, opposite the roadway.

Ref.: Sections 0.3, 2.7.4, 2.8 d), 2.8.1.1 to 2.8.1.4 and 2.8.2

Engineer's seal:



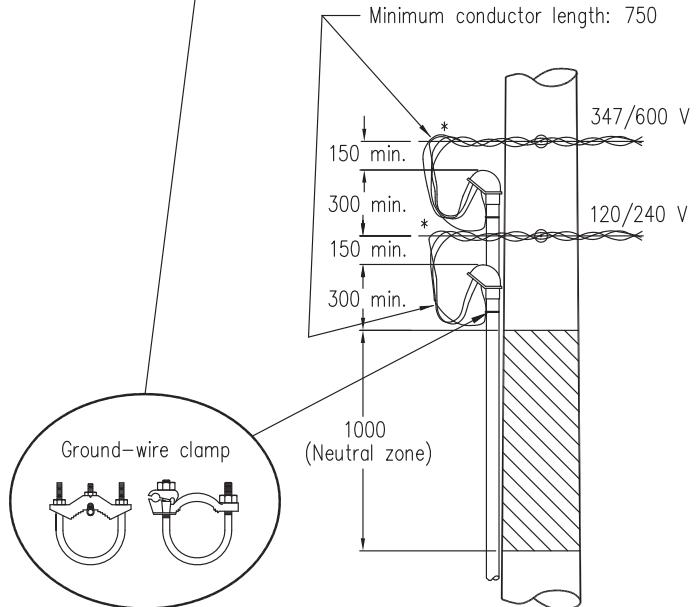
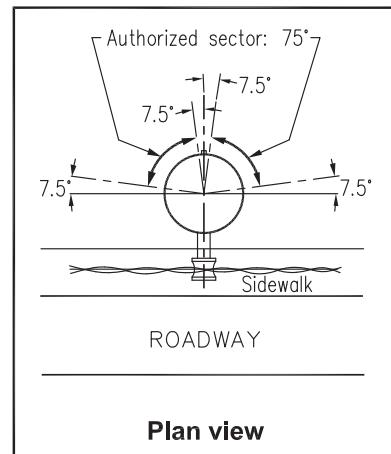
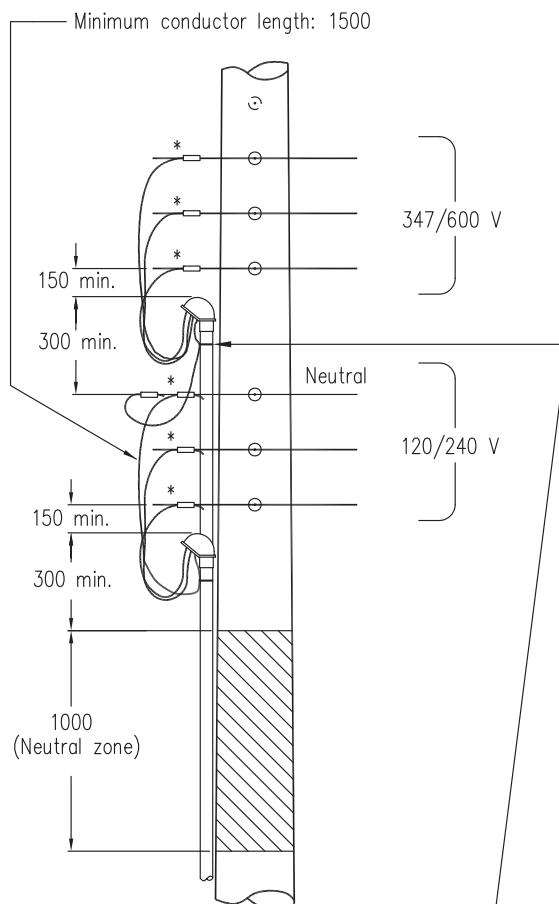
CONNECTION OF
OVERHEAD-UNDERGROUND SERVICE
ENTRANCE TO 347/600-V OVERHEAD
LINE WITH INSULATED CONDUCTORS

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10th edition

Figure

2.24



* Connection points

Note: Conduits must be installed in the authorized sector, opposite the roadway.

Ref.: Sections 0.3, 2.7.4, 2.8 d), 2.8.1.1 to 2.8.1.4 and 2.8.2

Engineer's seal:

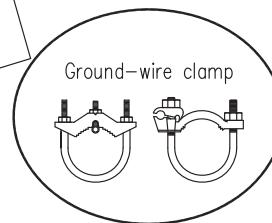
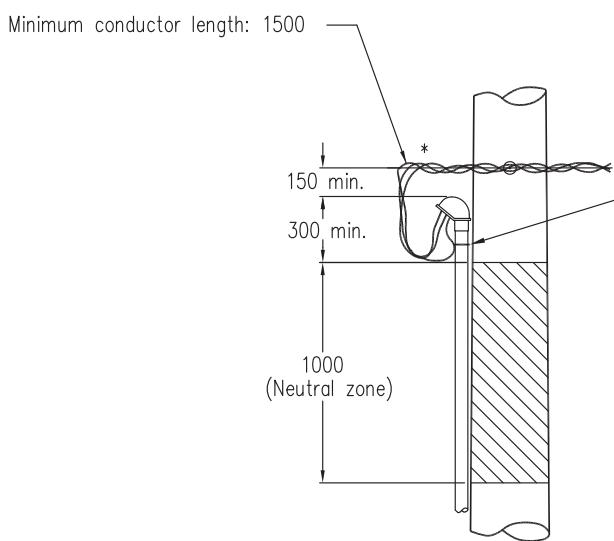
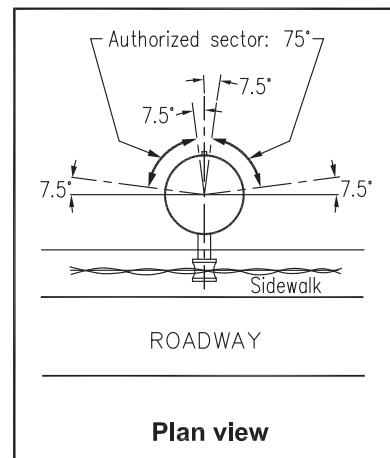
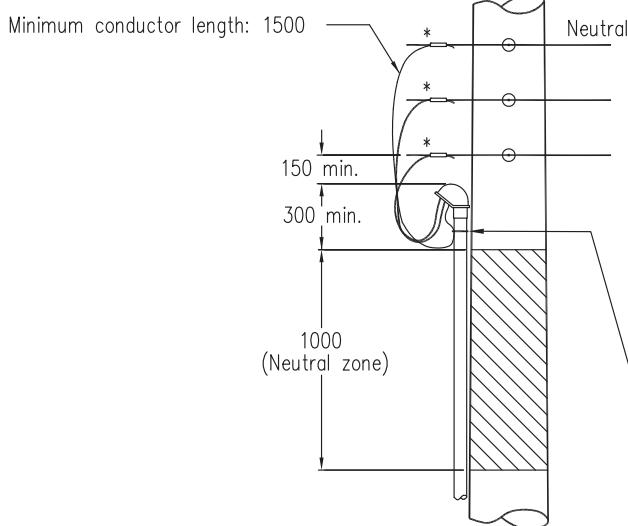


CONNECTION OF
OVERHEAD-UNDERGROUND SERVICE
ENTRANCE TO TWO OVERHEAD LINES
(120/240 V AND 347/600 V)
WITH INSULATED CONDUCTORS

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10th edition

Figure 2.25



* Connection points

Note: Conduits must be installed in the authorized sector, opposite the roadway.

Ref.: Sections 2.7.4, 2.9.1.1 to 2.9.1.4 and 2.9.2

Engineer's seal:



2015-09-10

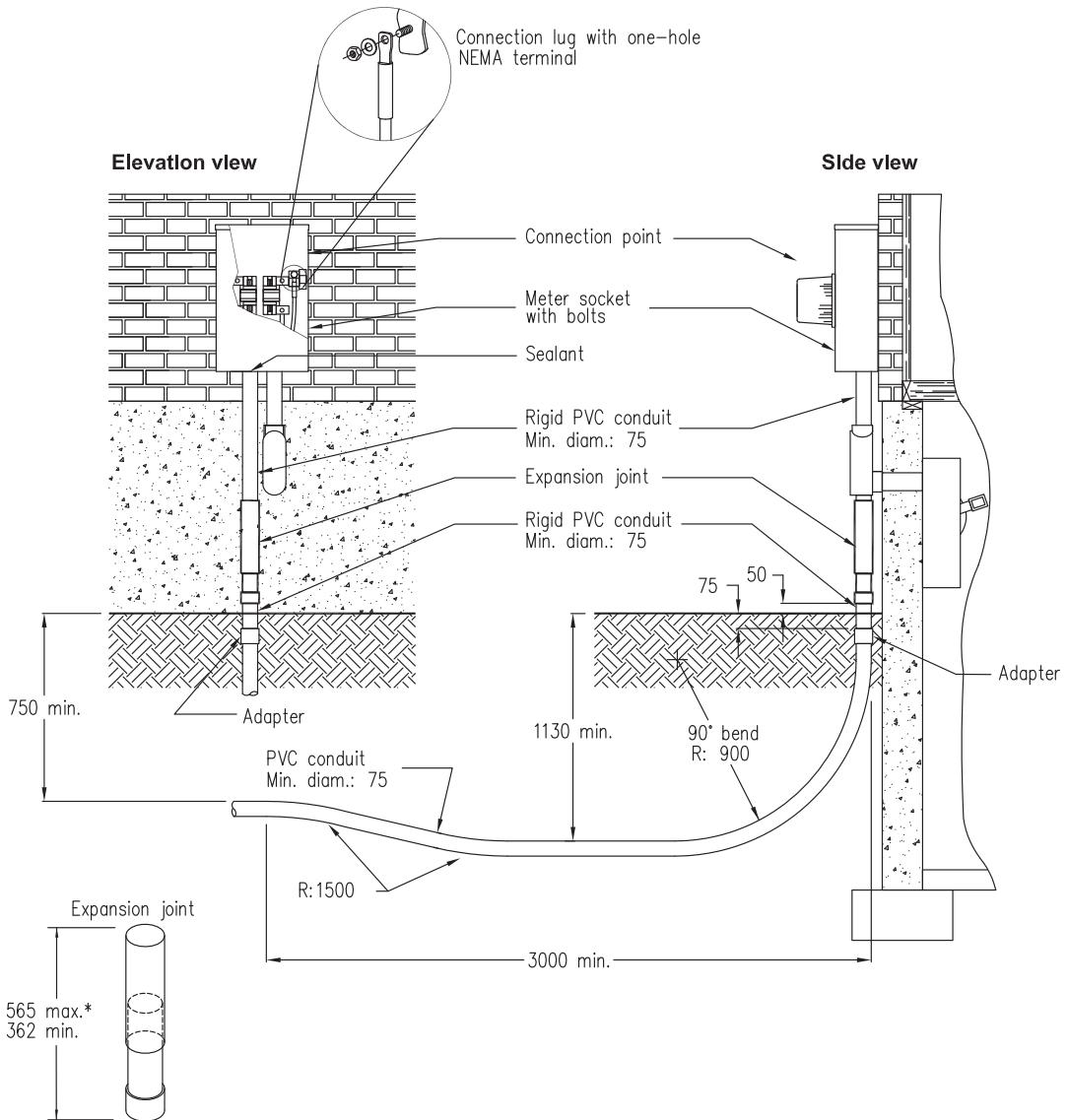
120/240-V EQUIPMENT CONNECTION ON A POLE

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10th edition

Figure

2.26



* Adjust length according to temperature at the time of installation.

Note: Meter sockets with or without combined circuit breakers are accepted.

Ref.: Sections 3.1.1, 3.2, 3.2.1, 3.4.1, 3.4.4, 3.4.5, 3.4.8 and 6.1

Engineer's seal:



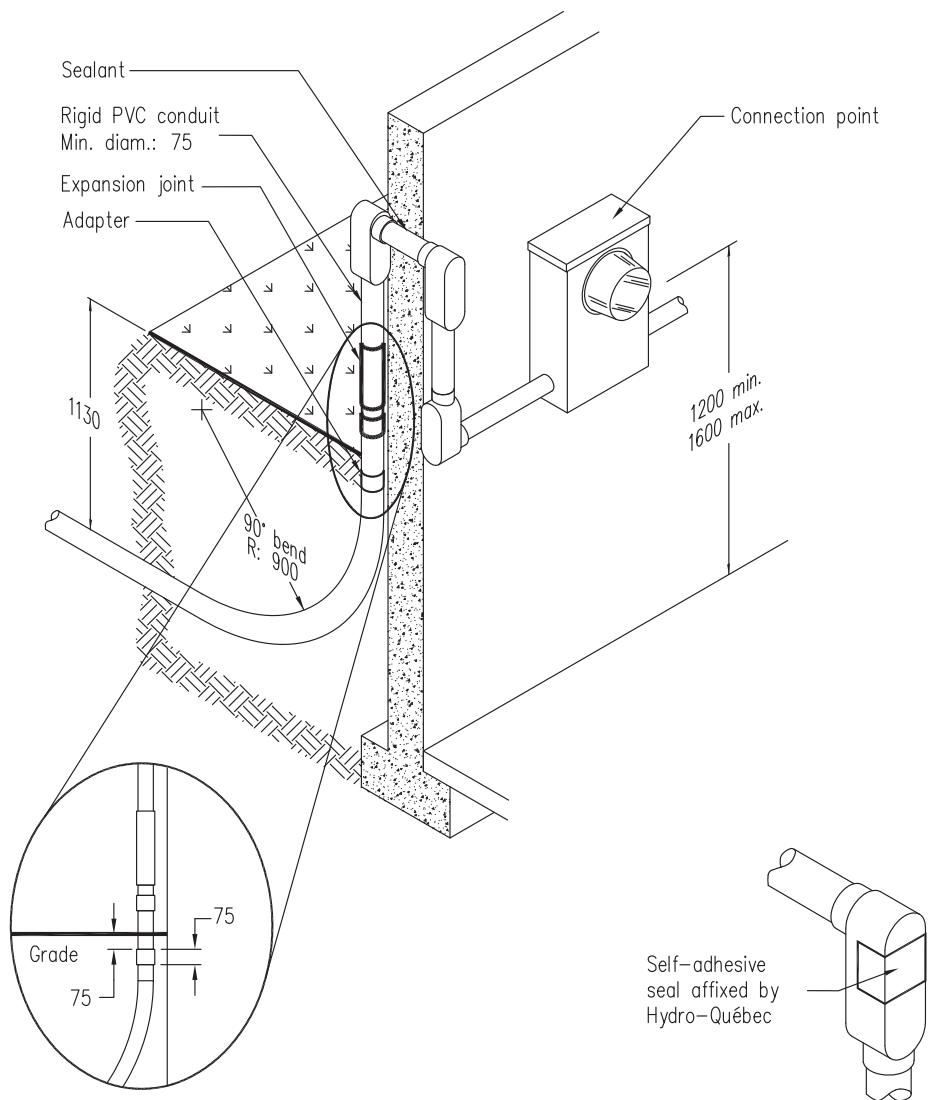
2015-07-16

CONNECTION TO AN OUTDOOR INDIVIDUAL METER SOCKET

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Figure 3.01



Ref.: Sections 1.1.3.3 d), 3.1.1, 3.2, 3.2.1, 3.4.1, 3.4.2.1, 3.4.4, 3.4.5, 3.4.8, 6.1, 6.3.1 a) and 6.4.2.2 d)

Engineer's seal:



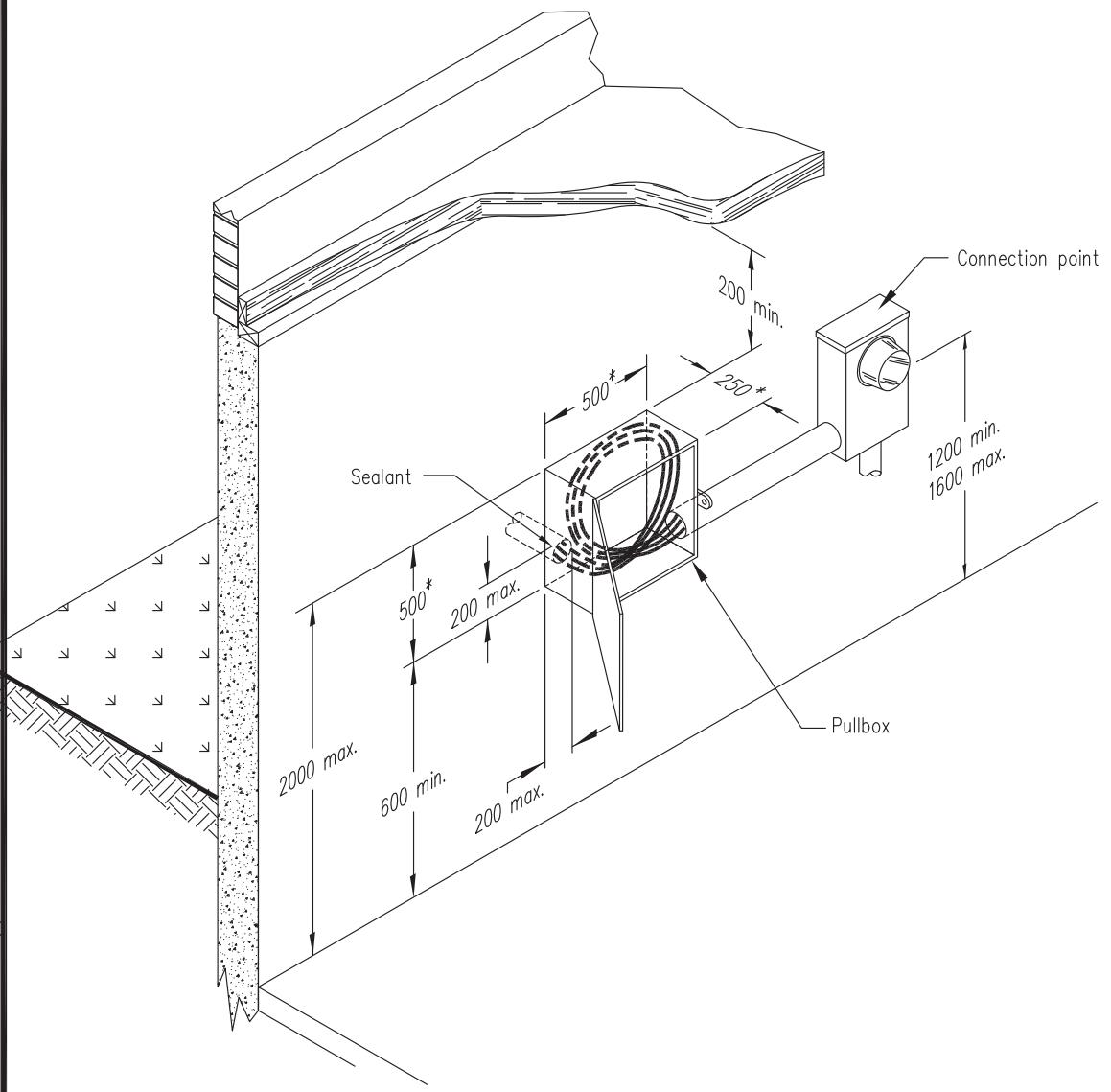
2015-07-16

CONNECTION TO INDIVIDUAL
INDOOR METER SOCKET (ÎLES
DE LA MADELEINE)

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Figure
3.02

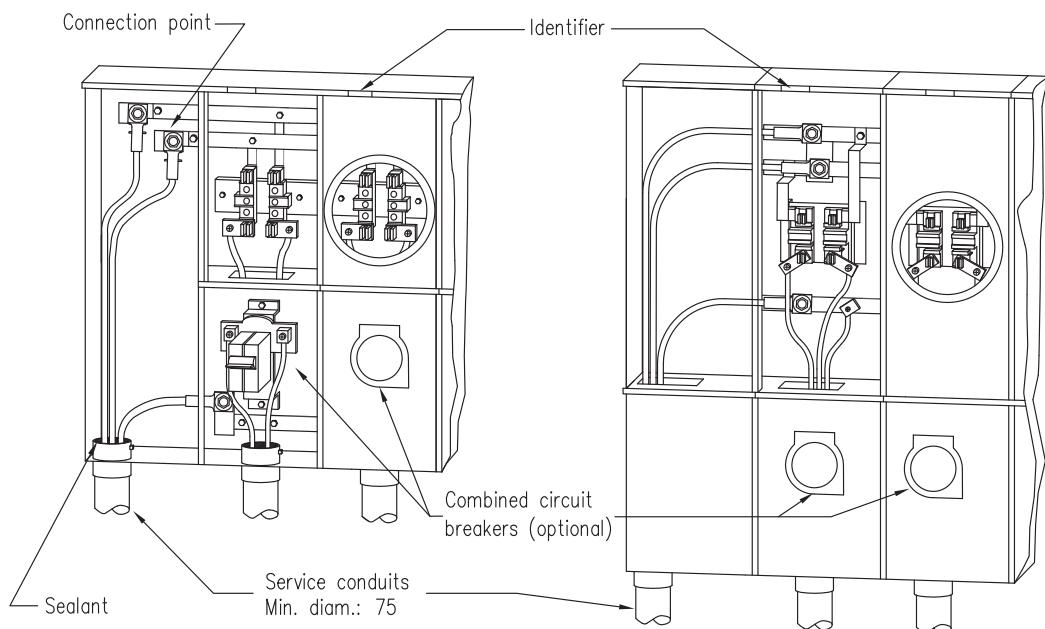
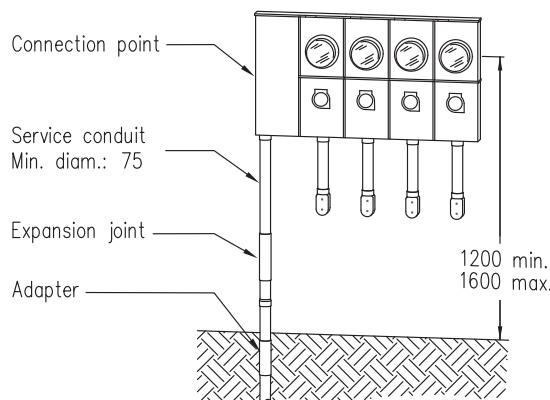


* Dimensions according to Table 9.

Note: Bonding (as required under Section 3.5.4) is not illustrated.

Ref.: Sections 0.3, 3.1.1, 3.2, 3.2.1, 3.4.2.1, 3.4.4, 3.4.5, 3.4.8, 3.5.1.1, 3.5.2.1, 3.5.6.2, 6.1, 6.3.1 a), 6.4.2.2 d) and Table 9

Engineer's seal:  2015-07-16	CONNECTION TO INDIVIDUAL INDOOR METER SOCKET USING A PULLBOX (ÎLES DE LA MADELEINE)	Hydro Québec Standard E.21-10, 10th edition Figure 3.03
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Notes:

- The service conduit must terminate in the connection compartment. Typical connections may vary depending on the model of multiple-meter mounting device.
- The circuit breaker must have a breaking capacity of at least 22 kA, as stated in Section 1.2.1.4. It must be approved for use with the meter socket and compliant with the *Code*.

Ref.: Sections 3.1.2, 3.2, 3.2.2, 3.4.1, 3.4.4, 3.4.5, 3.4.8, 5.14.1 and 6.3.1 a)

Engineer's seal:



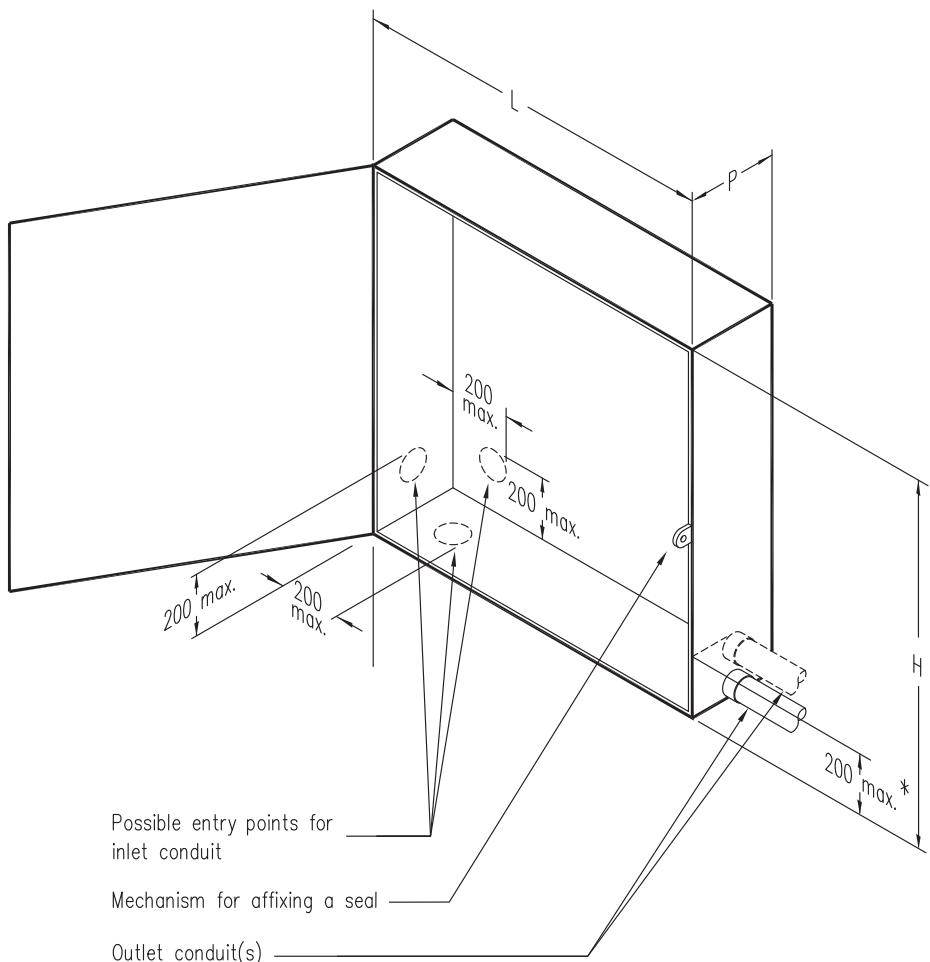
2015-07-16

CONNECTION TO OUTDOOR MULTIPLE-METER MOUNTING DEVICE

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10th edition

Figure
3.04



L, P and H: Dimensions according to Table 9

* This distance is 300 mm when the total rated ampacity of the metering equipment is 600 A or more.

Note: The connection point is in the junction box.

Ref.: Sections 0.3, 3.1.3, 3.2, 3.2.3 a), 3.5.2.2 a), 3.5.3, 3.5.6.2 and Table 9

Engineer's seal:

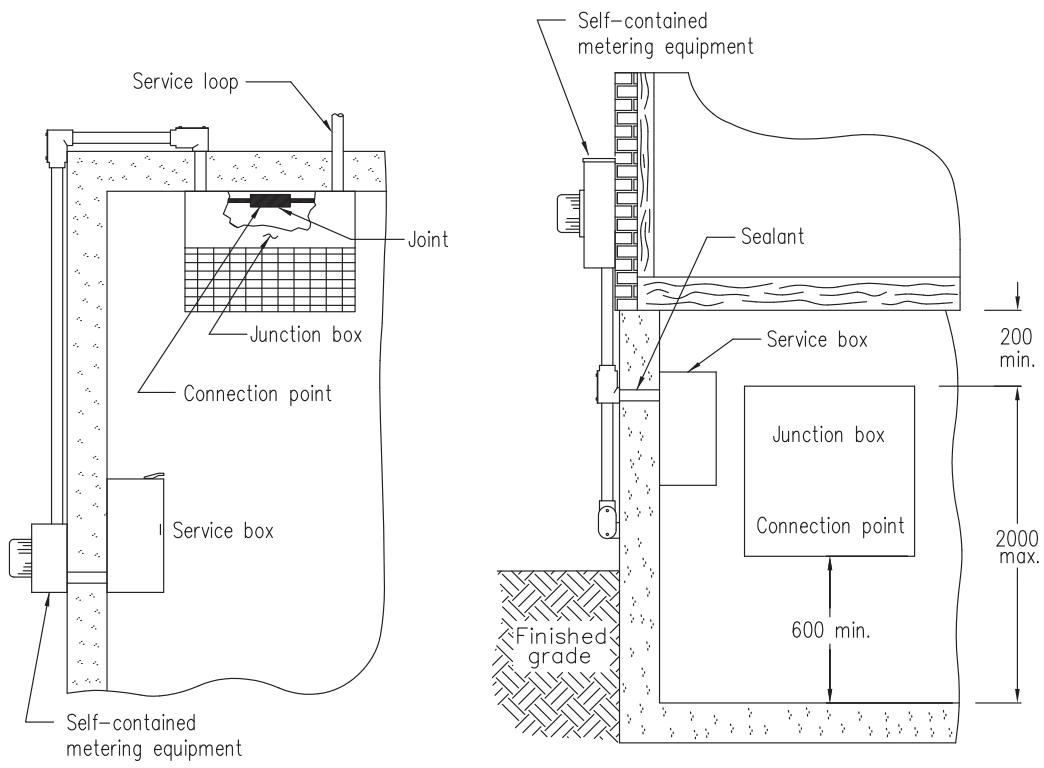


JUNCTION BOX

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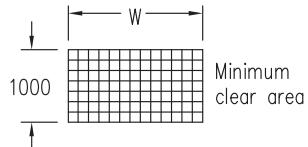
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Figure 3.05



Plan view

Elevation view



W: Width of junction box (Table 9)

Ref.: Sections 0.3, 3.1.3, 3.2, 3.2.3 a), 3.4.8, 3.5.2.2 a) and 3.5.5

Engineer's seal:



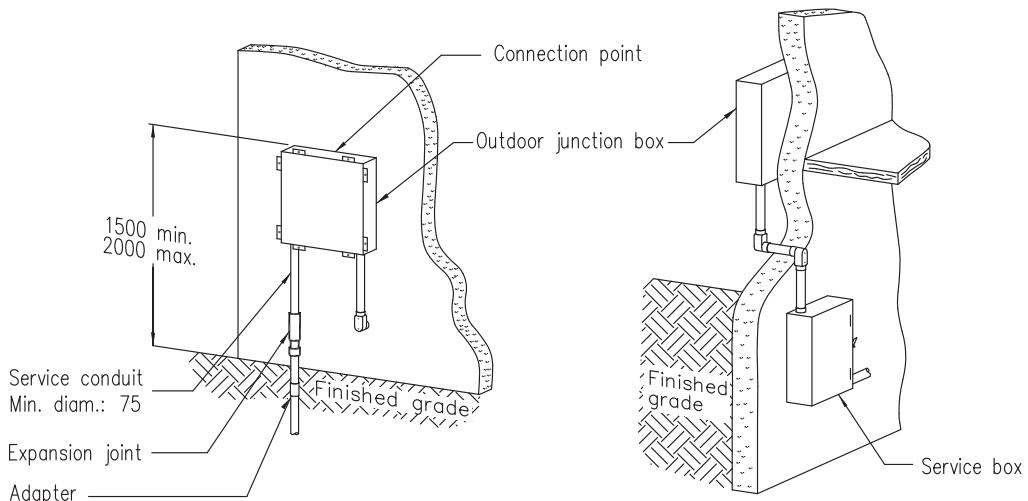
INDOOR JUNCTION BOX SUPPLYING OUTDOOR METERING EQUIPMENT

**Hydro
Québec**

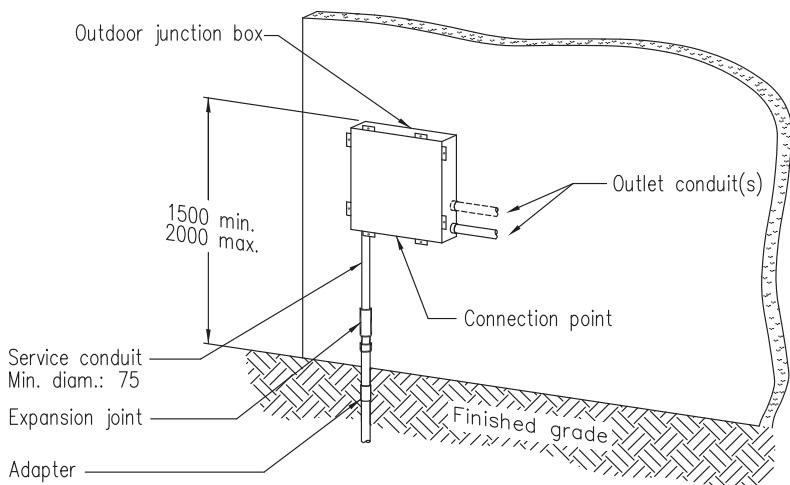
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Figure 3.06

A: Outdoor junction box for indoor metering equipment



B: Outdoor junction box for outdoor metering equipment



Ref.: Sections 0.3, 3.1.3, 3.2, 3.2.3 b), 3.4.1, 3.4.4, 3.4.5, 3.4.8, 3.5.2.2 b) and 3.5.6.2

Engineer's seal:

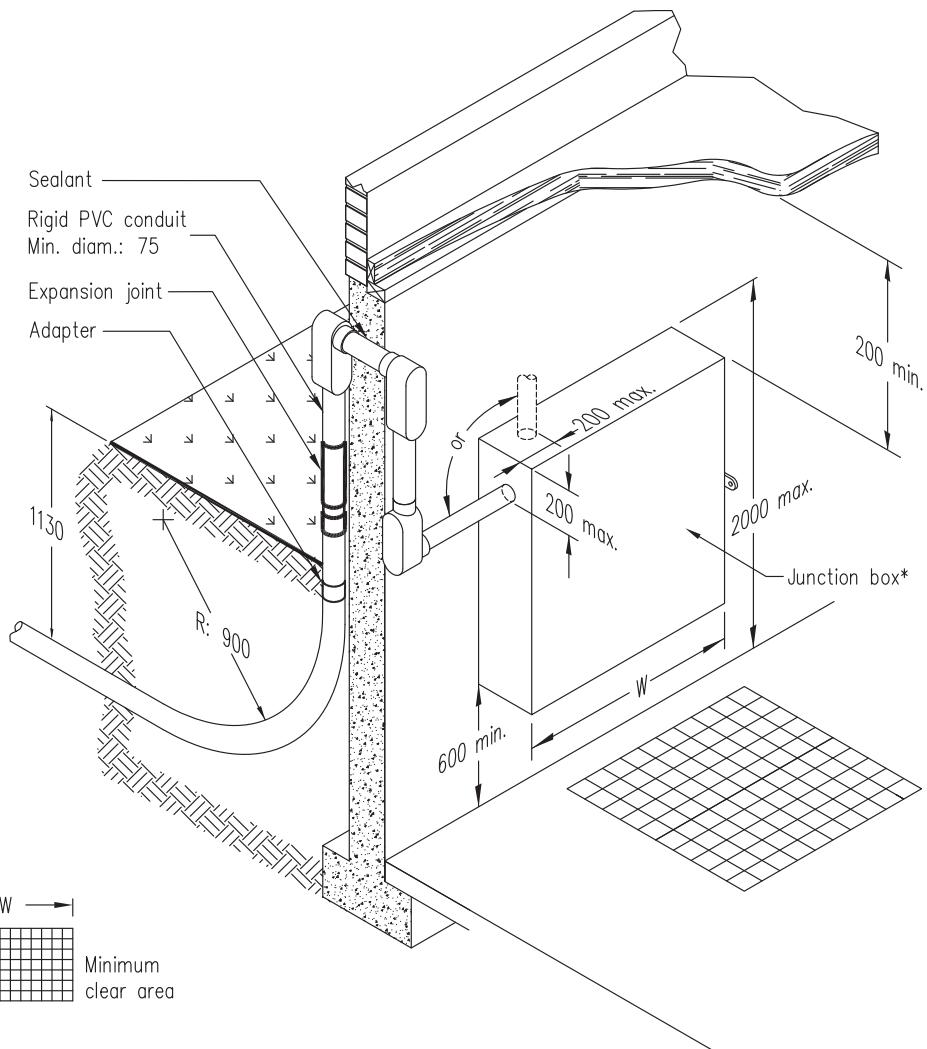


OUTDOOR JUNCTION BOX

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Figure 3.07



W: Width of junction box (Table 9)

* This may be a pullbox if the installation is rated 120/240 V, 200 A or less and has indoor self-contained metering equipment (Îles de la Madeleine).

Ref.: Sections 0.3, 3.4.1, 3.4.2.1, 3.4.4, 3.4.5, 3.4.8, 3.5.2.2 a), 3.5.5 and 3.5.6.2

Engineer's seal:

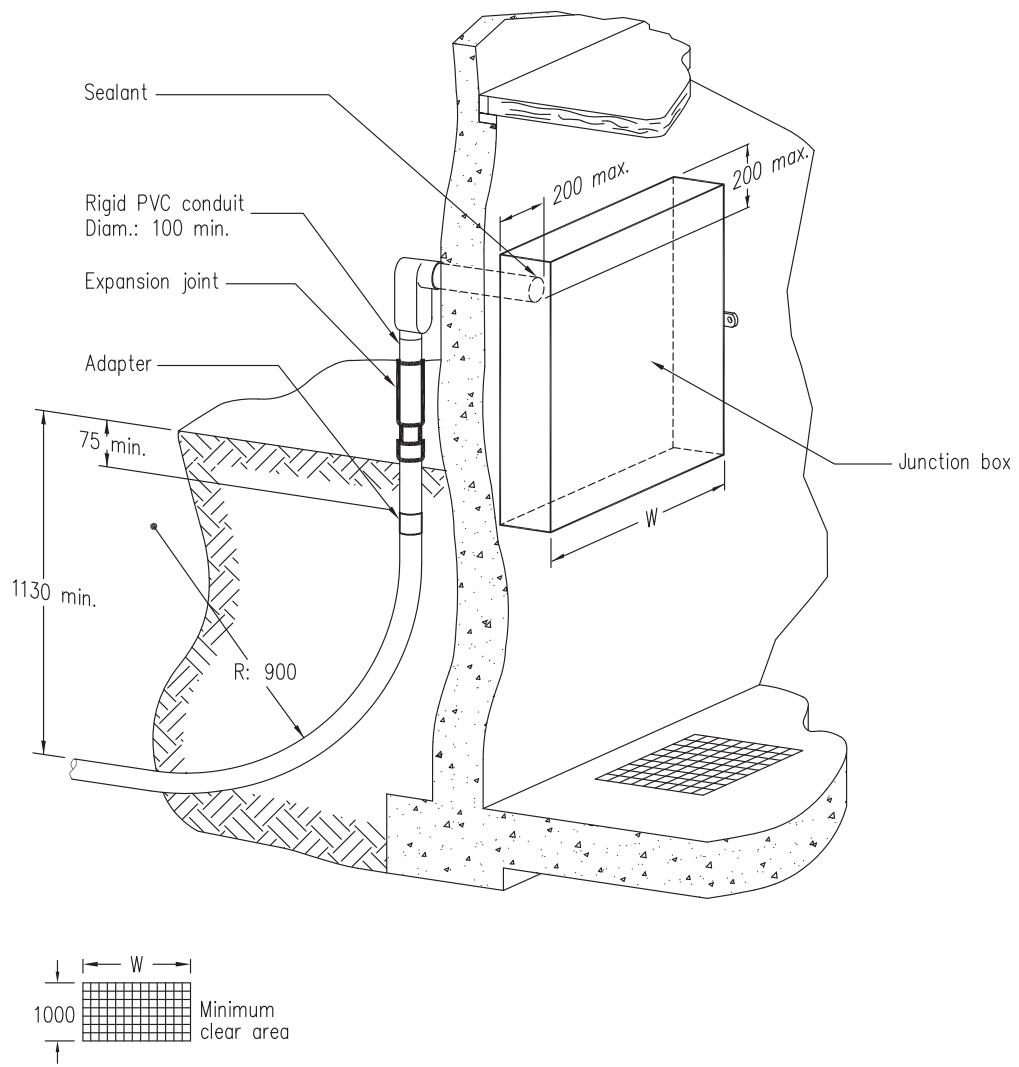


CONDUIT ENTERING BUILDING
ABOVE GRADE
TOTAL SERVICE BOX RATING
LESS THAN 600 A

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Figure 3.08



Ref.: Sections 0.3, 3.4.1, 3.4.2.1, 3.4.4, 3.4.5, 3.4.8, 3.5.2.2 a), 3.5.5 and 3.5.6.2

Engineer's seal:



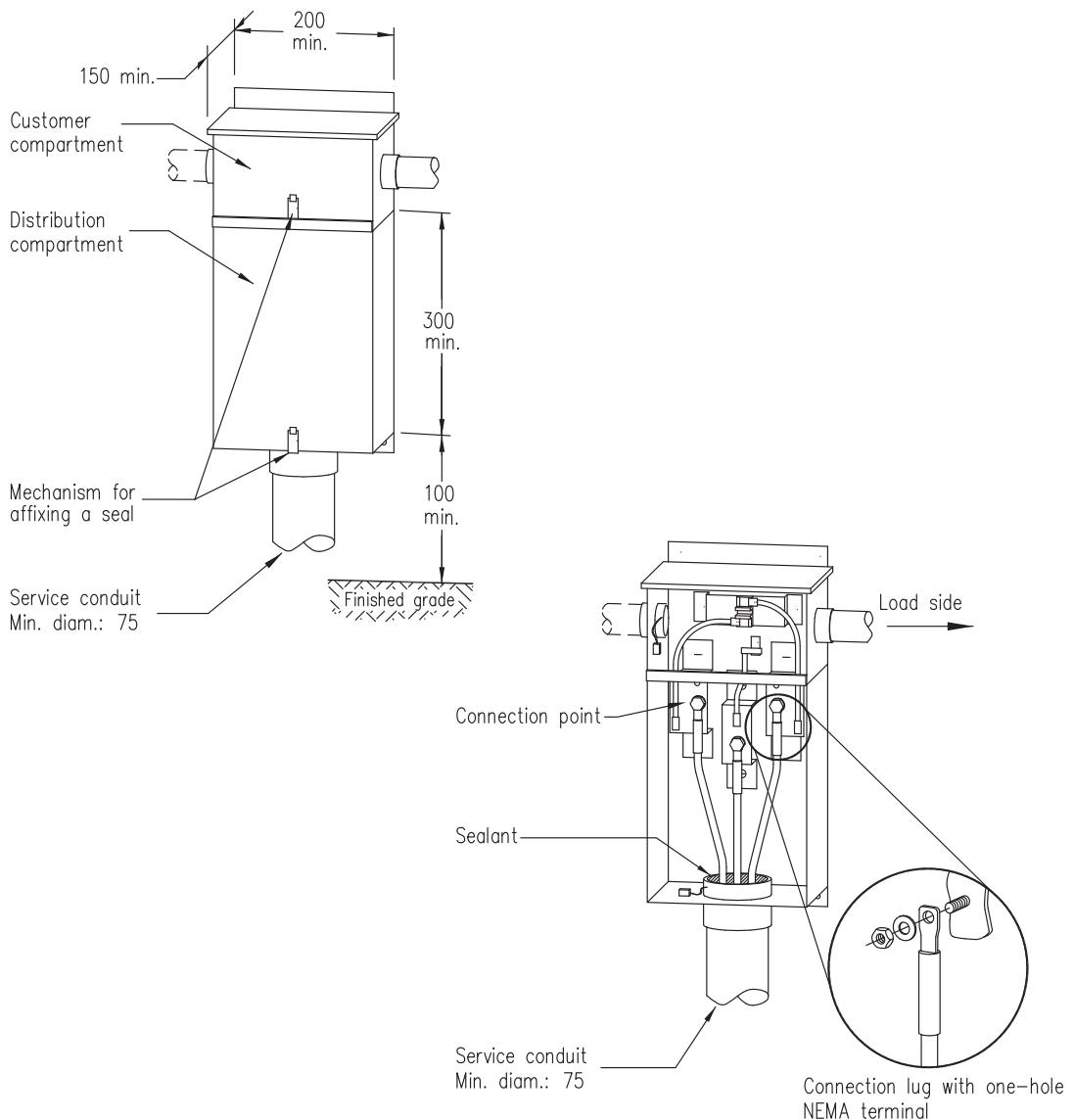
2015-09-10

CONDUIT ENTERING
BUILDING ABOVE GRADE
TOTAL SERVICE BOX RATING
600 A OR MORE

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Figure 3.09



Ref.: Sections 0.3, 3.1.4, 3.2, 3.2.4, 3.4.1, 3.4.8, 3.6.2 and 3.6.3

Engineer's seal:

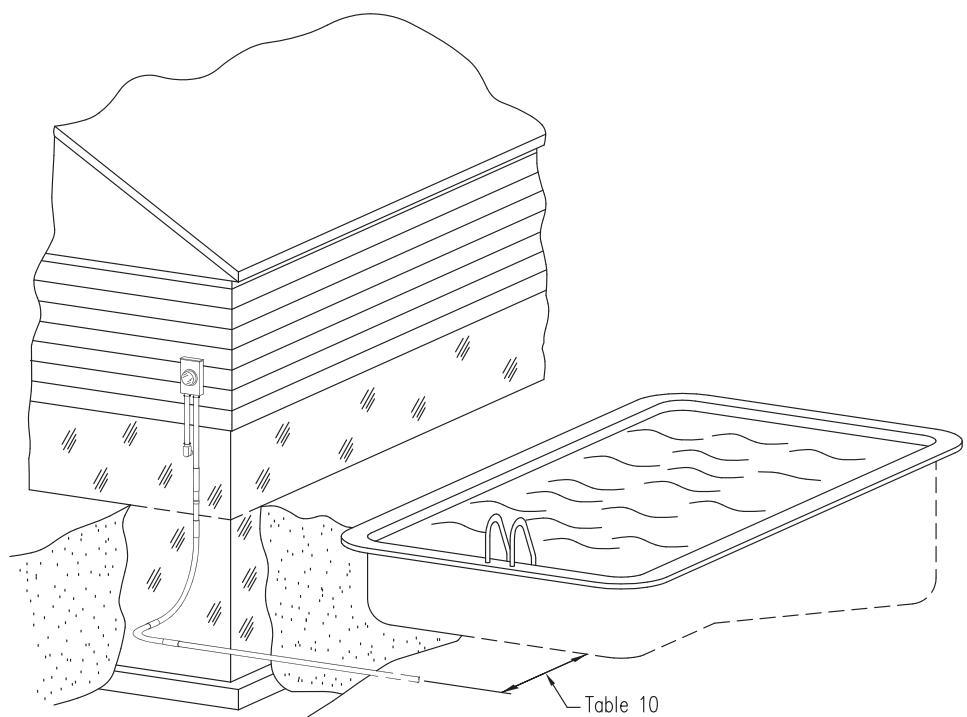


CONNECTION BOX FOR
FLAT-RATE SERVICE

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Figure
3.10



Ref.: Section 3.7.5 and Table 10

Engineer's seal:

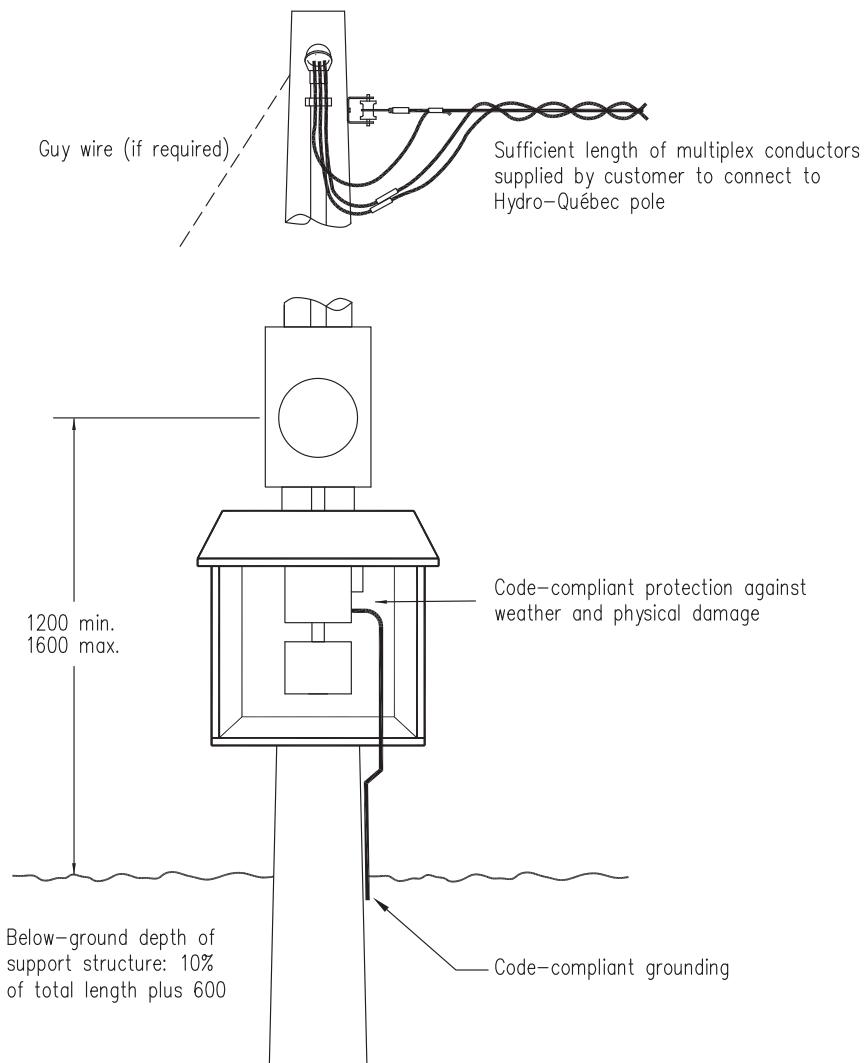


MINIMUM HORIZONTAL CLEARANCE
BETWEEN UNDERGROUND SERVICE
LOOP AND A POOL

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Figure 3.11



Ref.: Sections 4.3 b) and 6.3.1 a)

Engineer's seal:



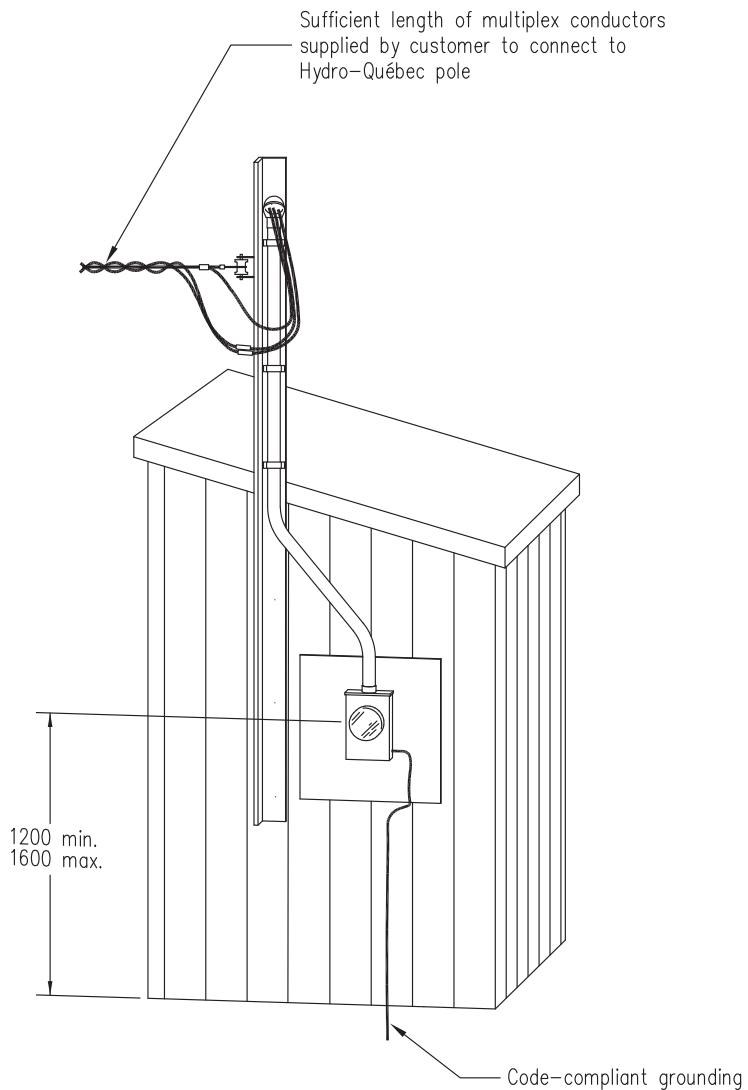
TEMPORARY OVERHEAD SERVICE ON A SUPPORT STRUCTURE

**Hydro
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Standard E.21-10,
10th edition

Figure

4.01



Ref.: Sections 4.3 b) and 6.3.1 a)

Engineer's seal:

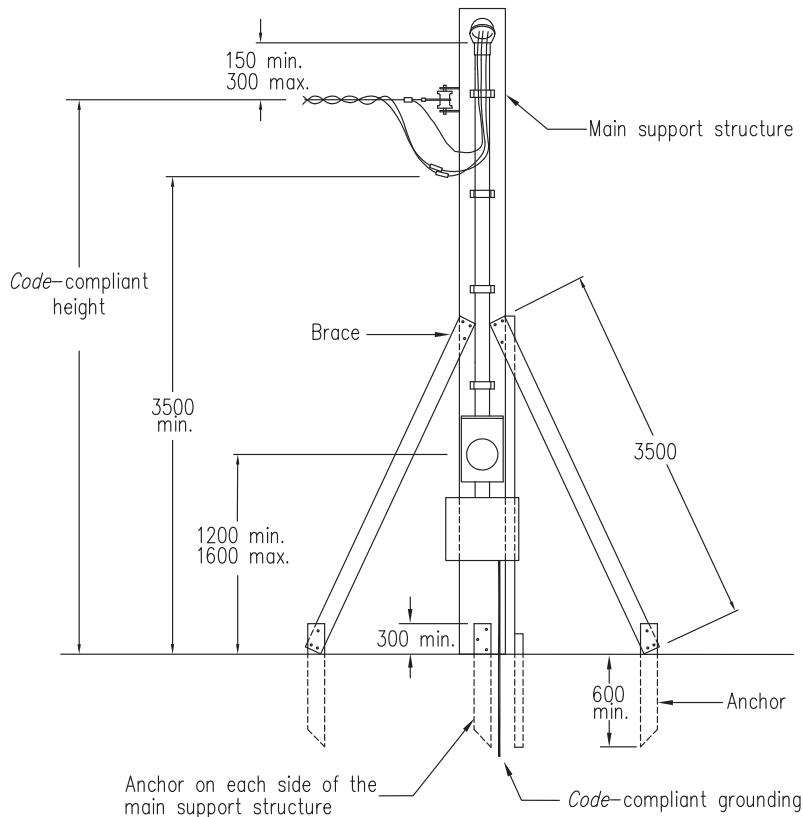


TEMPORARY OVERHEAD SERVICE
ON AN ANGLE IRON MAST

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Standard
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Figure
4.02



Notes:

- The main support structure must consist of at least two 50-mm (2 in.) x 150-mm (6 in.) planks nailed together along their entire length.
- At least three 50-mm (2 in.) X 100-mm (4 in.) braces must be attached to the main support structure and to the anchors by two 10-mm (3/8 in.) bolts or three nails at least 75 mm (3 in.) long.
- At least one brace must be parallel to the service entrance conductors.
- The anchors must be of 50-mm (2 in.) X 50-mm (2 in.) stud wood.
- All wood must be in good condition, solid (not jointed) and free of rot.
- The service head must not be higher than the main support structure.
- Code requirements apply.
- Any other arrangement must be approved by a competent authority.

Ref.: Sections 4.3 b) and 6.3.1 a)

Engineer's seal:



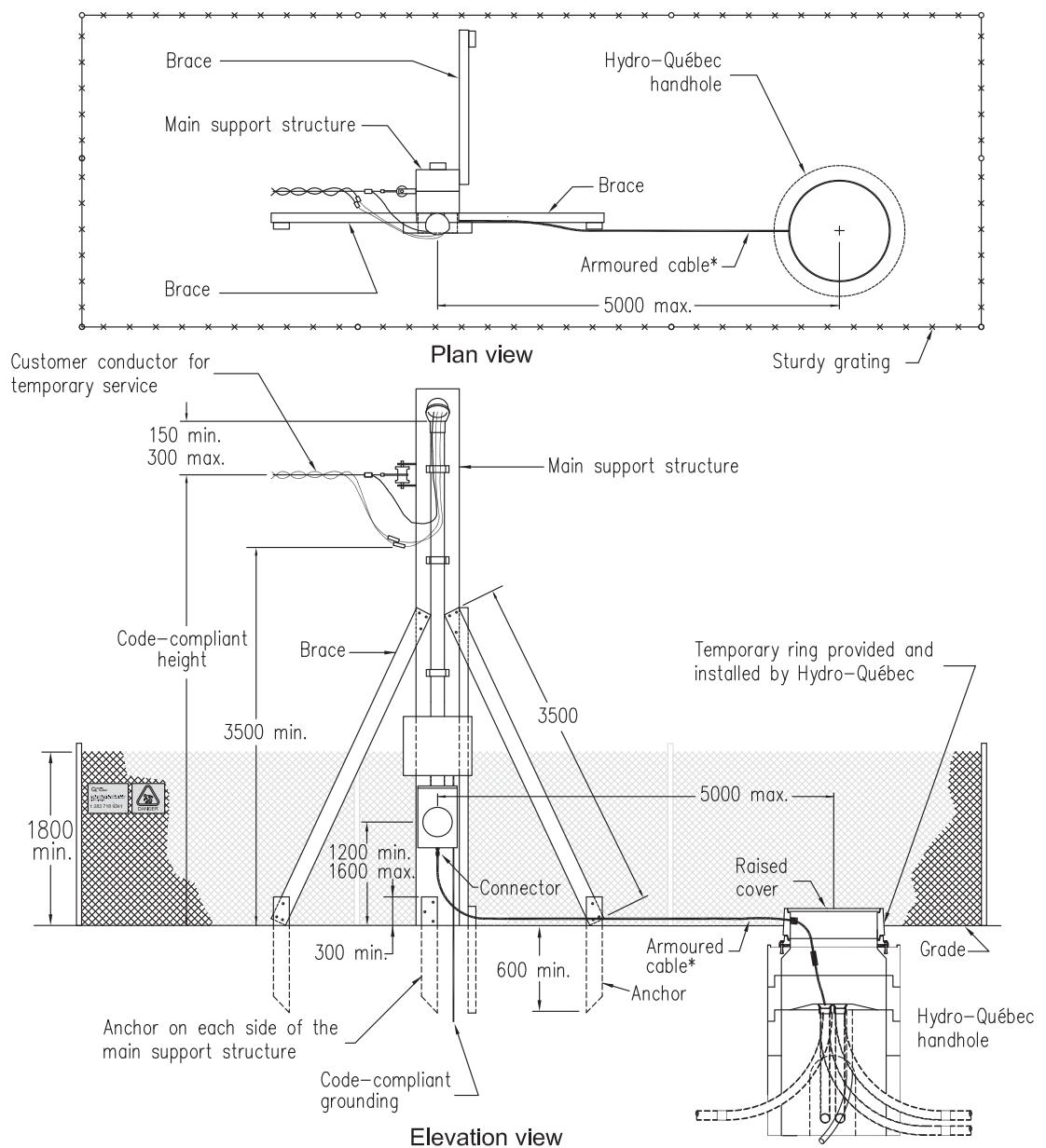
2015-09-10

TEMPORARY OVERHEAD SERVICE ON A SUPPORT STRUCTURE

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Figure
4.03



Notes: – The service head, support structure, braces and anchors must be in compliance with Figure 4.03 and the *Code*.
– Armoured cable must be type TECK90 or ACWU90.

Ref.: Sections 4.4 and 6.3.1 a)

Engineer's seal:

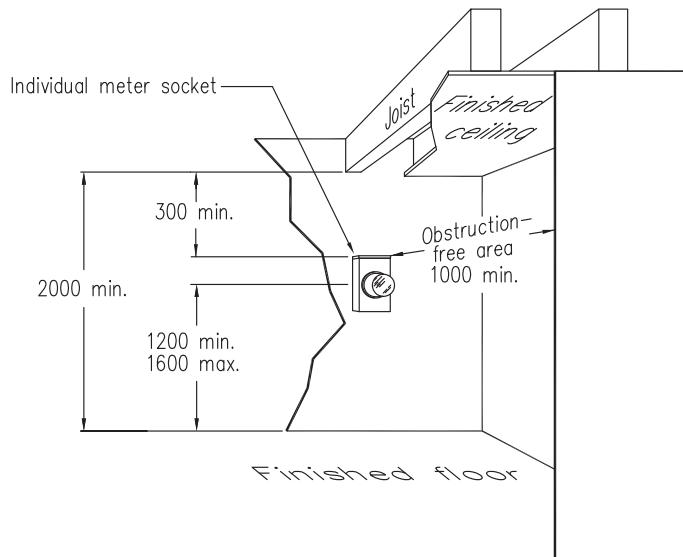


TEMPORARY UNDERGROUND SERVICE ON A SUPPORT STRUCTURE (ACCEPTABLE ARRANGEMENT)

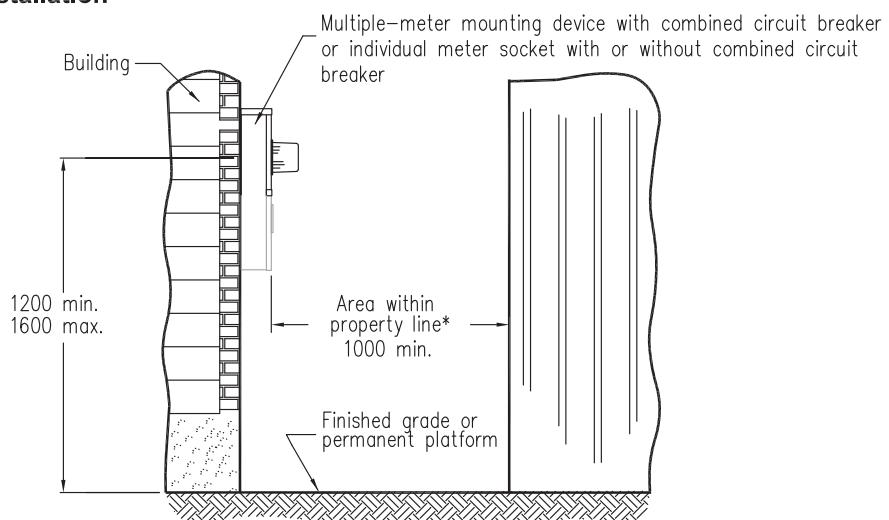
**Hydro
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Standard	E.21-10, 10th edition
Figure	4.04

A: Indoor installation



B: Outdoor installation



* This area must be clear of obstructions.

Ref.: Sections 5.7.1 and paragraphs 6.3.1 a) and b)

Engineer's seal:



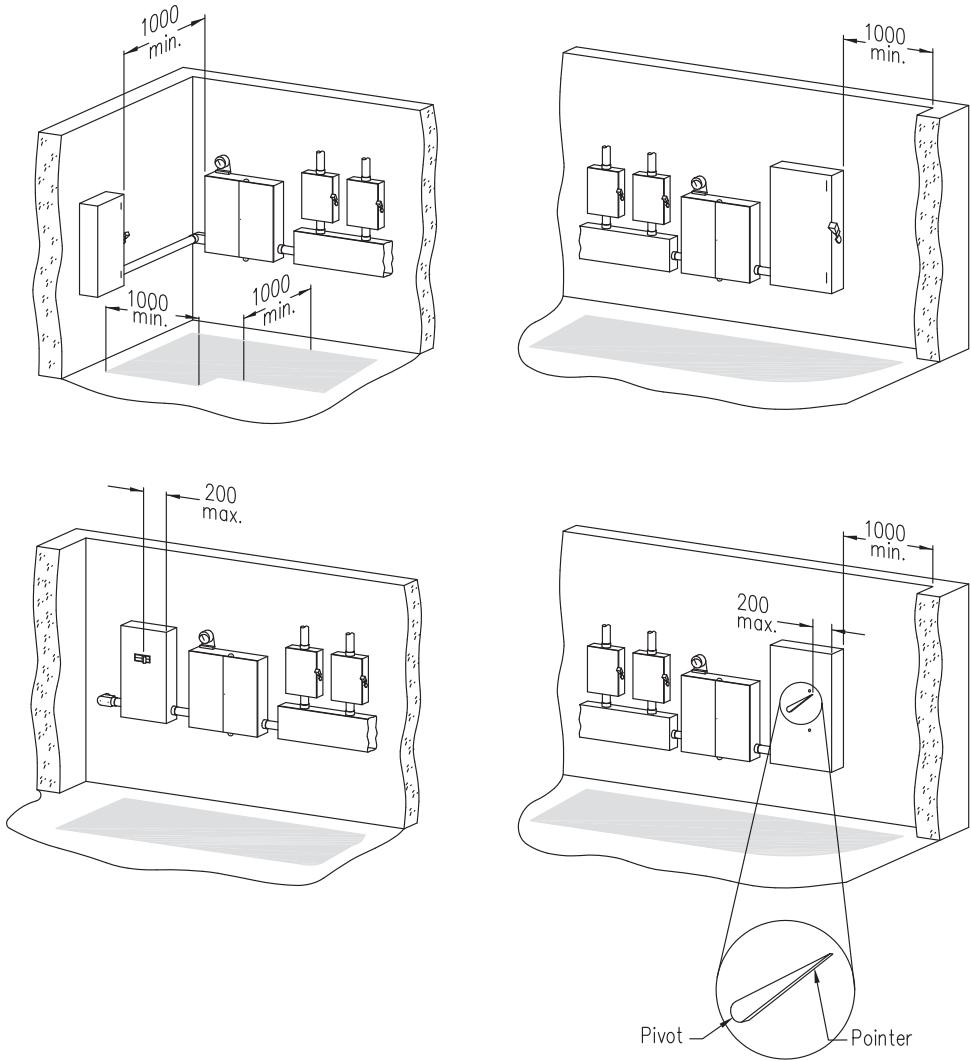
SERVICE ENTRANCE EQUIPMENT CLEARANCES

Hydro Québec

Standard E.21-10,
10th edition

Figure

5.01



1000
Minimum clearance

Ref.: Sections 5.7.1 and 5.7.2

Engineer's seal:

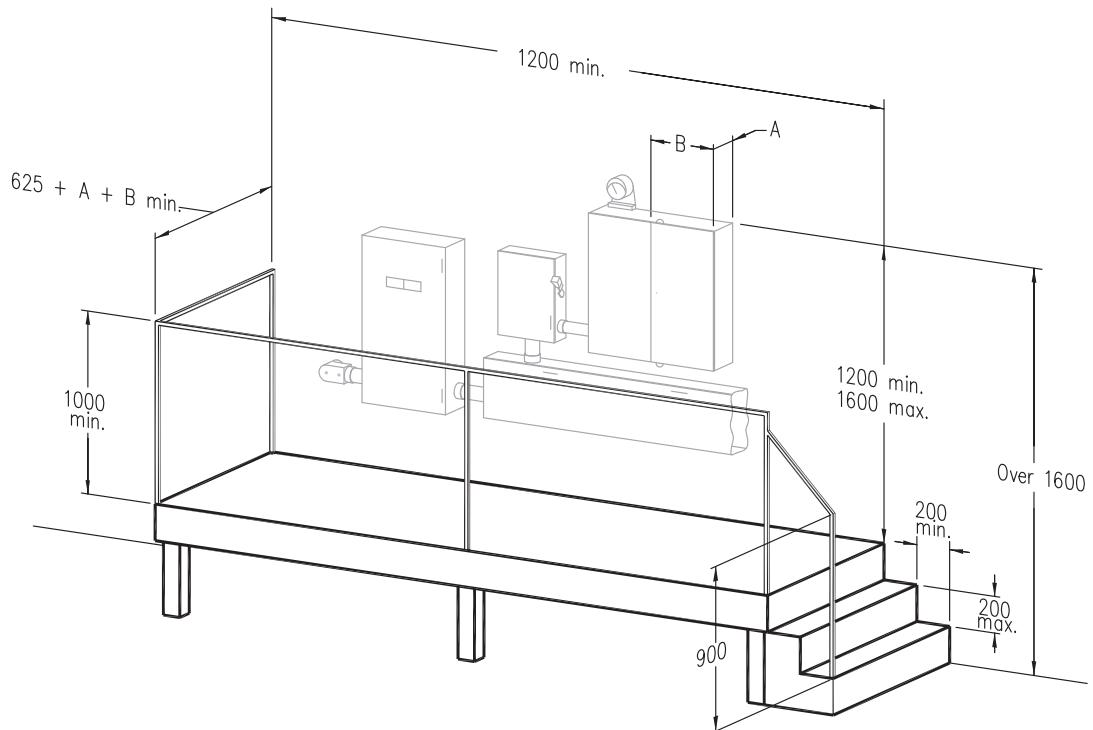


SERVICE ENTRANCE EQUIPMENT CLEARANCES

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Standard E.21-10,
 10th edition

Figure 5.02



Note: Steps, handrail and guardrail are required if the platform is 600 mm or more above finished floor/grade.

Ref.: Section 5.11



PERMANENT PLATFORM AND FIXTURES

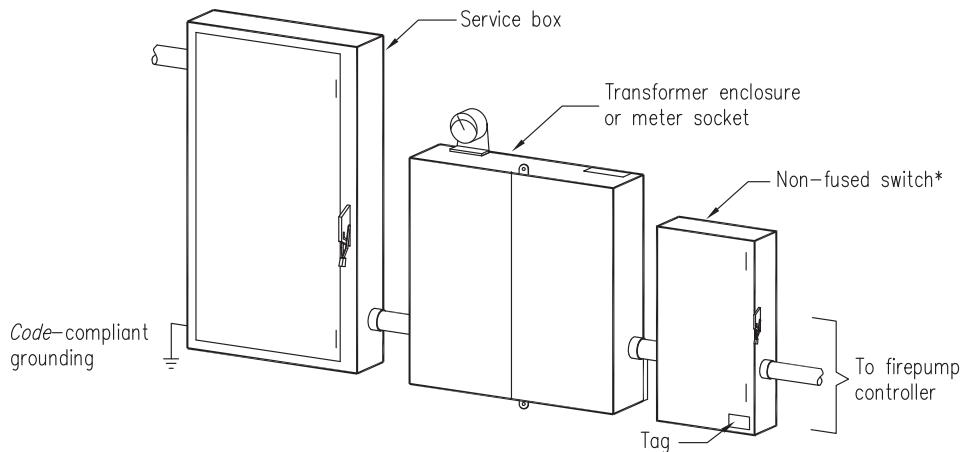
Standard E.21-10,
10th edition

Figure 5.03

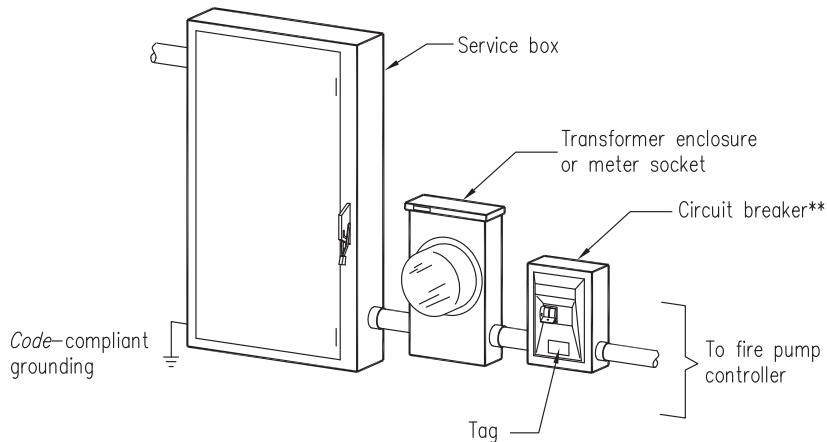
Figure

5.03

A: Non-fused switch



B: Circuit breaker



* The switch must not have overcurrent protection and must be lockable in OFF position. In addition, a signal must be sent to the fire alarm system when the switch is in OFF position.

** The circuit breaker must be lockable in ON position.

Ref.: Section 5.13

Engineer's seal:



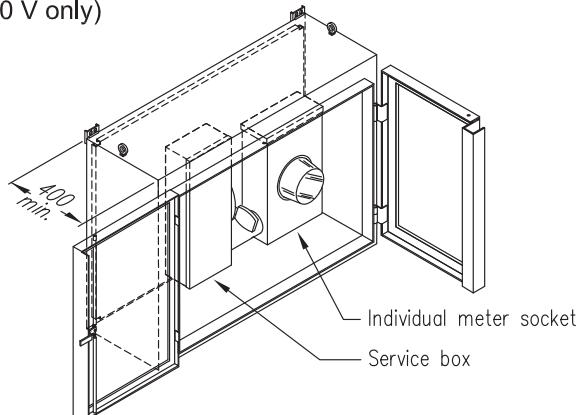
FIRE PUMP PROTECTION

**Hydro
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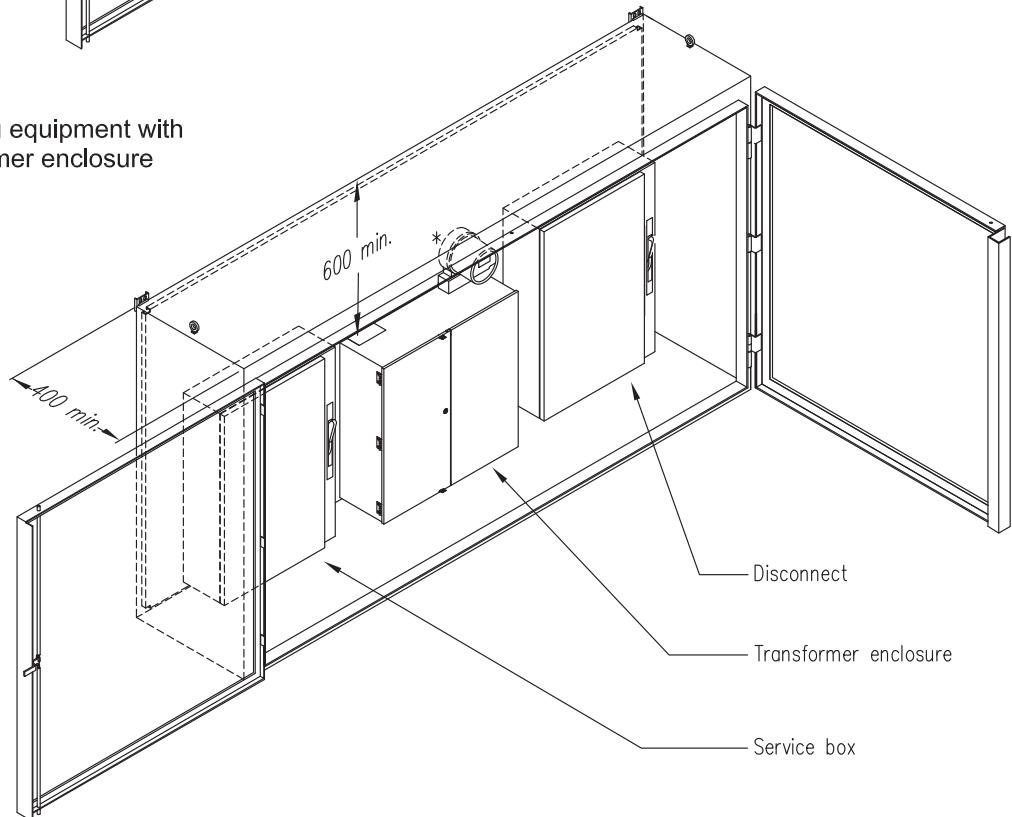
Standard E.21-10,
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Figure 5.04

**Self-contained metering
(347/600 V only)**



**Metering equipment with
transformer enclosure**



* A meter support must not be used with this type of installation.

Ref.: Section 5.8.2

Engineer's seal:



2015-09-21

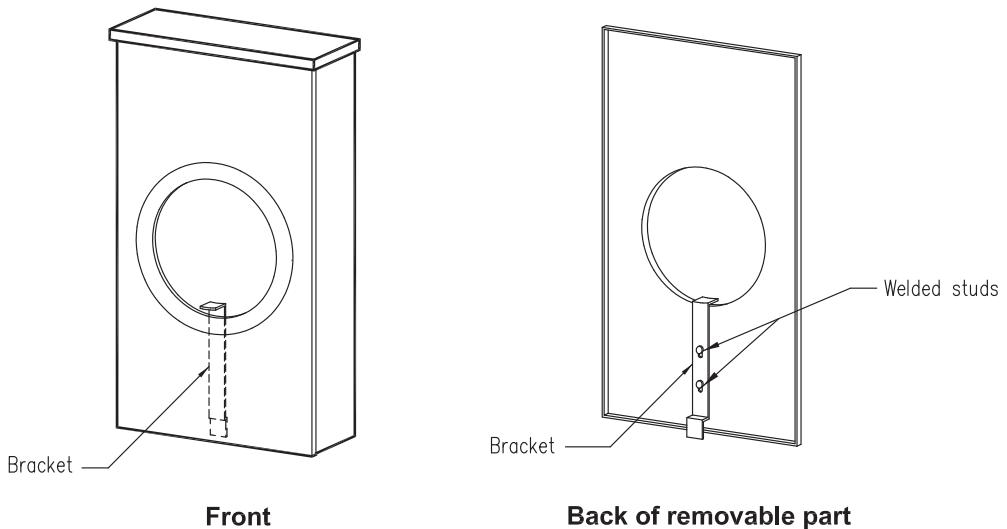
**ENCLOSURE FOR METERING
EQUIPMENT INSTALLED OUTSIDE**

**Hydro
Québec**

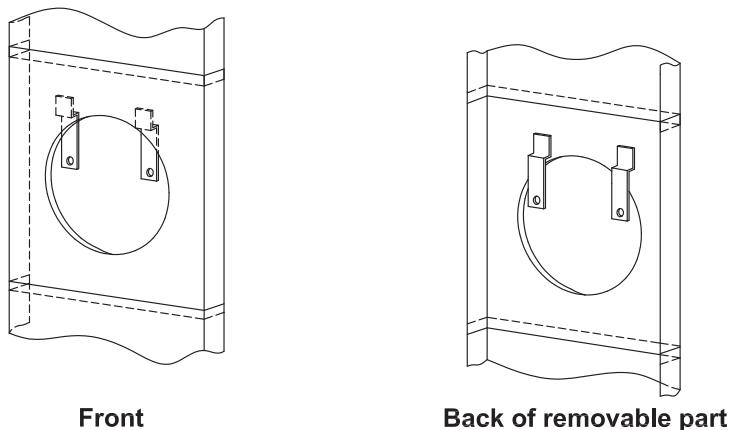
Standard
E.21-10,
10th edition

Figure
5.05

A: Example 1



B: Example 2



Ref.: Section 6.2 i)

Engineer's seal:

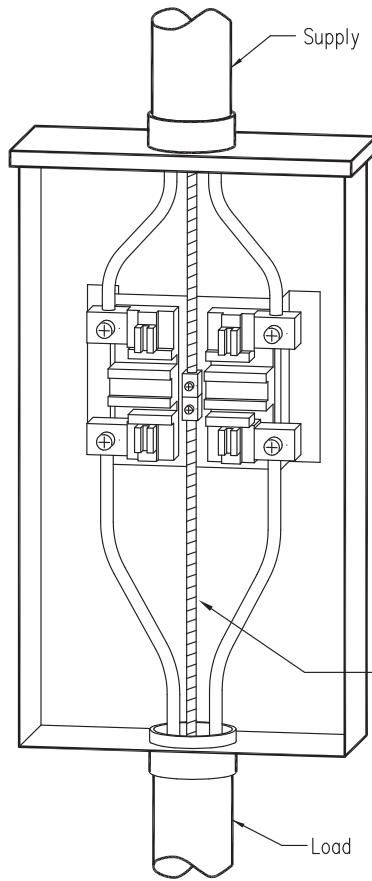


REMOVABLE PART OF
METER SOCKET COVER

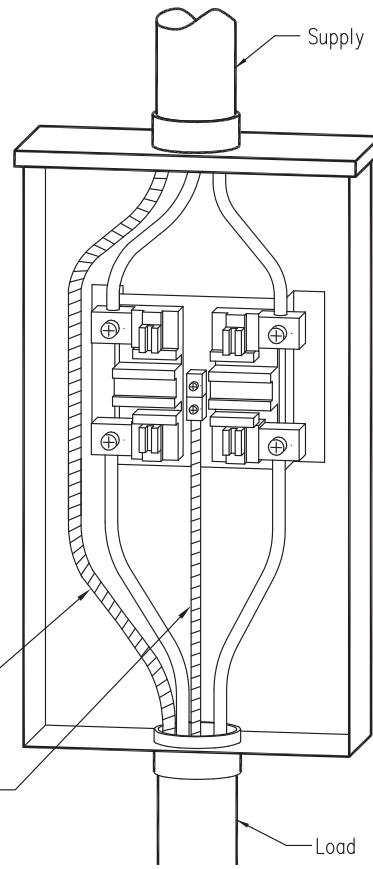
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 10th edition

Figure 6.01



In non-saline environments



In saline environments

Notes: – For PVC conduits, bond to ground as specified in the *Code*.
 – Conduit connection to meter socket may be different from illustrations.

Ref.: Sections 6.1, 6.2 a), b), j) and 6.4.2.1

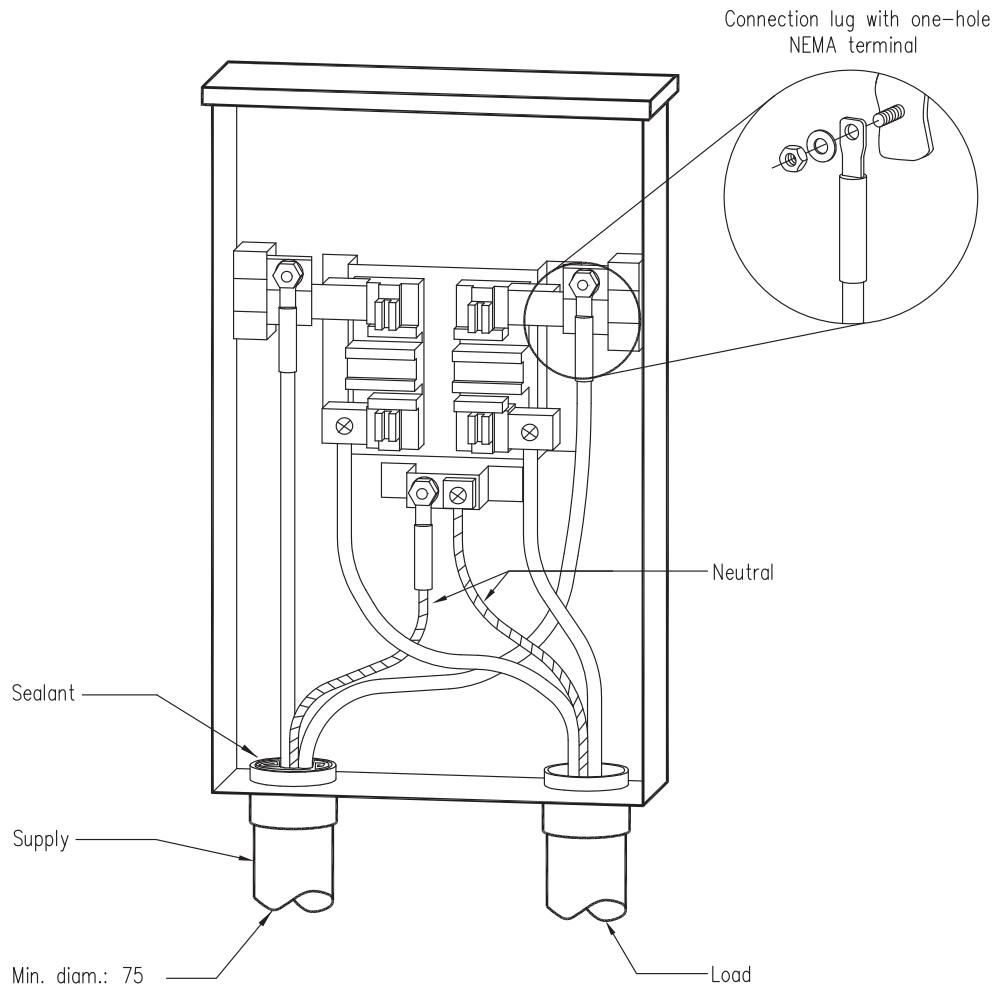
Engineer's seal:



120/240-V INDIVIDUAL METER SOCKET
 ON SUPPLY SIDE OF SERVICE BOX
 (OVERHEAD SERVICE)

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Standard	E.21-10, 10th edition
Figure	6.02



Notes: – For PVC conduits, bond to ground as specified in the *Code*.
 – Conduit connection to meter socket may be different from illustrations.

Ref.: Sections 6.1 and 6.2 a), b), c), j)

Engineer's seal:

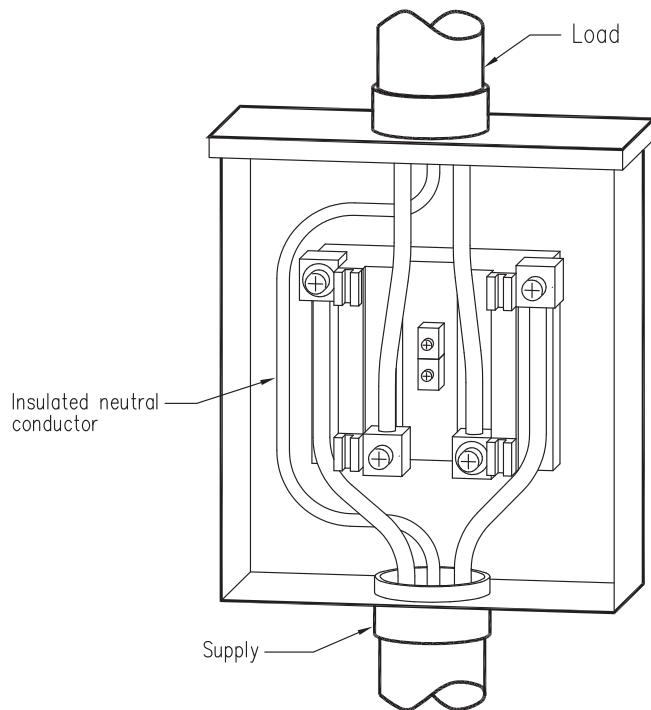
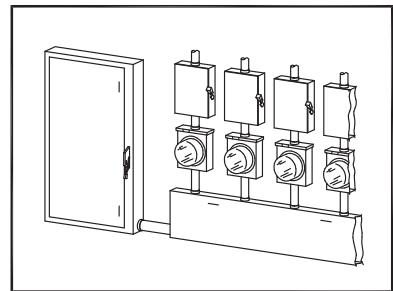


OUTDOOR 120/240-V
 INDIVIDUAL METER SOCKET
 (UNDERGROUND SERVICE)

**Hydro
 Québec**

Standard E.21-10,
 10th edition

Figure 6.03



Notes: – For PVC conduits, bond to ground as specified in the *Code*.
 – Conduit connection to meter socket may be different from illustration.

Ref.: Sections 6.1, 6.2 a), j) and 6.4.2.2

Engineer's seal:

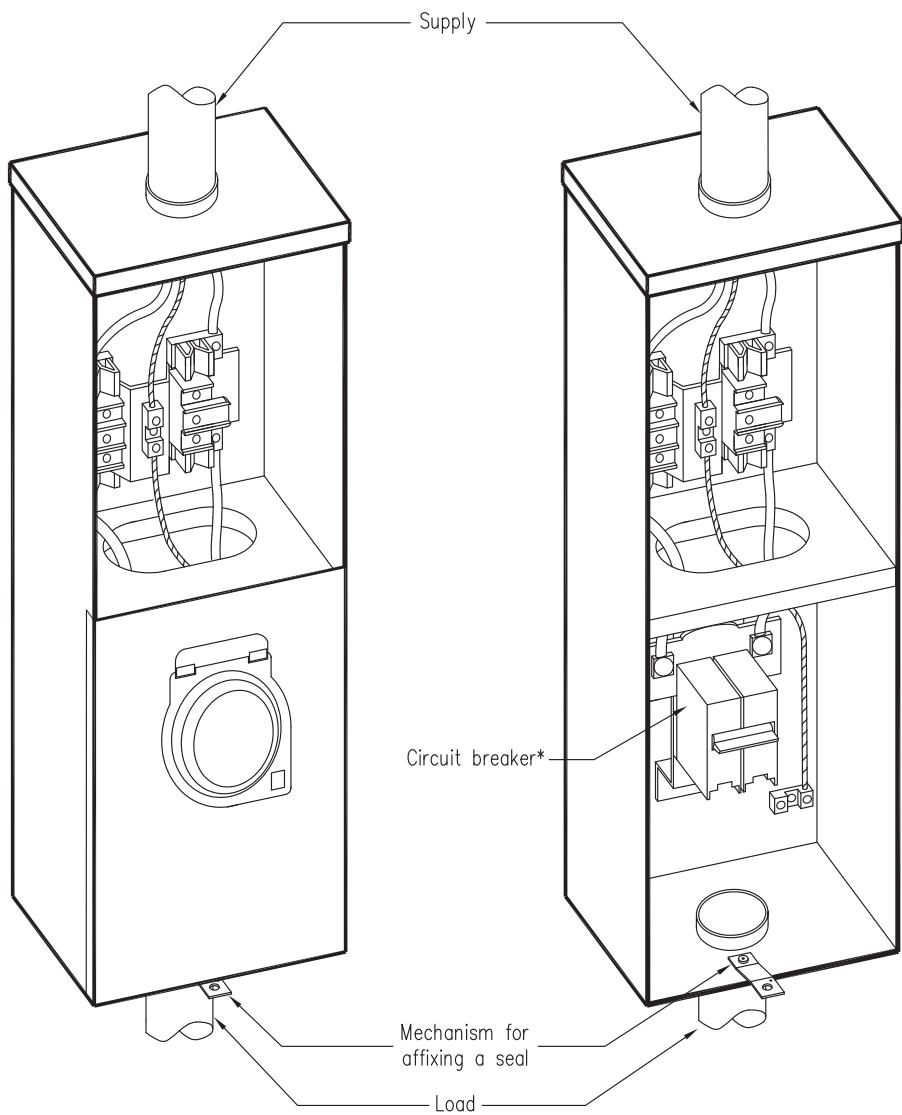


120/240-V INDIVIDUAL METER SOCKET
ON LOAD SIDE OF SERVICE BOX

**Hydro
Québec**

Standard
E.21-10,
10th edition

Figure
6.04



* The circuit breaker must have a breaking capacity of at least 22 kA, as stated in Section 1.2.1.4. It must be approved for use with the meter socket and compliant with the *Code*.

Notes: – For PVC conduits, bond to ground as specified in the *Code*.
 – Conduit connection to meter socket may be different from illustration.

Ref.: Sections 6.1 and 6.2 a), b), i) and j)

Engineer's seal:

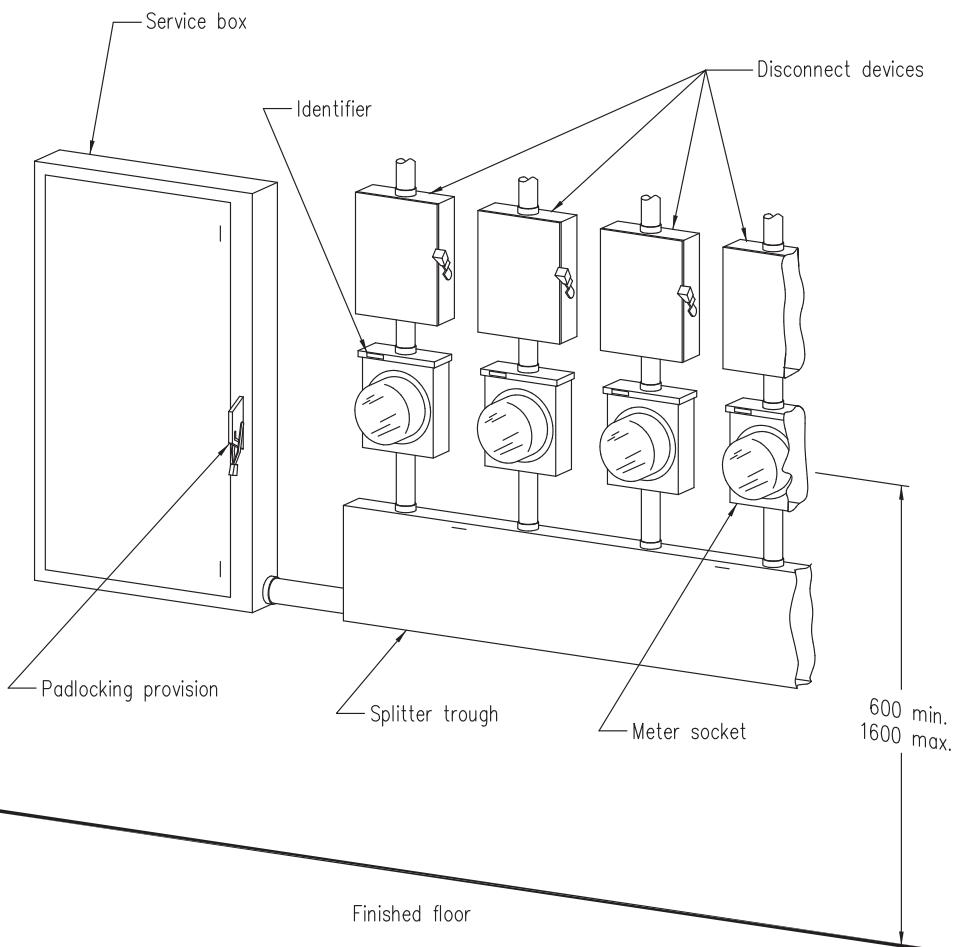


120/240-V INDIVIDUAL METER SOCKET
WITH COMBINED CIRCUIT BREAKER

**Hydro
Québec**

Standard E.21-10,
 10th edition

Figure 6.05



Ref.: Sections 5.14.1, 6.3.1 b) and 6.4.3

Engineer's seal:

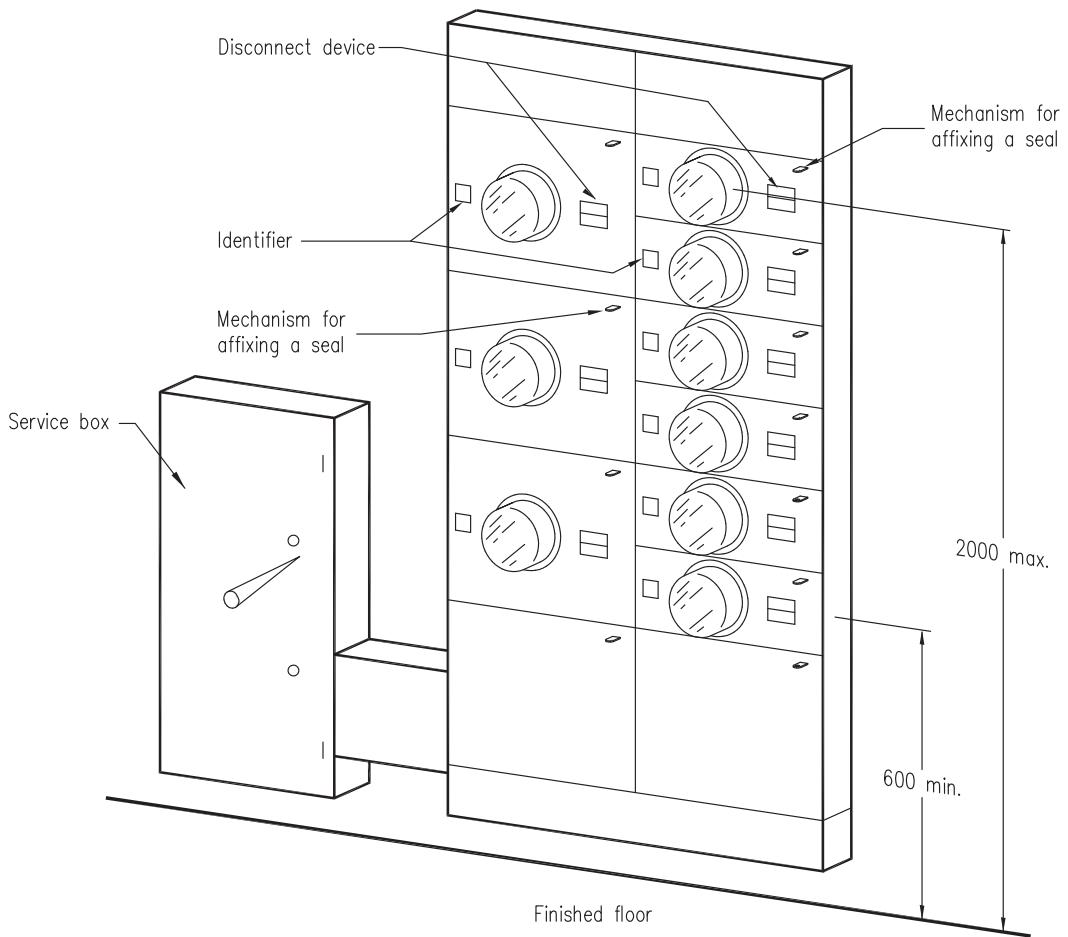


GROUPED SUPPLY FOR INDOOR
120/240-V INSTALLATION WITH
SPLITTER TROUGH

**Hydro
Québec**

Standard
E.21-10,
10th edition

Figure
6.06



Ref.: Sections 5.14.1, 6.3.1 c) and 6.4.4

Engineer's seal:

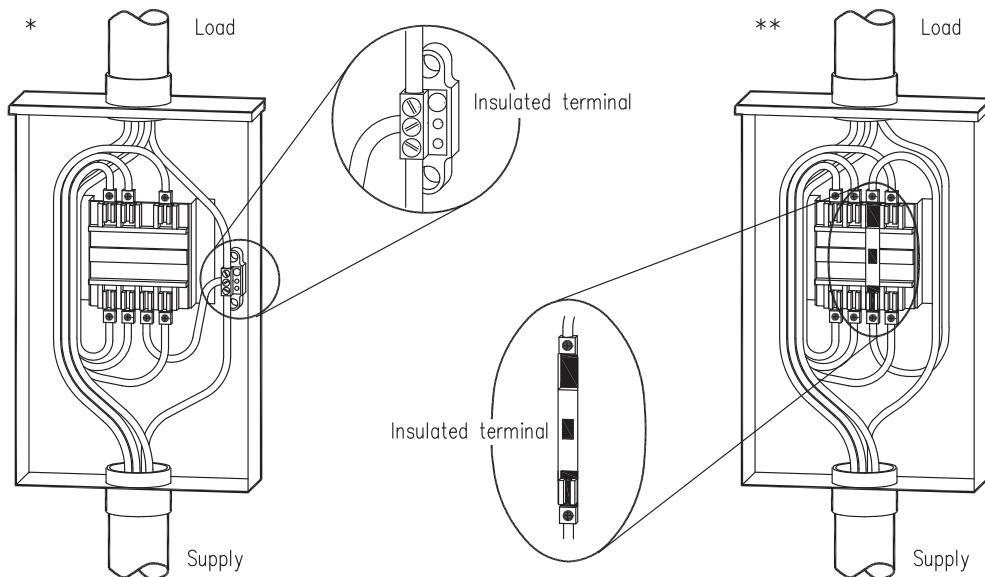
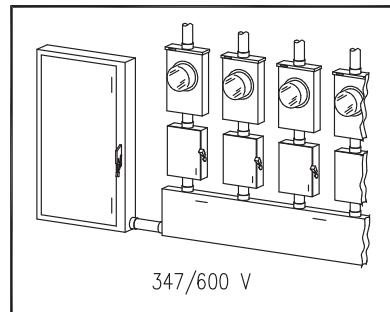
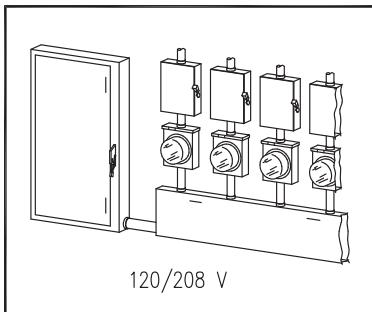


**GROUPED SUPPLY FOR INDOOR
120/240-V INSTALLATION WITH
METERING CENTRE**

**Hydro
Québec**

Standard E.21-10,
 10th edition

Figure 6.07



* The neutral must be connected to the insulated terminal, and an insulated neutral conductor must run from jaw seven to the insulated terminal.

** The neutral must be connected to the insulated terminal coupled to jaw seven.

Notes: – For PVC conduits, bond to ground as specified in the *Code*.
– Conduit connection to individual meter socket may be different from illustration.

Ref.: Sections 6.2 a), j) and 6.6.2

Engineer's seal:

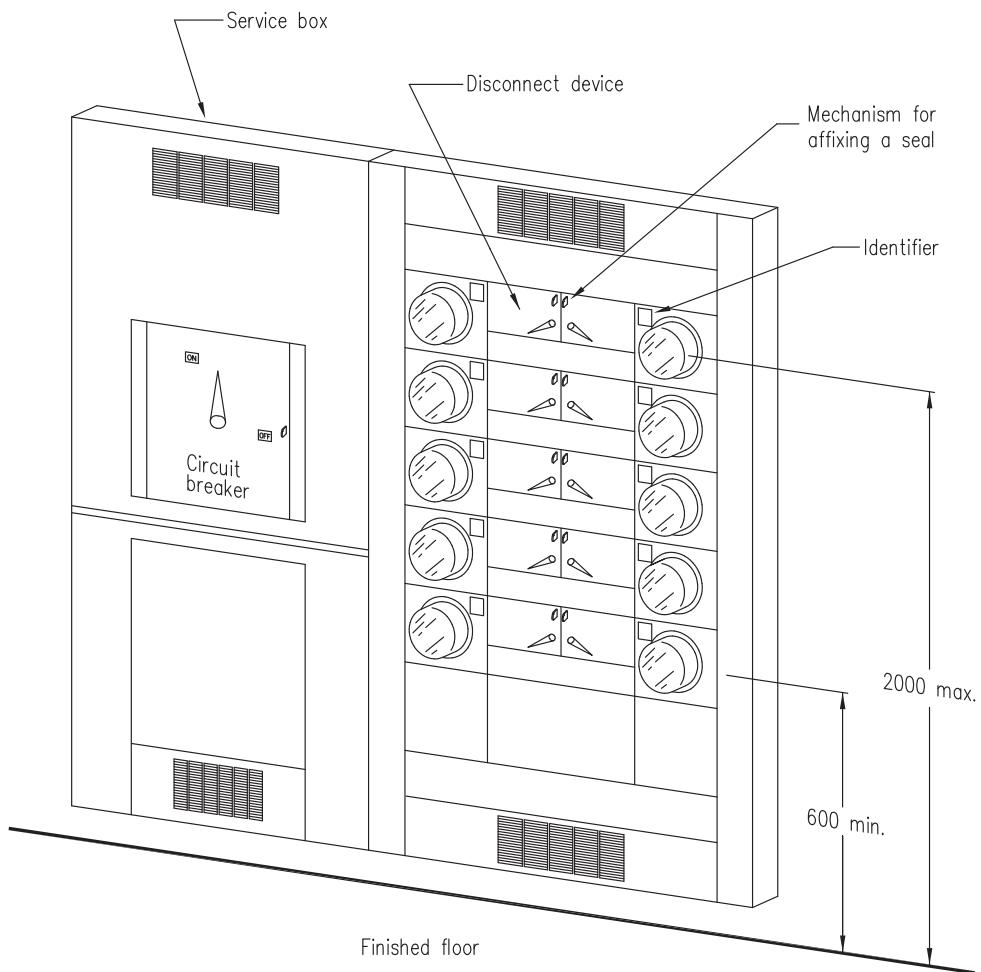


INDOOR 347/600-V OR 120/208-V INDIVIDUAL METER SOCKET

**Hydro
Québec**

Standard
E.21-10,
10th edition

Figure
6.08



Ref.: Sections 5.14.1, 6.3.1 c) and 6.6.3

Engineer's seal:

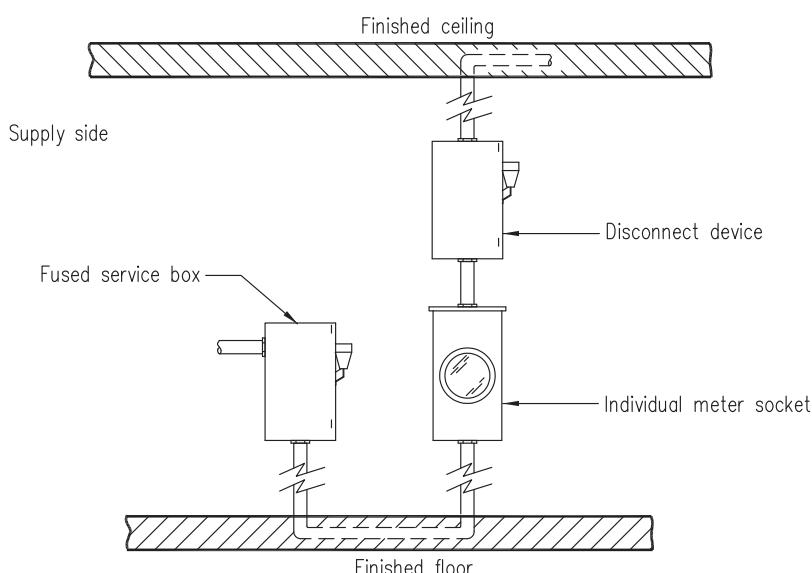
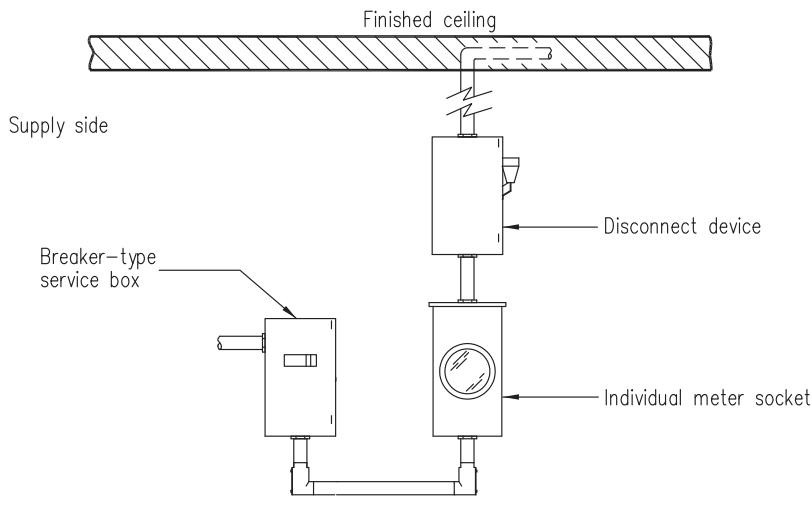


GROUPED SUPPLY FOR INDOOR
347/600-V INSTALLATION WITH
METERING CENTRE

**Hydro
Québec**

Standard E.21-10,
 10th edition

Figure 6.09



Ref.: Sections 5.16 and 6.7

Engineer's seal:

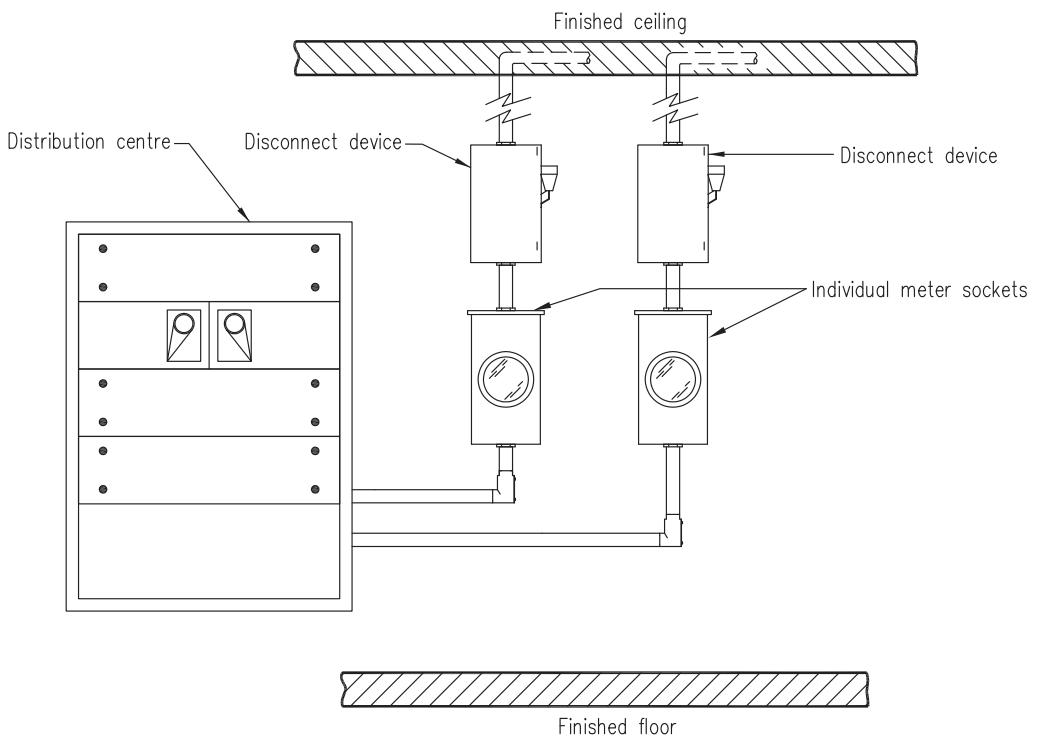


LOCKOUT AND ZERO-VOLTAGE TESTING MECHANISMS

**Hydro
Québec**

Standard
E.21-10,
10th edition

Figure
6.10



Ref.: Sections 5.16 and 6.7

Engineer's seal:

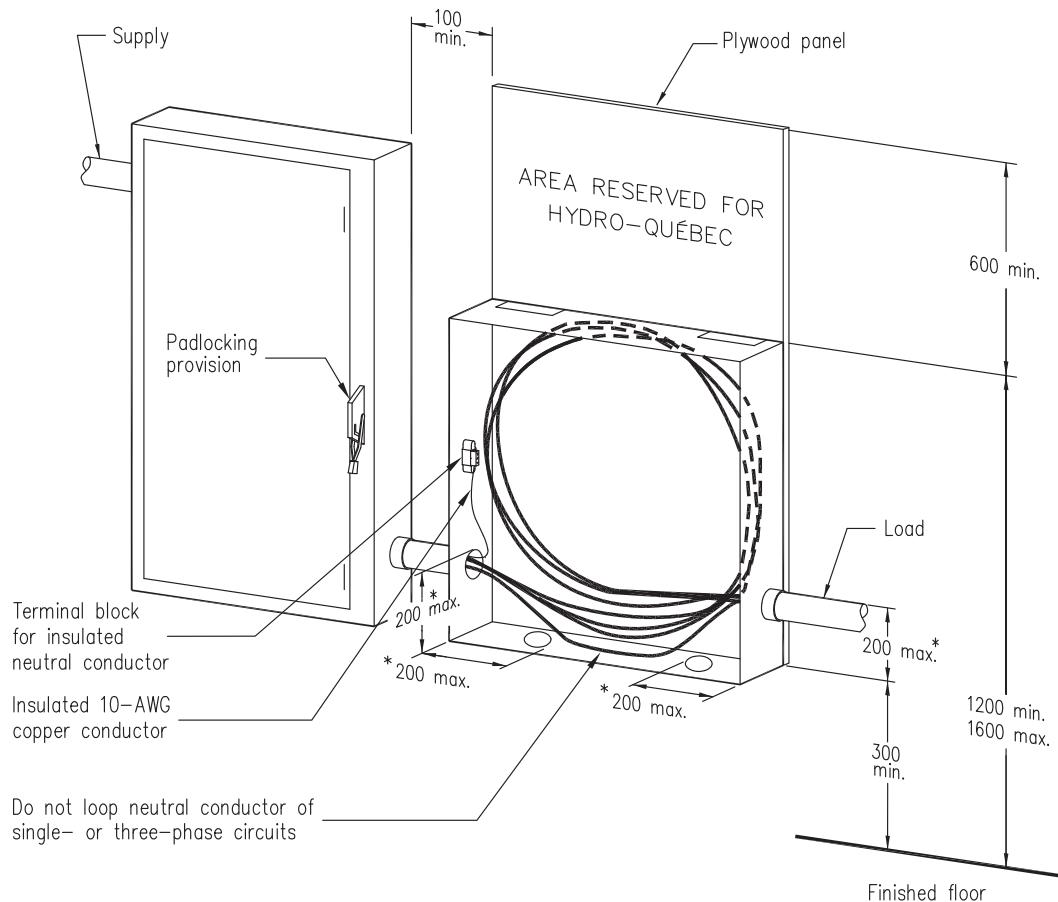


LOCKOUT AND ZERO-VOLTAGE TESTING MECHANISMS

**Hydro
Québec**

Standard E.21-10,
 10th edition

Figure 6.11



* This distance is 300 mm if the main switch is 600 A or higher.

Ref.: Sections 7.1, 7.2.3, 7.2.4, 7.3 and 7.4

Engineer's seal:

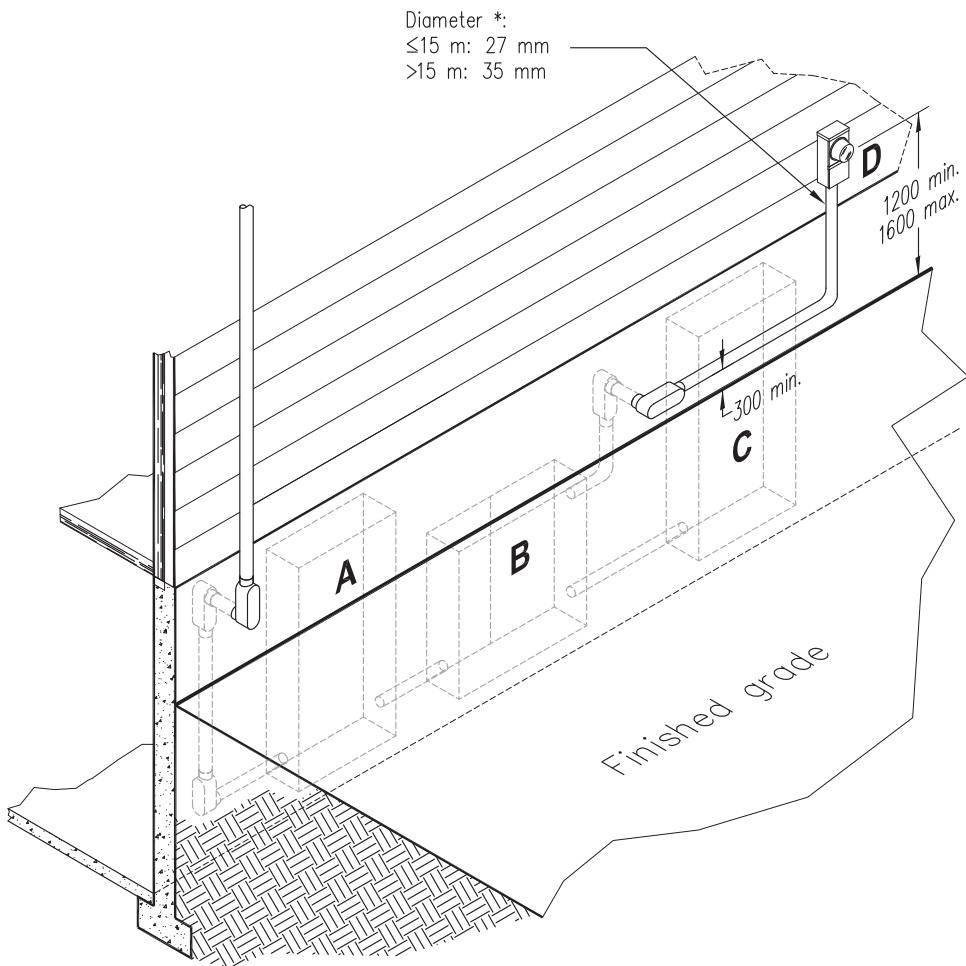


ARRANGEMENT OF CONDUCTORS
IN TRANSFORMER ENCLOSURE

**Hydro
Québec**

Standard
E.21-10,
10th edition

Figure
7.01



A : Service box
 B : Transformer enclosure
 C : Distribution panel
 D : Meter support

* The conduit may not be more than 30 m long.

Ref.: Sections 0.3, 7.3, 7.5.1 and 7.5.1.1

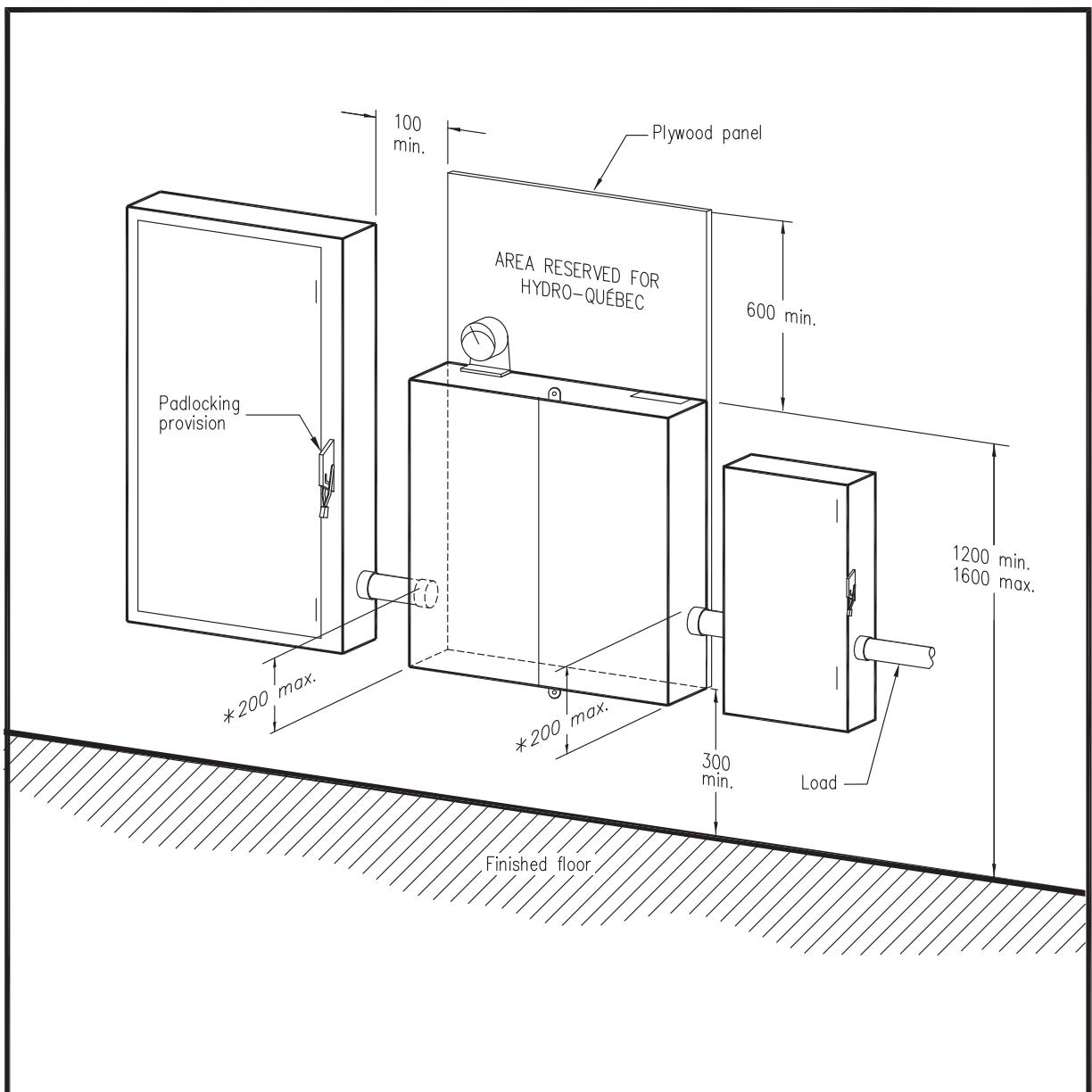
Engineer's seal:



METER SUPPORT WITH
120/240-V TRANSFORMER
ENCLOSURE

**Hydro
Québec**

Standard	E.21-10, 10th edition
Figure	7.02



* This distance is 300 mm if the main switch is rated 600 A or higher.

Ref.: Sections 7.1, 7.2.3, 7.2.4, 7.3 and 7.5.2

Engineer's seal:



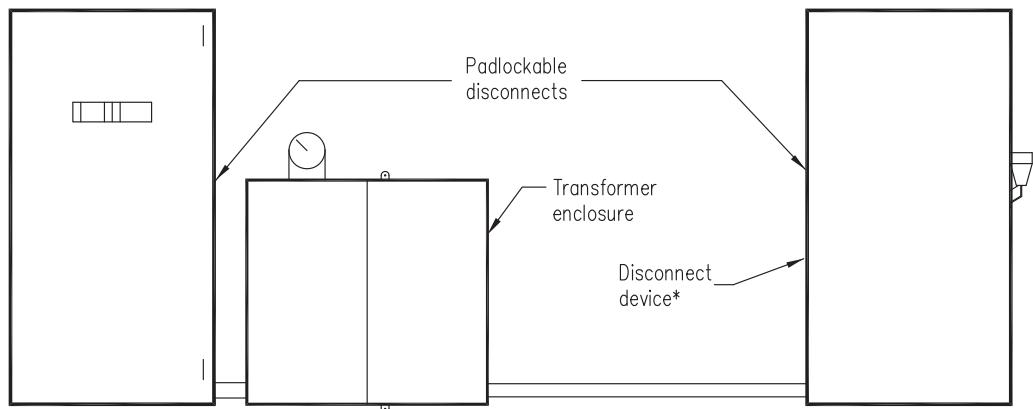
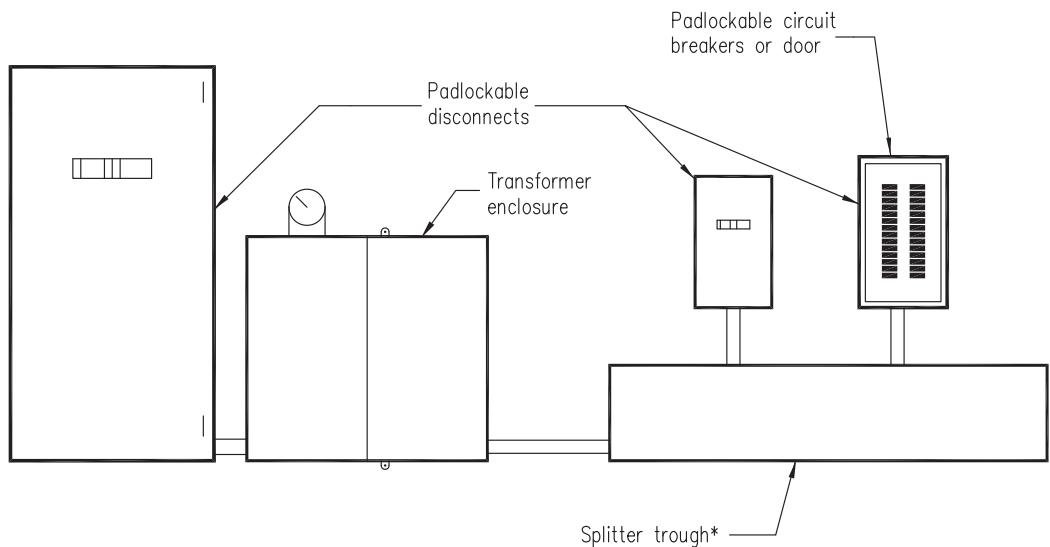
METERING WITH TRANSFORMER ENCLOSURE

**Hydro
Québec**

Standard E.21-10,
10th edition

Figure

7.03



* This disconnect or splitter trough must allow zero-voltage testing.

Ref.: Sections 5.16 and 7.6

Engineer's seal:



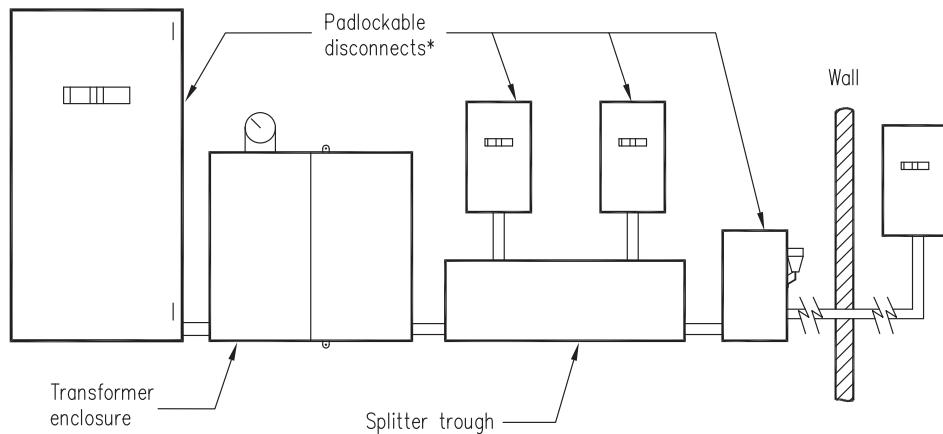
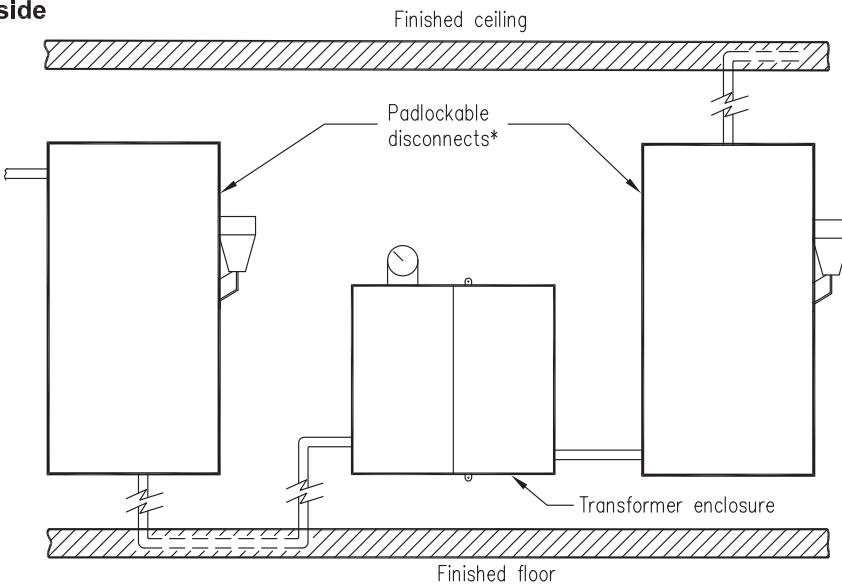
LOCKOUT AND ZERO-VOLTAGE TESTING MECHANISMS

**Hydro
Québec**

Standard E.21-10,
 10th edition

Figure 7.04

Supply side



* A disconnect device allowing zero-voltage testing is required on the load side of the transformer enclosure.

Ref.: Sections 5.16 and 7.6

Engineer's seal:



2015-07-16

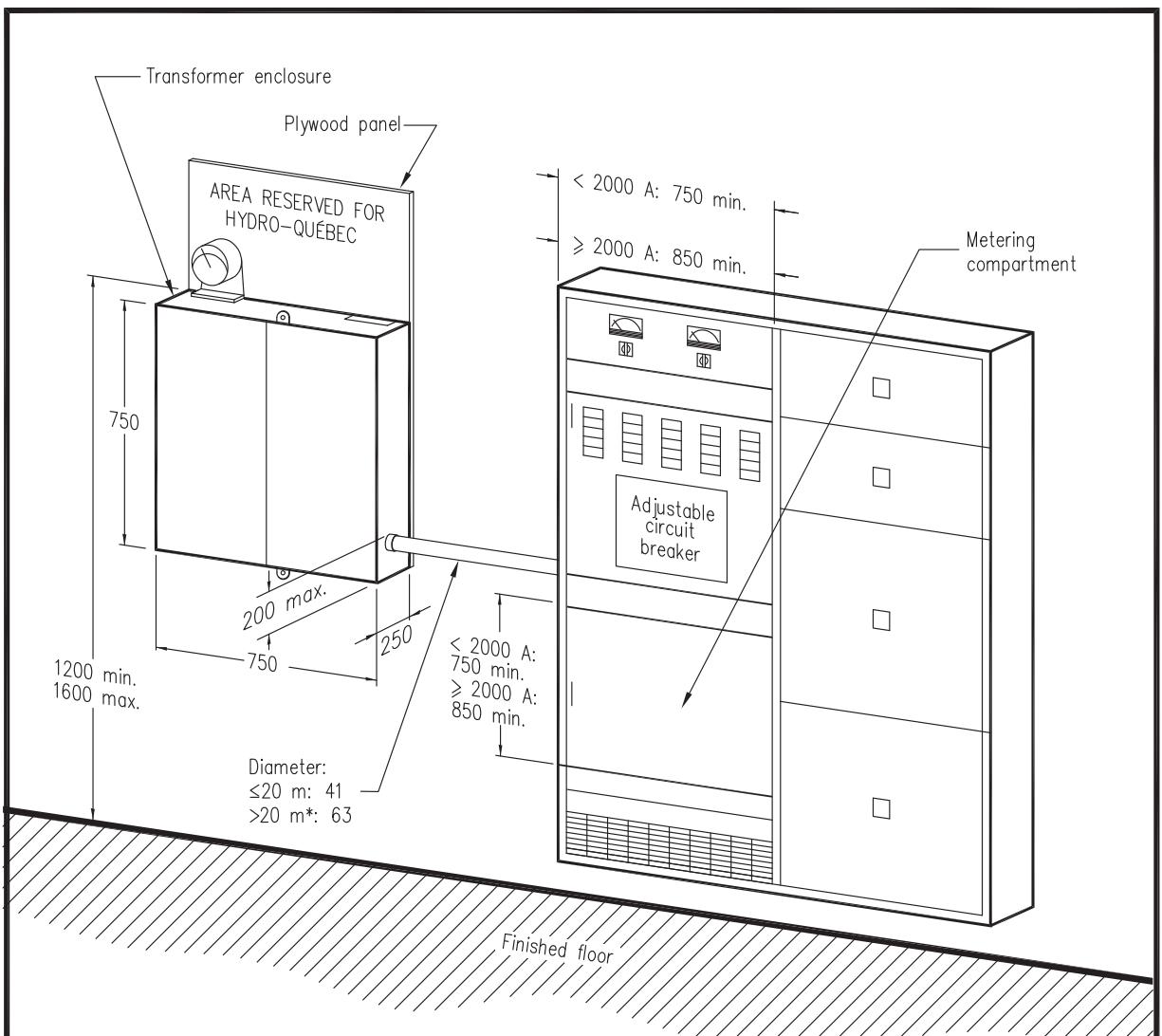
LOCKOUT AND ZERO-VOLTAGE TESTING MECHANISMS

**Hydro
Québec**

Standard
E.21-10,
10th edition

Figure

7.05



* The conduit may not be more than 140 m long.

Ref.: Sections 8.1 to 8.4

Engineer's seal:



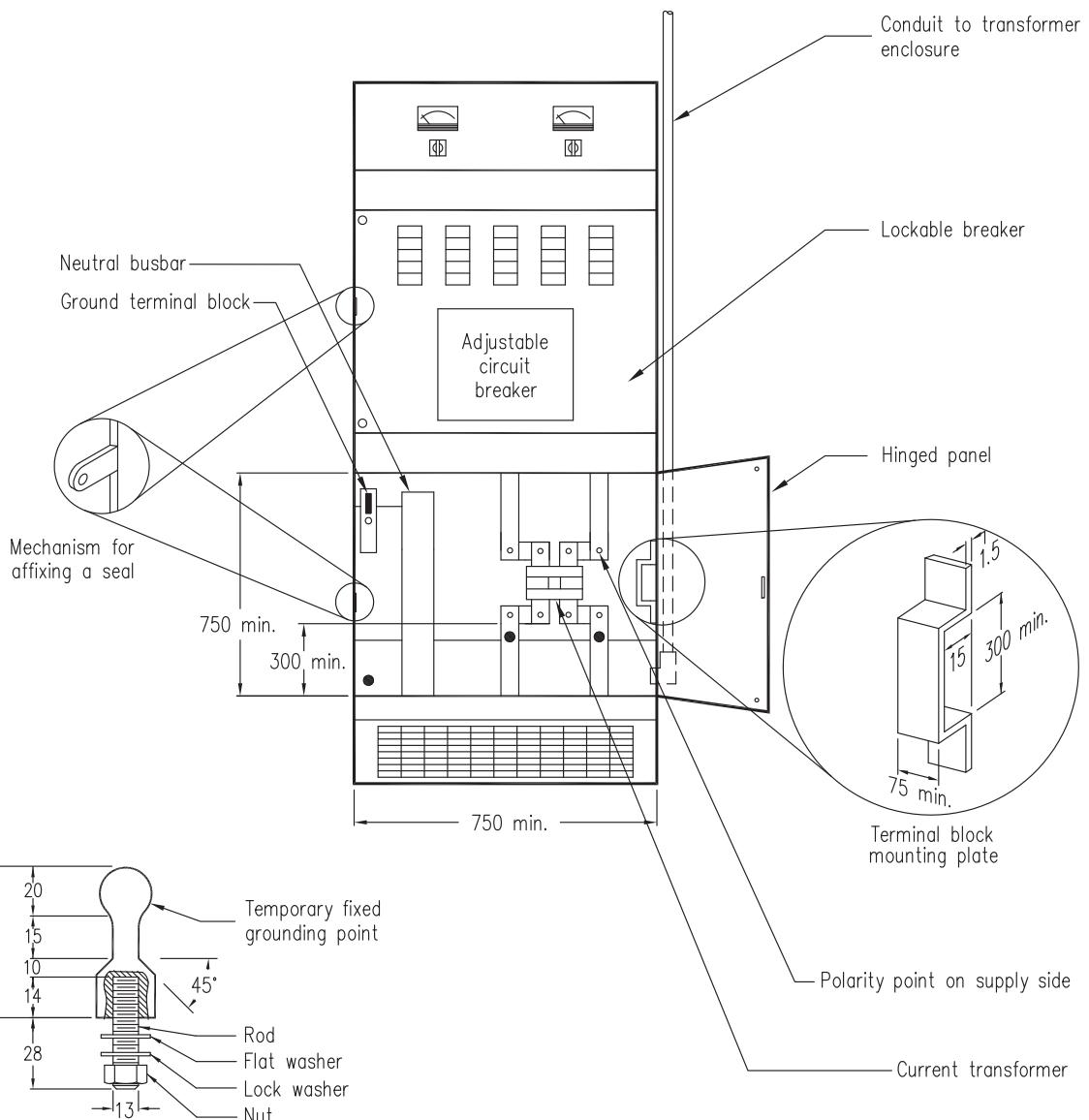
2015-07-16

**METERING COMPARTMENT
 (METAL-CLAD SUBSTATION AND
 TRANSFORMER ENCLOSURE)**

**Hydro
 Québec**

Standard E.21-10,
 10th edition

Figure 8.01



- Fixed grounding point

Ref.: Sections 0.3, 8.1, 8.2 and 8.6

Engineer's seal:



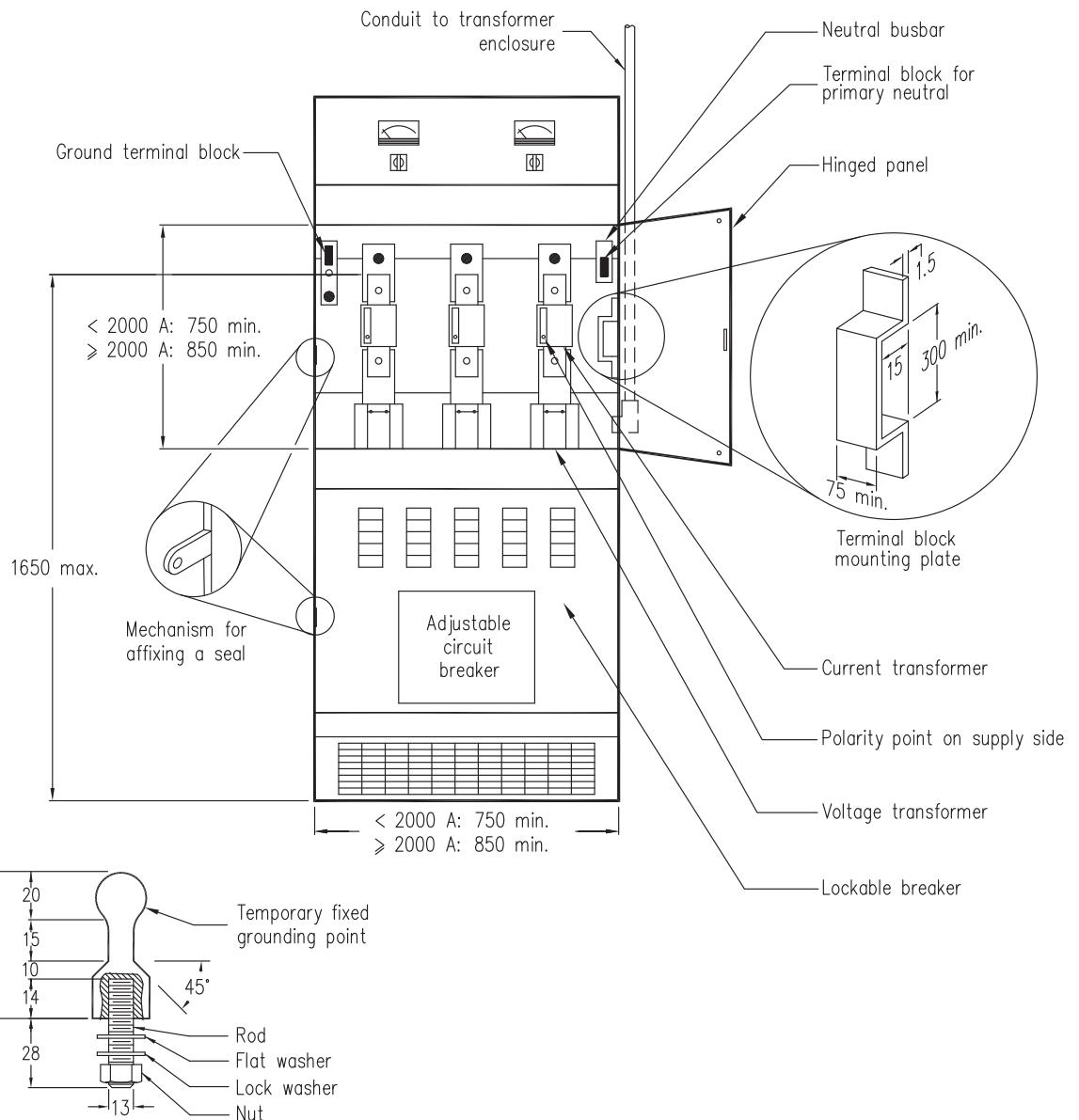
METERING COMPARTMENT
(METAL-CLAD SUBSTATION AND
TRANSFORMER ENCLOSURE)

**Hydro
Québec**

Standard E.21-10,
10th edition

Figure

8.02



- Fixed grounding point

Ref.: Sections 0.3, 8.1, 8.2 and 8.6

Engineer's seal:



**METERING COMPARTMENT
(METAL-CLAD SUBSTATION AND
TRANSFORMER ENCLOSURE)**

**Hydro
Québec**

Standard E.21-10,
 10th edition

Figure 8.03

Tables

Table 1

Conversion Table

Dimensions		
Millimetres	Approximate equivalent in inches	Exact millimetre equivalent of inches given
6	1/4	6.35
13	1/2	12.70
19	3/4	19.05
25	1	25.40
38	1 1/2	38.10
50	2	50.80
63	2 1/2	63.50
75	3	76.20
100	4	101.60
150	6	152.40
200	8	203.20
250	10	254.00
300	12	304.80
400	16	404.40
450	18	457.20
500	20	508.00
600	24	609.60
750	30	762.00
915	36	914.40
1,000	40	1,016.00
1,200	48	1,219.20
1,500	60	1,524.00
1,600	63	1,600.20
1,800	72	1,828.80
2,000	79	2,006.61
2,030	80	2,032.00
3,000	120	3,048.00

Table 2

Service voltage limits – Allowable range

Type of line Nominal voltage (volts)	At supply point (in volts)			
	Extreme operating conditions			
	Normal operating conditions			
Single-phase 120/240	106/212	110/220	125/250	127/254
Three-phase 4 conductors 120/208Y 347/600Y	110/190 306/530	112/194 318/550	125/216 360/625	127/220 367/635
Three-phase 3 conductors 600 (existing installations)	530	550	625	635

Notes: Normal operating conditions – No improvements or corrective measures are required.
 Extreme operating conditions – Improvements or corrective measures must be planned based on an established program, but immediate action is not necessarily required.

Ref.: Section 1.2.2 and CAN3-C235-83 (latest edition)

Table 3

Mechanical strength of supports and spool racks

Rated ampacity or total rated ampacity of service box(es)*	Type of service loop conductors		Minimum strength at attachment point
200 A or less	120/240 V	Triplex, 2 AWG	2,670 N (275 kg)
	347/600 V	Quadruplex, 2 AWG	2,670 N (275 kg)
201 A to 400 A	120/240 V	Triplex, 4/0 AWG (2/0 neutral)	2,670 N (275 kg)
	347/600 V	Quadruplex, 4/0 AWG (2/0 neutral)	2,670 N (275 kg)
401 A to 800 A	120/240 V	3 separate conductors 477 kcmil	6,900 N (700 kg)
	347/600 V	4 separate conductors 477 kcmil	9,200 N (940 kg)

* In the case of a 120/240-V multiple-meter mounting device, the rated ampacity as shown on its nameplate may be used instead of the total rated ampacity of the service boxes it supplies.

Ref.: Sections 2.2.7, 2.2.12 a), 2.3.2, 4.3 and CAN/CSA-C22.3 No. 1

Table 4

Minimum spool rack height based on length of service loop

Length of service loop	Minimum height of spool rack above ground level**		
	Service loop crossing a public thoroughfare or loading ramp access road*	Service loop crossing a driveway	Service loop crossing a pedestrian area
30 m (98 ft.)	6.5 m (21.3 ft.)	5.6 m (18.4 ft.)	5.0 m (16.4 ft.)
25 m (82 ft.)	6.5 m (21.3 ft.)	5.6 m (18.4 ft.)	5.0 m (16.4 ft.)
20 m (66 ft.)	6.4 m (21 ft.)	5.4 m (17.7 ft.)	4.8 m (15.8 ft.)
15 m (49 ft.)	5.6 m (18.4 ft.)	4.7 m (16.4 ft.)	4.1 m (13.5 ft.)

* When the spool rack cannot be installed at the specified height without guying the existing support, Hydro-Québec relocates the conductors on the pole or erects a new pole to allow the connection.

** This assumes that grade is at the same elevation at the line supply point as at the connection point.

Notes: The spool rack must not be more than 8 m above grade. Heights must be increased by at least 0.61 m if telecommunications cabling is to be run beneath the service loop.

Ref.: Sections 2.2.8.1, 2.2.8.3, 2.7.2.1, 2.7.2.5, 4.3 b) and c)

Table 5

Distributor's service loop over a public thoroughfare

Rated ampacity or total rated ampacity of service box(es)	Distance Y	Distance X + Y	Additional pole needed to cross public thoroughfare***		
			Service loop provided entirely by distributor	Service loop provided by customer on own property	
			Distributor	Distributor	Customer pole
200 A or less	≤ 30 m	≤ 30 m	0*	0*	0
		> 30 m	1	1	0
	> 30 m	> 30 m	1**	1	1 or more
201 A or more	≤ 30 m	≤ 30 m	1	1	0
		> 30 m	1	1	0
	> 30 m	> 30 m	1**	1	1 or more

* Under Section 2.2.8, the distributor in some instances provides a pole.

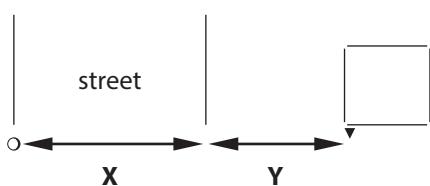
** A connection over 30 m long requires erecting one or more poles and possibly one or more guy wires, depending on the configuration. Charges established under the *Conditions of Electricity Service* in force are then payable. For some configurations it may be possible, subject to agreement with the distributor, to avoid erecting an additional pole to cross a public thoroughfare.

*** The distributor also provides this pole when the customer wishes to install an overhead-underground service entrance.

≤ Less than or equal to

> Greater than

Ref.: Sections 2.2.8.3 a) and 2.6.2

**Legend**

- X Width of public thoroughfare
- Y Distance between connection point and property line
- ▼ Connection point
- O Utility pole

Table 6

Last span of overhead service

This table is based on clearances in CAN/CSA-C22.3 No. 1.

Type of line Voltage	Conductor type	Maximum length of span nearest to line (m)
Single-phase 120 V**	Duplex 4 NS75 (NS1) NS75 FT1 (NSF2)	38 38
Single-phase 120/240 V	Triplex 2 NS75 (NS1) NS75 FT1 (NSF2)	30 30
	Triplex 2/0 NS75 (NS1) NS75 FT1 (NSF2)	25 25
	Triplex 4/0 NS75 (NS1) NS75 FT1 (NSF2)	25 21
	3 separate conductors No. 477 covered	Must be guyed (max. 6 m unguyed if max. tension = 100 N or 10 kg)*
	Quadruplex 2 NS75 (NS1) NS75 FT1 (NSF2)	30 28
Three-phase 347/600 V and 600 V	Quadruplex 4/0 (NS1) NS75 FT1 (NSF2)	21 18
	4 separate conductors No. 477 covered	Must be guyed (max. 6 m unguyed if max. tension = 100 N or 10 kg)*

* The maximum 6-m span nearest the line must not be taut (maximum: 100 N or 10 kg).

** For public lighting only.

Ref.: Sections 2.6.2, 2.7.2.5, 4.3 b) and figures 2.16 and 2.21

Note: Parallel conductors are allowed, provided that they are installed as specified in the *Code*.

Table 7

Clearance between overhead service conductors and building

Distance AF – Adjacent wall (mm)	Clearance required AB (mm)	Distance AF – Adjacent wall (mm)	Clearance required AB (mm)
5° angle			
100	9	1,600	140
200	17	1,700	149
300	26	1,800	157
400	35	1,900	166
500	44	2,000	175
600	52	2,100	184
700	61	2,200	192
800	70	2,300	201
900	78	2,400	210
1,000	87	2,500	219
1,100	96	2,600	227
1,200	105	2,700	236
1,300	114	2,800	245
1,400	122	2,900	254
1,500	131	3,000	262
15° angle			
3,001	804		
3,100	830		
or more	---		

$$\tan = \frac{\text{clearance (AB)}}{\text{adjacent wall (AF)}}$$

$$\text{Clearance (AB)} = \tan \times \text{adjacent wall (AF)}$$

$$\tan \text{ of } 5^\circ = 0.087$$

$$\tan \text{ of } 15^\circ = 0.267$$

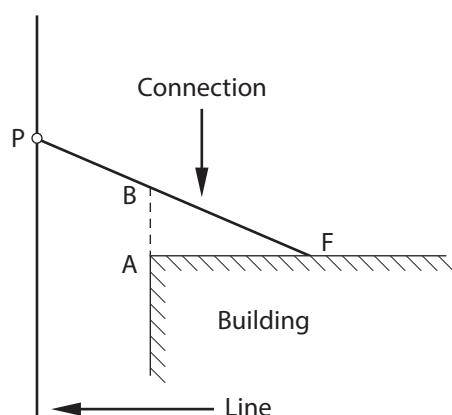


Table 8

Ladder height-to-base range

Height of resting point (mm)	Minimum horizontal distance to base (mm)	Maximum horizontal distance to base (mm)
3,600	900	1,200
3,900	975	1,300
4,200	1,050	1,400
4,500	1,125	1,500
4,800	1,200	1,600
5,100	1,275	1,700
5,400	1,350	1,800
5,700	1,425	1,900
6,000	1,500	2,000
6,300	1,575	2,100
6,600	1,650	2,200
6,900	1,725	2,300
7,200	1,800	2,400
7,500	1,875	2,500
7,800	1,950	2,600
8,100	2,025	2,700
8,400	2,100	2,800

Ref.: Section 2.7.1 and Figure 2.20

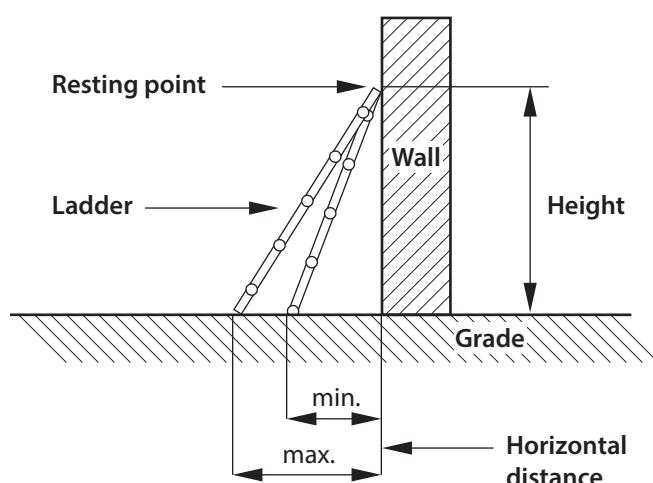


Table 9

Junction box and pullbox specifications

Rated ampacity or total rated ampacity of service box(es)	Box dimensions (mm)			Number of mechanisms for affixing a seal	Gauge of metal enclosure*
	Height	Width	Depth		
200 A or less	500	500	250	1	16
201 to 400 A	750	750	250	1	16
401 to 600 A	900	900	300	2	14
601 to 1,200 A	1,200	1,200	300	2	14

* If the box is installed outdoors, it must be Type 3R and have mechanisms for affixing a seal.

Ref.: Section 3.5.3 and figures 3.03 and 3.05

Table 10

Minimum horizontal clearance between underground service conductors and pools

Type of installation	Minimum horizontal clearance (m)	
	Direct buried unjacketed cable with bare neutral or cables with a semi-conducting jacket	Cable with a non-conductive jacket or in a non-conductive conduit
Telecommunications cabling	1.5	1.0
0 to 750 V	1.5	1.0
751 to 15,000 V	3.0	1.5
15,001 to 28,000 V	6.0	2.0

Ref.: Section 3.7.5 and Figure 3.11 of this Standard, and Section 68-056 and Table 61 of the *Code*.

Notes: Voltages are phase-to-phase.

Clearance from non-conducting conduits is measured from the nearest edge of the conduit to the inside wall of the pool.

Table 11

Transformer enclosure or meter socket

A – Type of enclosure or socket								
Rated ampacity of service box overcurrent protection	Installation with one conductor per phase				Installation with parallel conductors (maximum of three per phase)			
	Supply voltage				Supply voltage			
	120/240 V	120/208 V	347/600 V	600 V**	120/240 V	120/208 V	347/600 V	600 V**
200 A and under	Socket	Socket	Socket or type A*	Type A	–	–	–	–
201 to 320 A	Socket or type A*	Type B	Type B	Type B	Socket or type A*	Type B	Type B	Type B
321 to 400 A	Type A	Type B	Type B	Type B	Type A	Type B	Type B	Type B
401 to 600 A	Type A	Type B	Type B	Type B	Type B	Type C	Type C	Type C
601 A and over	–	–	–	–	Type C	Type C	Type C	Type C

* Electrical installation with dual-energy capability or metering equipment with a telephone line connection.

** Existing installation, or standard voltage not offered.

B – Transformer enclosure specifications according to type					
Type of enclosure	Dimensions	Gauge of box metal	Gauge of plate metal	Number of bolts*	Number of mechanisms for affixing a seal*
A	750 x 750 x 250 mm	16	14	2	2
B	900 x 900 x 300 mm	14	14	2	2
C	1,200 x 1,200 x 300 mm	14	14	2	2

* Bolts and mechanisms for affixing a seal may be combined in the same device.

Ref.: Sections 5.3.1.1, 5.5.1.1, 7.2.2, 8.4 and Figure 0.03

Table 12

Compression connectors

Combinations: aluminum-aluminum or aluminum-copper

Customer conductor	Distribution conductor									
	Groove B (Tap)					Insulating cover				
Groove A (Run)	4 Al or 4 ACSR or 2 Al or 2 ACSR									
	Manufacturer					Manufacturer		Compression tool		
	Blackburn	Burndy	Homac	Ilscos	Kearney	Thomas & Betts	Burndy	Manual	Hydraulic 12 t	
	Catalogue number					Catalogue number		Number of indents		
10, folded in two				HT-6	506-82	C5C		4	2	0
8, folded in two				HT-6	506-82	C5C		4	2	0
6		YHO1		HT-6	506-82	C5C	CCO	4	2	0
4		YHO1		HT-6	506-82	C5C	CCO	4	2	0
3		YHO1	OB-101	HT-6	506-82	C5C	CCO	4	2	0
2	WR-189	YHO2	OB-101	HT-8	508-82	C7C	CCO	5	2	0
1	WR-189	YHO2	OB-101	HT-8	508-82	C7C	CCO	5	2	0
1/0	WR-189	YHO2	DB-202	HT-8	508-82	C7C	CCO	5	2	0
2/0	WR-189	YHO2*	DB-202	HT-8	508-82	C7C	CCO	5	2	0
3/0	WR-289	YHD3*	DB-202	HT-2	502-82	C7C	CCD	5	2	D
4/0	WR-379	YHD5		HT-3	503-82	C7C	CCD	5	2	D
250 kcmil	WR-379	YHD5		HT-3	503-82	C7C	CCD	5	2	D

- Conductors must be brushed before connection.
- Copper conductor must be placed beneath aluminum conductor.
- Cables to replace: conductors smaller than 2 AWG.
- Compliant cables: 1 No. 2 ACSR neutral messenger and 2 No. 2 Al conductors (200 A or under).
- This list is for reference only. The master electrician must ensure that connectors approved for the application are used and that the manufacturer has not made changes to the products.

Ref: Section 2.4.4

Table 13

Insulation-piercing connectors (saline environment)

Combinations: aluminum-aluminum or aluminum-copper

Customer conductor	Distribution conductor	
Groove A (Run)	Groove B (Tap)	
	4 Al to 4/0 Al	2 Al to 4/0 Al
	Manufacturer	
	AMP	SICAME
	Catalogue number	
4	KZ3-4/0	TTD 2710 F BHQ
3	KZ3-4/0	TTD 2710 F BHQ
2	KZ3-4/0	TTD 2710 F BHQ
1	KZ3-4/0	TTD 2710 F BHQ
1/0	KZ3-4/0	TTD 2710 F BHQ
2/0	KZ3-4/0	TTD 2710 F BHQ
3/0	KZ3-4/0	TTD 2710 F BHQ
4/0	KZ3-4/0	TTD 2710 F BHQ
250 kcmil	KZ4	

- These connectors must only be used in a saline environment.
- Cables to replace: Conductors smaller than 2 AWG.
- Compliant cables: 1 No. 2 ACSR neutral messenger and 2 No. 2 Al conductors (200 A and less).
- Single-use connector.
- This list is for reference only. The master electrician must ensure that connectors approved for the application are used and that the manufacturer has not made changes to the products.

Ref.: Section 2.4.4

Table 14

Overhead service conductor clearances required under the *Code*

Position of conductor	Minimum clearance (m)
Above highway, street, alley or lane	5.5
Above driveway to a residential garage	4.0
Above driveway to industrial or commercial premises	5.0
Above ground normally accessible to pedestrians only	3.5
Above a balcony, porch, terrace or stairs (accessible area)	2.5
To the left or right of a balcony, porch, terrace or stairs*	1.0
To the left, right or above a window, door or porch**	1.0
Near pools, spas and related facilities	See Figure 2.15

* Clearance required if 2.5 m of clearance above is not possible.

** Not required if the conductors (including drip loops) run above the window, door or porch.

Note: Clearances required under the *Code* apply to conditions existing at the time of installation and not to maximum sag. The clearances specified exceed those required under CSA-C22.3 No. 1.

See rules 6-112, 12-310 and 68-054 of the *Code* for further information.

Ref: Sections 2.2.3 and 2.7.3, Figure 2.15

Job Aids

Disconnection



1 Open customer's main switch



2 Install protective equipment

- Cover neutral and one service entrance conductor with insulating blanket.
- Leave only the conductor being worked on exposed.



5 Repeat steps 3 and 4 for other phase



6 Remove protective equipment



7 Disconnect customer's neutral

- Cut conductor.



3 Disconnect one service entrance phase

- Cut conductor.



4 Insulate end of service entrance conductor

- Insulate conductor on supply and load sides with insulating tape.

Requirements

- Electrical contractor's licence
- Journeyman construction electrician's certificate

Tools and materials*

- Cable cutter
- Fibreglass ladder
- Tape

* Must comply with CAN/CSA Z462 (latest edition).

Protective equipment

The protective equipment specified in CAN/CSA Z462 (latest edition) is mandatory on the jobsite and must be used as stipulated therein.

	<p>Work at the Connection Point: Disconnecting 120/240-V (200 A or less) Overhead Service</p>	<p>Standard E.21-10 10th edition</p>
<p>Engineer's seal :</p>  <p>2015-09-14</p>		<p>Job Aid 2.01</p>

Reconnection



1 Open customer's main switch



2 Connect customer's neutral

- Wire brush conductors.
- Install and crimp appropriate connector using compression tool (see Table 12).



3 Install protective equipment

- Cover neutral with insulating blanket.



4 Strip one service conductor

- Length must match connector size.



5 Strip one live supply service conductor

- Length must match connector size.



6 Wire brush conductors



7 Connect one service entrance conductor

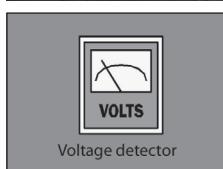
- Copper conductor must be placed beneath aluminum conductor.
- Install and crimp appropriate connector.
- Install insulating cover.



8 Repeat steps 4 to 7 for other service entrance conductor



9 Remove protective equipment



10 Check for voltage

- Use voltage detector.
- Close customer's switch.



Tools and materials*

- Connector compression tool
- Connector brush
- Knife
- Voltage detector
- Fibreglass ladder
- Tape

* Must comply with CAN/CSA Z462 (latest edition).

Protective equipment

The protective equipment specified in CAN/CSA Z462 (latest edition) is mandatory on the jobsite and must be used as stipulated therein.



Work at the Connection Point: Reconnecting 120/240-V (200 A or less) Overhead Service

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Job Aid 2.02

Disconnection in a saline environment



1 Open customer's main switch



2 Install protective equipment

- Cover neutral and one service entrance conductor with insulating blanket.
- Leave only the conductor being worked on exposed.



5 Repeat steps 3 and 4 for other phase



6 Remove protective equipment



7 Disconnect customer's neutral

- Unbolt insulation-piercing connector or cut conductor if necessary.



3 Disconnect one service entrance phase

- Unbolt insulation-piercing connector or cut conductor if necessary.



4 Insulate end of service conductor

- Insulate conductor on supply and load sides with insulating tape.

Tools and materials*

- 9/16-in. ratchet wrench
- Cable cutter
- Fibreglass ladder
- Tape

* Must comply with CAN/CSA Z462 (latest edition).

Protective equipment

The protective equipment specified in CAN/CSA Z462 (latest edition) is mandatory on the jobsite and must be used as stipulated therein.

Requirements

- Electrical contractor's licence
- Journeyman construction electrician's certificate



Engineer's seal



Work at the Connection Point: Disconnecting 120/240-V (200 A or less) Overhead Service in a Saline Environment

Standard E.21-10
10th edition

Job Aid 2.03

Reconnection in a saline environment



1 Open customer's main switch



2 Connect customer's neutral

- Install appropriate insulation-piercing connector.
- Tighten until rupture nut/bolt breaks.



3 Install protective equipment

- Cover neutral with insulating blanket.



4 Insulate end of service conductor

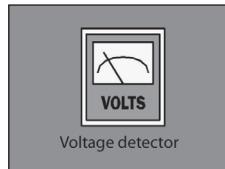
- Install appropriate insulation-piercing connector.
- Tighten until rupture nut/bolt breaks.



5 Repeat Step 4 for other service entrance conductor



6 Remove protective equipment



7 Check for voltage

- Use voltage detector.
- Close customer's switch.



Requirements

- Electrical contractor's licence
- Journeyman construction electrician's certificate

Tools and materials*

- 9/16-in. ratchet wrench
- Fibreglass ladder
- Voltage detector

* Must comply with CAN/CSA Z462 (latest edition).

Protective equipment

The protective equipment specified in CAN/CSA Z462 (latest edition) is mandatory on the jobsite and must be used as stipulated therein.

 <p>Engineer's seal</p>  <p>2015-09-14</p>	<p>Work at the Connection Point: Reconnecting 120/240-V (200 A or less) Overhead Service in a Saline Environment</p>	<p>Standard E.21-10 10th edition</p> <p>Job Aid 2.04</p>
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Disconnection with relocation



1 Open customer's main switch



2 Install protective equipment

- Cover neutral and one service entrance conductor with insulating blanket.
- Leave only the conductor being worked on exposed.



3 Disconnect one service entrance phase

- Cut conductor.



4 Insulate end of service entrance conductor

- Insulate conductor on supply and load sides with insulating tape.



7 Disconnect customer's neutral

- Cut neutral conductor.



8 Relocate supply service

- Attach hook of Howe wire tool to new spool rack.
- Attach bulldog grip and other end of Howe wire tool to service to be relocated.
- Pick up slack using wire tool to free service entrance tension clamp of all tension.



9 Remove service entrance tension clamp

Note: Leave wire tool in place until service entrance tension clamp is installed on new spool rack.



5 Repeat steps 2, 3 and 4 for other phase



6 Remove protective equipment



Work at the Connection Point: Disconnecting and Relocating 120/240-V (200 A or less) Overhead Service

Standard E.21-10
10th edition

Job Aid 2.05
(1 of 2)

The work described herein is performed on energized installations in accordance with the "additional hazards or increased risk" provision of Section 4.3.2.1 of CAN/CSA Z462-12. In this case, de-energizing by operating the medium-voltage cutout switch on the supply side of the transformer would be more hazardous.

Requirements

- Electrical contractor's licence
- Journeyman's construction electrician's certificate

Tools and materials*

- Fibreglass ladder rated grade 1 (heavy load rating) under CAN3-Z11-M81
- Clamp
- Insulating tape
- Howe wire tool
- Bulldog grip
- Voltage detector rated CAT IV under CSA C22.2 No. 61010

* Must comply with CAN/CSA Z462 (latest edition).

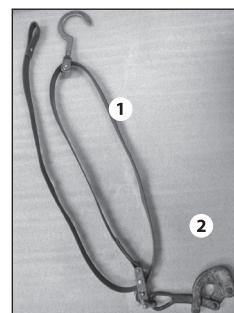
Protective equipment

The protective equipment specified in CAN/CSA Z462 (latest edition) is mandatory on the jobsite and must be used as stipulated therein.

Approved models of service entrance tension clamp

- Al for conductor No. 4 and No. 2, ACSR SL 100%, MacLean Power Systems
- Anodized Al for conductor No. 4 and No. 2, ACSR SL 100%, coated (polluted environment), Blackburn
- With plastic jaws for conductor No. 4 and No. 2, ACSR SL, coated (saline environment), Cicame Energie

Howe wire tool and bulldog grip



① Howe wire tool:
used for tensioning or
loosening small-gauge
conductors (Klein Tools)

② Bulldog grip:
used as an anchor
point to a loop
conductor (Klein Tools)

 Engineer's seal  2015-09-10	Work at the Connection Point: Disconnecting and Relocating 120/240-V (200 A or less) Overhead Service	Standard E.21-10 10th edition
		Job Aid 2.05 (2 of 2)

Reconnection with relocation

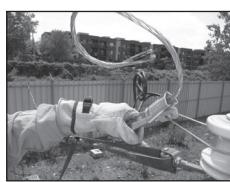


1 Make sure the customer's main switch is open



2 Install service entrance tension clamp

- Tension service loop adequately.
- Cut and remove excess length, if any, from service loop.
- Attach service entrance tension clamp to service loop and to new spool rack.
- Remove Howe wire tool and bulldog grip.



3 Reconnect customer's neutral to service loop

- Wire brush neutral conductors (lineworker's wire brush shown).
- Install and crimp appropriate connector using compression tool (see tables 12 and 13).



4 Install protective equipment

- Cover neutral with insulating blanket.



5 Strip one service conductor

- Length must match connector size.



6 Strip one live service conductor

- Length must match connector size.



7 Wire brush conductors

8 Connect one service entrance conductor

- Place copper conductor beneath aluminum conductor.
- Install and crimp appropriate connector.
- Install insulating cover.

9 Repeat steps 4 to 8 for other service entrance conductor

10 Remove protective equipment



11 Check for voltage

- Use a voltage detector.
- Close customer's switch.



Work at the Connection Point: Relocating and Reconnecting 120/240-V (200 A or less) Overhead Service

Standard E.21-10
10th edition

Job Aid 2.06
(1 of 2)

The work described herein is performed on energized installations in accordance with the "additional hazards or increased risk" provision of Section 4.3.2.1 of CAN/CSA Z462-12. In this case, de-energizing by operating the medium-voltage cutout switch on the supply side of the transformer would be more hazardous.

Requirements

- Electrical contractor's licence
- Journeyman's construction electrician's certificate

Tools and materials*

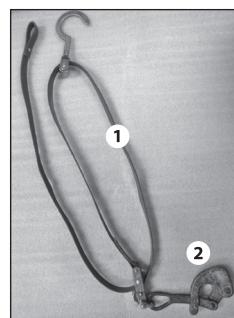
- Fibreglass ladder rated grade 1 (heavy load rating) under CAN3-Z11-M81
- Clamp
- Insulating tape
- Howe wire tool
- Bulldog grip
- Voltage detector rated CAT IV under CSA C22.2 No. 61010

* Must comply with CAN/CSA Z462 (latest edition).

Protective equipment

The protective equipment specified in CAN/CSA Z462 (latest edition) is mandatory on the jobsite and must be used as stipulated therein.

Howe wire tool and bulldog grip

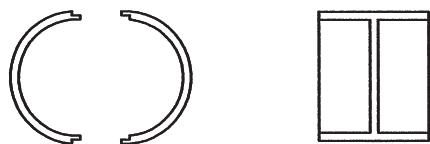
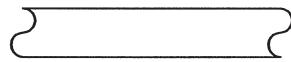


① **Howe wire tool:**
used for tensioning or
loosening small-gauge
conductors (Klein Tools)

② **Bulldog grip:**
used as an anchor
point to a loop
conductor
(Klein Tools)

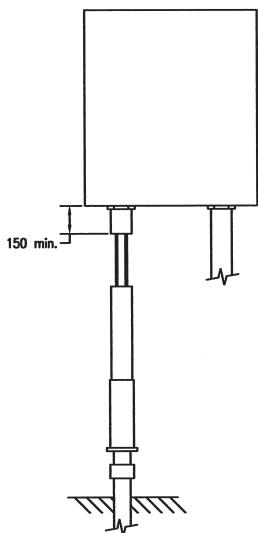
 Engineer's seal  2015-09-10	Work at the Connection Point: Relocating and Reconnecting 120/240-V (200 A or less) Overhead Service	Standard E.21-10 10th edition
		Job Aid 2.06 (2 of 2)

Repair of conduit

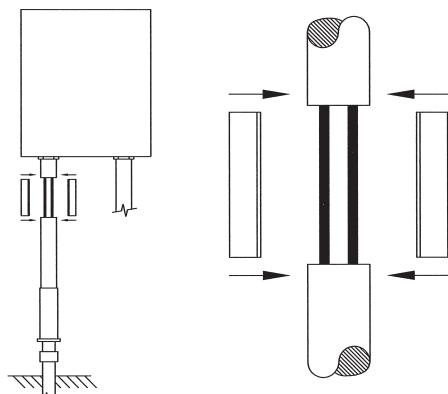
Component	Description
	<ul style="list-style-type: none"> • Split conduit, rigid • Variable diameter
	<ul style="list-style-type: none"> • Two split couplings, rigid PVC • Variable diameter • Coupling generally not required if each end of the split conduit is equipped with an integral bell adapter
	<ul style="list-style-type: none"> • 9-mm (3/8-in.) stainless steel band clamp
	<ul style="list-style-type: none"> • Clasp for 9-mm (3/8-in) stainless steel band clamp

Reference: Section 3.4.10

	<p>Repairing an Existing Aboveground Conduit</p>	<p>Standard E.21-10 10th edition</p>
 <p>2015-07-15</p>		<p>Job Aid 3.01 (1 of 3)</p>

Assembly method**1 Preparing the conduit**

- Cut the conduit from the underground system at least 150 mm beneath the junction box or meter socket, taking care not to damage the live cables inside the conduit.
- Adjust the expansion joint opening to manufacturer's recommendations.

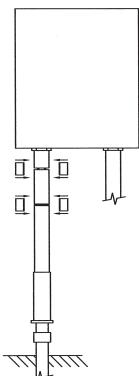
**2 Preparing and installing the split conduit**

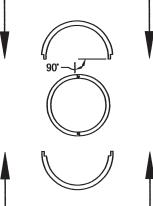
- Cut the split conduit to the appropriate length. It must be 25 mm* shorter than the missing section of supply conduit.
- Clean the ends of the split conduit.
- Apply a layer of solvent primer and then solvent cement on the split conduit's interlocking joints and mating ends, as applicable.
- Install the conduit so it covers the exposed cable beneath the junction box or meter socket.

* If conduits with integral bell adapters are used, consult the manufacturer's instructions to determine length.

Reference: Section 3.4.10

 Engineer's seal  2015-07-15	Repairing an Existing Aboveground Conduit	Standard E.21-10 10th edition Job Aid 3.01 (2 of 3)
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- 1) Insert the male half of the coupling.


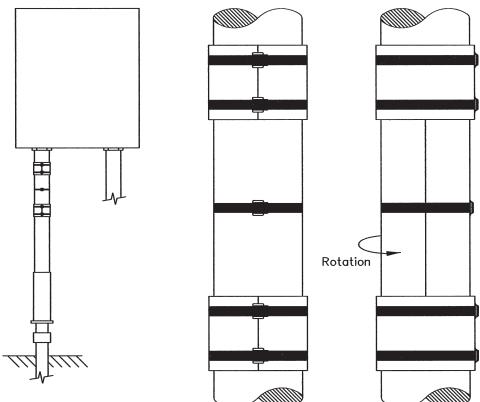
- 2) Insert the female half of the coupling.


3 Preparing and installing split couplings

Proceed as follows for each end of a split conduit without an integral bell adapter:

- Clean the inside of the couplings.
- Apply a layer of solvent primer and then solvent cement on the outside of the conduit over an area matching the size of the split coupling.
- Do likewise for each half of the split coupling, making sure to cover interlocking edges.
- Install the coupling on either side of the split conduit with its interlocking edges at 90° to the interlocking joint of the conduit.

Warning: Install the male half of the coupling before the female half.



4 Installing stainless steel band clamps and rotating the service conduit

- Install two non-detachable stainless steel band clamps around each coupling thus assembled or on each of the mating ends of the assembled split conduit.
- Install non-detachable stainless steel band clamps at least every 500 mm along any repair run exceeding 500 mm.
- Rotate the service conduit so the clasps of the stainless steel band clamps are on the side of the conduit.

Requirements

- Electrical contractor's licence
- Journeyman construction electrician's certificate

Reference: Section 3.4.10

Protective equipment

The protective equipment specified in CAN/CSA Z462 (latest edition) is mandatory on the jobsite and must be used as stipulated therein.

  2015-07-15	Repairing an Existing Aboveground Conduit	Standard E.21-10 10th edition
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Legal deposit – 3rd quarter 2015
Bibliothèque et Archives nationales du Québec
Library and Archives Canada
ISBN 978-2-550-73258-7

Ce document est également publié en français.
This is a translation of the original French text.

2015G1263A

Coordinated by *Communication avec la clientèle*
for vice-présidence – Réseau de distribution

