Hydro Québec

Low-Voltage Electrical Service

Standard E.21-10

9th edition
Updated December 2008

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Table of Contents

Introduction

The conditions governing electrical service are laid out in the document *Conditions of Electricity Service* as approved by the Régie de l'énergie in its Decision D-2008-028.

This Standard 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 have also been developed:

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*

The 9th edition of Standard E.21-10 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.

This update, in effect since December 31, 2008, incorporates new electrical service conditions approved by the Régie de l'énergie.

The content was approved by a Hydro-Québec Distribution task force and the technical content checked and validated by the engineers below.

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

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.

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 reach a solution. The list of products approved 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 ÉNERGIE (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 standard figures and 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 standalone generator designed to supply special auxiliary 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 approved by the Régie de l'énergie in its Decision D-2008-028.

connection box for flat-rate service
A metal enclosure used to supply a customer having a flat-rate contract with Hydro-Québec. **(See Figure 3.11)**

CSA
The Canadian Standards Association.

detached building
A building that is not in contact with any other building.

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

distribution service loop
The circuit extending Hydro-Québec's system from its distribution line to the connection point.

fixed grounding point
A round-headed metal part for temporarily connecting the grounding cable. **(See figures 7.07 and 7.08)**

grouped supply
A 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 used to join underground distribution service loop cables to customer conductors. **(See figures 3.05 to 3.10)**

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

manhole
A concrete civil structure, generally underground and large enough for workers to enter, that is used for joining cables from one or more duct banks.

metal-clad substation
A metal enclosure with separate metal compartments housing disconnect switches, protective equipment, metering transformers and busbars. **(See figures 7.06 to 7.08)**

meter box
A metal enclosure used to house the test-terminal box and other Hydro-Québec equipment, and above which one or more meters are installed. **(See Table 11 and Figure 0.03)**

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

meter socket
A square or rectangular base with jaws into which the blades of a plug-in meter are fitted. **(See Figure 6.01)**

meter support
An enclosure topped with a base for installing a meter (A-base).

It must be large enough to house a test-terminal box and be equipped with both a sealing joint and a mechanism for installing a seal. **(See Figure 7.01)**

metering centre
A metal enclosure used to house service boxes and meter sockets.

The front must be removable.

Each meter socket must have a mechanism for installing a seal. **(See Figure 6.09)**

multiple-meter mounting device
A metal enclosure containing a number of meter sockets interconnected by busbars. **(See figures 0.02 and 3.04)**

multiple supply
An arrangement whereby several service entrances are supplied from a single connection point. **(See Figure 0.02)**

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

overcurrent protective device
A device that automatically opens an electrical circuit under specified overload or short-circuit conditions, either electromechanically or by the melting of metal.

overhead-underground service entrance
An underground service entrance connected to an overhead line.
(See figures 2.24 to 2.26)

pole-mounted substation
One or more overhead transformers installed on one or more poles.

power system or 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.

pullbox
An indoor metal enclosure used to pull underground distribution service loop cables to the meter socket without splicing. **(See Figure 3.01)**

rated ampacity
The intensity of the electrical current indicated on the service box (referred to as "rated current" in the *Conditions of Electricity Service*).

readily accessible location
An indoor or outdoor location for metering equipment that can be reached at all times through a passageway at least 600 mm wide and 2 m high and kept clear at all times. It must be accessible without having to step over or remove obstructions, use a fixed or portable ladder or employ any other such means. Snow is not considered an obstruction.

An indoor location must have adequate lighting. An outdoor location must be accessible even when the customer is away.

rooftop support structure
A metal support structure fitted with insulators and installed on the roof of a building. **(See Figure 2.15)**

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

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

service entrance
The part of the electrical installation of the premises to be supplied, from the service box up to the connection point inclusively (referred to as "customer's service entrance" in the *Conditions of Electricity Service*).

splitter box
A metal enclosure used to connect feeders. **(See Figure 6.08)**

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 power supply.

transformer box
A metal enclosure used to house voltage and current transformers and other Hydro-Québec equipment, and above which one or more meters are installed. **(See Figure 0.04)**

underground conduit system
A system of one or more conduits, laid in a trench and sometimes encased in concrete, through which distribution cables are run.

1 Administrative Information

1.1 General

1.1.1 Request for service

The applicant must make a request to Hydro-Québec for a service contract and provide the information required under the *Conditions of Electricity Service* in effect.

Where a master electrician or consulting engineer makes the request, he acts as the duly authorized representative of the customer who will be the contract holder.

1.1.2 Making the request

When a written request to Hydro-Québec for a low-voltage supply contract is required for a project, it must be submitted during the planning phase.

For both written and verbal requests, the applicant must furnish the documents required based on the nature of the work to be done, such as the *Demande d'alimentation et déclaration de travaux* (request for supply and statement of work) form, along with the information required under the *Conditions of Electricity Service* and this Standard.

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 mentioned above has done the work according to accepted industry practices and as specified in the *Code*. Any exception of any nature must be justified by an appropriate modification or written approval from the Régie du bâtiment, which the master electrician shall submit to Hydro-Québec before the connection is made.

If the Hydro-Québec representative deems that an installation on the load side of the connection point is faulty and a safety hazard, he may ask the competent authorities to verify it before the connection is made.

1.1.3 Information required

The applicant must provide the following additional information:

- 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
- Cadastral plan, building layout and desired connection point, on request
- 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.

1.1.4 Costs

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

1.2 Responsibilities of the master electrician

Before installing, modifying or renovating a service entrance, the master electrician must

- check the availability of electricity service and the applicable conditions;
- inform the customer of the steps to be taken in order to obtain service at the desired date;
- tell the customer about connection charges or charges that may be applied to extend or modify the line, and suggest that the customer contact Hydro-Québec for further information.

1.2.1 Breaking of seals

1.2.1.1 Breaking of metering equipment seals

The master electrician must obtain Hydro-Québec's consent before breaking any metering equipment seal unless an unanticipated event (*force majeure*) occurs, in which case consent may be given after the work, before the *Demande d'alimentation et déclaration de travaux* form is submitted. He must enter the date the seal was broken and the authorization number (*numéro de dossier*) on the form.

1.2.1.2 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 metering equipment. He must enter the date

the work was done on the notice of unsealing or on the *Demande d'alimentation et déclaration de travaux* form, or must convey this information by phone.

1.2.1.3 Deadline

The master electrician must submit via the Web or by fax the notice of unsealing or the completed *Demande d'alimentation et déclaration de travaux* form within 48 hours of starting the work. For work on weekends or holidays, the document must be sent to Hydro-Québec as soon as its offices open or within the 48-hour limit. The same deadlines apply to a notice of unsealing given over the telephone.

1.2.2 Authorization

1.2.2.1 New installation

The master electrician is not authorized to connect a service entrance to the distribution service loop or line.

1.2.2.2 Requirements for connection

Only Hydro-Québec can connect a service entrance to the 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 or, for exclusions under the *Building Act* or the *Code*, a document certifying that the installation is safe and complies with good engineering practice.

b) Identification of premises
Clearly display on the front of the building or structure the civic number, project reference number or other identification accepted by the Hydro-Québec representative.

c) Identification of components
Identify service boxes, transformer boxes, meter sockets and distribution panels as stipulated in Section 5.9.

d) Sealing
Install a mechanism for installing a seal on components that are on the supply side of metering equipment and allow access to energized conductors and devices.

These components include service boxes, transformer boxes, meter boxes and meter sockets, as well as pullboxes, junction boxes, flat-rate connection boxes and splitter boxes that are on the supply side of metering equipment.

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

1.2.2.3 Reconnecting after a disconnection

If electricity delivery resumes more than 12 months after service was terminated or if Hydro-Québec so requires, the applicant must submit the *Demande d'alimentation et déclaration de travaux* form and comply with the rules set out herein.

Subject to the above paragraph and if electricity delivery resumes less than 12 months after service was terminated, Hydro-Québec agrees to connect a customer's electrical installation that does not comply with the requirements herein, provided that

- doing so does not compromise safety;
- no modification was made between the connection point and the main service box; and
- no modification to the building or structure has made the electrical installation non-compliant.

1.2.2.4 Reconnection by a master electrician

A master electrician may disconnect and reconnect at the connection point an overhead service entrance he is modifying or renovating, provided that he

- first obtains Hydro-Québec's consent unless an unanticipated event (*force majeure*) occurs, in which case consent may be given after the work, before the *Demande d'alimentation et déclaration de travaux* form is submitted;
- checks when reconnecting that the distribution 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 1.2.2.6);
- makes sure that the connection point is located on the distribution service loop (120/240 V, 200 A or less);
- does not lengthen, shorten or move the distribution service loop (if any such change is necessary, the new service entrance must be supplied temporarily from the existing connection point);
- keeps distribution service loop conductors off the ground during and after the work;
- takes the precautions needed to ensure public safety and to maintain standard clearance; and
- meets the requirements in Tables 12 and 13, and under the section "Work at the Connection Point" herein.

If an unanticipated event affects an installation and the distribution service loop or connection point connectors are damaged, the master electrician is not authorized to repair the connectors but must notify Hydro-Québec, which will take the necessary measures.

An unanticipated event (*force majeure*) is a weather event, catastrophe (fire, flood, etc.) or fortuitous incident caused by a third party or a customer, who must undertake urgent or unforeseen repair work as a result.

1.2.2.5 Modification or subsequent work

For a modification that entails changing the size or capacity of the service entrance or for work carried out 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 1.2.1.1.

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 intact, so Hydro-Québec can recover it.

He must not reconnect metering equipment that includes current transformers regardless of the supply voltage.

1.2.2.6 Temporary supply circuits

If a modification entails transferring load from an existing to a new connection, Hydro-Québec will refuse to hook up even temporarily more than one connection of the same voltage, in accordance with Section 1.4.1.1. 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, and with requirements regarding warning signs;
- be connected to the existing connection point, if necessary, provided there is a distribution service loop conductor;
- not be interconnected with the existing meter socket, metering transformer box 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.

Under no circumstances is the master electrician authorized to lengthen, shorten or move the existing distribution service loop to connect a temporary circuit to supply an existing installation. 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 loop conductor.

Once the new connection is in place, the material (like temporary cabling and connectors) must, to the extent possible, be left on site or in a predetermined location so the owner can recover it. **(See Figure 1.04)**

1.2.3 Electricity generation

Applicants must obtain Hydro-Québec's written consent before connecting electricity generating equipment in parallel with the line. The connection and use of such equipment must at all times comply with conditions set by Hydro-Québec and with the standards in effect.

1.2.3.1 Backup generators

Any backup generator a customer installs must be equipped with a manual or automatic transfer switch meeting Hydro-Québec requirements. A transfer switch may include one or more distinct devices installed so as to prevent the normal power supply from interconnecting with the backup generator.

Backup generators must always be installed on the load side of metering equipment, which must be de-energized whenever a backup generator is running. Safety precautions are covered in Section 7.3.4.

(See Figure 1.01)

1.2.4 Quality of service

1.2.4.1 General

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 phenomen: voltage and current fluctuations, flicker, harmonics, etc.

In order to maintain power quality, Hydro-Québec must ensure compliance with the limits for the various types of disturbances on its power system. Based on the information regarding load type provided on the form *Demande d'alimentation et déclaration de travaux* (request for supply and statement of work), Hydro-Québec may ask the customer to conduct any necessary studies.

Even if no studies are required by Hydro-Québec, the customer must comply with the requirements set out in sections 1.2.4.2 and 1.2.4.3 below.

1.2.4.2 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 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 motor with a higher rating than those mentioned.

1.2.4.3 Unbalanced loads

Unless Hydro-Québec has otherwise authorized in writing, 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.

1.2.5 Protection coordination

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

For service supplied directly from the power line, the electrical installation's protective device must ensure a minimum 22,000-A interrupting capacity.

At Hydro-Québec's request, however, the customer must install a protective device with a higher interrupting capacity.

For service boxes rated higher than 600 A, the customer must send Hydro-Québec the following 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, interrupting capacity and rated voltage

b) *Primary protection settings*
   Relay settings, fuse rating and time-amperage curves

To coordinate Hydro-Québec transformer substation protection with the customer's primary installation protection, the latter may be lowered.

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*.

When coordination is impossible at the first level of protection, Hydro-Québec agrees to coordination with each element at the second level of protection to comply with the *Code*. The instantaneous trip of 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 primary protection. The customer must then provide its load calculation, the information listed above for elements comprising 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 conductors between this second level of protection and the primary protection.

When conductors between second-level elements and 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 1.02)

1.3 Available voltages

Under the *Conditions of Electricity Service*, low-voltage service is supplied as

- single phase 120/240 V; or
- three phase 347/600 V, wye-connected, grounded neutral.

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

- 600 A or less;
- 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 any other low-voltage service, the master electrician or applicant must write to Hydro-Québec, which will determine the application procedures and inform the master electrician or applicant.

1.3.1 Existing installations with 600-V supply

Subject to Section 1.3, where the power line is underground and 347/600-V, wye-connected, 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 supply insofar as no change is made between the connection point and the main service box or to the main service box itself. In such cases, however, a neutral conductor must be installed as stipulated in Section 7.3.2.9 b).

1.3.2 Existing installations with 120/208-V supply

Subject to Section 1.3, an addition or change can be made to an existing 120/208-V, wye-connected, grounded-neutral supply insofar as no change is made between the connection point and the main service box, or to the main service box itself.

When an addition or change leads to a modification between the connection point and main service box, the master electrician can reconnect the existing 120/208-V installation to a new 347/600-V, wye-connected, grounded-neutral supply as shown in Figure 1.03.

Adding a transformer to measure the voltage at 120/208 V is prohibited, however, if there is no metering facility at that voltage on the customer's premises. For any other addition to an existing supply, metering must be at 120/240 V or 347/600 V. **(See Figure 1.03)**

1.4 Supply over one or more distribution service loops

1.4.1 Service loops from the line

1.4.1.1 Supply at two voltages

Subject to Section 1.4.1.2, a single building cannot be supplied at a given voltage over more than one distribution service loop. Hydro-Québec thus installs a single service loop per voltage per building. It will, however, provide both single-phase and three-phase supply to a single building.

1.4.1.2 Additional service loops

Hydro-Québec may agree to an additional service loop with a separate metering point in the cases below:

a) Fire pumps and emergency power systems

An additional service loop may be provided from the power line if the main loop is connected to the line or is a medium-voltage loop. Fire alarm, emergency lighting and other emergency systems can be supplied over the additional service loop.

The loop dedicated to emergency power 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. The emergency loop is left energized so that the fire pump and other emergency systems are not interrupted, provided the emergency loop is clearly identified with color coding.

When circumstances so require, however, Hydro-Québec can interrupt power to this loop.

b) *Industrial plants and other complex structures*
An additional service loop may be installed for complex structures such as industrial plants, commercial buildings and shopping centres with adjacent parking lots, on condition that the customer provide Hydro-Québec with technical reasons justifying its necessity. Thus, buildings comprising several parts, often built in successive phases and sometimes having different uses, may be connected to the power system by more than one distribution service loop. Each part supplied by a separate service loop must be independent and not connected to any other service box.

c) *Independent units in a building*
- Such units must not be one above the other.
- They must have a private entrance and direct ground-level access.

Each unit must be equipped with a separate electrical installation and be independent, with no connection to another service box. Independent units may have different uses (e.g., residential or commercial). Firewalls between units are not mandatory if the conditions above are met.

It must be noted, however, that in accordance with requirements in Section 1 of the *Québec Construction Code*, any unit separated by firewalls is considered a separate building. There may then be one service loop per building.

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.

1.4.2 Service loops from one or more distribution substations

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

1.4.3 Distribution service loops – Termination of special rates

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

- an appropriate metering method is possible over the loop; and
- the capacity of the building's service boxes does not need to be 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.

1.5 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 1.4.1.2.

2 Overhead Connections

2.1 Number of service entrances per building

2.1.1 New service entrances

The number of low-voltage service entrances connected to an overhead distribution service loop supplying a building depends on the following factors:

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

2.1.2 Modified service entrances

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

2.2 Spool rack

2.2.1 Supply and installation

The master electrician shall, at the customer's expense, supply and install the spool rack in accordance with *Code* requirements and with the recommendations of the Régie du bâtiment du Québec, particularly to avoid any problem due to vibrations. The customer retains ownership of the spool rack.

2.2.2 Location

The spool rack may be attached to the exterior wall of a building or to a customer pole, service mast or other support structure. The master electrician shall ensure that the service loop is secured firmly to the building in a location not conducive to vibrations, and shall strengthen the structure, if necessary, at the customer's expense. The location must also allow the meter to be installed in a readily accessible place.

2.2.3 Clearances

The location of the spool rack must always comply with clearances specified in CAN/CSA-C22.3 No. 1 (latest edition) and in the *Code* when the distribution service loop runs over lots, roads, appurtenant structures, pools or any other obstacle or constraining element.

The distribution service loop must never run above a customer's building or an appurtenant structure, with the following exceptions:

- Conductors entering a building can run above it.
- The distribution service loop can run above the eaves no farther than 1 m from the edge of the roof, without going past the edge of the adjacent wall.

If the requirements herein cannot be met, the connection point must be located at the supply point and the service entrance must comply with Section 2.6.

This Section does not include appurtenant structures of less than 13 m^2 that can be moved at any time at Hydro-Québec's request. The minimum vertical clearance between the highest point of the structure and the distribution service loop conductor must then be 1 m above areas normally inaccessible, i.e., areas only accessible using a ladder or something else not permanently fixed in place, and 2.5 m above accessible areas, e.g., a flat roof.

(See figures 2.16 and 2.18)

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. A wall-mounted spool rack must be bolted to the same wall as the service head, no farther than 300 mm from the first conduit. If there are additional conduits, the minimum length of conductors exiting a 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 50 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 distribution service loop at the higher voltage must be installed above the one at the lower voltage. **(See Figure 2.06)**

2.2.7 Mechanical strength

At the distribution service loop attachment point, the spool rack and any fixture supporting it must have the minimum strength specified in Table 3 for different service box ratings. A service mast must be installed using three mast clamps as specified in the *Code*. Wall-mounted spool racks must be bolted in place at two or more anchor points.

2.2.8 Height of spool rack

2.2.8.1 Minimum height

For adequate clearance above the ground, 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)**

2.2.8.2 Maximum height

The spool rack must never be attached more than 8 m above the ground. **(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:

a) Slope
If the spool rack support is lower than the distribution pole or if the distribution service loop crosses a street. Hydro-Québec may then have to install a pole on the service entrance side to meet the requirements in Table 5.

b) Obstructions
If the service loop passes over a pool, appurtenant structure or other obstacle or constraining element.

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 distribution service loop along its entire length and the eaves, and 600 mm of clearance from 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 separation 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 distribution service loop conductors.

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

(See Figure 2.08)

2.2.12 Common support

If two spool racks for distribution service loops at different voltages share a common support, 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 comply with the values given in Table 3, which are based on the rated ampacity of each service box or the sum of the ratings for all boxes.

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 distribution service loop at the higher voltage must be installed above the one for the loop at 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) Conductor types
Only triplex or quadruplex conductors are authorized for service loops.

2.3 Service entrance

2.3.1 Length of conductors at the service head

Conductors exiting the service head must be of adequate length, never less than 750 mm, and free of splices or connectors. On the Îles-de-la-Madeleine, conductors must be at least 1,000 mm long. **(See figures 2.01 to 2.06)**

2.3.2 Length of service mast

The length of the mast above the roof from the upper mast clamp to the spool rack must not exceed 1.5 m, unless the mast is guyed. **(See Figure 2.01)**

2.3.3 Types of service masts

Prefabricated metal masts, angle irons or steel conduits are acceptable.

Wooden masts are not allowed for new installations, modifications or replacements.

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.

Steel conduits must have a minimum diameter of 63.5 mm and comply with the *Code*. **(See figures 2.01, 2.02, 2.04, 2.05 and 2.07)**

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.

O-Z/Gedney G350B, Microelectric Canada MM700 or equivalent ground-wire clamps are acceptable. Galvanized steel clamps of the same type are also permitted. **(See Figure 2.01)**

2.3.5 Insulation of neutral conductor

In a saline environment or when a tingle voltage filter is used, the service entrance neutral conductor must be insulated and identified as specified in the *Code*. **(See Figure 2.09)**

In a saline environment, the insulated neutral conductor must be connected to the meter socket but not cut. However, if the meter socket does not have a detachable terminal block, the neutral conductor must be continuous in the socket. 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 a continuous ground.

For Hydro-Québec, a saline environment corresponds to a 1.6-km strip of land along the shoreline or coast of any saltwater body. Saline environments include the land along the St. Lawrence River east of the Rivière Saguenay on the north shore and from Rimouski to Bonaventure on the south shore, along with the south coast of the Gaspésie and the Îles-de-la-Madeleine.

2.4 Service entrance modifications

In this Section, the term "modification" excludes replacing a faulty service entrance component by another with the same characteristics.

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

2.4.1 One connection point

Modifications made to one or more service entrances in a multiple supply arrangement must allow for connection to the existing connection point, provided that point meets the conditions herein. If it does not meet the conditions, a new connection point is determined. The master electrician must then supply the unmodified entrance(s) from that point. **(See Figure 2.10)**

2.4.2 More than one connection point

2.4.2.1 Unchanged number of connection points

If more than one distribution service loop supplies a building at the same voltage, modifications to one or more service entrances must not result in increasing the number of such loops. **(See Figure 2.14)**

2.4.2.2 Single connection point

All modified service entrances must be connected to a single point in accordance with the requirements herein.

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 grouped with the unmodified one.

If two or more connection points comply with the requirements herein, the point with the greatest number of service entrances must be selected. **(See figures 2.11 to 2.14)**

2.4.3 Service entrances on existing rooftop support structures

2.4.3.1 Rooftop support structure not more than 8 m above ground

The connection point is located at the top of the rooftop support structure, provided that point is no more than 8 m above ground level. 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 2.15)**

2.4.3.2 Rooftop support structure more than 8 m above ground

If the rooftop support structure is more than 8 m above ground level, 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.

2.5 Distribution 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 of the loop. If Hydro-Québec is not authorized to run an overhead line across a public thoroughfare, it must provide, at the customer's expense, an underground crossing meeting Section 3 requirements.

2.5.2 Clearance

A customer who installs a pool, appurtenant structure, platform or stand below or beside the distribution service loop must ensure it complies with Section 2.2.3. **(See Figure 2.06)**

2.6 Connection provided by the customer

2.6.1 Supply and installation

Customers may elect to extend their service entrance by providing the connection up to the connection point determined by Hydro-Québec.

(See Figure 2.17)

2.6.2 Conditions

The connection provided by the customer must not cross a public thoroughfare unless municipal bylaws and Transport Department standards so permit and 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 customer provides an overhead (or overhead-underground) connection, metering equipment must be installed no more than 30 m from the line in accordance with the requirements herein.

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

(See Figure 2.17)

In such cases, the voltage measured at the connection point is considered to be the voltage at the supply point. Those voltages are given in Table 2.

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 snowbank or ice, for safety reasons; and
- be at a sufficient distance from the nearest trees.

To be accessible using a 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 2.18 and 2.19)

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 2.20)**

For access by ladder to the connection point, 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 that document 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 this Section, the base can only be located on the customer's property or in a road or lane.

For distribution service loops, access to the connection point may differ from access to meters. **(See Table 8 and Figure 2.21)**

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 clearances in Table 4 are maintained. **(See Figure 2.18)**

2.7.2.2 On an adjacent wall

The connection point may be located on a wall adjacent to the wall nearest the line and at a distance not exceeding 3 m from the nearest wall, provided the distribution service loop conductors form at least a 5° angle with that adjacent wall. The distance may be greater provided the distribution service loop conductors form at least a 15° angle with the wall. For clearance values, refer to Table 7. **(See Figure 2.18)**

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 mounted on an adjacent wall, the distribution 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 2.18 and 2.19)**

2.7.2.4 Above an adjoining structure

The distribution service loop may run above an appurtenant structure adjoining a building, over a distance of no more than 1 m from the edge of that structure's roof, provided it does not cross the entire width of the structure. **(See Figure 2.18)**

2.7.2.5 On a customer's pole

The connection point may be located on a customer's 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 installed no farther than 30 m from the distribution line or property line, whichever is to the customer's advantage;
- is class 7 or better under CSA-O15-05;
- is buried at a depth of at least 1.7 m;
- is installed such that the distribution service loop complies with the heights given in Table 4; and
- is guyed if stress from the service entrance could destabilize the line, as indicated in Table 6. **(See Figure 2.22)**

2.7.2.6 On the power line

If the customer elects to extend the service entrance to the line, the connection point is located at the supply point and the customer retains ownership of and responsibility for the connection provided. **(See Figure 2.17)**

2.7.3 Clearance

The connection point must be located so that there is at least 1 m of clearance between the distribution service loop conductors and any windows, doors and porches, unless the conductors are higher than these structures. Furthermore, there must be 1 m of horizontal clearance between the distribution service loop and any veranda, balcony, terrace or stairway for which a vertical clearance of 2.5 m with the conductors is not feasible. **(See Figure 2.23)**

2.8 Overhead-underground service entrance

When there is an overhead line and an overhead-underground service entrance, the latter must be installed on the utility pole, provided that the following conditions are met:

a) Authorization
The customer must obtain authorization from the owner of the pole to use it.

b) Compliance with standards
Installation must be carried out 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, Télébec or Telus) and government bodies. **(See figures 2.24 to 2.26)**

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 systematically refuses any customer request for an overhead-underground service entrance from a pole which already has underground risers or equipment other than transformers or street lights.

d) Space on the pole
The pole must have enough free space to accommodate the conduits.

No meter socket, protective device or disconnect switch can be mounted on the pole.

e) Crossing public thoroughfares
The overhead-underground service entrance must never cross a public thoroughfare unless the customer obtains authorization from the municipality or the Ministère du Transport.

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.

g) Address
The customer's street address or equipment identification label must be posted near underground riser conduits.

A metal tag with engraved or permanently glued digits at least 38 mm high, nailed to the pole near the riser in question, is acceptable. The owner's name, type of equipment and street address of the closest building must be shown to identify the equipment.

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

Rigid metal conduits must be used and must be installed as specified in the *Code*. **(See figures 2.24 to 2.26)**

2.8.1.2 Distance between conductors and service head

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

It is important to maintain a minimum vertical separation of 1,000 mm between all conductors, including drip loops, and 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 2.24 to 2.26)**

2.8.1.3 Conductor length

Conductors exiting the service head must be at least 1.5 m long when the line consists of separate conductors, and 750 mm long when it consists of multiplex conductors or when the connection is

to be made with transformer secondary terminals. Hydro-Québec supplies conductors to run from those exiting the service head to the transformer terminals. **(See figures 2.24 to 2.26)**

2.8.1.4 Metal conduit

The metal conduit must be connected to the neutral conductor using a ground-wire clamp. **(See figures 2.24 to 2.26)**

2.8.2 Safety requirements

The master electrician must take the necessary steps with Hydro-Québec to ensure that work is done in accordance with the *Safety Code for the Construction Industry* (R.Q. c. S-2.1, r. 6), which applies to all work done on a construction site as defined in the *Act Respecting Occupational Health and Safety* (R.S.Q., c. S-2.1), and with the *Regulation Respecting Occupational Health and Safety* (R.Q. c. S-2.1, r. 19.01), which applies to all institutions, subject to provisions to the contrary.

Under Section 331 of the last regulation above, any work carried out near a power line must be done in accordance with Section V of the *Safety Code for the Construction Industry*.

The employer must ensure that no one carries out work that could result in a part, load, scaffolding, machinery component or individual coming within 3 m of bare conductors on a power line at a maximum phase-to-phase voltage of 125 kV. Section 5.2.2 of the *Safety Code for the Construction Industry*, however, lists conditions where this distance does not apply.

Charges for safety work under this Section are set by Hydro-Québec and billed to the customer. **(See Section 1.2.2)**

2.8.3 Connection point

The connection point is located at the supply point or on the customer's pole in accordance with Section 2.7.2.5. **(See figures 2.24 to 2.26)**

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, decorative municipal lighting, sign lights or traffic lights.

a) Compliance with standards

Installation is at the customer's expense and must comply with Hydro-Québec standards. **(See Figure 2.27)**

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
Refer to Section 2.8 f).

2.9.1 Technical requirements

2.9.1.1 Number and types of conduits

Refer to Section 2.8.1.1. **(See Figure 2.27)**

2.9.1.2 Distance between conductors and service head

Refer to Section 2.8.1.2. **(See Figure 2.27)**

2.9.1.3 Conductor length

Refer to Section 2.8.1.3. **(See Figure 2.27)**

2.9.1.4 Grounding

Pole-mounted equipment must be connected to ground with a ground-wire clamp following the equipment-specific requirements. **(See Figure 2.27)**

2.9.2 Safety requirements

Refer to Section 2.8.2.

2.9.3 Connection point

Refer to Section 2.8.3. **(See Figure 2.27)**

3 Underground Connections

For underground connections, customers must consult a Hydro-Québec representative regarding connection methods and any applicable charges.

3.1 Service entrance

3.1.1 Meter socket

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

For connection to the underground distribution service loop, 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 distribution service loop.

For connection to the underground distribution service loop, the multiple-meter mounting device must be equipped with bolts to accommodate one-hole NEMA terminal lugs. The service conduit must terminate in the connection compartment. **(See Figure 3.04)**

3.1.3 Junction box

Each distribution service loop conductor may connect to a maximum of two service entrance conductors. A transformer box is not considered a junction box. **(See figures 0.02, 3.05 and 3.06)**

3.1.4 Connection box for flat-rate service

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

For connection to the underground distribution service loop, the connection box must be equipped with bolts to accommodate one-hole NEMA terminal lugs. **(See Figure 3.11)**

Pad-mounted telecommunications enclosures are generally equipped with a separate compartment meeting Hydro-Québec's connection-related technical specifications.

3.2 Connection point

3.2.1 Location

Depending on the installation, the connection point may be located in the meter socket, multiple-meter mounting device, junction box or connection box for flat-rate service, or in a dedicated compartment of the telecommunications enclosure. **(See figures 3.01 to 3.08 and 3.11)**

The connection point may also be located in a manhole, customer's handhole or distribution handhole for installations supplied at 120/240 V under a special agreement. In the last case, a Hydro-Québec representative must supervise installation of the service entrance at the customer's expense. Cables must be from 2 AWG to 750 kcmil in size for compatibility with the distributor's multiway connector.

3.2.1.1 In a 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 3.02 and 3.03)

3.2.1.2 In a multiple-meter mounting device

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

3.2.1.3 In a junction box

The connection point is located 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 of the preceding, located indoors **(See figures 3.05 and 3.06)**
- On the supply side of one or two meter sockets, or one or two multiple-meter mounting devices, located outdoors **(See Figure 3.07)**

b) Outdoors

- On the supply side of the service conduit
- On the supply side of two meter sockets, two multiple-meter mounting devices or one of each of the preceding

For 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. **(See Figure 3.08)**

3.2.1.4 In a connection box for flat-rate service

The connection point is located on the bolts for one-hole NEMA terminal lugs in the Hydro-Québec compartment. **(See Figure 3.11)**

3.2.1.5 In a handhole

The connection point may be located in the customer's handhole.

3.2.1.6 In a manhole

The connection point may be located in the customer's manhole.

3.3 Underground conduit system

Customers must build, at their expense, the underground conduit system and install the manhole and handhole if necessary on their property. They then have ownership of and responsibility for the system.

The conduit containing distribution service loop cables must be laid beneath a 750-mm or deeper covering following Hydro-Québec specifications.

3.4 Conduits

3.4.1 Description

A rigid conduit of at least 75-mm 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 rest of the underground conduit system.

Rigid PVC conduit at least 100-mm in diameter is required when service box ratings total 600 A or more and the conduit system has type-L conduit bodies.

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

(See figures 3.03, 3.04 and 3.08 to 3.11)

3.4.2 Conduit entrance

To avoid drainage problems, the conduit should enter the building through a wall above ground level at the most suitable location for the electrical installation. **(See figures 3.02 and 3.10)**

3.4.3 Below-ground conduit entrance

If the customer nevertheless decides to have the conduit enter the building below ground level, Hydro-Québec accepts no responsibility for any drainage problems.

The conduit must go through the wall perpendicularly, extending far enough indoors for a coupling to be installed.

An adapter joins the underground conduit system to the rigid conduit entering the building. It is suggested that the conduit be perforated and placed on a bed of clean crushed stone (10–20 mm) at least 1.5 m in length leading to a drain or sump pit. **(See Figure 3.09)**

3.4.4 Conduit compatibility

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

3.4.5 Riser conduit on an exterior wall

A riser conduit may be mounted outdoors on the wall of a building 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 3.03 and 3.10)**

3.4.6 Expansion joint and adapter

The master electrician must install an expansion joint and adapter

- on an outdoor riser conduit connected directly to a meter socket or multiple-meter mounting device; **(See figures 3.03 and 3.04)**
- on a conduit entering the building above ground level; and **(See figures 3.02 and 3.10)**
- on a conduit entering a junction box outdoors. **(See Figure 3.08)**

An adapter must also be installed for conduit entrances that are below ground level. **(See Figure 3.09)**

3.4.7 Inspection and cleaning

Once work is completed, the master electrician must, with a Hydro-Québec representative present, inspect and clean the conduits with a brush and steel wire joined to a mandrel. This must always be done for 347/600-V service, and must be done at Hydro-Québec's request for 120/240-V service.

3.4.8 Cable-pulling rope

For cable pulling, an industrial-grade polypropylene rope 6 mm or more in diameter must be inserted in the conduit.

For 120/240-V service, installing this pull rope is only required when the master electrician inspects and cleans the conduits.

3.4.9 Conduit sealing

The customer premises end of a conduit containing distribution service loop cables must be sealed by Hydro-Québec workers using a suitable sealant.

(See figures 3.02, 3.03, 3.04, 3.07, 3.08, 3.09 and 3.10)

3.4.10 Repairing above-ground conduit systems

Repairs may be carried out on a conduit system located above ground level, in accordance with the *Code* and Figure 3.13.

3.5 Pullbox and junction box

3.5.1 Use

3.5.1.1 Pullbox

A pullbox may be used for underground cables supplying a meter socket with a maximum rating of 200 A at 120/240 V, except if the distribution service conduit enters the building above ground level.

(See figures 3.01 and 3.02)

Meter socket clearance must comply with Section 6.3.6.1. A transformer box 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.

3.5.2 Location

3.5.2.1 Pullbox

The pullbox must be installed indoors where the distribution 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 3.01)**

3.5.2.2 Junction box

A junction box for connecting the distribution service loop to one or two service entrance conductors may be installed either indoors or outdoors.

a) Indoors

The junction box is located where the distribution 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 figures 3.05 to 3.07, 3.09 and 3.10)**

b) Outdoors

The junction box is located on the supply side of the customer's service conduit with the top of the box from 1.5 to 2 m above ground level. **(See Figure 3.08)**

3.5.3 Characteristics

The doors of pullboxes and junction boxes must have welded hinges with non-removable pins and a mechanism for installing a seal. **(See figures 3.01 and 3.05)**

3.5.3.1 Pullbox

The pullbox must be at least 500 mm high by 500 mm wide by 250 mm deep, and have 16 gauge or thicker walls. **(See Figure 3.01 and Table 9)**

3.5.3.2 Junction box

Table 9 specifies the size of the junction box, number of mechanisms for installing a seal and the gauge of the walls.

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 meter sockets, or one or two multiple-meter mounting devices are supplied, installed and grounded by the master electrician at the customer's expense in accordance with the *Code*.

3.5.5 Access and clearance

The access to the pullbox or junction box must be at least 600 mm wide and 2 m high. Clearance of 1.1 m in front of the box is required for at least the full width of the box. **(See figures 3.09 and 3.10)**

3.5.6 Location of conduits

3.5.6.1 At the conduit entrance

a) Sufficient clearance on wall

If the building has two connections at different voltages, the conduit entrance shall be arranged so that a pullbox or junction box can be installed for each connection.

b) Insufficient clearance on wall

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

3.5.6.2 On the pullbox or junction box

Entrance conduits for distribution service loop conductors may terminate on the back, sides or bottom of the pullbox or junction box but must be no farther than 200 mm from a corner. They may also terminate on the top of the pullbox or junction box if the conduit system drains toward outdoors.

The outlet conduit(s) for customer conductors or running to the connection point 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.

This distance may be increased to 300 mm when the service box ratings total more than 600 A.

In all cases, the conduit must be as close as possible to the corners.

The inlet conduit and the outlet conduit(s) must never be installed near the same corner of the pullbox or junction box.

(See figures 3.01, 3.05, 3.06 and 3.10)

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 vault dug beneath the building and kept dry, provided that clearances are as specified in Section 3.5.5 and that the vault is accessible at all times through a 685 x 760 mm or larger trap door and down a fixed vertical ladder.

The trap door must be large enough to allow installation or replacement of the pullbox or junction box required for the installation's rating.

Thus, the pullbox or junction box must fit through the trap door if there is no other opening.

Metering equipment must not be installed in the vault, however, since it must be readily accessible.

3.5.8 Alternative arrangements

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, such as telephone booths, bus shelters, lighted signs and (small-scale) oil distributors.

3.6.2 Supply and installation

Customers with flat-rate contracts must supply the connection box. The underground distribution service loop can then be connected in the box, which must be installed outdoors by a master electrician. **(See Figure 3.11)**

3.6.3 Characteristics

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

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

(See Figure 3.11)

3.7 Distribution service loop

3.7.1 Supply and installation

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

3.7.2 Customer's handhole

If the distribution service loop is not likely to be used to connect new customers, the connection point can be located in the customer's handhole. The master electrician must leave an extra 3-m length of cable in the handhole. Customers retain ownership of and responsibility for their installations.

The master electrician must contact a Hydro-Québec representative regarding applicable requirements.

3.7.3 Manhole

In the manhole, the master electrician shall leave enough cable for the connection point to be located in the middle of the vault.

3.7.4 Distribution service loops 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 three conditions below are met.

1. The distribution service conduit must be encased in concrete at least 50 mm thick.
2. The distribution service loop must consist of a single span of cable running from the distribution manhole or handhole to the connection point.
3. If the sum of bends exceeds 180° (not counting the bend beneath the customer service equipment), the master electrician has 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 Clearance

A customer who installs a pool, appurtenant structure, platform or stand near the distribution service loop or line must ensure that it complies with the clearance values specified in CSA C22.3 No. 7 (latest edition) and given in Table 10 herein. **(See Figure 3.12)**

3.8 Connection

3.8.1 Lugs

Hydro-Québec supplies 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 7.3.2.9 d), however, cables in the metering transformer box must not exceed 500 kcmil. **(See Figure 0.02)**

3.8.2 Length of conductors in the junction box

The service entrance conductors inside the junction box must be at least long enough to go once around the box. **(See Figure 0.02)**

4 Temporary Connections

4.1 Application

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

4.2 Conditions of service

Certain conditions govern electrical service to temporary installations. 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 distribution pole or in underground conduits for distribution service loops.

b) Requirements
The temporary customer installation must comply with the *Code* and with the requirements herein. The service entrance attachment point must meet Table 3 requirements. 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.

c) Distance of the meter from the distribution line
For an overhead service entrance, the meter must be attached to the customer's installation, which must be located no more than 30 m from the distribution line or from the line between the customer's property and the adjacent public thoroughfare. This requirement does not apply to

- a residence;
- service entrances fully visible from the power line connection point; or
- service entrances partly visible from the power line connection point if the remaining part is visible from the metering point.

d) Metering equipment shelter
If metering transformers are used, the equipment must be installed in a weatherproof shelter.

e) Supply and installation of overhead service entrance conductors
For installations to be connected to the distribution line, the master electrician must supply the conductors running to the pole in accordance with Tables 4 and 6. The customer retains ownership of and responsibility for the conductors. Hydro-Québec, however, must connect the conductors.

(See figures 4.01, 4.02 and 4.03)

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 distribution pole complies with minimum clearance requirements stipulated in the *Code*. If the excess cable is not rolled up, it can be cut when the service entrance is connected.

f) Crossing public thoroughfares
Where municipal bylaws permit, temporary overhead service entrances can cross public thoroughfares insofar as the requirements in Table 4 are met.

g) Supply and installation of underground distribution service loop cables
If the installation must be connected to an underground line, Hydro-Québec supplies and installs service loop cables through the customer's conduit to the connection point. Hydro-Québec retains ownership of and responsibility for its service loop and removes the cables when the contract comes to an end. The customer is billed for the costs in accordance with the *Conditions of Electricity Service*.

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 rating, installed load and delivery point voltage.

5.3 Installations with single-phase 120/240-V supply

5.3.1 Rating not exceeding 200 A

Self-contained metering with no current transformer is used. A meter socket must be installed according to the specifications in Chapter 6.

5.3.2 Rating exceeding 200 A

Instrument transformer metering is used. A current transformer box must be installed according to the specifications in Chapter 7.

5.4 Existing installations with three-phase 120/208-V supply

5.4.1 Rating not exceeding 100 A

Self-contained metering with no current transformer is used. A meter socket must be installed according to the specifications in Chapter 6.

5.4.2 Rating exceeding 100 A

Instrument transformer metering is used. A current transformer box must be installed according to the specifications in Chapter 7.

5.5 Installations with three-phase 347/600 V supply

5.5.1 Rating not exceeding 200 A

Self-contained metering with no current transformer is used. A meter socket must be installed according to the specifications in Chapter 6.

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

Sockets for metering three-phase 120/208-V and 347/600-V installations may not be located inside the same building.

5.5.2 Rating exceeding 200 A

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

5.6 Existing installations with three-phase, three-conductor, 600-V supply

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

5.7 Service box clearance

A service box on the supply side of the metering equipment must be so placed as to leave the operator at least 1 m of free space in front of the box and a lateral radius of at least 1 m from the point to be operated. The operator must be able to stand in front of the transformer box, splitter box or other boxes to operate the service box.

The same clearance applies to the first protective device or disconnect switch on each feeder on the load side of the transformer box. If there is a main service box and a number of secondary service boxes, the required clearance applies to all service boxes.

An exception to this rule is any front rotary-knob switch rated 200 A or less in a box whose width does not exceed 400 mm, for which the 1 m of free space may be located to the left or right of either side of the service box and must allow the operator to operate the control easily. **(See Figure 5.01)**

5.8 Installing metering equipment for different voltages

Subject to the exceptions mentioned in Section 5.5.1, the metering equipment for different voltages is normally grouped. It is possible, however, to reach an agreement with Hydro-Québec to have them separate for the following reasons:

- To avoid unnecessary voltage drops
- To facilitate connection to the line
- Lack of space in the existing meter room when a new electrical installation is added

5.9 Permanent identification of installation components

Before installing any metering equipment, the master electrician must identify all service boxes, meter sockets, transformer boxes and distribution panels.

5.9.1 Identification of meter sockets

The master electrician must identify each individual meter socket or each meter socket of a multiple-meter mounting device or metering centre.

The street address of the building or unit is used for identification and must be inscribed on the fixed part of each meter socket.

(See figures 3.04, 6.08, 6.09 and 6.11)

It is not mandatory to identify a meter socket that is the only meter socket on a distribution service loop.

5.9.2 Identification for grouped supply

The master electrician must identify all service boxes, meter sockets, transformer boxes and distribution panels.

The street address of the building or unit is used for identification and must be inscribed on the fixed part of each meter socket and on any corresponding service box, transformer box and distribution panel.

(See figures 3.05, 6.09 and 6.11)

If there is no street address, all corresponding meter sockets, service boxes, transformer boxes and distribution panels 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.

5.9.3 Methods of identification

The following methods of identification are allowed:

a) *Embossed metal tag*
   A metal tag must be secured to the fixed part of the front of the meter socket or pinned down when the detachable part is in place. The inscription must be at least 5 mm high.

b) *Engraved tag*
   A permanent glued, riveted or screwed-down tag must bear an engraved inscription at least 5 mm high. Chisel-engraved metal tags are permitted. Only a glued tag is authorized for outdoor use.

c) *Adhesive tape*
   Indoors, a label (from an electronic labeling device) affixed permanently in place must bear a black, red or blue inscription at least 5 mm high on a white background. Vinyl embossing tape is not permitted.

5.10 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.

6 Self-Contained Metering

This Chapter lays down requirements for self-contained metering, whether the meter socket is separate or part of a multiple-meter mounting device or metering centre.

6.1 Supply and installation

The meter socket is an integral part of the customer's installation and must, under the *Code*, meet the legal and regulatory requirements governing equipment for electrical installations. The master electrician installs and connects it at the customer's expense in accordance with Hydro-Québec standards.

6.2 Meter socket and fixtures

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. A combined meter socket/circuit breaker complying with that standard may also be used at 120/240 V if the *Code* so permits.

b) Outdoor use
Only a meter socket for outdoor use is authorized.

c) Meter socket with one-hole NEMA terminals
The meter socket must have one-hole NEMA terminal bolts for connecting lugs whenever the connection point for the underground distribution service loop is on the socket terminals.

The bottom wall of the meter socket must accommodate a conduit with a diameter of 75 mm or more for the underground distribution service loop. **(See figures 3.01 and 6.04)**

d) Automatic bypass
It is prohibited to use a meter socket with an automatic bypass mechanism.

e) Screw clamp
The meter socket must have a screw clamp designed for installing a seal. The list of approved screw clamps can be found on the Web site for master electricians (**www.hydroquebec.com/cmeq**). A copy can also be obtained by calling 1 800 ÉNERGIE (1 800 363-7443).
(See Figure 6.05)

f) *Temporary cover*
Until the meter is installed, the opening for the meter on the front of the socket must be protected by a watertight cover held in place by the screw clamp.

g) *Jaws*
The meter socket jaws must ensure an adequate electrical and mechanical contact with the meter blades at all times.

For temporary service, master electricians must obtain jumpers (SAP 1018874) from Customer Services (1 877 COURANT) for connections between jaws. It is prohibited to use bits of wire or nails.

h) *Neutral conductor*
The full length of the neutral conductor inside the meter socket must be insulated or taped to prevent contact with live parts. **(See figures 6.01 to 6.04)**

i) *Removable front cover*
The removable front cover of the meter socket must have a lock secured by studs welded from the inside. This lock must not be visible or accessible from the outside once the meter is installed and secured by the screw clamp with a seal. Any other device meeting these requirements may be used with Hydro-Québec's approval.
(See Figure 6.06)

j) *Combined meter socket/circuit breaker*
The removable part giving access to the conductors behind the circuit breaker must have a mechanism for installing a seal.

6.3 Installations with single-phase 120/240-V supply

Only a four-jaw meter socket meeting the requirements in sections 5.3.1 and 6.2 is authorized for metering installations with single-phase 120/240-V supply.

6.3.1 Outdoor installations with five or fewer meter sockets

When there is more than one meter socket, Hydro-Québec recommends that master electricians use a multiple-meter mounting device to reduce the number of conduits on the building.

a) *Detached or semidetached buildings*
Any installation with five or fewer meter sockets must be located outside the building at ground-floor level in a place readily accessible from the outside at all times.

b) *Row houses*
Any installation with five or fewer meter sockets must be located indoors unless prior consent has been given by Hydro-Québec. Such consent is only given, however, for buildings with a shared

yard or parking lot in back, or to which access from the back is protected by a legal instrument. This excludes locations where private, lockable fences are usually installed. Since Hydro-Québec considers the building at the end of a line of row houses as semi-detached, meter sockets there are located outdoors at ground-floor level in a place readily accessible at all times.

6.3.2 Installations with six or more meter sockets

For buildings with six or more meter sockets, customers may opt to have them installed either indoors or outdoors. In either case, Section 1.3 requirements must be met.

6.3.2.1 Indoor installations with six or more meter sockets

a) In one meter room

For installations with a main service box and several meter sockets, the main service box along with the meter sockets and their service boxes must be grouped in the meter room, which may be in the basement, on the ground floor or on a higher floor.

b) In more than one meter room

In a building with more than one distribution point, the meter sockets can be grouped in several meter rooms, each near a distribution point.

6.3.2.2 Outdoor installations with six or more meter sockets

Any installation with meter sockets and/or multiple-meter mounting devices must be located at ground-floor level in a place readily accessible from the outside at all times.

6.3.3 Location of outdoor meter sockets

If the meter sockets cannot be grouped together at ground-floor level for reasons of safety, accessibility or feasibility, they may be installed in a readily accessible location at another floor level after agreement with Hydro-Québec.

6.3.4 Choice of location when making modifications

The term "modification" means changing conductor size or service entrance capacity, or moving a meter socket.

6.3.4.1 Buildings with five or fewer meter sockets

a) One or more individual service entrances

When a modification is made between the connection point and the meter or main service box, the meter socket is installed outdoors in a location readily accessible at all times from outside.

b) Grouped supply

When a modification is made between the connection point and main service box, the meter(s) must be installed outdoors in a location readily accessible at all times from outside.

When a modification is made between the main service box and secondary service box(es), the socket(s) of the modified secondary service box(es) may remain indoors.

For grouped supply, the number of meter sockets may be increased to optimize the capacity of the main service box.

6.3.4.2 Buildings with six or more meter sockets

When modifications are made to the first service entrance, the master electrician may install the meter socket indoors or outdoors in accordance with Section 6.3.2. The location chosen then applies to all other service entrances to be modified.

6.3.4.3 Buildings with a meter in each unit

If the meter in a unit cannot be installed outdoors or in the indoor meter room at the time an installation is modified, it may be kept inside the unit. The master electrician must, however, have Hydro-Québec's prior consent. Furthermore, the meter must be readily accessible and located as specified in the *Code* and in Section 6.3.6.

6.3.5 Indoor installation of meter sockets

Meter sockets must be installed indoors in the following cases:

- On the Îles-de-la-Madeleine, regardless of the preceding sections, unless they are installed in outdoor NEMA 4X enclosures
- When a unit already has three-phase supply and the meter socket can be placed in the unit's meter room
- In all other cases not covered by sections 6.3.1 and 6.3.3, or if the customer so elects under Section 6.3.2

6.3.6 Placement of single-phase 120/240-V meter sockets

Such sockets must be installed on the level, in a readily accessible location and must be firmly and permanently secured to a wall not subject to excessive vibrations, to a customer-owned pole (if wood, CSA-O15 class 7 or better) or to any other support with equivalent characteristics.

6.3.6.1 Clearance and height

a) Multiple-meter mounting device or individual meter socket

A 1-m or greater space free of any temporary or permanent obstruction must be left in front of the multiple-meter mounting device or meter socket. The same clearance must be kept between the meter socket and property line. The top of the multiple-meter

mounting device or meter socket must be at least 1.5 m and at most 1.8 m above the floor, ground (after earthwork) or any permanent platform at ground-floor level. There must be at least 300 mm between the top of an indoor meter socket and the ceiling or joists. Customers with a service entrance to renovate or move must consult a Hydro-Québec representative if they find it impossible to meet these requirements. **(See Figure 6.07)**

b) *Grouped meter sockets*
The top of all meter sockets grouped in a meter room must be 750 to 1,800 mm above the floor. **(See Figure 6.08)**

The top of the highest meter socket in a metering centre may, however, be up to 2,030 mm above the floor. **(See Figure 6.09)**

Clearance must comply with Section 6.3.6.1 a).

c) *Clearance from combustible gas exhausts or vents*
There must be at least 1 m of clearance between the meter socket and any combustible gas vent or exhaust duct, as specified in the *Code*. In the case of a combined meter socket/circuit breaker, the minimum clearance must be 3 m.

The minimum clearance must be 1 m for natural gas vents, regardless of the type of meter socket.

6.3.6.2 Protection of meters

To ensure that metering equipment remains undamaged and in good working condition, Hydro-Québec may require that meters not located in a meter room be installed in an appropriate-sized enclosure or protected by guard posts.

A permanent shelter may be required for outdoor meters. In all instances the conditions below must be met in addition to clearance requirements under Section 6.3.6.1.

a) *Enclosure*
A type-3 metal enclosure is required, except in a saline environment where a NEMA 4X enclosure must be used. Clearance of at least 100 mm around the socket and 50 mm in front of the meter is required so that the meter and its screw clamp can be installed and removed using appropriate tools.

b) *Guard posts*
Guard posts are not considered obstructions under Section 6.3.6.1. At least 500 mm of space must, however, be left between multiple-meter mounting devices or meter sockets and the guard post.

c) *Permanent shelters*
Permanent shelters must

- protect equipment from bad weather, condensation, splashes, salt air and excessive dust; and
- meet requirements under the *Code*. **(See Figure 7.09)**

6.3.7 Location of meter sockets

6.3.7.1 Individual meter sockets

For individual 120/240-V service entrances, the meter socket must always be installed between the connection point and the service box. **(See Figure 6.01)**

6.3.7.2 Multiple-meter mounting devices

Multiple-meter mounting devices must always be installed between the connection point and the service boxes.

(See figures 0.02, 3.04 and 3.08)

6.3.7.3 Multiple secondary service boxes

If there are a main service box and several secondary service boxes, the meter sockets must be placed between the main box and secondary boxes. **(See Figure 6.08)**

In such instances, the neutral conductor must be permanently insulated from the meter sockets. If it must be cut, the neutral must then be connected to an insulated terminal inside the meter socket.

(See Figure 6.02)

For a 120/240-V metering centre, the secondary service boxes may be located on either the supply or load side of the meters. **(See Figure 6.09)**

6.4 Installations with three-phase 120/208-V supply

6.4.1 Meter sockets allowed

Hydro-Québec authorizes the use of five-jaw meter sockets for two-phase 120/208-V installations and seven-jaw sockets for three-phase 120/208-V installations, subject to sections 5.4.1 and 6.2.

6.4.2 Location and installation

All 120/208-V meter sockets must be located indoors and installed in compliance with sections 6.3.5 and 6.3.7.3. **(See Figure 6.10)**

6.5 Installations with three-phase 347/600-V supply

6.5.1 Meter sockets allowed

Hydro-Québec authorizes the use of seven-jaw meter sockets for three-phase, 347/600-V, wye-connected installations with a grounded neutral and insulated neutral terminal, subject to sections 5.5.1 and 6.2. **(See figures 6.10 and 6.11)**

6.5.2 Location

The meter socket must always be located on the load side of the service box. Subject to exceptions under the *Code*, it must be located indoors and positioned according to the conditions in Section 6.3.6. **(See figures 6.10 and 6.11)**

If the meter socket and service box must be located outdoors, they must be installed in a shelter. Two types of shelters are authorized:

1. A permanent shelter that must:
   - be large enough to comply with the requirements in sections 5.7, 6.3.6.1 and 6.3.6.2;
   - have a useful depth of at least 400 mm;
   - meet safety requirements under Section 6.5.4; and
   - meet requirements under the *Code*. **(See Figure 6.14)**
2. A weatherproof type 3 enclosure large enough to house the service box and meter socket. A NEMA 4X enclosure is required in a saline environment. It must have a useful depth of at least 400 mm.

Service boxes and meter sockets installed in such shelters are considered to be indoors even though the shelter is outdoors. On farms or at potentially unsafe locations where access constraints may apply (limited visiting hours, special clothing required, etc.), the metering equipment must be installed outside the security perimeter.

6.5.3 Locking

Service boxes installed on the supply side of the meter must be lockable.

(See Figure 6.10)

6.5.4 Zero-voltage testing

There must be a device (switch with a hinged door) for zero-voltage testing on either the supply or load side of the meter socket.

It must be possible for authorized workers to perform testing at this test point using a voltage detector. A circuit breaker is not considered an adequate device for zero-voltage testing.

All electrical cabling from the test point to the meter socket must be visible.

If the electrical cabling between the service box and meter socket cannot be visually checked, the master electrician must energize the service box to unequivocally identify the socket's dedicated service box using a voltage detector.

Furthermore, he must lock out the main service box if it is impossible to energize the socket's dedicated service box or if the connection point is de-energized.

6.5.5 Metering centre

Hydro-Québec authorizes use of a metering centre at 347/600 V. Requirements under Section 6.3.6.1 apply. All service boxes must be lockable and located on the supply side of the corresponding meter socket.

(See Figure 6.11)

7 Instrument Transformer Metering

Every metering point must have a dedicated service box in the same room. When the metering point is in a shelter, the service box must be installed in that shelter. If the metering equipment is in an unheated shelter or room, the master electrician must contact a Hydro-Québec representative to check whether the shelter or room must be kept at or above 10°C.

7.1 Location of metering equipment

Subject to exceptions in the *Code*, metering equipment must be indoors. It must be in a readily accessible location.

7.1.1 Metering equipment in a shelter

Hydro-Québec allows the transformer box and meters to be installed in a permanent shelter if

- environmental conditions so require, as described in the *Code*; or
- there is no building to house the metering equipment on the site.

The two types of shelters below are authorized:

1. A permanent shelter, which must
   - be large enough to meet requirements under sections 5.7 and 7.3.3;
   - meet safety requirements under Section 7.3.4; and
   - meet requirements under the *Code*. **(See Figure 7.09)**
2. A type-3 enclosure large enough to house the service box, transformer box and meters. A NEMA 4X enclosure is required in a saline environment.

Service boxes and metering equipment installed in such shelters are considered indoors even though the shelter is outdoors. On farms or locations where access constraints may apply (limited hours, special clothing required, etc.), metering equipment must be installed outside the security perimeter.

7.1.2 Outdoor single-phase meter

For a domestic-use contract at over 200 A for a detached, semidetached or farm building, the meter support must be installed outdoors on the wall of the building served, in a location accessible from the outside at all times. At least 600 mm of clearance must be left above the meter support. The transformer box must be installed inside the same building.

The 600 mm of clearance left above the box makes it possible to install an indoor meter should the need arise. For a non-domestic-use contract at over 200 A, the meter must always be installed indoors. For farm buildings, except

at farms with a security perimeter where Section 7.1.1 requirements must be met, the meter must be located outdoors near the building's entrance so that it is accessible at all times.

The master electrician must supply and install, at the customer's expense, the conduit, meter support (A-base) and transformer box, in compliance with sections 6.3.6 and 7.3.2.3. **(See Figure 7.01)**

7.1.2.1 Conduit

A conduit must be run from the meter support to the transformer box and must

- enter the support from below;
- exit the building at least 300 mm above ground level;
- have a minimum diameter of 25.4 mm for runs of up to 15 m, 31.75 mm for runs exceeding 15 m and not be over 30 m long;
- not have more than two 90° bends without an accessible pulling point;
- have pulling points equipped for affixing self-adhesive seals; and
- have a rope or wire for pulling the metering conductors, inserted by the master electrician. **(See Figure 7.01)**

7.2 Customer equipment on supply side of metering point

7.2.1 Customer metering 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. The transformer must have only one secondary winding to which only the protective device may be connected.

Only customer metering transformers exclusively 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. Customer equipment for electrical load management and metering must be installed on the load side of Hydro-Québec metering equipment.

7.2.2 Auxiliary systems in a customer vault substation

Auxiliary systems (lighting, electrical outlets, fire alarm and ventilation systems, etc.) connected in a customer vault substation are installed on the supply side of Hydro-Québec metering equipment.

7.3 Instrument transformer metering in a transformer box

7.3.1 Responsibilities

7.3.1.1 Master electrician

The transformer box is an integral part of the customer's installation and is reserved for the exclusive use of Hydro-Québec. The master electrician must supply and install the box at the customer's expense.

7.3.1.2 Hydro-Québec

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

7.3.2 Transformer box

7.3.2.1 Description

The transformer box must have the items below: **(See Figure 0.04)**

a) Doors
Doors must have welded hinges with nonremovable pins.

b) Tongue
One of the two doors must have a tongue against which the other rests, making it impossible to slip an object between them to pry them open.

c) Openings
The top of the box must have two standard-size openings with cover plates. Once installed, the plates can only be removed from the inside.

d) Mounting plates
The metering equipment must be installed on three perforated metal plates. These plates are designed by the transformer box manufacturer to meet Hydro-Québec specifications. They must be screwed onto the back of the box leaving about 50 mm between the edge of the plates and the walls of the box.

e) Bolts
The doors must have bolts preventing either one from opening unless they are unbolted.

f) Sealing mechanism
The box must have mechanisms for affixing seals, installed to make it impossible to remove the seals from the outside and open the doors once the seals are in place.

g) Approved transformer boxes

The list of boxes approved by Hydro-Québec and meeting its requirements can be found on the Web site for master electricians (**www.hydroquebec.com/cmeq**). A copy can also be obtained by calling 1 800 ÉNERGIE (1 800 363-7443).

7.3.2.2 Specifications

Table 11 gives the dimensions, number of bolts, number of sealing mechanisms and gauge of the metal for the three types of transformer box.

7.3.2.3 Location

Transformer boxes must be in a readily accessible location and firmly secured to a wall not subject to excessive vibrations.

7.3.2.4 Placement

The transformer box must be installed at least 100 mm from the service box, on the load side. **(See Figure 7.02)**

Section 6.3.2.1 requirements for grouping meter sockets also apply to transformer boxes and their service box.

7.3.2.5 Height

Transformer boxes must be installed so that their top is level and from 1.2 to 1.55 m above the floor. **(See figures 7.01 to 7.03)**

If the top of a transformer box is more than 1.55 m above the floor, a platform can be installed. Such a platform must be permanently in place, at least 1.2 m wide and deep enough to allow 625 mm of clearance, accounting for the depth of the box and width of the door opened to 90°. If it is 600 mm or more above the floor, a guardrail at least 1 m high must be installed. The mechanical strength of the top rail must comply with Québec laws and regulations in effect.

A stairway is also required 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 7.03)**

7.3.2.6 Clearance

a) In front of box

At least a 1-m space must be left free at all times both in front of the box and between the box and a wall or any other obstruction.

(See Figure 5.01)

b) For open doors

When the doors cannot open to 180°, an additional 625 mm of clearance must be left between the opposite wall or any other obstruction and the edge of the doors opened to 90°.

7.3.2.7 Protection

To make sure that metering equipment remains undamaged and in good working condition, the Hydro-Québec representative may require that a transformer box not inside a meter room be installed in another enclosure or protected by guard posts.

To be compliant, the enclosure for housing a transformer box must be of plywood at least 15 mm thick or of metal. In all cases, clearance must comply with the preceding Section.

7.3.2.8 Placement of conduits

The only conduit inlets or outlets at the top and back of the transformer box must be Hydro-Québec ones.

For transformer boxes with a main service box of less than 600 A, the conduits must not be more than 200 mm from the bottom corners. For boxes with a main service box of 600 A or more, the conduits must not be more than 300 mm from the bottom corners. In all cases, however, the conduits must be as close as possible to the corners. Supply-side conduits and load-side conduits must be on opposite sides.

(See figures 7.02 and 7.06)

Notwithstanding the preceding paragraphs, the conduit running from the transformer box to a meter box or meter support (A-base) must be installed in one of the sides of the transformer box, within 200 mm of the top corner. **(See figures 7.01 and 7.06)**

7.3.2.9 Placement of conductors

a) Phase conductors

Conductors connected to current transformers must be sufficiently long, free of splices and looped across the entire width of the transformer box. **(See Figure 7.02)**

b) Neutral conductor

The master electrician must run the neutral conductor of single- and three-phase installations along the bottom of the box. The neutral must always be connected to the first component on the load side of the transformer box. **(See Figure 7.02)**

c) Insulated terminal

For wye-connected 120/208-V or 347/600-V installations with a grounded neutral, a 12 AWG or thicker copper conductor with white or gray insulation, connected to the service box neutral terminal, must be connected to an insulated terminal on one of the side walls inside the transformer box. **(See Figure 7.02)**

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.

7.3.2.10 Identification of conductors

The phase conductors of polyphase installations must be color-coded using adhesive tape at the connection point, in the service box and in the transformer box: red for phase A, black for phase B, blue for phase C and either white or gray for neutral, if it is insulated. The phase conductors must be arranged from left to right (A, B, C) in the service box. Conductors of single-phase installations need not be color-coded.

Conductors of the same phase running parallel must be bundled.

7.3.3 Space for installing meters

7.3.3.1 Above the transformer box

The part of the wall above the transformer box must be strong enough to firmly support the meter(s) and unobstructed over a height of 600 mm or more. If this part of the wall is not made of wood, it must be covered with a 19-mm plywood panel 600 mm high and the width of the box. The panel must not block openings. Materials other than plywood are not permitted. **(See figures 0.03, 0.04, 7.02 and 7.06)**

7.3.3.2 Above the meter box

If the space above the transformer box does not meet the conditions in Section 7.3.2.5 and a platform as described in that Section cannot be built, a meter box is required. It must meet the requirements in Section 7.3.3.1 and the specifications for a type-A transformer box given in Table 11. The master electrician supplies and installs the meter box at the customer's expense. **(See figures 0.03 and 7.06 A)**

The meter box must have the characteristics below:

a) Size

The box must be at least 750 mm high, 750 mm wide and 250 mm deep. **(See Table 11)**

b) Mounting plates

The metering equipment must be installed on three perforated metal plates designed by the manufacturer to meet Hydro-Québec specifications. They must be screwed into the back of the box leaving about 50 mm of clearance between the edge of the plates and the walls of the box.

c) Height and clearance

The meter box must be installed so that its top is level and between 1.2 and 1.55 m above the floor. Clearance must comply with Section 7.3.2.6. **(See Figure 7.06)**

d) Location

Meter boxes must be in a readily accessible location and firmly secured to a wall not subject to excessive vibrations.

e) Conduit between boxes
A conduit must run from the meter box to the transformer box. It must have a minimum diameter of 38 mm for runs of up to 20 m, 63.5 mm for runs exceeding 20 m and not be over 140 m long. The conduit must have no more than two 90° bends without a pulling point. It must enter the meter box within 200 mm of a bottom corner. The master electrician must insert into the conduit a rope or wire for pulling the conductors. **(See Figure 7.06 A)**

7.3.4 Safety precautions

7.3.4.1 Zero-voltage testing

There must be an arrangement for zero-voltage testing on either the supply or load side of the transformer box.

Acceptable arrangements are

- a switch equipped with a hinged door; or
- a splitter box equipped with a hinged door.

It must be possible for authorized workers to perform testing at this test point using a voltage detector. A circuit breaker is not considered an adequate device for zero-voltage testing.

All electrical cabling from the test point to the transformer box must be visible.

If the electrical cabling between the service box and meter socket cannot be visually checked, the master electrician must energize the service box to unequivocally identify the transformer box's dedicated service box using a voltage detector.

Furthermore, he must lock out the main service box if it is impossible to energize the transformer box's dedicated service box or if the connection point is de-energized. **(See figures 7.04 and 7.05)**

7.3.4.2 Lockout

To be considered lockable, equipment must have a permanent manufacturer-supplied or -installed mechanism for securing a lock to prevent it from being energized.

It must be possible to lock out the following equipment:

a) Service box
A lockable service box must be installed on the supply side of the transformer box. **(See figures 7.04 and 7.05)**

b) Protective devices and disconnects
Each feeder on the load side of the transformer box must have at least one protective device or disconnect in the same room as the box.

The first device on each feeder must be lockable. All electrical cabling from the device to the transformer box must be visible.

(See figures 7.04 and 7.05)

c) *Circuit breaker panel door*
To be considered lockable, the door of a circuit breaker panel must have a permanent manufacturer-supplied or -installed mechanism for securing a personal lock. The circuit breakers in a panel with a lockable door are also considered lockable. **(See Figure 7.04)**

7.4 Instrument transformer metering in a metal-clad substation

7.4.1 Conditions

7.4.1.1 Standards

The compartment containing metering transformers must meet all requirements in this Standard, 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*, and CAN/CSA-C71-2 (latest edition), *Insulation Co-ordination – Part 2: Application Guide*, or to any new applicable standard.

The compartment is reserved for the exclusive use of Hydro-Québec.

7.4.1.2 Compartment size

The minimum height and width of the metering transformer compartment must be 750 mm for installations of 2,000 A or lower and 850 mm for installations over 2,000 A. For a 120/240-V installation, the maximum allowable ampacity is 1,200 A.

(See figures 7.06, 7.08 and 7.10)

7.4.2 Responsibilities

7.4.2.1 Consulting engineer or 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 switches to be installed. Hydro-Québec must approve those documents before the substation is built.

7.4.2.2 Master electrician

The master electrician, at the customer's expense, supplies the metal-clad substation, installs or has the manufacturer install the current transformers, and connects the primary windings. He also supplies

and installs the conductors, fittings needed to connect the primary windings, and ducts or conduits needed for voltage and current transformer secondary conductors.

The conduit from the meter box to the metal-clad substation compartment containing the metering transformers must be a continuous run and must comply with Section 7.3.3.2 e).

(See figures 7.07, 7.08 and 7.10)

7.4.2.3 Hydro-Québec

Hydro-Québec supplies the metering equipment, and installs and connects the meters, voltage transformers, test-terminal box, terminal blocks and metering transformer secondary conductors.

Hydro-Québec installs the terminal block on one of the walls of the metal-clad substation.

7.4.3 Meters

7.4.3.1 Installation above a meter box

A meter box must be installed in compliance with Section 7.3.3.2.

(See Figure 7.06)

7.4.4 Current transformers

7.4.4.1 Supply

Hydro-Québec supplies the metal-clad substation manufacturer or master electrician with the current transformers.

7.4.4.2 Installation

The manufacturer or master electrician must install the current transformers on the busbars of the metal-clad substation.

(See figures 7.07, 7.08 and 7.10)

7.4.4.3 Access

A panel with welded hinges and nonremovable pins on one side and bolted pins on the other must make access to current transformers possible from the front or the back of the compartment. Clearances must comply with Section 7.3.2.6. Such panels must have a mechanism for installing a seal. **(See figures 7.07, 7.08 and 7.10)**

7.4.4.4 Placement

Current transformers must be arranged so it is easy to inspect and maintain them, and to connect the secondary conductors.

The conditions below must be met:

a) Polarity
Transformers must be arranged such that the polarity shown on the equipment is on the supply side. **(See figures 7.07, 7.08 and 7.10)**

b) Height
The bottom of the transformers in the compartment must be at least 300 mm above the floor or ground, and the top of the transformers cannot be more than 1.65 m above the floor or ground.
(See figures 7.07, 7.08 and 7.10)

c) Clearance
At least 50 mm of clearance must be left between the door and the transformers.

d) Window-type transformers
Any window-type transformer supplied by Hydro-Québec must be secured with the centre of the window aligned with the busbars and with visible marks identifying the secondary terminals.

e) Single-phase 120/240-V installations
Hydro-Québec provides a three-phase current transformer for single-phase 120/240-V installations. Dimensions must be as specified in Figure 7.10. **(See Figure 7.10)**

7.4.5 Voltage transformers

7.4.5.1 Supply and installation

Hydro-Québec supplies the voltage transformers and installs them on structures provided for this purpose in the metering transformer compartment. The manufacturer or master electrician must install a copper or brass slotted round-head 10-32 bolt on the supply side of the busbars for Hydro-Québec to connect the transformer primary conductors. This bolt is not required for 120/240-V installations.

7.4.5.2 Access

Section 7.4.4.3 requirements also apply to voltage transformers.

7.4.5.3 Height of support structures

The height of the structures for voltage transformer installation must comply with Section 7.4.4.4 b) requirements regarding current transformers.

7.4.6 Terminal block

So Hydro-Québec can install the terminal block, the manufacturer or master electrician must attach a metal mounting plate that must

- have a usable area at least 75 mm wide by 300 mm long, a minimum thickness of 1.5 mm and be raised by 15 mm; and
- be placed on the same side as the conduit running from the meter box to the shielded substation compartment to make it easier to install the terminal block and connect the secondary conductors.

(See figures 7.07, 7.08 and 7.10)

7.4.7 Connection to the ground bar

The metering transformer compartment and all removable metal plates must be bonded to the ground bar with stranded copper wire or braided copper ribbon tape.

7.4.8 Extension of the neutral conductor

For wye-connected assemblies, the master electrician must extend the insulated neutral conductor to the transformer compartment.

7.4.9 Safety precautions

7.4.9.1 Zero-voltage testing

The metering transformer compartment must be arranged so that zero-voltage testing is possible.

7.4.9.2 Lockout

To be considered lockable, equipment must have a permanent manufacturer-supplied or -installed mechanism for securing a lock to prevent it from being energized. A disconnect or protective device must be located on the supply side of the metering transformer compartment and is considered the metal-clad substation's service box.

Each feeder on the load side of the metering transformer compartment must have at least one protective device or disconnect in the same room as the metal-clad substation.

All protective devices and disconnects, whether on the supply or load side of the metering transformer compartment, must be lockable. All electrical cabling between disconnects not next to the metering transformer compartment and the metal-clad substation must be visible.

7.4.9.3 Temporary grounds

The metal-clad substation must be arranged so that temporary grounds can be installed on the fixed grounding points.

a) Fixed grounding points

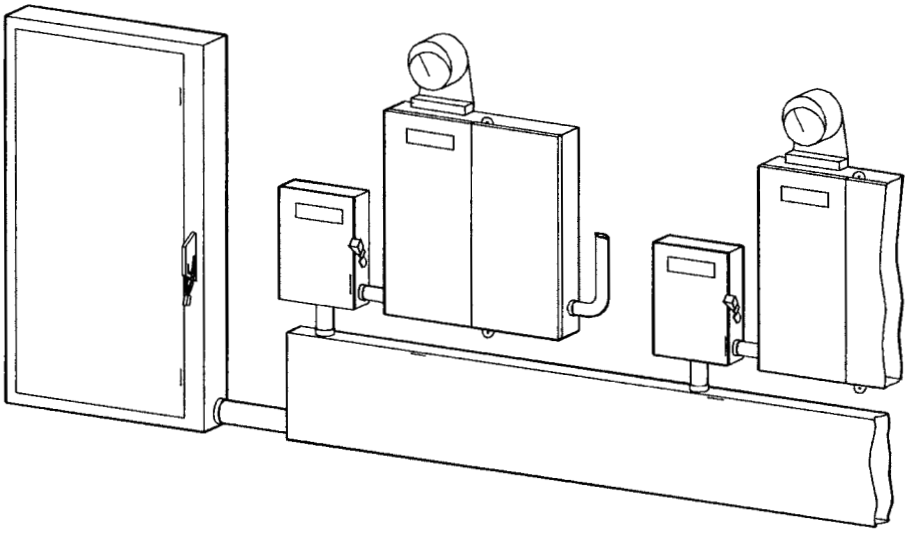
A grounding bolt consists of a round-headed copper part with a hexagonal base and a threaded steel rod, bolt, flat washer and lock washer; all parts must be galvanized. Such grounding bolts must be approved by Hydro-Québec. **(See figures 7.07, 7.08 and 7.10)**

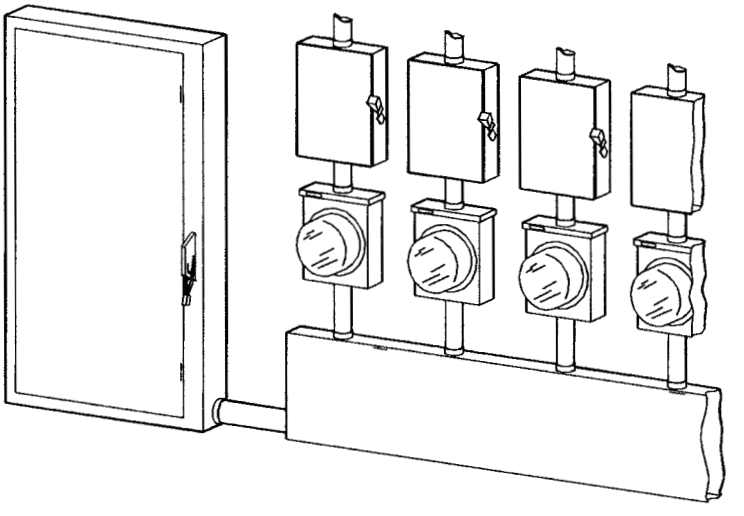
b) Supply and installation of fixed grounding points

Grounding bolts are supplied and installed at the customer's expense by the manufacturer of the metal-clad substation or by the master electrician. They are installed on the grounding terminal block and on the busbars in the metering transformer compartment on the load side of the current transformers. Sufficient clearance for attaching a temporary ground must be left around each bolt.

(See figures 7.07, 7.08 and 7.10)

Figures

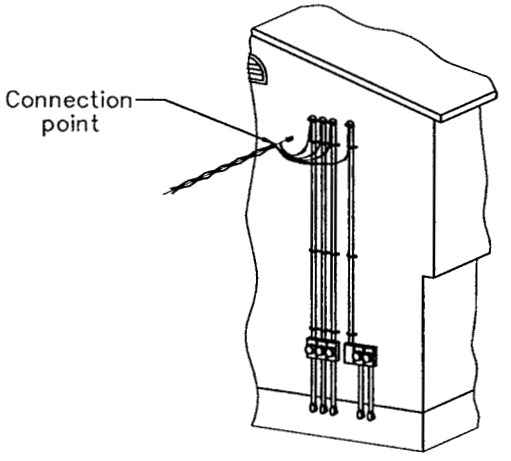




Ref.: Section 0.3

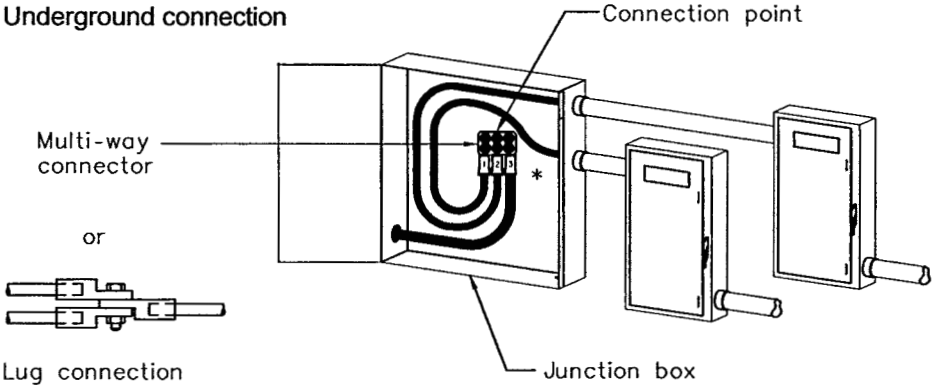
Hydro Québec	EXAMPLES OF GROUPED SUPPLY	
Technical validation INGÉNIEUR JEAN JOLY 30601 Québec Date: 09/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 0.01

A: Overhead connection



– Maximum of four customer service conductors per distribution service loop conductor

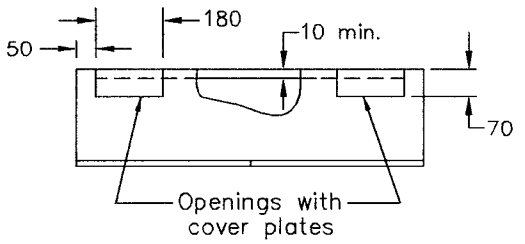
B: Underground connection

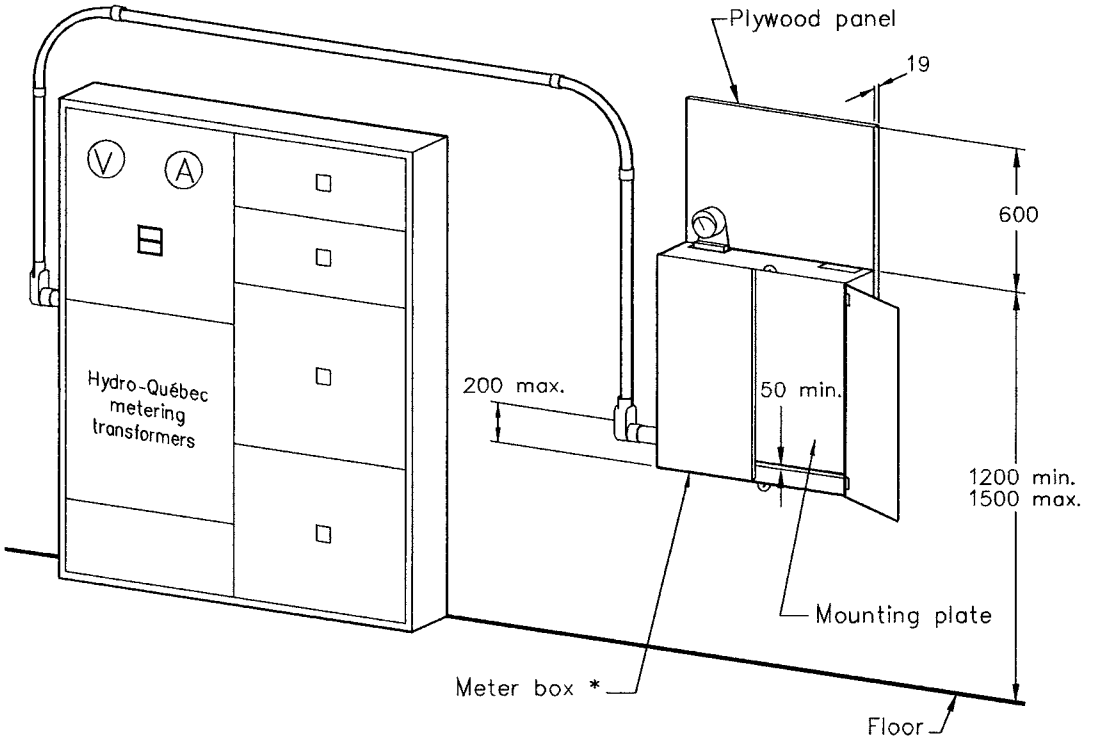


- Maximum of two service entrance conductors per distribution service loop conductor
* Only one distribution service loop conductor shown

Ref.: Sections 0.3, 2.1.1, 3.1.3, 3.8.1, 3.8.2 and 6.3.7.2

Hydro Québec	MULTIPLE SUPPLY	
Technical validation INGÉNIEUR Jacques Côté 99299 QUÉBEC Date: 2009, 09, 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization ing. Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 0.02

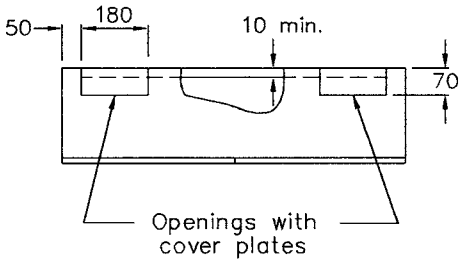


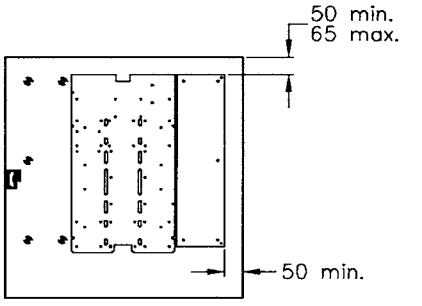


* Type A box: 750 X 750 X 250

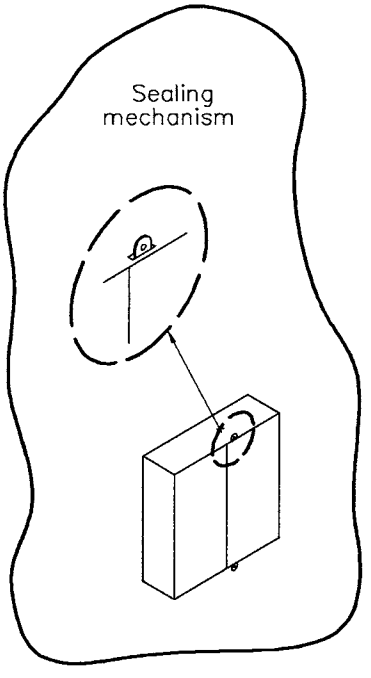
Ref.: Sections 7.3.3.1 and 7.3.3.2 and Table 11

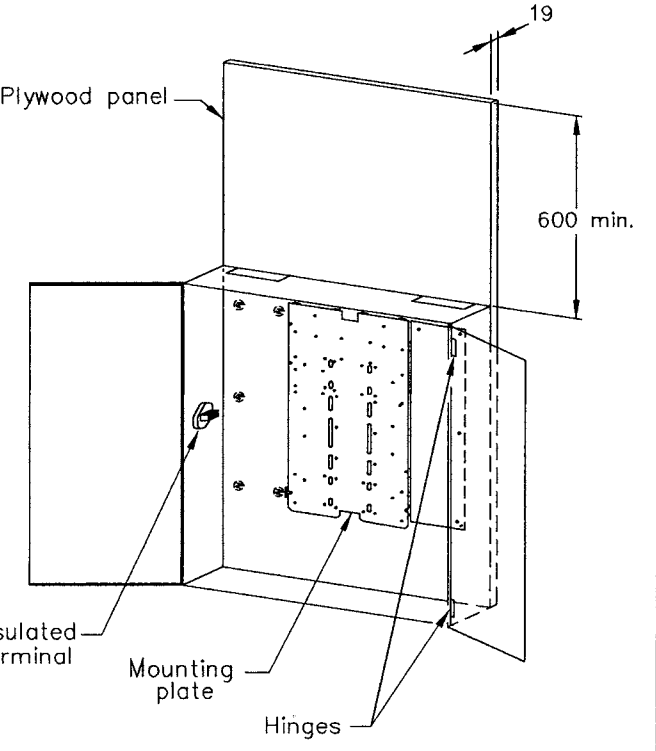
Hydro Québec	METER BOX	
Technical validation INGÉNIEUR JEAN JOLY 30601 QUÉBEC Date: 09 / 11 / 06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 0.03





Mounting plate
clearance

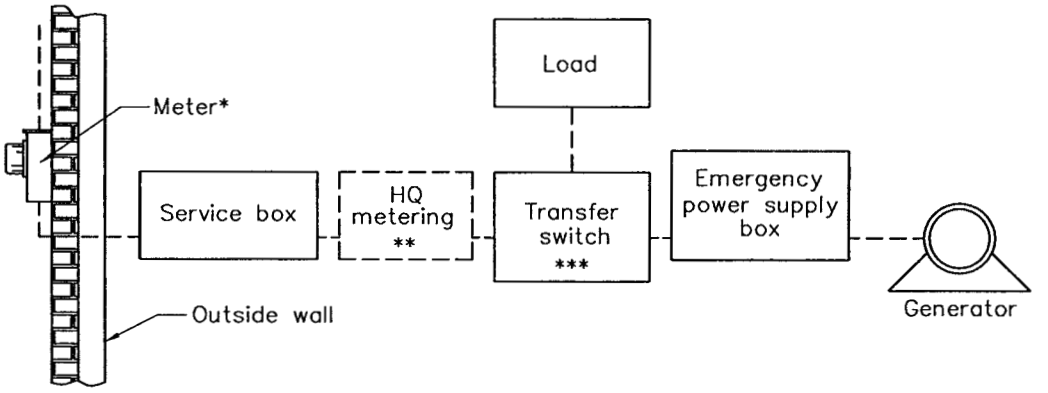




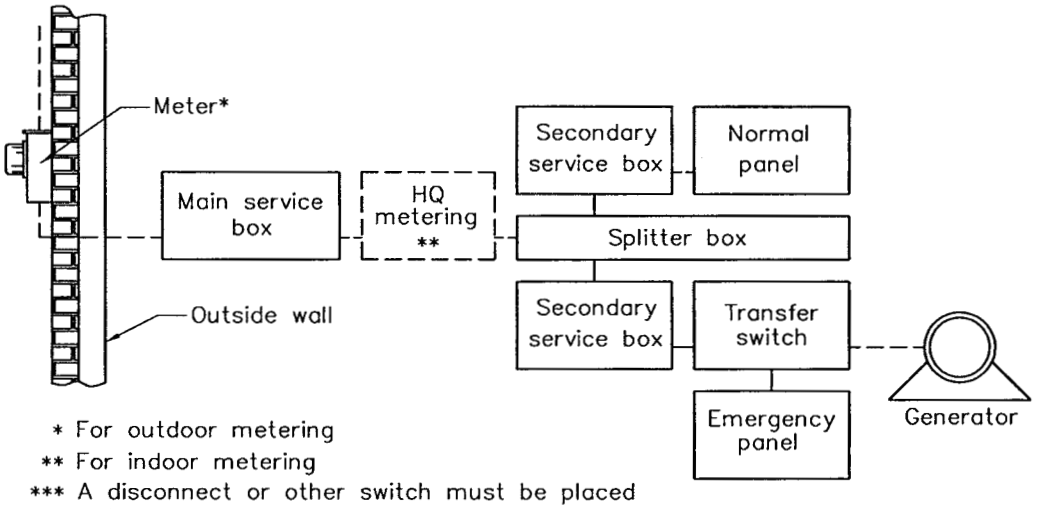
Ref.: Sections 0.3, 7.3.2.1 and 7.3.3.1

Hydro Québec	TRANSFORMER BOX	
Technical validation INGÉNIEUR JEAN JOLY 30601 QUÉBEC Date: 09/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 0.04

A: Generator supplying the entire load



B: Generator supplying part of the load



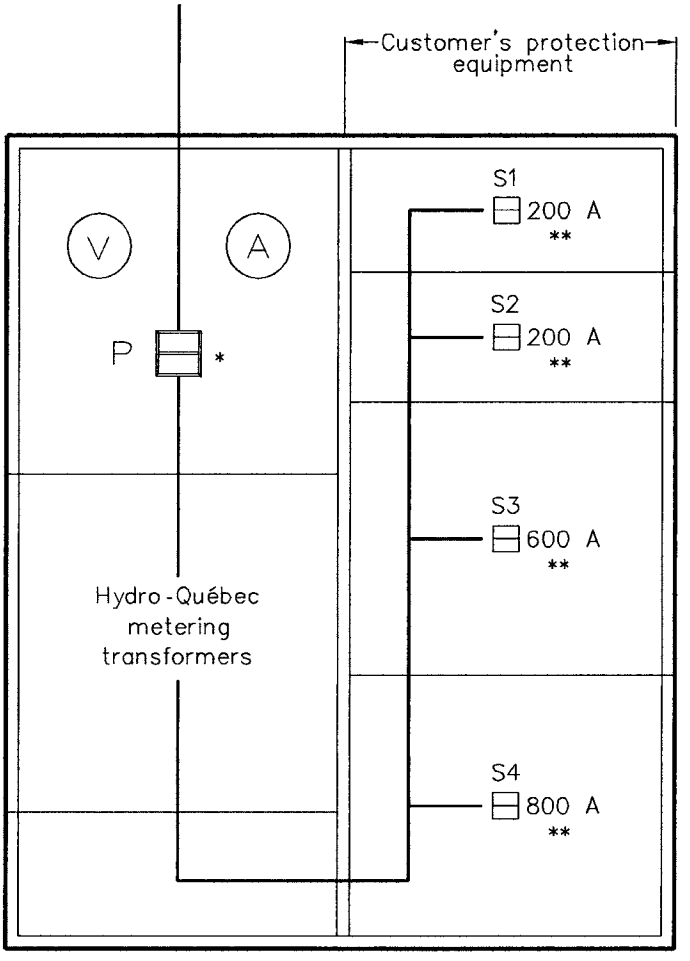
* For outdoor metering

** For indoor metering

*** A disconnect or other switch must be placed between the transfer switch, if automatic, and the Hydro-Québec metering equipment.

Ref.: Section 1.2.3.1

Hydro Québec	ELECTRICAL INSTALLATION WITH BACKUP GENERATOR	
Technical validation INGÉNIEUR DENIS DESLAURIERS 042176 QUÉBEC Date: 09/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization | Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 1.01

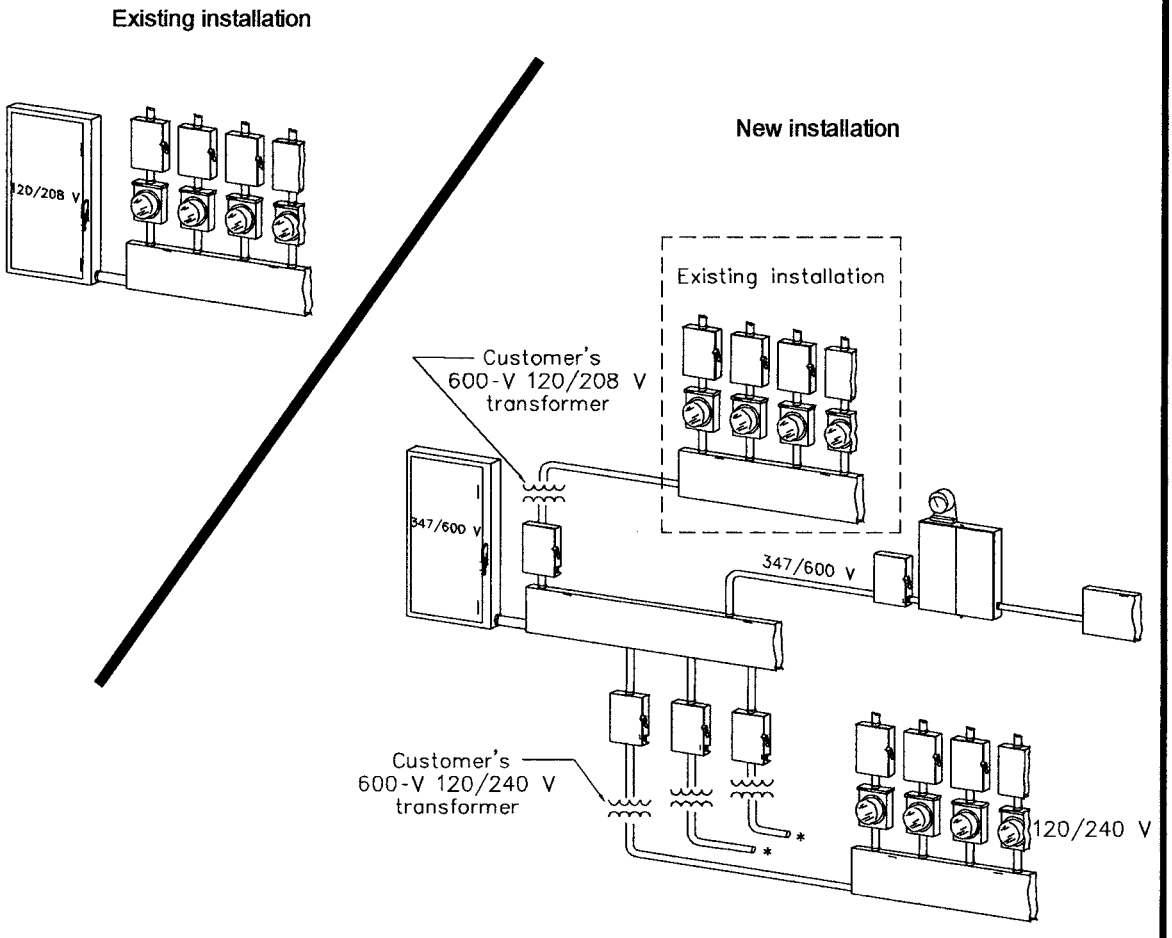


P: Primary protection
S: Secondary protection
* First level of protection coordination
** Second level of protection coordination

Ref.: Section 1.2.5

Hydro Québec	PROTECTION COORDINATION ARRANGEMENT	
Technical validation INGÉNIEUR JEAN JOLY 30001 QUÉBEC Date: 01 / 11 / 06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 1.02

Modification between the connection point and a main service box with 120/208-V supply

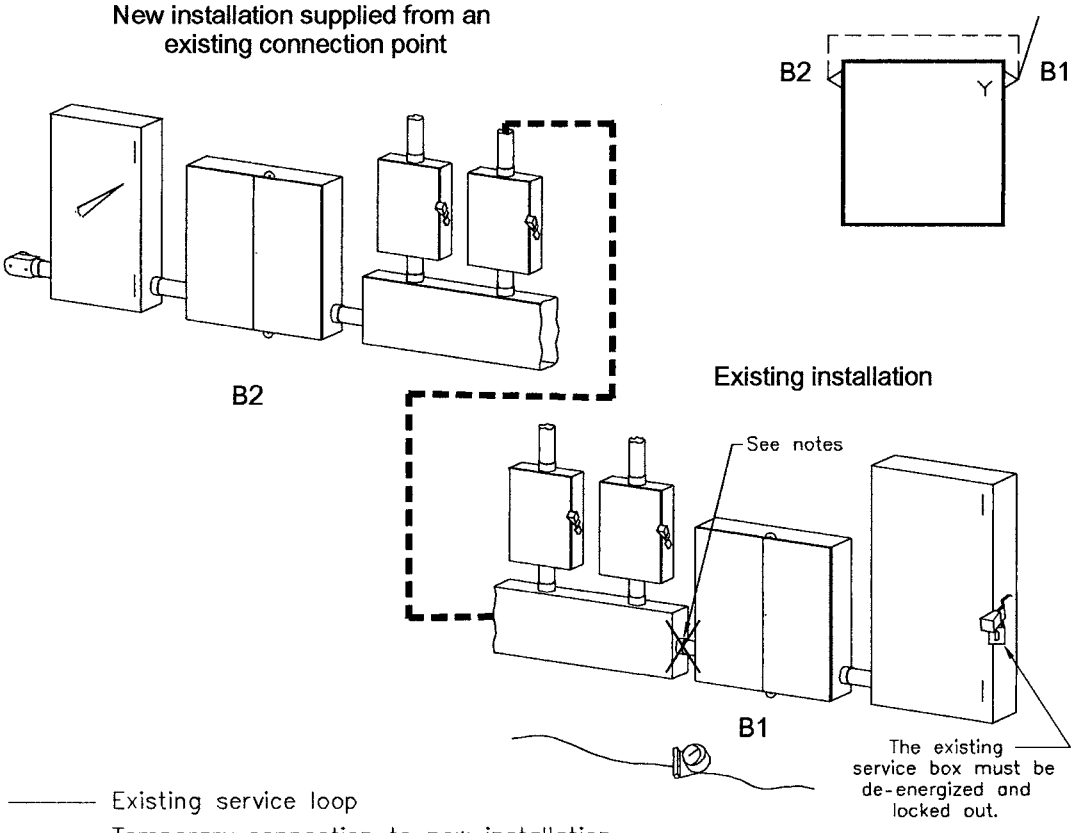


* Installation required for phase balancing when a single-phase load exceeds 25 kW.

Ref.: Section 1.3.2

Hydro Québec	MODIFICATION OF A 120/208-V SERVICE ENTRANCE	
Technical validation INGÉNIEUR JEAN JOLY 30601 QUÉBEC Date: 09 / 11 / 06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 1.03

New installation supplied from an existing connection point



——— Existing service loop

– – – – Temporary connection to new installation

▬ ▬ ▬ Link between new installation and existing installation

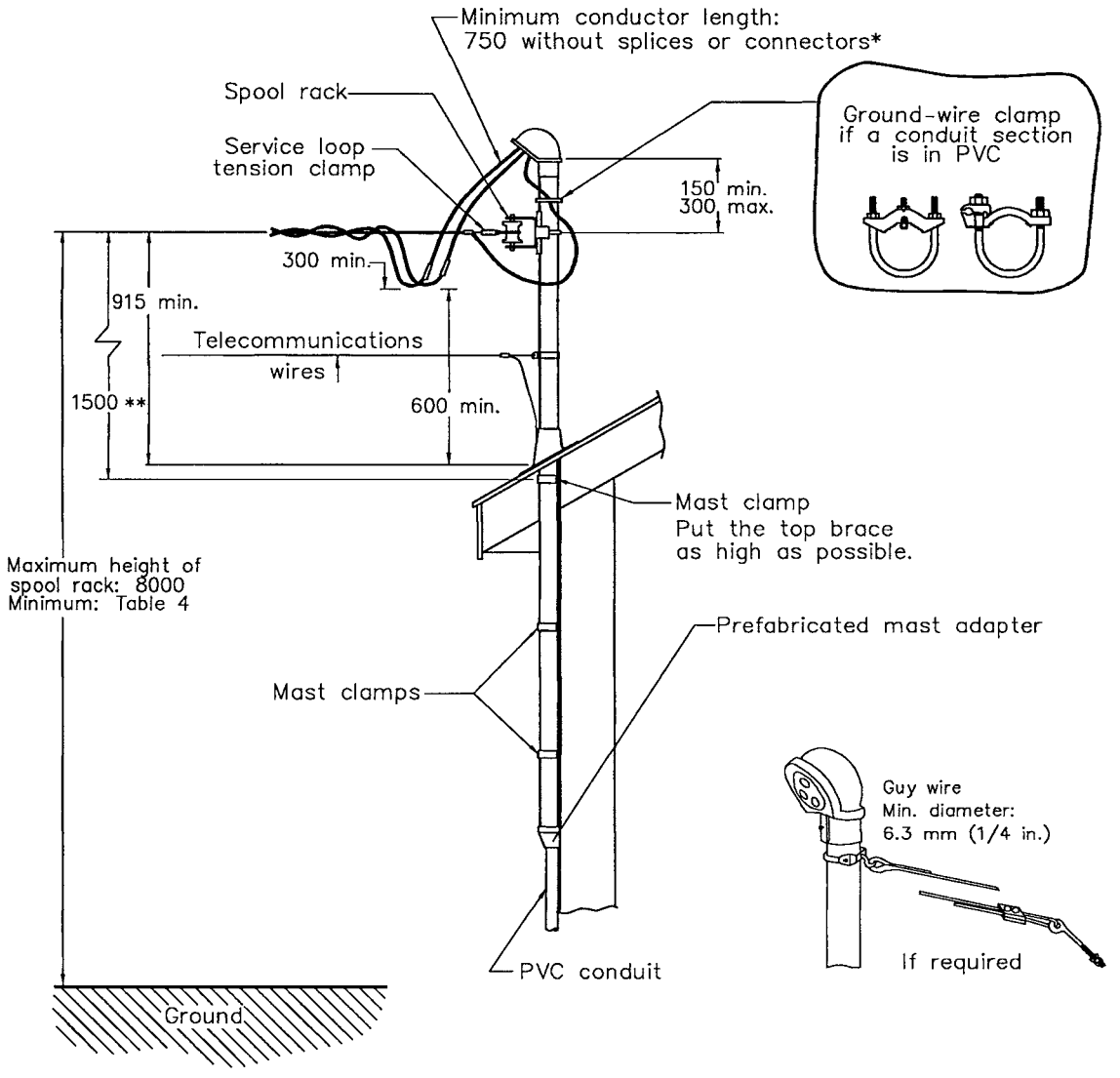
Notes: The temporary supply circuit must not be connected to the existing meter socket, metering transformer box or service box.

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 Hydro-Québec can recover it.

The installation must comply with provisions in this Standard and in the *Code* (specifically Section 76), and with requirements regarding warning signs.

Ref.: Section 1.2.2.6

Hydro Québec	TEMPORARY SUPPLY CIRCUIT LINKED TO AN EXISTING CONNECTION POINT	
Technical validation INGÉNIEUR DENIS DESLAURIERS 42176 QUÉBEC Date: 03/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 1.04

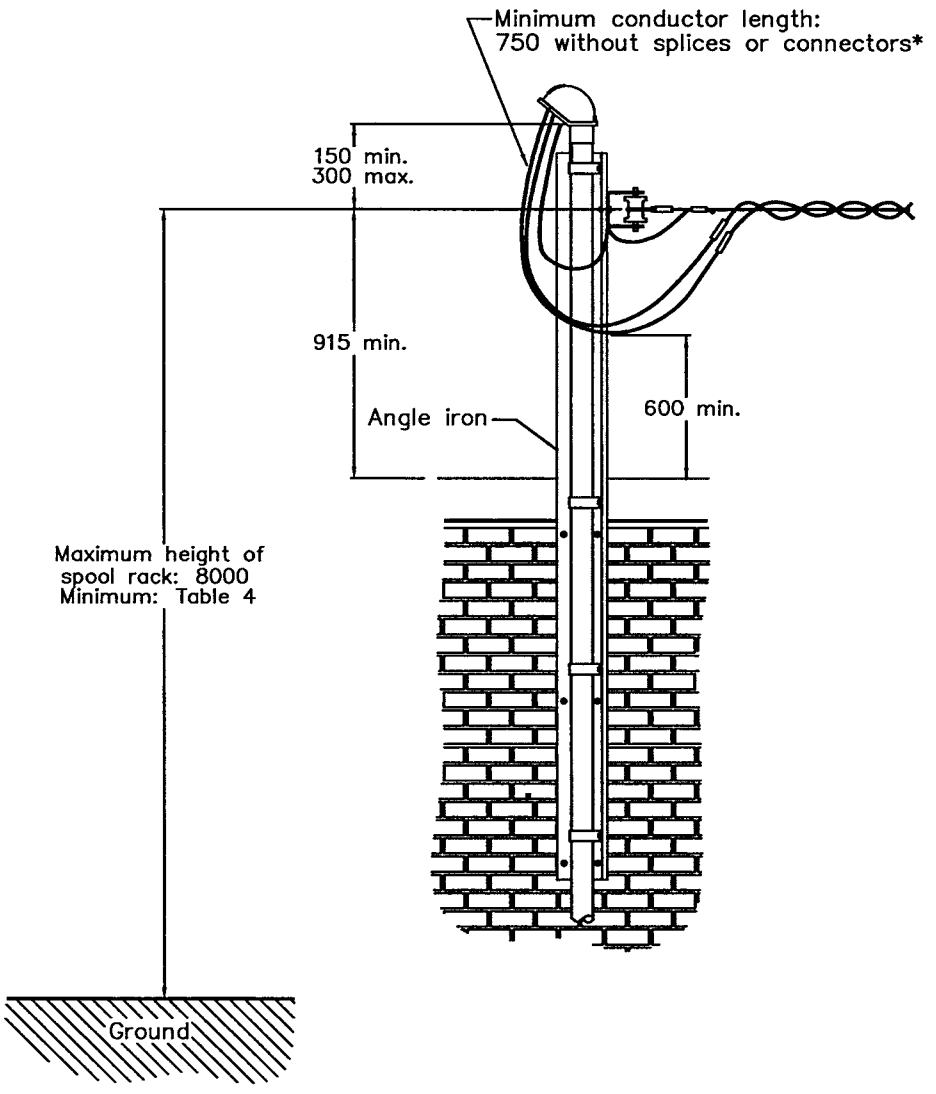


* On Iles-de-la-Madeleine, minimum length: 1000 mm

** 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 and 2.3.1 to 2.3.4

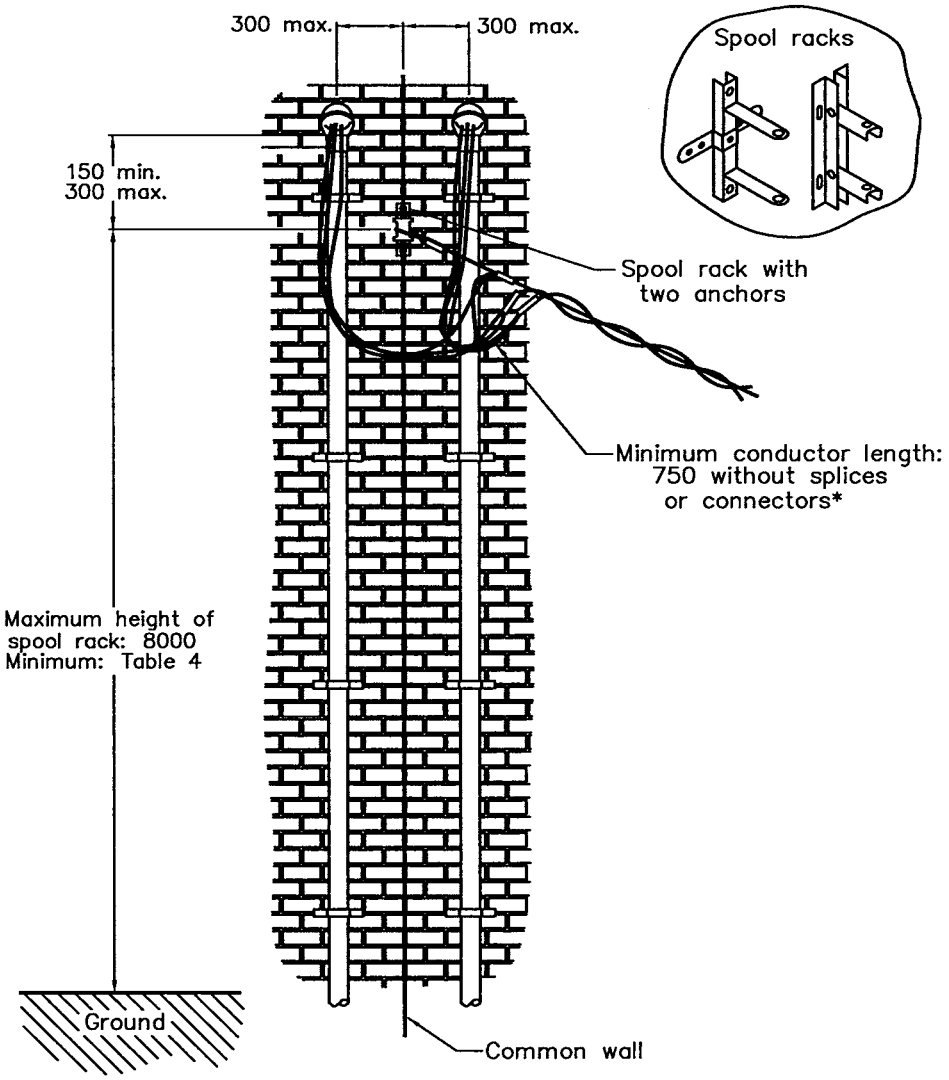
Hydro Québec	120/240-V SUPPLY PREFABRICATED SERVICE MAST OR RIGID STEEL CONDUIT	
Technical validation Ordre des ingénieurs du Québec Roger Desbiens 35448 Québec Date: 2009 07 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 2.01



* On Iles-de-la-Madeleine, minimum length: 1000 mm

Ref.: Sections 2.2.4, 2.2.8.1, 2.2.8.2, 2.2.9.1, 2.3.1 and 2.3.3

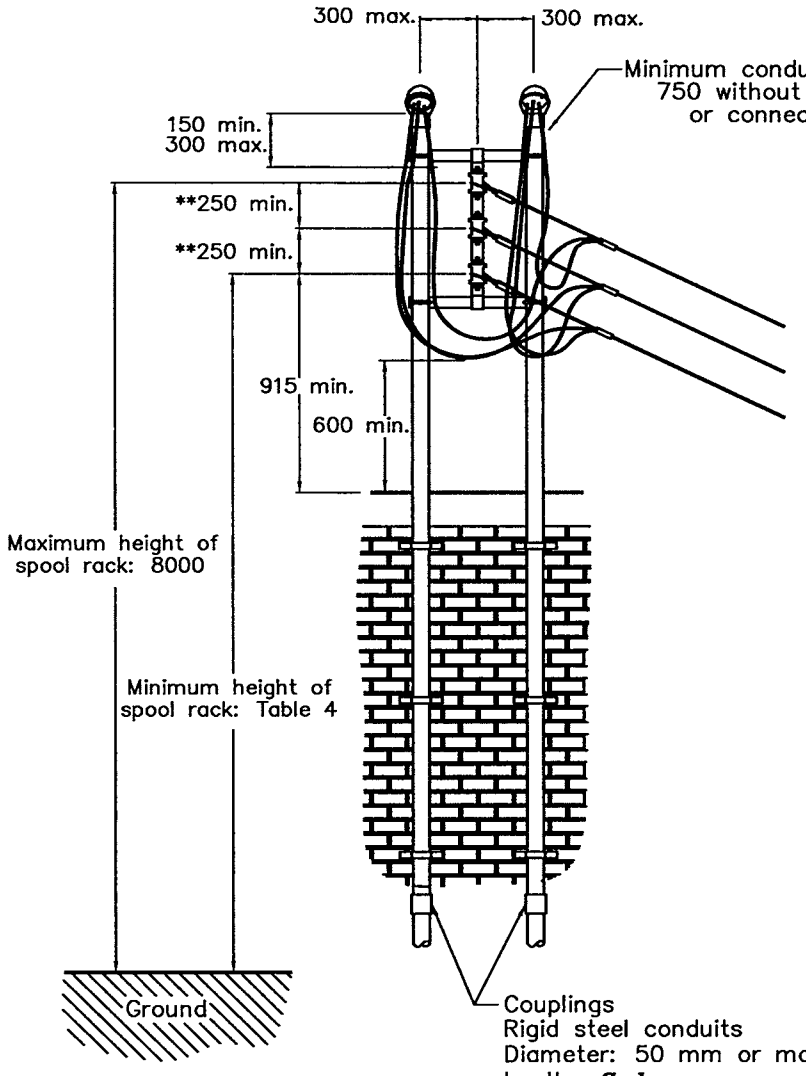
Hydro Québec	120/240-V SUPPLY SERVICE CONDUIT WITH ANGLE IRON SUPPORT	
Technical validation INGÉNIEUR Roger Desbiens 35448 QUÉBEC Date: 2009 07 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Ing. Operations	Standard: E.21-10 9th edition Figure: 2.02



* On Iles-de-la-Madeleine, minimum length: 1000 mm

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

Hydro Québec	TWO SERVICE ENTRANCES WITH A COMMON SPOOL RACK (SEMI-DETACHED OR ROW HOUSES)	
Technical validation Ingénieur Roger Desbiens 35448 Québec Date: 2009/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 2.03

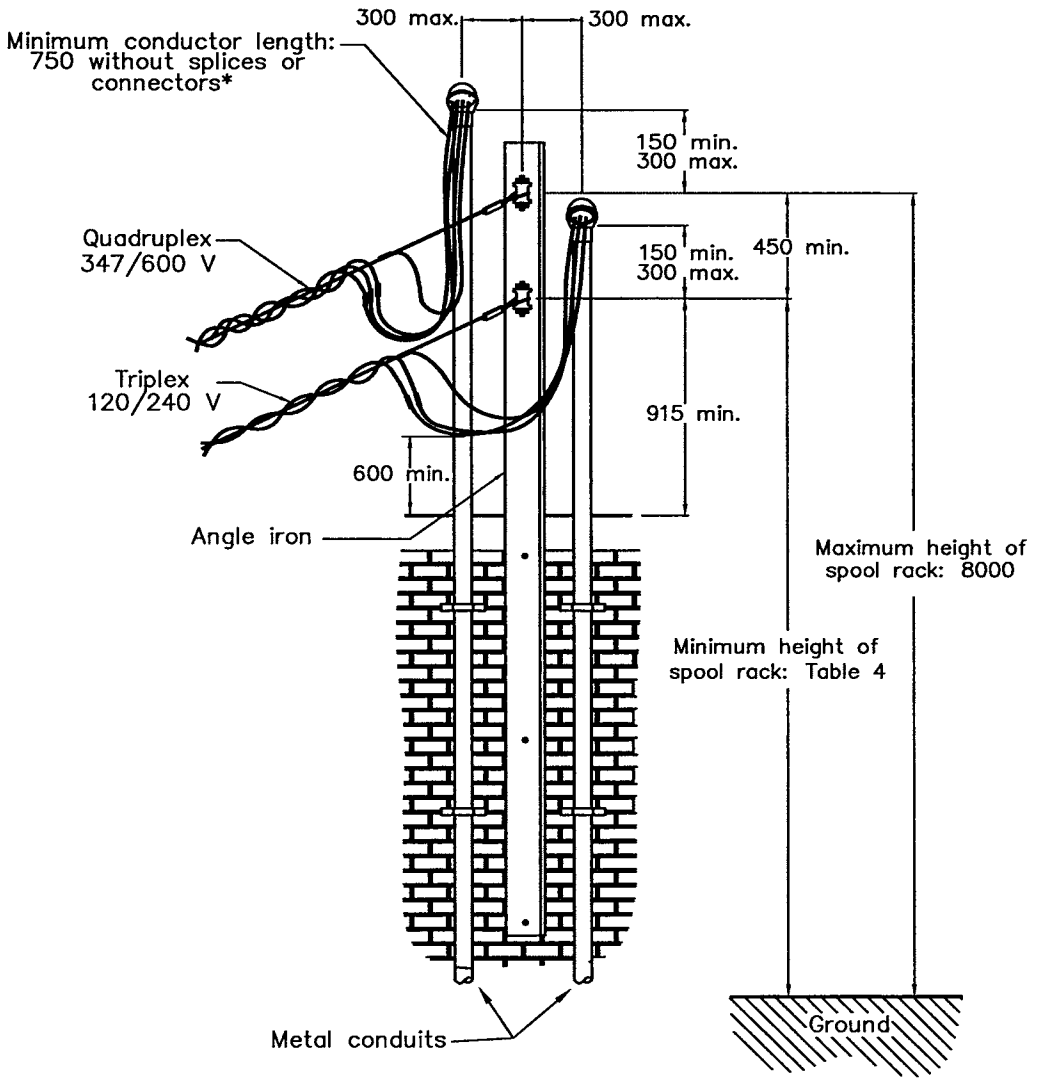


* On Iles-de-la-Madeleine, minimum length: 1000 mm

** 300 min. for uninsulated 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 and 2.3.3

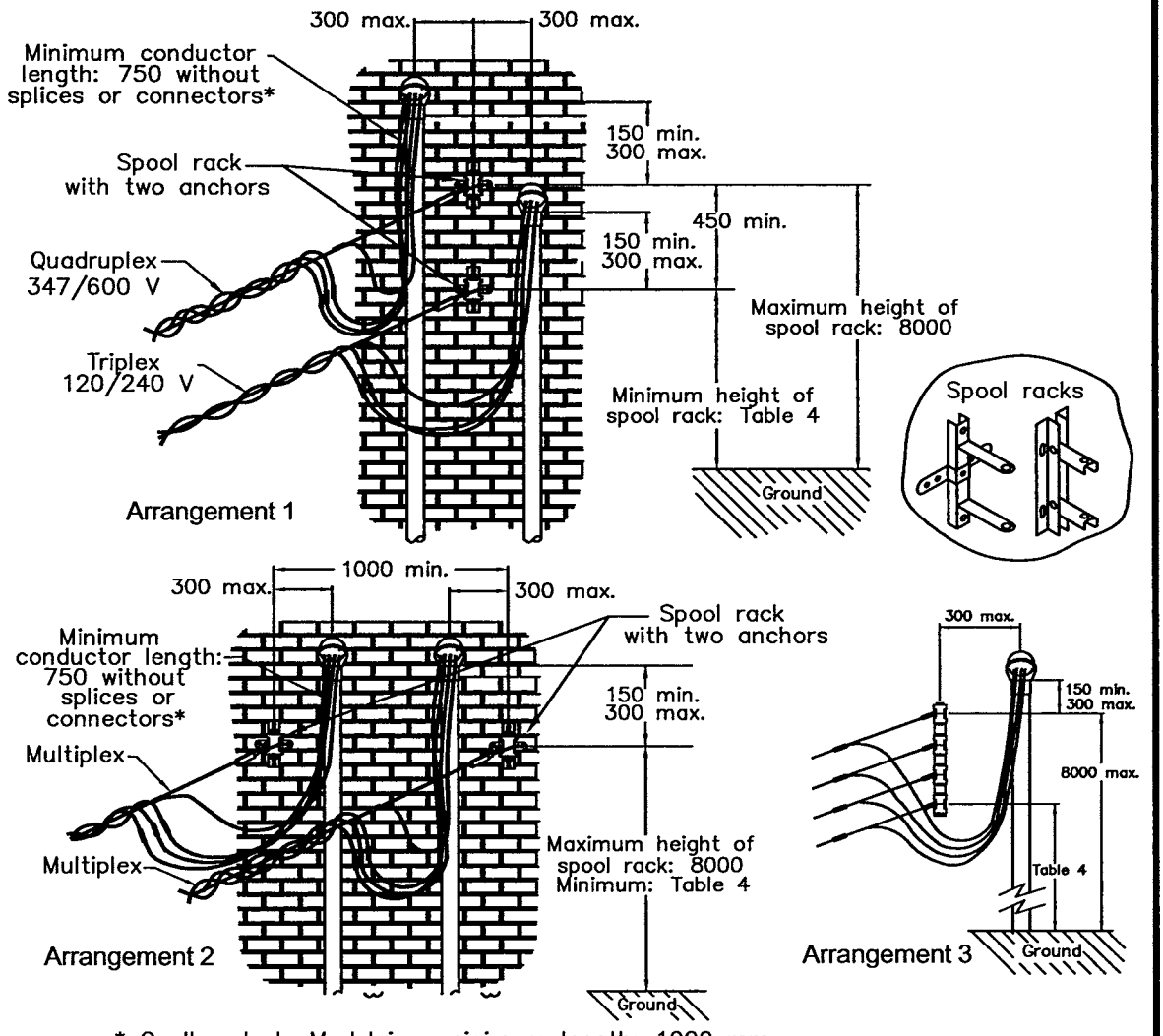
Hydro Québec	120/240-V SUPPLY TWO RIGID STEEL CONDUITS WITH A COMMON SPOOL RACK	
Technical validation INGÉNIEURS Roger Desbiens 35448 QUÉBEC Date: 2009/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 2.04



* On Iles-de-la-Madeleine, minimum length: 1000 mm

Ref.: Sections 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 and 2.3.3

Hydro Québec	TWO DISTRIBUTION SERVICE LOOPS AT DIFFERENT VOLTAGES ARRANGED VERTICALLY ON A COMMON SUPPORT	
Technical validation Roger Desbiens 35448 QUÉBEC Date: 2009 01 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.05

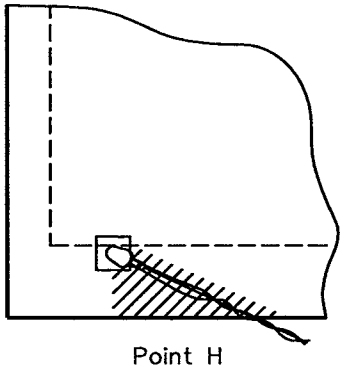


* On Iles-de-la-Madeleine, minimum length: 1000 mm

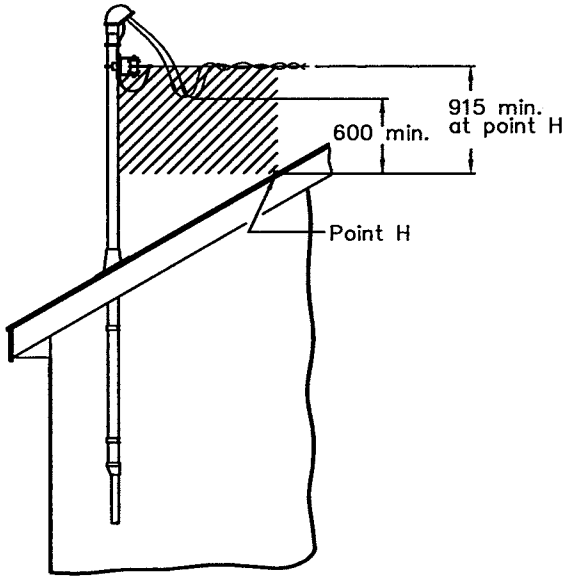
Notes: Arrangement 1 is allowed for service loops at the same or different voltages.
Arrangement 2 is only allowed for service loops at the same voltage.
Arrangement 3 shows a service loop with separated conductors.

Ref.: Sections 0.3, 1.4.1, 2.2.4, 2.2.6, 2.2.8.1, 2.2.8.2, 2.2.12 b), 2.2.12 c) and 2.3.1

Hydro Québec	MULTIPLE DISTRIBUTION SERVICE LOOPS	
Technical validation Roger Desbiens 35448 Québec Date: 2009 07 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization — Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.06



Plan view

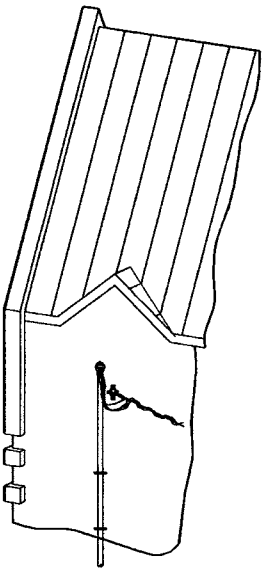


Elevation view

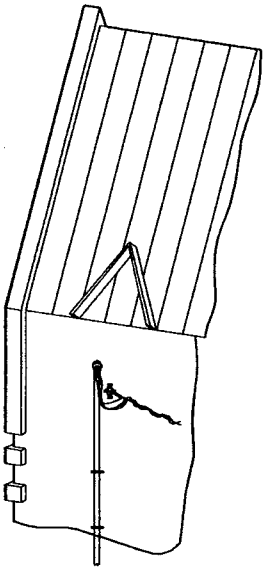
Ref.: Sections 2.2.9.2 and 2.3.3

Hydro Québec	MINIMUM CLEARANCE BETWEEN DISTRIBUTION SERVICE LOOP AND EAVES	
Technical validation INGÉNIEUR Roger Desbiens 35448 QUÉBEC Date: 2009 07 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.07

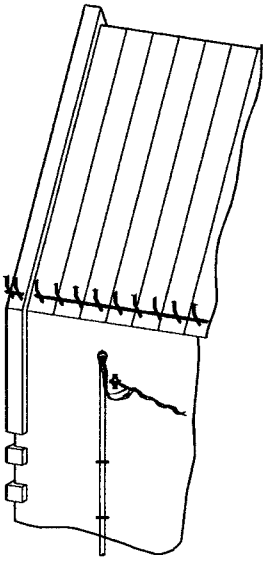
A:



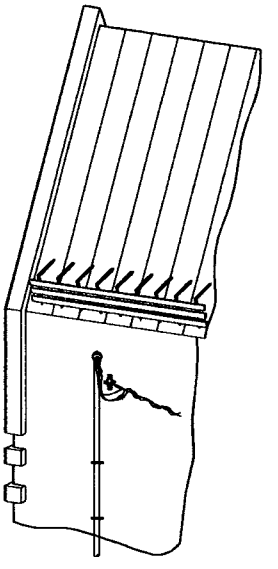
B:



C:



D:



Ref.: Section 2.2.11

Hydro Québec

ICE FENDERS FOR SMOOTH ROOFING

Technical validation

INGÉNIEUR
Roger Desbiens
35448
QUÉBEC

Date: 16/11/06

Approved by

Hydro-Québec

RÉGIE DU BÂTIMENT DU QUÉBEC

Standardization

Operations

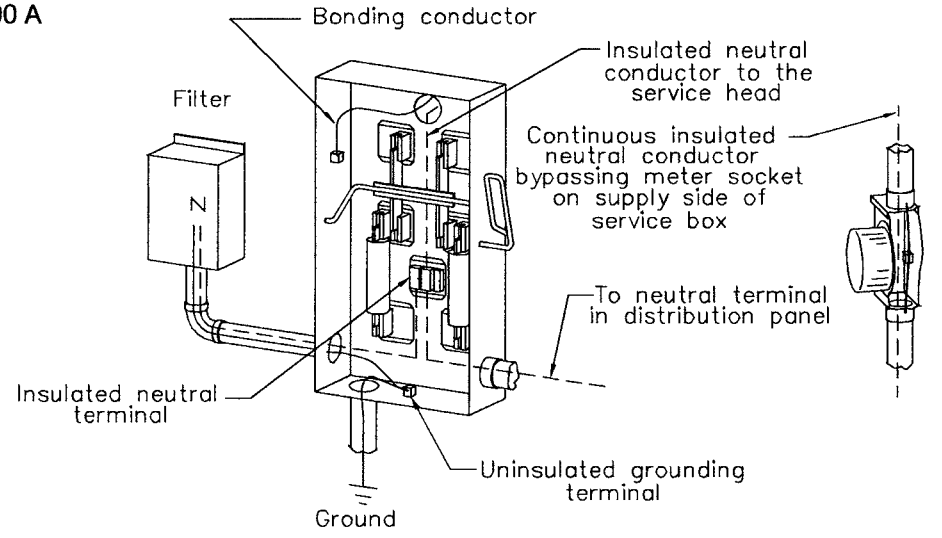
Standard:

E.21-10
9th edition

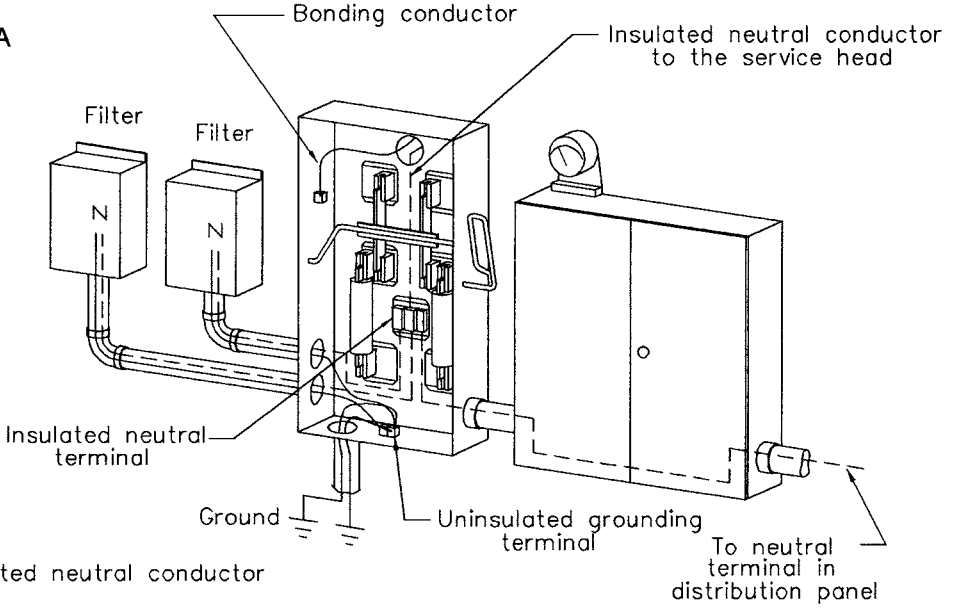
Figure:

2.08

200 A



400 A



– – – Insulated neutral conductor

Ref.: Section 2.3.5

Hydro Québec

GROUNDING CIRCUIT WITH TINGLE VOLTAGE FILTER

Technical validation

INGÉNIEUR
Roger Desbiens
35448
QUÉBEC

Date: 16 11 06

Approved by

Hydro-Québec

RÉGIE DU BÂTIMENT DU QUÉBEC

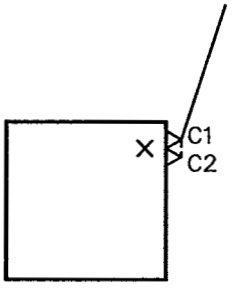
Standardization

Operations

Standard: E.21-10 9th edition

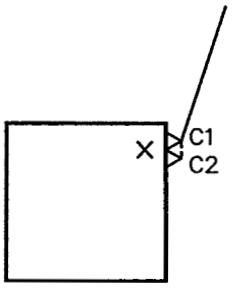
Figure: 2.09

Before



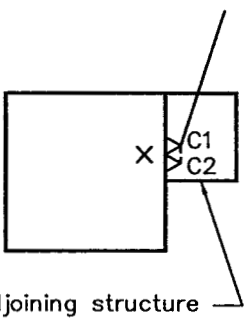
– Point X in compliance

After



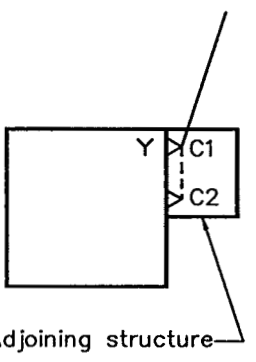
– C1 modified

Before



– Point X not in compliance

After



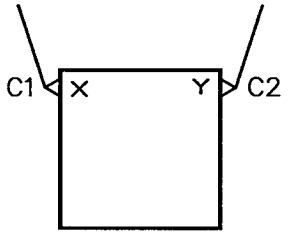
– C1 modified
Y: New point

——— Distribution service loop
- - - - Service entrance
⊳ Service entrances C1 and C2
X, Y Connection points

Ref.: Section 2.4.1

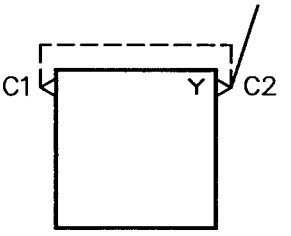
Hydro Québec	SERVICE ENTRANCE MODIFICATIONS	
Technical validation Roger Desbiens 35448 QUÉBEC Date: 2009 07 10	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.10

Before



– Points X and Y in compliance

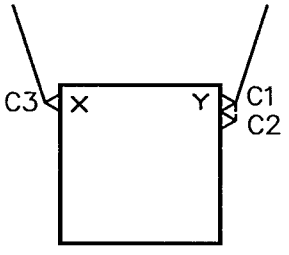
After



– C1 modified
Point X grouped with point Y

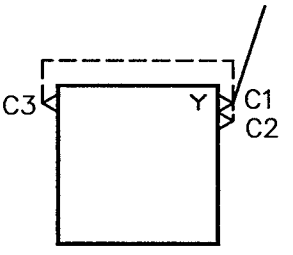
– C2 modified
Point Y grouped with point X

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.

—— Distribution service loop

--- Service entrance

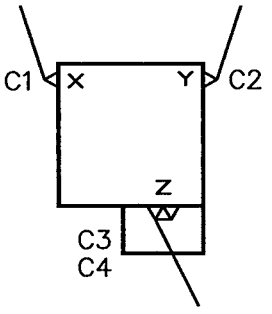
▷ Service entrances C1, C2 and C3

X, Y Connection points

Ref.: Section 2.4.2.3

Hydro Québec	SERVICE ENTRANCE MODIFICATIONS	
Technical validation INGÉNIEUR Roger Desbiens 35448 QUÉBEC Date: 2009 07 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.11

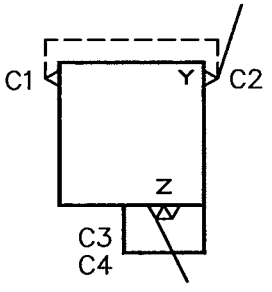
Before



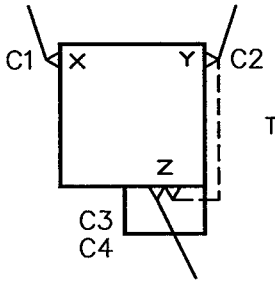
– Points X and Y in compliance

– Point Z not in compliance

After



– C1 modified
Point X grouped with point Y
Point Z remains.



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

—— Distribution service loop

--- Service entrance

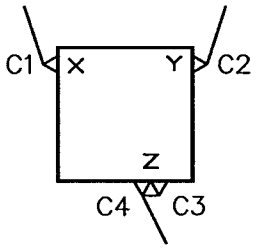
Service entrances C1, C2, C3 and C4

X, Y, Z Connection points

Ref.: Section 2.4.2.3

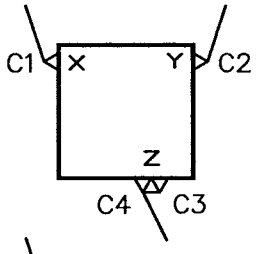
Hydro Québec	SERVICE ENTRANCE MODIFICATIONS	
Technical validation Roger Desbiens 35448 QUÉBEC Date: 2007 10 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.12

Before

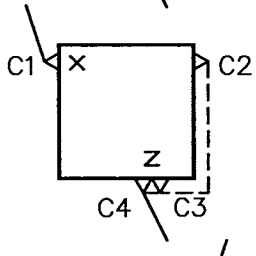


– Points X, Y and Z in compliance

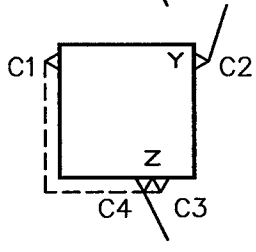
After



– C3 or C4 modified
Point Z remains.



– C2 modified
Point Y grouped with point Z



– C1 modified
Point X grouped with point Z

—— Distribution service loop

--- Service entrance

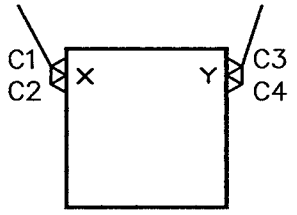
Service entrances C1, C2, C3 and C4

X, Y, Z Connection points

Ref.: Section 2.4.2.3

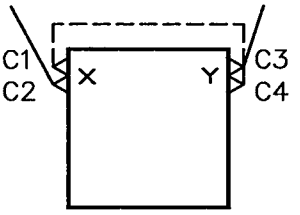
Hydro Québec	SERVICE ENTRANCE MODIFICATIONS	
Technical validation Roger Desbiens 35448 Québec Date: 2009 07 10	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.13

Before



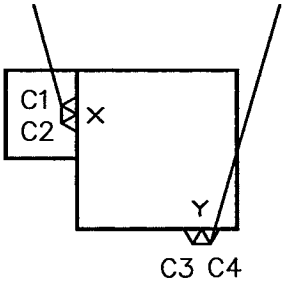
– Points X and Y in compliance

After



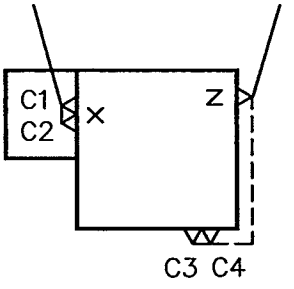
– C1 or C2 modified
The modified service entrance must be supplied from point Y.
– C3 or C4 modified
The modified service entrance must be supplied from point X.

Before



– Points X and Y not in compliance

After



– Z: New point
– C3 or C4 modified
The other point must be supplied from point Z.
– C1 or C2 modified
The other point must be supplied from point Z.

—— Distribution service loop

---- Service entrance

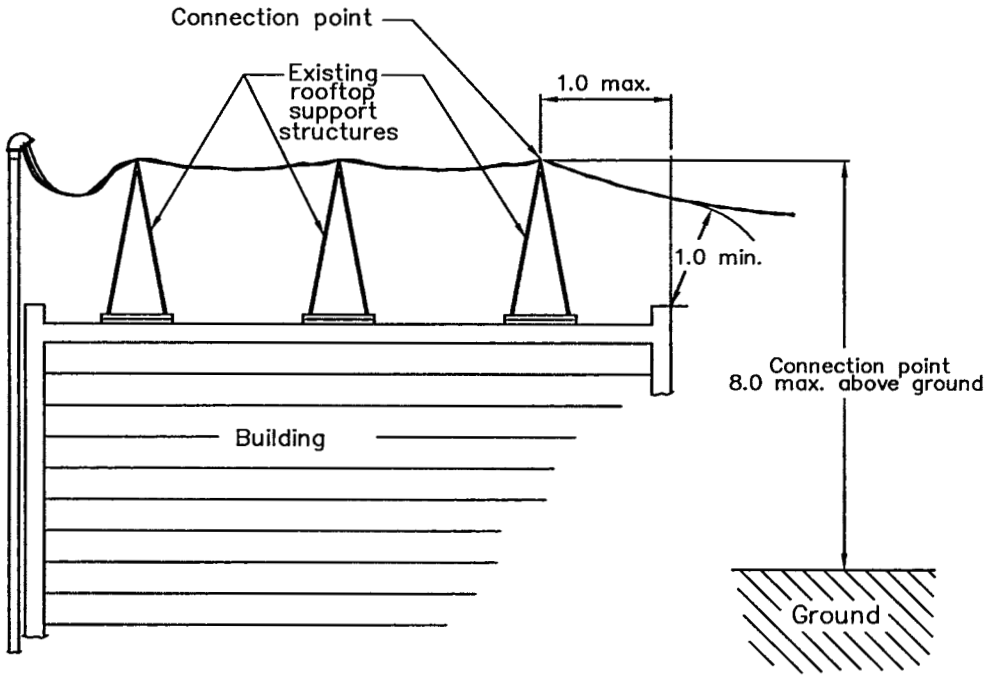
Service entrances C1, C2, C3 and C4

X, Y, Z Connection points

Ref.: Sections 2.4.2.1 and 2.4.2.3

Hydro Québec	SERVICE ENTRANCE MODIFICATIONS	
Technical validation INGÉNIEUR Roger Desbiens 35448 QUÉBEC Date 2009 01 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.14

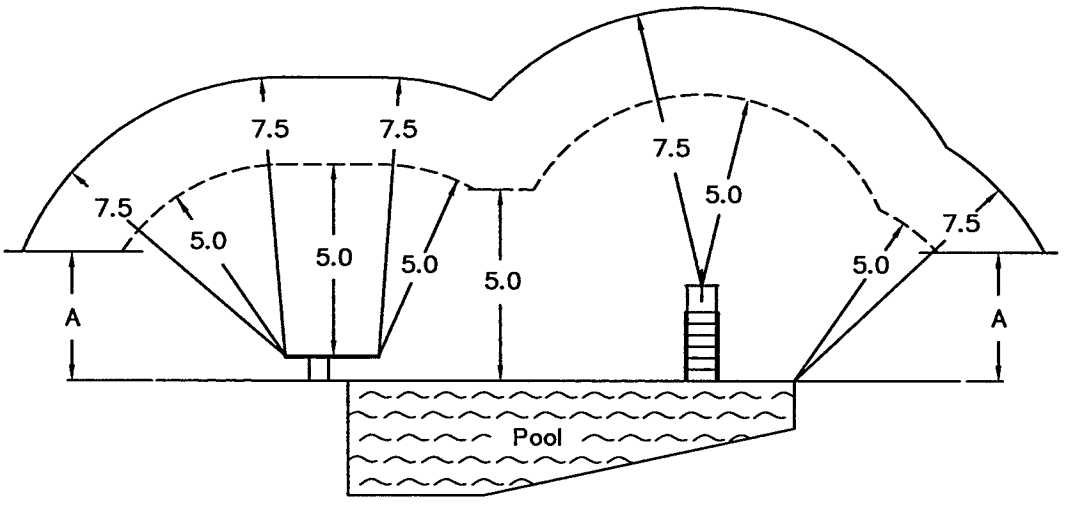
Distribution service loop connected at first rooftop support structure



Note: Dimensions are in metres.

Ref.: Sections 0.3 and 2.4.3.1

Hydro Québec	SERVICE ENTRANCE ON EXISTING ROOFTOP SUPPORT STRUCTURES	
Technical validation Roger Desbiens 35448 QUÉBEC Date: 2009 07 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.15



--- Minimum clearance of 5.0 m from twisted conductors (750 V or less) and insulated telecommunications cables

—— Minimum clearance of 7.5 m from other types of conductors (up to 50 kV phase-to-phase)

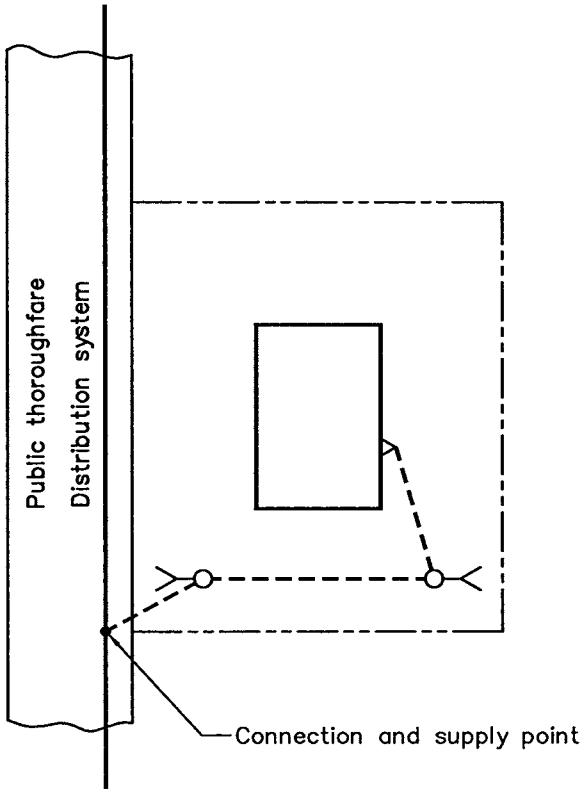
A: Minimum clearance of 3.5 m above ground in areas accessible to pedestrians only

Notes: Clearances may be less, provided they are calculated in accordance with the most recent edition of CAN/CSA-C22.3 No. 1.

Dimensions are in metres.

Ref.: Section 2.2.3

Hydro Québec	MINIMUM CLEARANCES BETWEEN CONDUCTORS AND A POOL AND ITS ACCESSORIES	
Technical validation Ingénieur Roger Desbiens 35448 Québec Date: 2009 07 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.16



O Inaccessible customer pole
>— Customer guy wire
- - - Service entrance

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

Ref.: Sections 0.3, 2.6.1, 2.6.2 and 2.7.2.6

Hydro Québec

CONNECTION POINT TO THE DISTRIBUTION LINE

Technical validation

Roger Desbiens
35448
QUÉBEC

Date: 2009 07 09

Approved by

Hydro-Québec

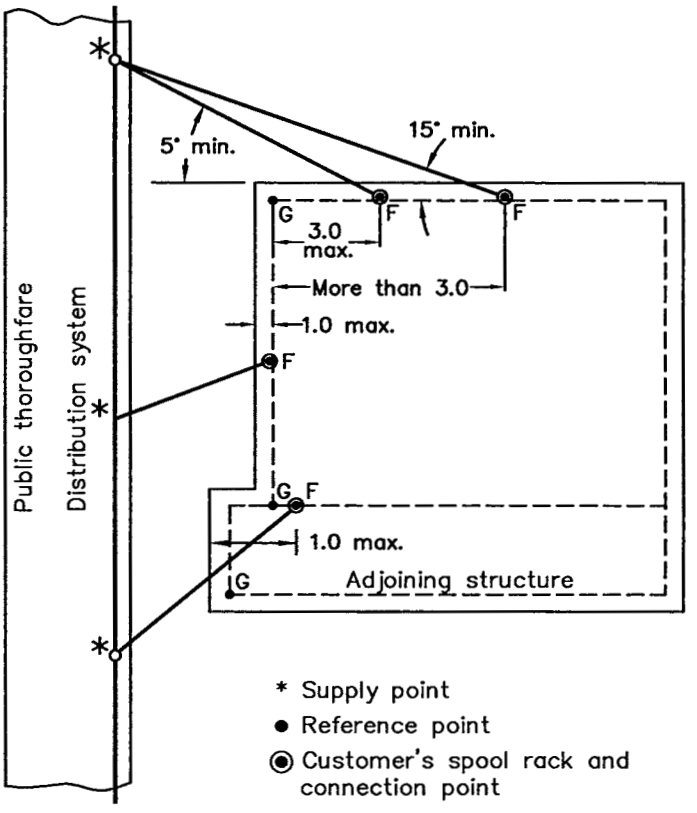
RÉGIE DU BÂTIMENT DU QUÉBEC

Standardization

Operations

Standard: E.21-10
9th edition
Updated
May 2008

Figure: 2.17

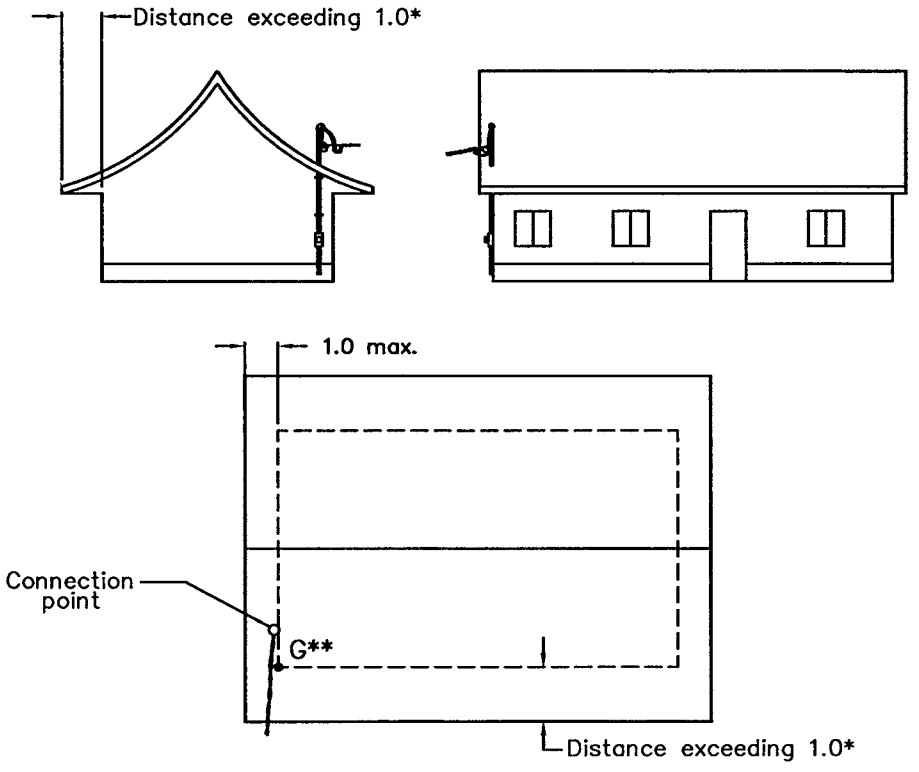


Note: A service loop connected at point F to a mast above the roof must not go past any point G.

Ref.: Sections 0.3, 2.2.3, 2.7.1, 2.7.2.1 to 2.7.2.4 and Table 7

Hydro Québec	CONNECTION POINT AND DISTRIBUTION SERVICE LOOP	
Technical validation Roger Desbiens 35448 Québec Date: 2009 07 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.18

Gable-roofed building



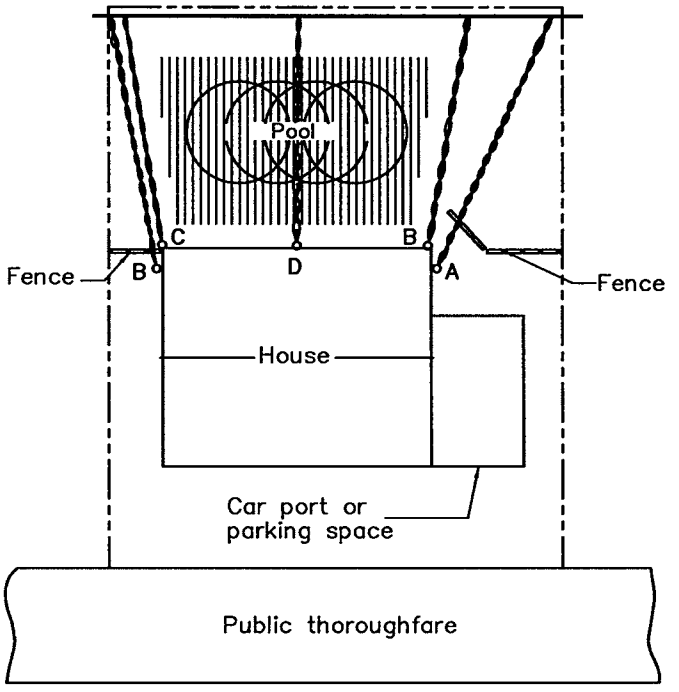
* The 1.0-m maximum distance for access to the connection point is measured from the edge of the eave to the spool rack. If the distance exceeds 1.0 m, the mast cannot be installed on that wall.

** The distribution service loop must not go past any point G.

Note: Dimensions are in metres.

Ref.: Sections 0.3, 2.7.1 and 2.7.2.3

Hydro Québec	DISTRIBUTION SERVICE LOOP MAXIMUM DISTANCE TO CONNECTION POINT	
Technical validation INGÉNIEUR Roger Desbiens 35448 QUÉBEC Date: 2009 10 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.19



Location:

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

Legend:

Probable location of the pool.
The distribution service loop must not overhang the pool unless clearance requirements are met.

O Service entrance with outdoor meter

Property line

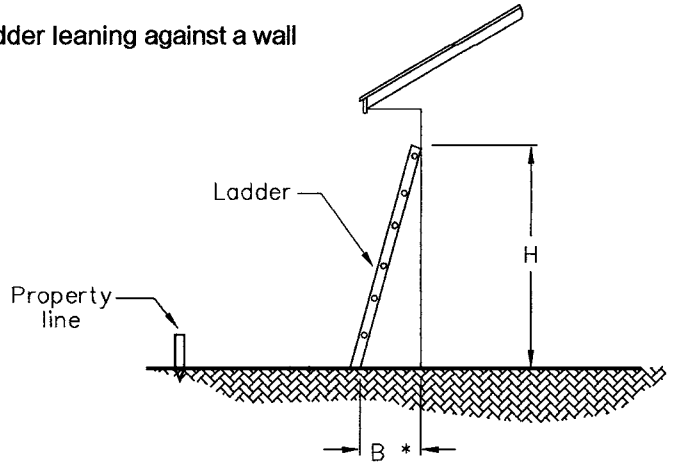
Power system

Distribution service loop

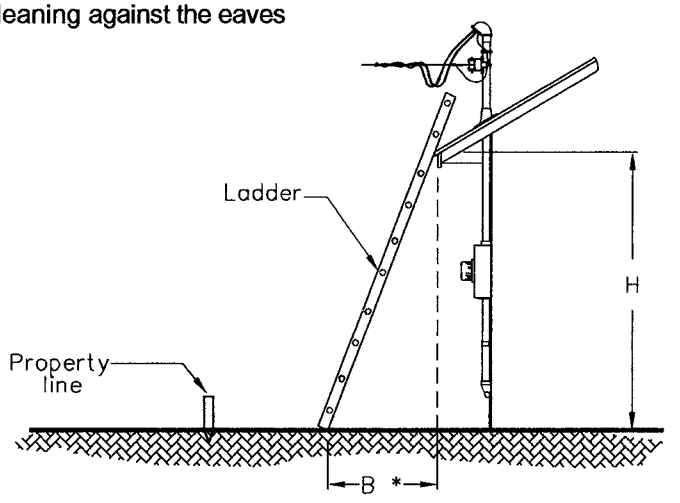
Ref.: Section 2.7.1

Hydro Québec	LOCATION OF SERVICE ENTRANCE WITH AN OUTDOOR METER TO ALLOW FOR POOL INSTALLATION	
Technical validation INGÉNIEUR Roger Desbiens 35448 QUÉBEC Date: 2009 07 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.20

A: Ladder leaning against a wall



B: Ladder leaning against the eaves

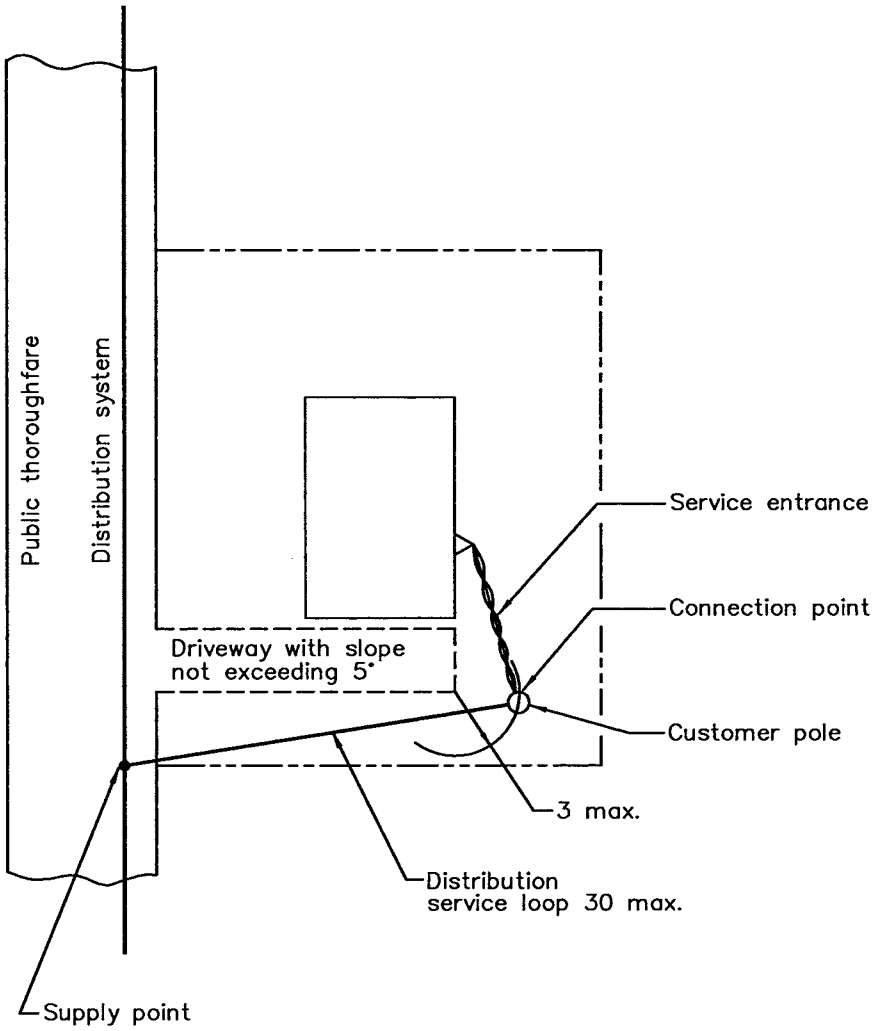


* The height-to-base (H/B) ratio must not be more than 4:1 or less than 3:1.

Note: The ladder may also rest on a public thoroughfare that is clear of obstructions.

Ref.: Section 2.7.1 and Table 8

Hydro Québec	ACCESS TO CONNECTION POINT USING A LADDER	
Technical validation INGÉNIEUR Roger Desbiens 35448 QUÉBEC Date: 16/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 2.21

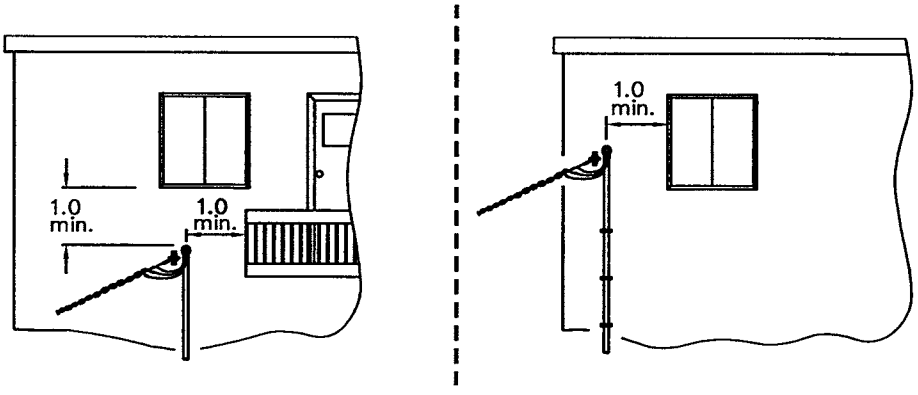


Note: Dimensions are in metres.

Ref.: Sections 0.3 and 2.7.2.5

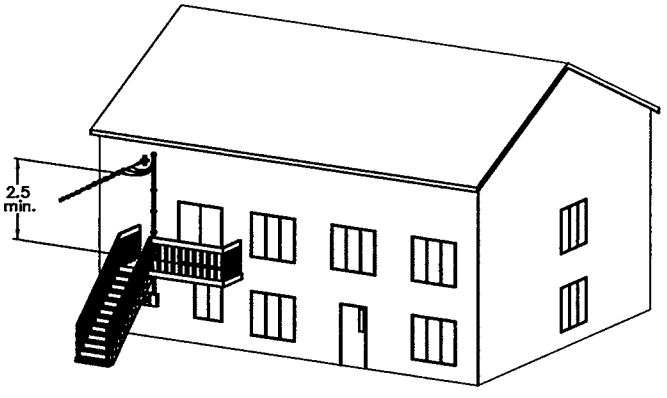
Hydro Québec	CONNECTION POINT ON CUSTOMER POLE	
Technical validation Roger Desbiens 35448 QUÉBEC Date: 2009 07 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.22

A: Near a window or balcony



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 installed accordingly. A distance of at least 400 m between the spool rack and the top of the window should provide clearance for the drip loops.

B: Above an uncovered balcony or stairway

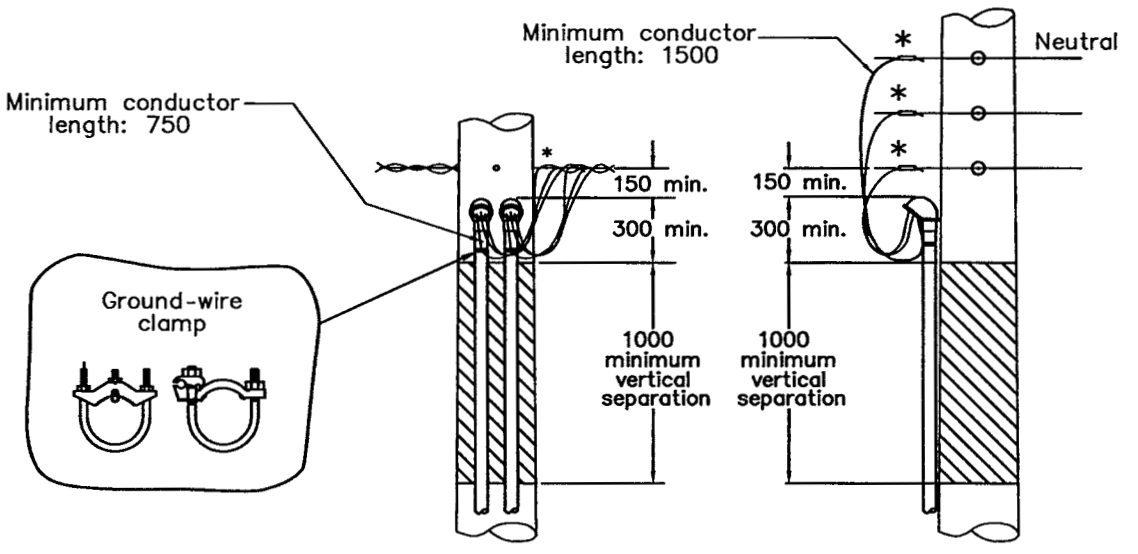


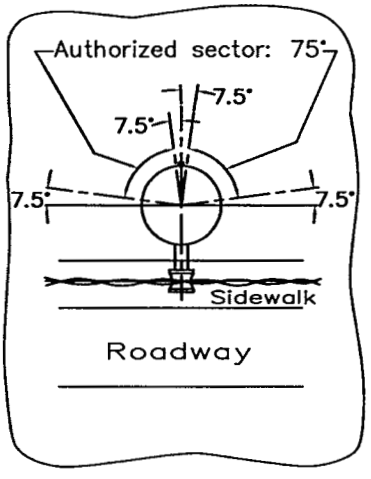
Note: The connection point must remain accessible using a ladder or bucket truck, in accordance with Section 2.7.1

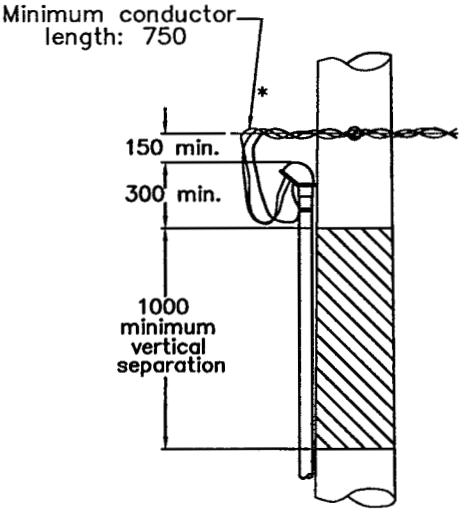
Dimensions are in metres.

Ref.: Section 2.7.3

Hydro Québec	MINIMUM CLEARANCE FOR CONDUCTORS	
Technical validation Roger Desbiens 35448 QUÉBEC Date: 2009 01 16	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.23





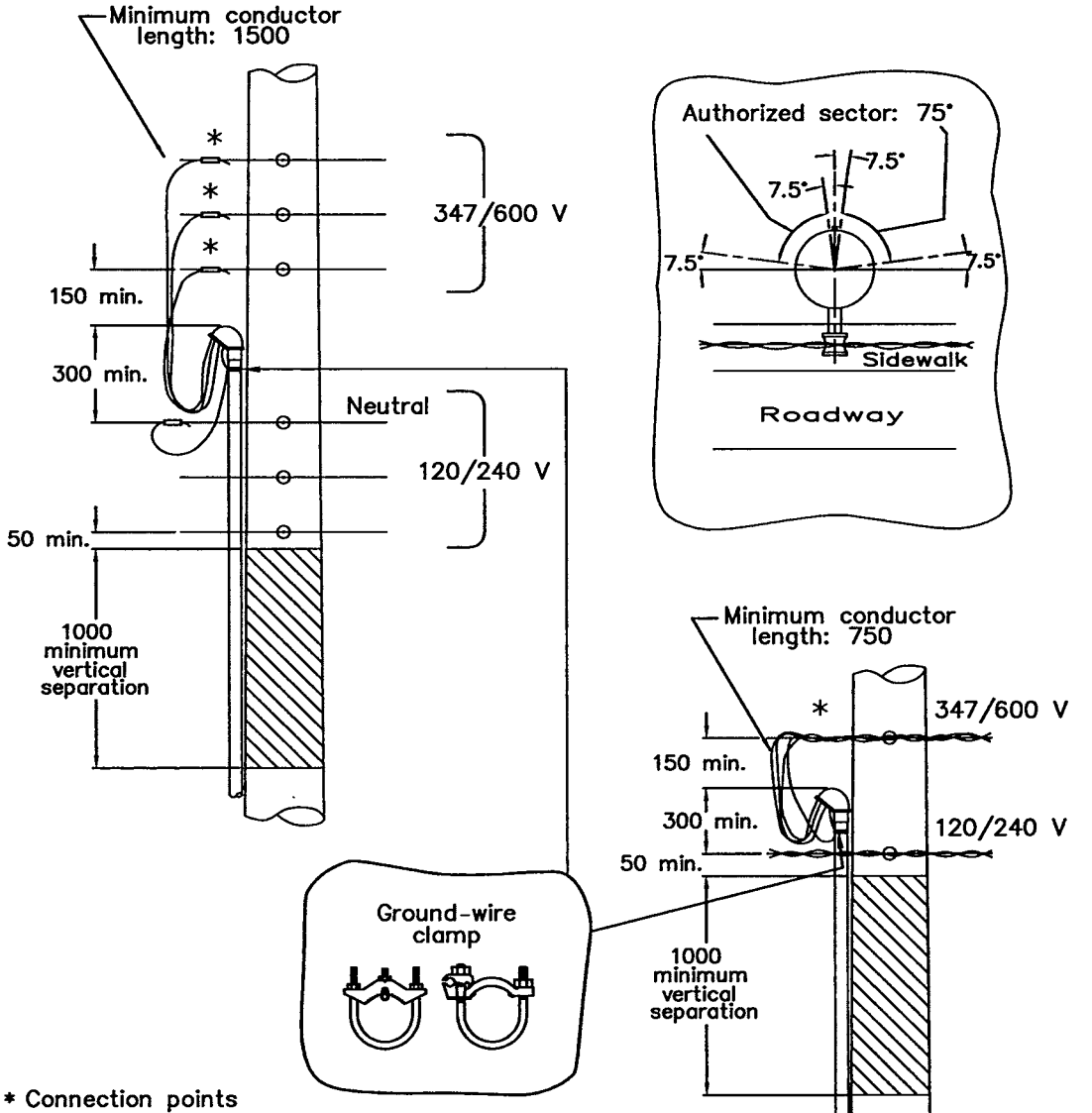


* Connection points

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

Ref.: Sections 0.3, 2.8 a), 2.8.1.1 to 2.8.1.4 and 2.8.3

Hydro Québec	UNDERGROUND SERVICE ENTRANCE FROM 120/240-V OVERHEAD LINE	
Technical validation Roger Desbiens 35448 QUÉBEC Date: 2009 07 16	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.24



* Connection points

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

Ref.: Sections 0.3, 2.8 a), 2.8.1.1 to 2.8.1.4 and 2.8.3

Hydro Québec

UNDERGROUND SERVICE ENTRANCE FROM 347/600-V OVERHEAD LINE WITH INSULATED CONDUCTORS

Technical validation

Roger Desbiens 35448 Québec

Date: 2009 07 09

Approved by

Hydro-Québec

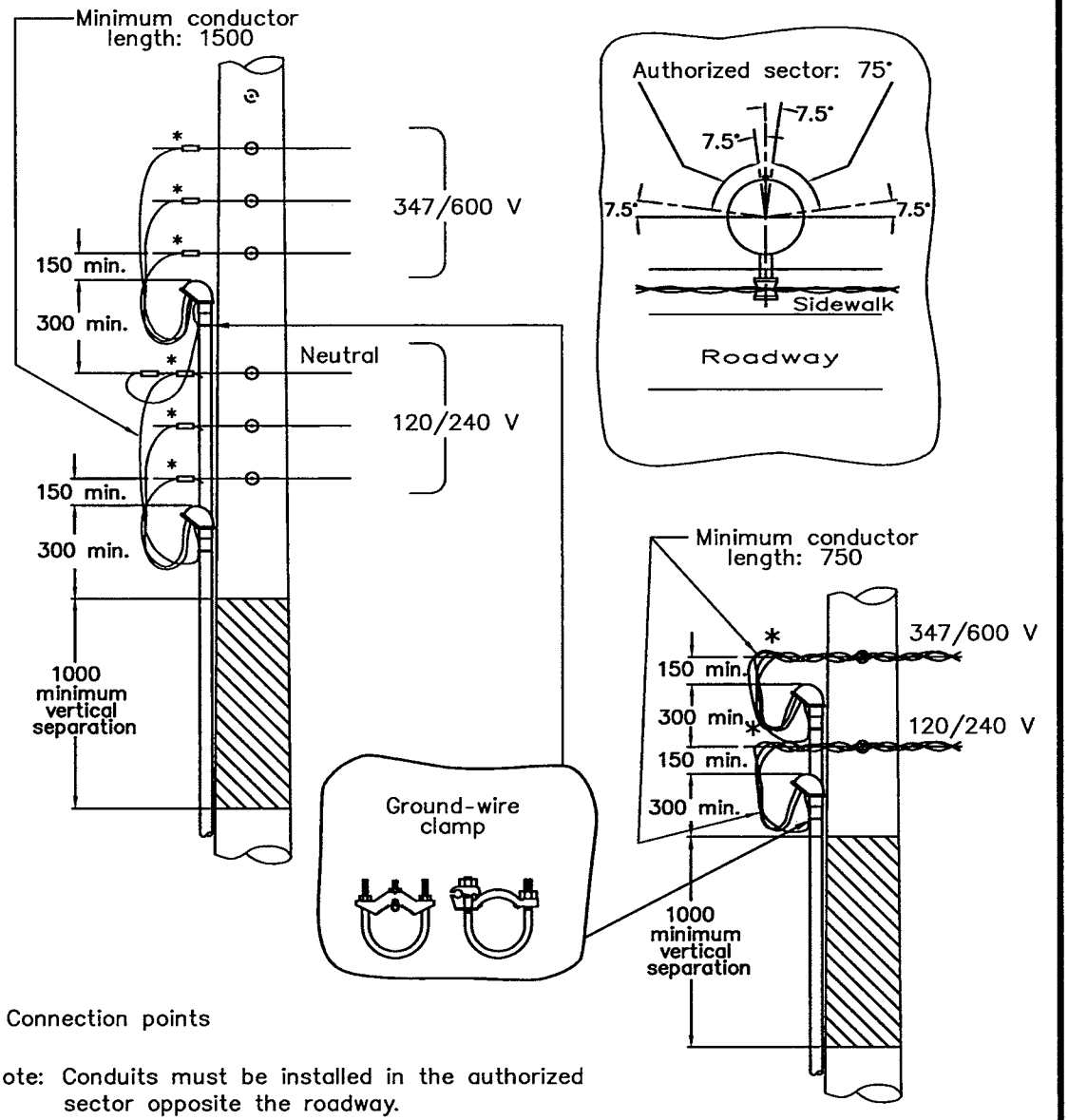
RÉGIE DU BÂTIMENT DU QUÉBEC

Standardization

Operations

Standard: E.21-10 9th edition Updated May 2008

Figure: 2.25

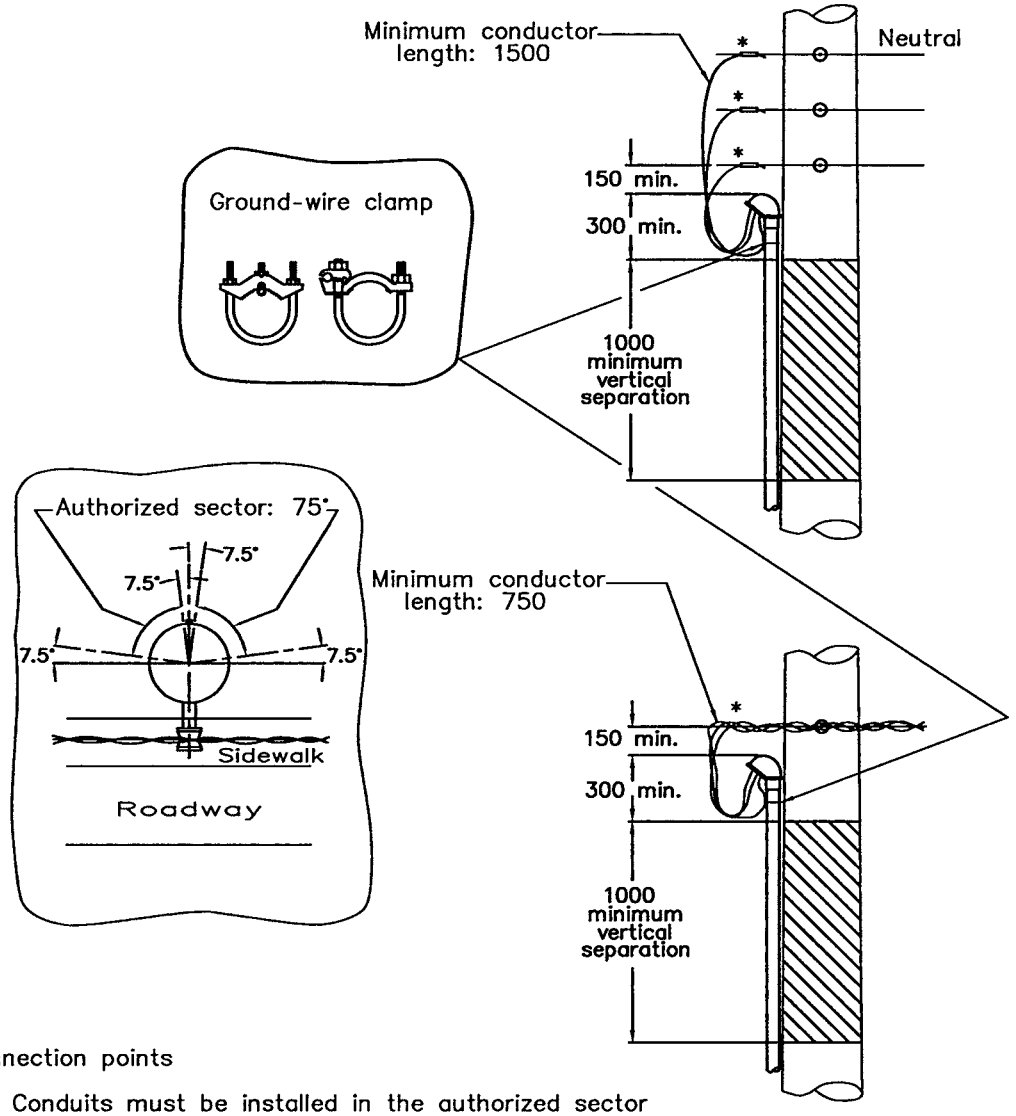


* Connection points

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

Ref.: Sections 0.3, 2.8 a), 2.8.1.1 to 2.8.1.4 and 2.8.3

Hydro Québec	UNDERGROUND SERVICE ENTRANCE FROM 120/240-V OR 347/600-V OVERHEAD LINES WITH INSULATED CONDUCTORS	
Technical validation Roger Desbiens 35448 QUÉBEC Date: 2009/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.26

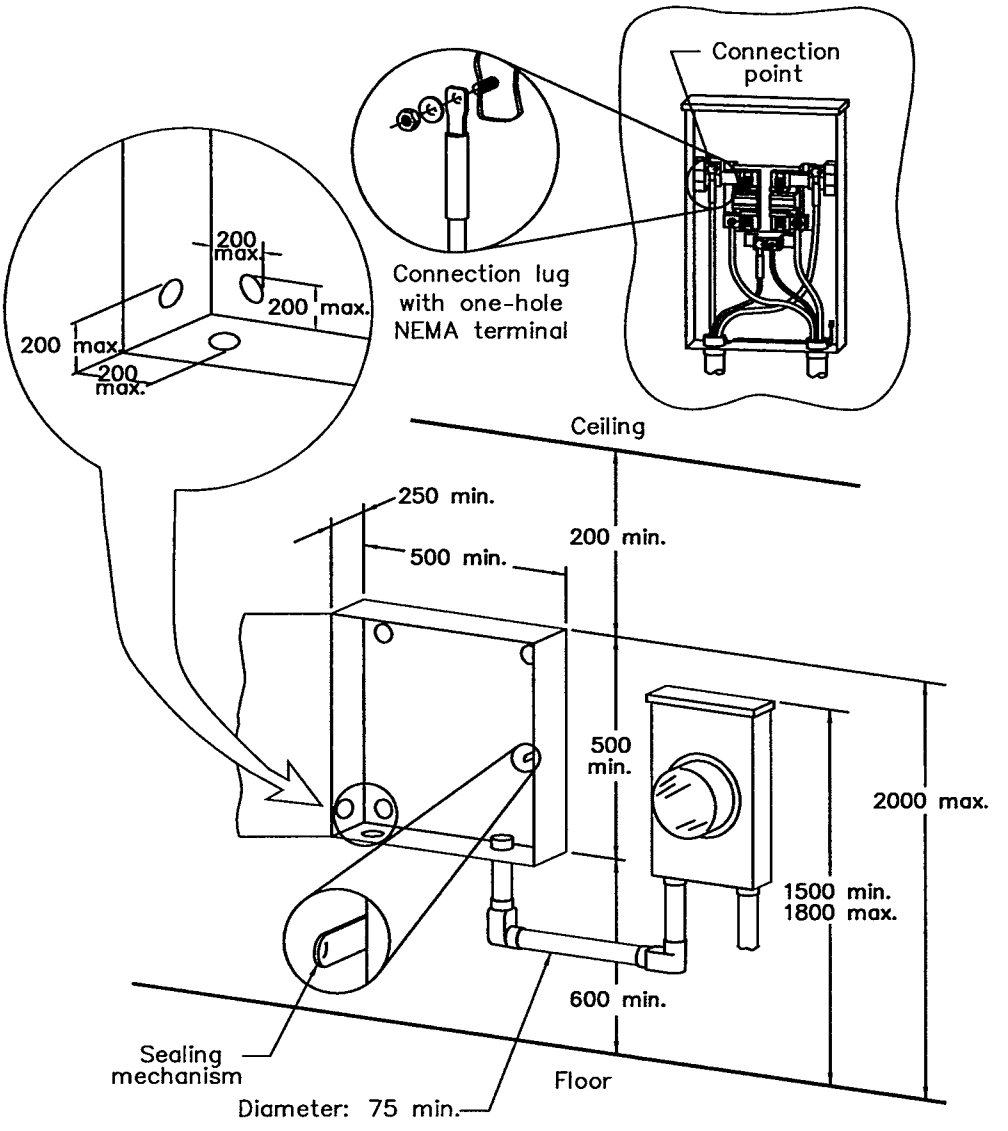


* Connection points

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

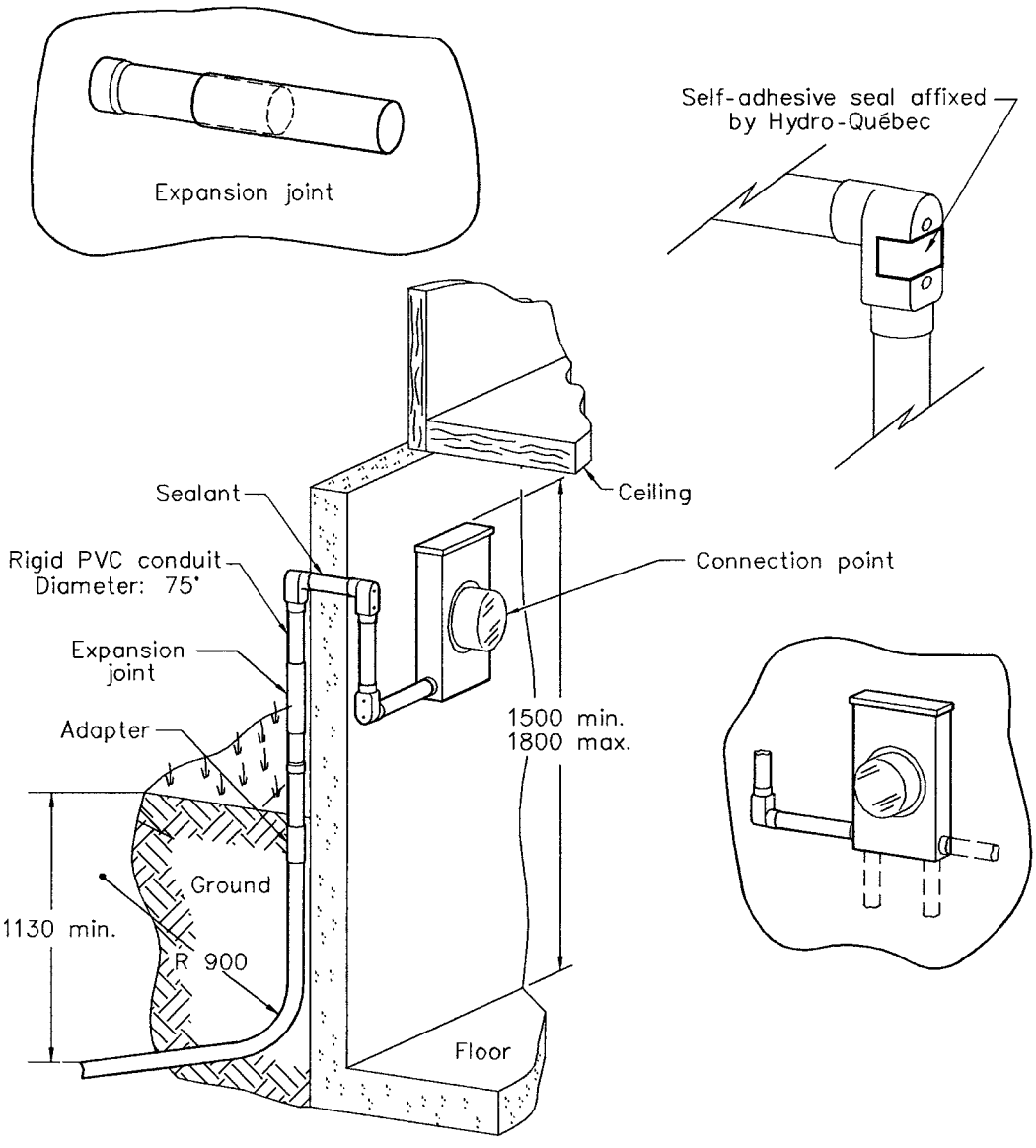
Ref.: Sections 2.9 a), 2.9.1.1 to 2.9.1.3 and 2.9.3

Hydro Québec	120/240-V EQUIPMENT CONNECTION ON A POLE	
Technical validation INGÉNIEUR Roger Desbiens 35448 QUÉBEC Date: 2009 07 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 2.27



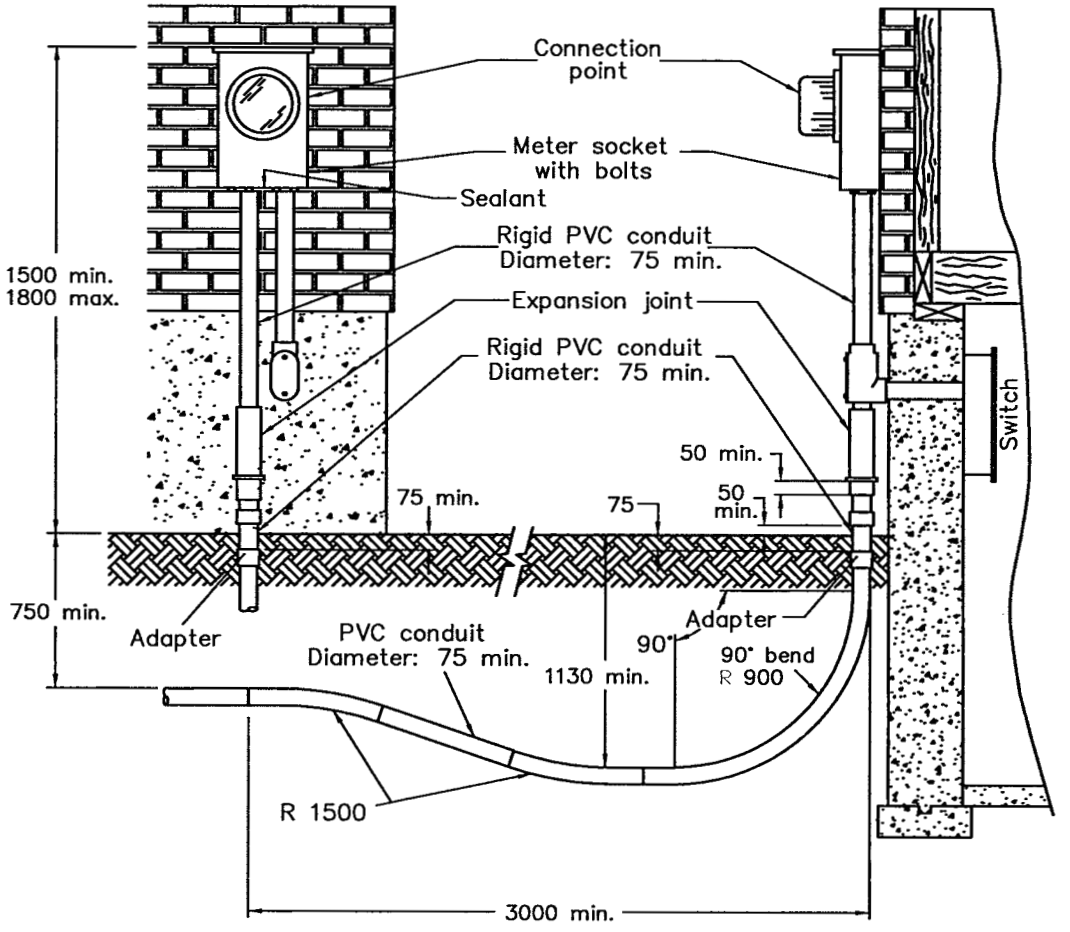
Ref.: Sections 0.3, 3.1.1, 3.2.1, 3.5.1.1, 3.5.2.1, 3.5.3, 3.5.3.1, 3.5.6.2 and 6.2 c)

Hydro Québec	PULLBOX AND METER SOCKET	
Technical validation INGÉNIEUR Jacques Côté 98298 QUÉBEC Date: 2009, 07, 09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 3.01



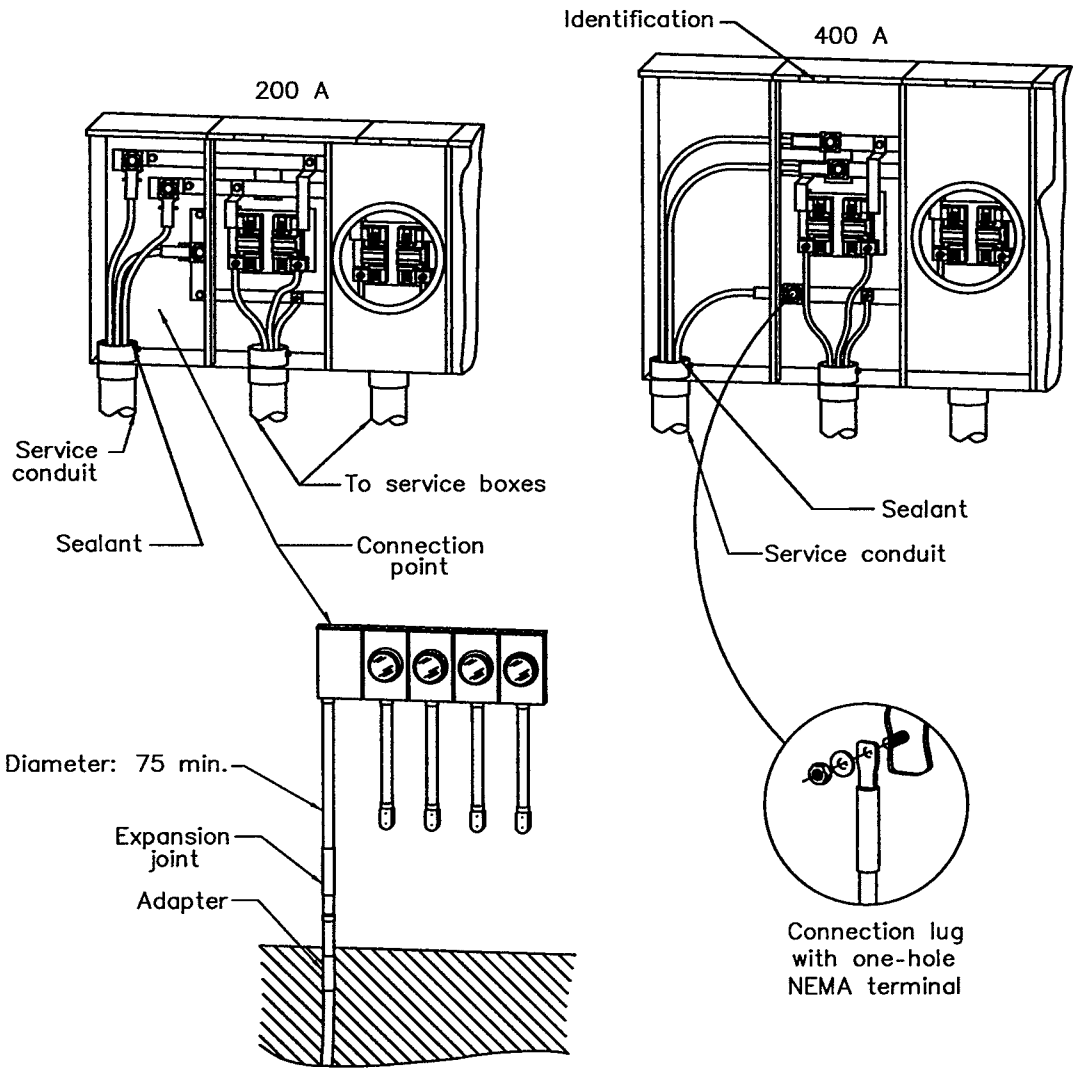
Ref.: Sections 1.2.2.2, 3.1.1, 3.2.1, 3.2.1.1, 3.4.2, 3.4.6 and 3.5.1.1

Hydro Québec	CONNECTION TO INDOOR METER SOCKET	
Technical validation INGÉNIEUR Guy Léger 29544 QUÉBEC Date: 13 / 11 / 2006	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 3.02



Ref.: Sections 0.3, 3.1.1, 3.2.1, 3.2.1.1, 3.4.1, 3.4.5 and 3.4.6

Hydro Québec	CONNECTION TO OUTDOOR METER SOCKET WITH BOLTS FOR ONE-HOLE NEMA TERMINAL LUGS	
Technical validation INGÉNIEUR Guy Léger 28544 QUÉBEC Date: 2009/07/10	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 3.03



Notes: The service conduit must terminate in the connection compartment. Typical connections may vary depending on the model of multiple-meter mounting device.

Ref.: Sections 0.3, 3.1.2, 3.2.1, 3.2.1.2, 3.4.1, 3.4.6, 5.9.1 and 6.3.7.2

Hydro Québec

TYPICAL CONNECTION TO MULTIPLE OUTDOOR METER SOCKETS WITH BOLTS FOR ONE-HOLE NEMA TERMINAL LUGS

Technical validation

INGÉNIEUR Jacques Côté 99299 QUÉBEC

Date: 2009 01 09

Approved by

Hydro-Québec

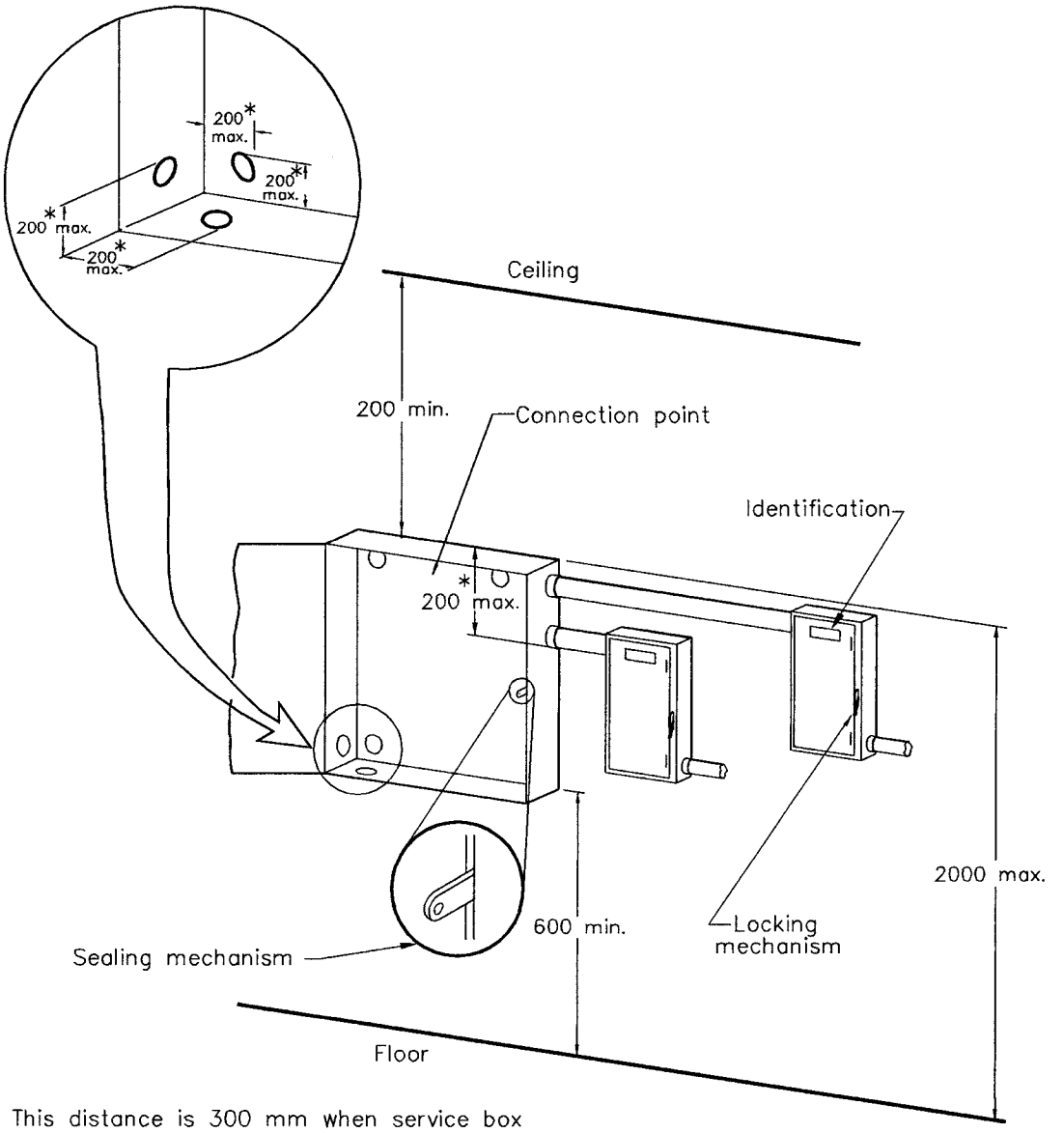
RÉGIE DU BÂTIMENT DU QUÉBEC

Standardization

Operations

Standard: E.21-10 9th edition Updated May 2008

Figure: 3.04



* This distance is 300 mm when service box ratings total more than 600 A.

Ref.: Sections 0.3, 3.1.3, 3.2.1, 3.2.1.3 a), 3.5.2.2 a), 3.5.3, 3.5.6.2 and 5.9.2

Hydro Québec

INDOOR JUNCTION BOX SUPPLYING TWO SERVICE BOXES

Technical validation

INGÉNIEUR Jacques Côté 99299 QUÉBEC

Date: 10/11/06

Approved by

Hydro-Québec

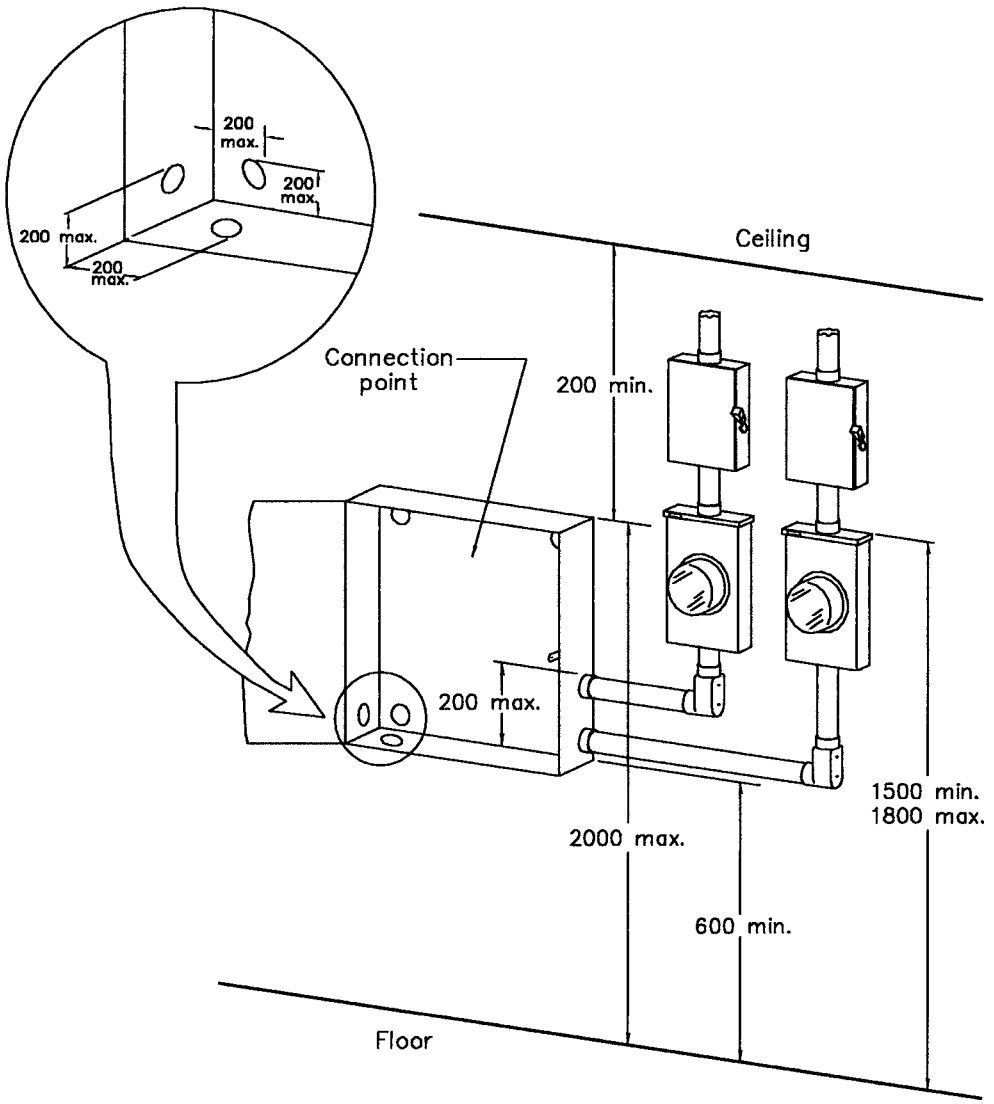
RÉGIE DU BÂTIMENT DU QUÉBEC

Standardization

Operations

Standard: E.21-10 9th edition

Figure: 3.05



Ref.: Sections 0.3, 3.1.3, 3.2.1, 3.2.1.3 a), 3.5.2.2 a) and 3.5.6.2

Hydro Québec

INDOOR JUNCTION BOX SUPPLYING
TWO METER SOCKETS

Technical validation

INGÉNIEUR
Jacques Côté
99299
QUÉBEC

Date: 10 / 11 / 06

Approved by

Hydro-Québec

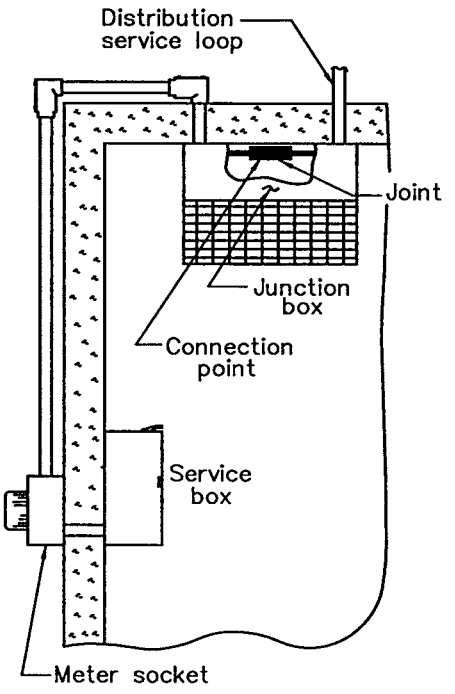
RÉGIE DU BÂTIMENT DU QUÉBEC

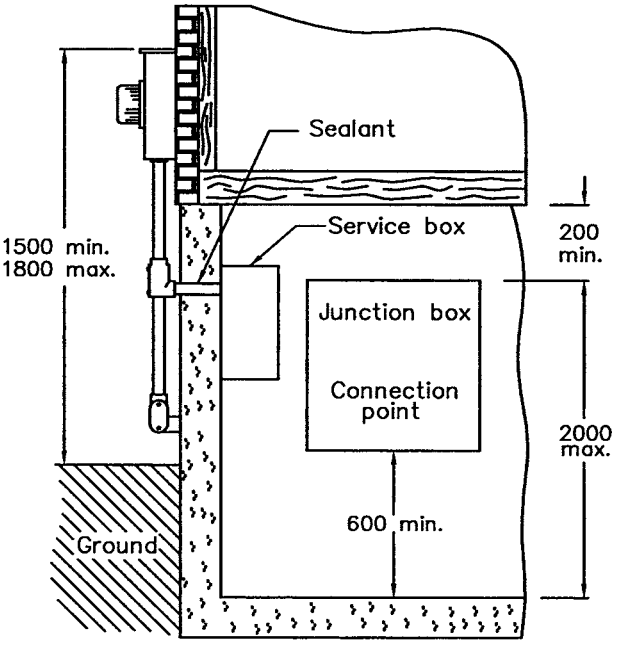
Standardization

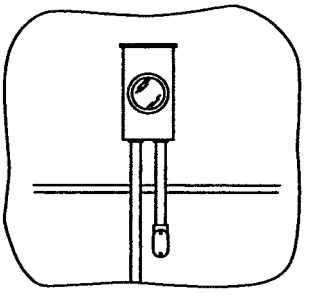
Operations

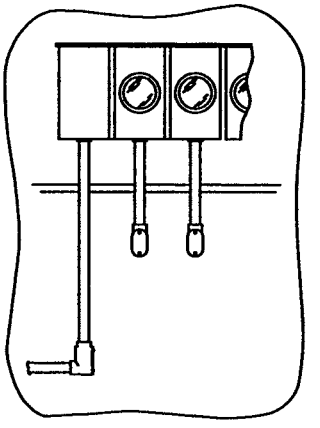
Standard:
E.21-10
9th edition

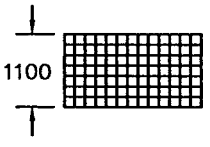
Figure:
3.06











Ref.: Sections 0.3, 3.2.1, 3.2.1.3 a), 3.4.9 and 3.5.2.2 a)

Hydro Québec

INDOOR JUNCTION BOX SUPPLYING AN OUTDOOR METER SOCKET OR MULTIPLE-METER MOUNTING DEVICE

Technical validation

INGÉNIEUR Jocques Côté 99299 QUÉBEC

Date: 2009/07/09

Approved by

Hydro-Québec

RÉGIE DU BÂTIMENT DU QUÉBEC

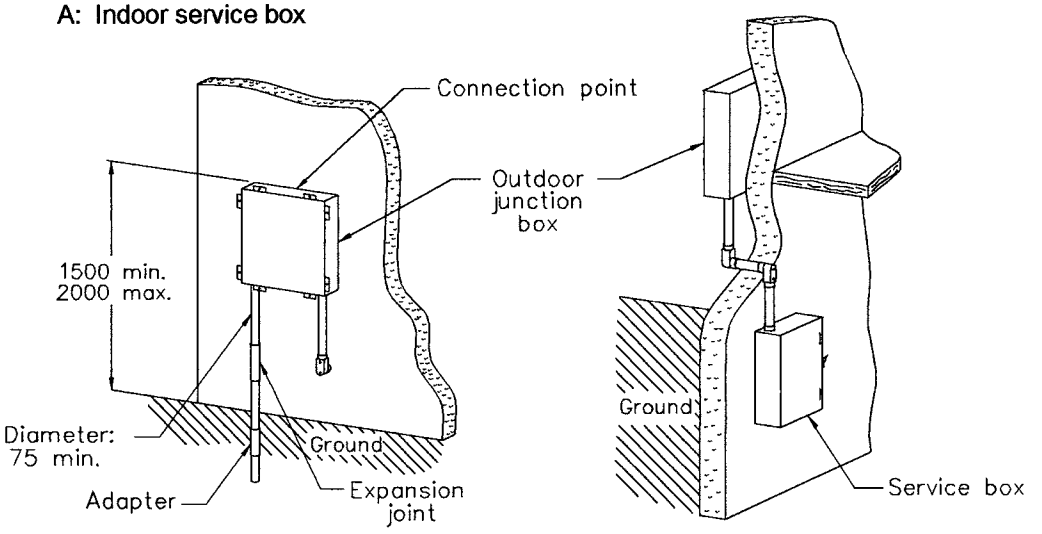
Standardization

Operations

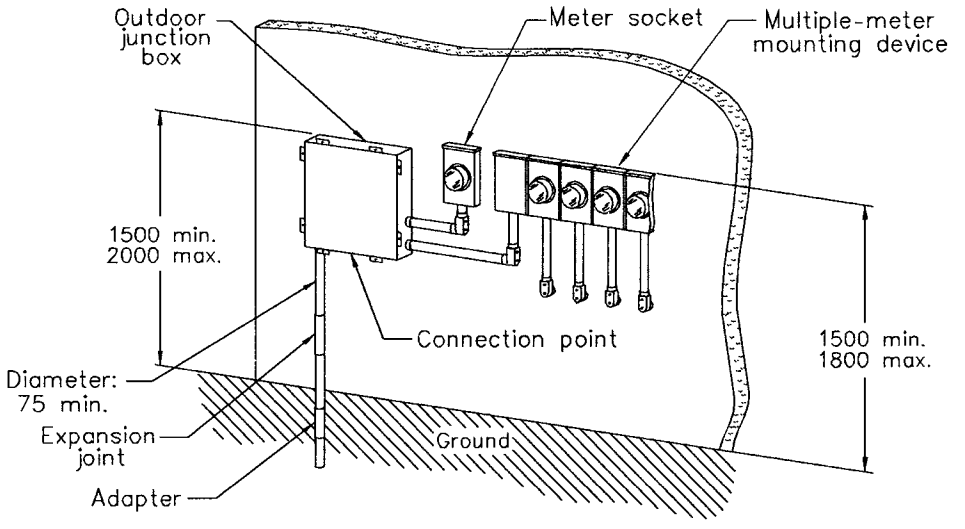
Standard: E.21-10
9th edition
Updated
May 2008

Figure: 3.07

A: Indoor service box

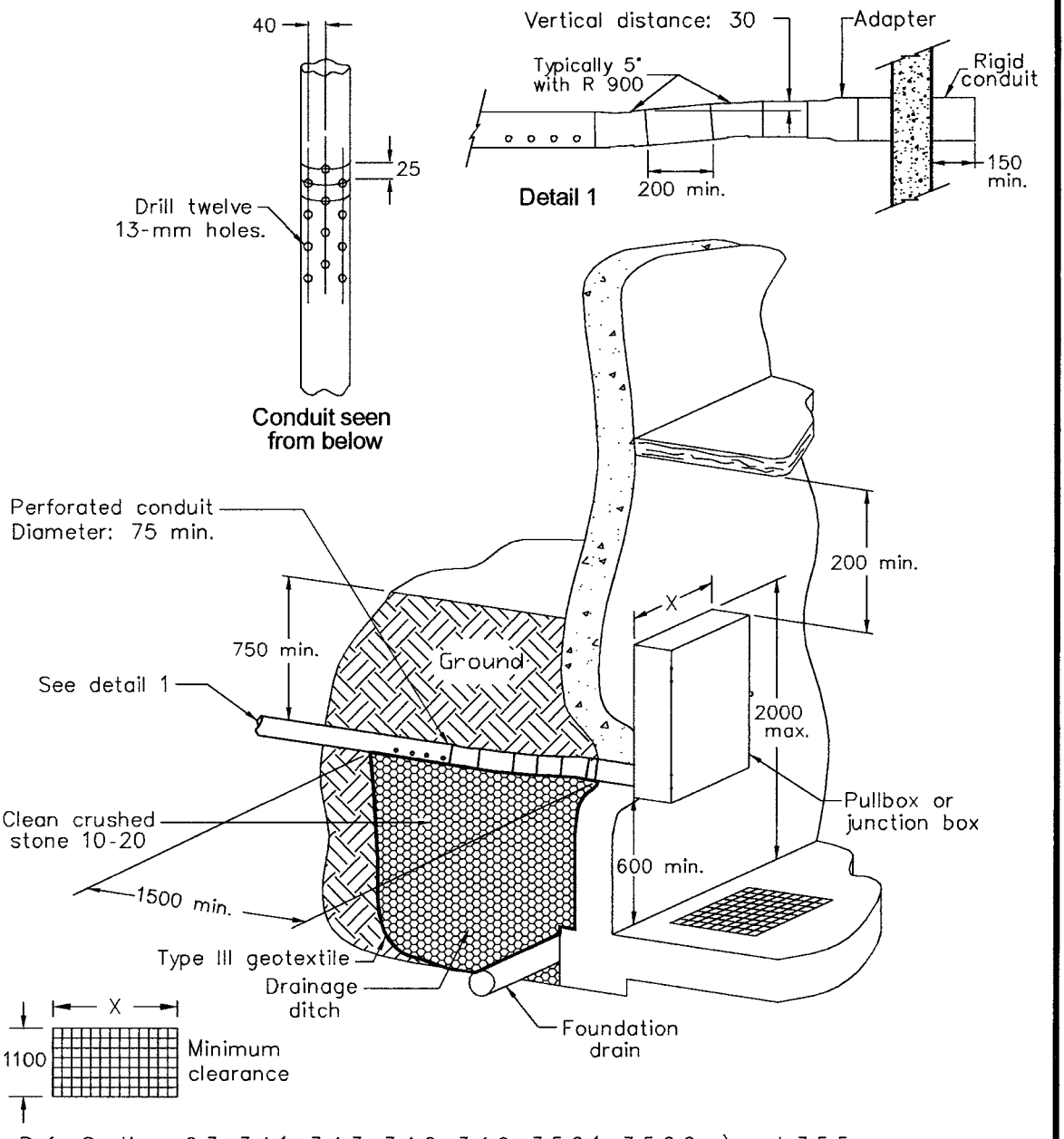


B: Outdoor meter socket or multiple-meter mounting device



Ref.: Sections 0.3, 3.2.1, 3.2.1.3, 3.4.1, 3.4.6, 3.5.2.2 b) and 6.3.7.2

Hydro Québec	OUTDOOR JUNCTION BOX	
Technical validation INGÉNIEUR Jacques Côté 99299 QUÉBEC Date: 10/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 3.08



Ref.: Sections 0.3, 3.4.1, 3.4.3, 3.4.6, 3.4.9, 3.5.2.1, 3.5.2.2 a) and 3.5.5

Hydro Québec

CONDUIT ENTERING A BUILDING BELOW GROUND LEVEL

Technical validation

INGÉNIEUR Guy Léger 29544 QUÉBEC

Date: 13/11/2006

Approved by

Hydro-Québec

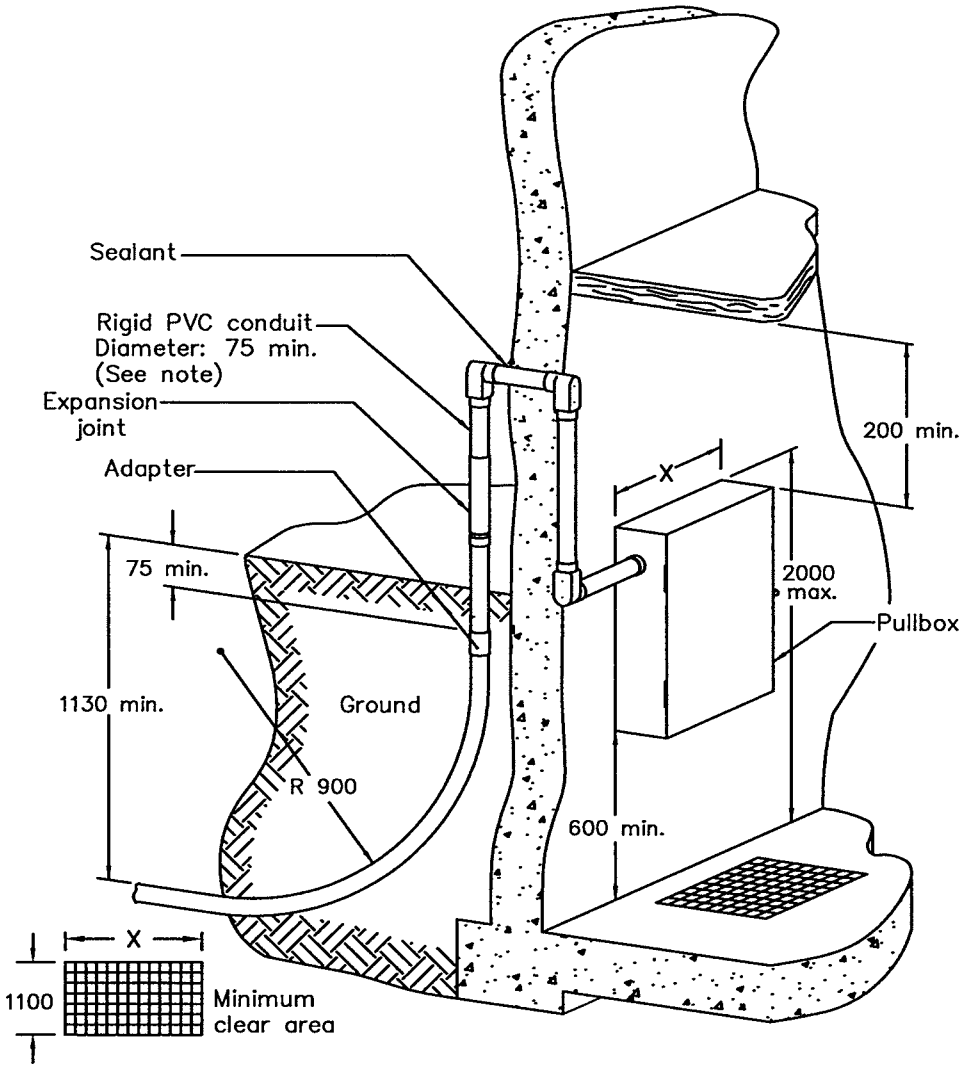
RÉGIE DU BÂTIMENT DU QUÉBEC

Standardization

Operations

Standard: E.21-10 9th edition

Figure: 3.09



Note: Rigid conduit at least 100 mm in diameter is required when the service box ratings total 600 A or more.

Ref.: Sections 0.3, 3.4.1, 3.4.2, 3.4.5, 3.4.6, 3.5.2.1, 3.5.2.2 a), 3.5.5 and 3.5.6.2

Hydro Québec

CONDUIT ENTERING A BUILDING
ABOVE GROUND LEVEL

Technical validation

INGÉNIEUR Guy Léger 29544 QUÉBEC

Date: 2009/07/10

Approved by

Hydro-Québec

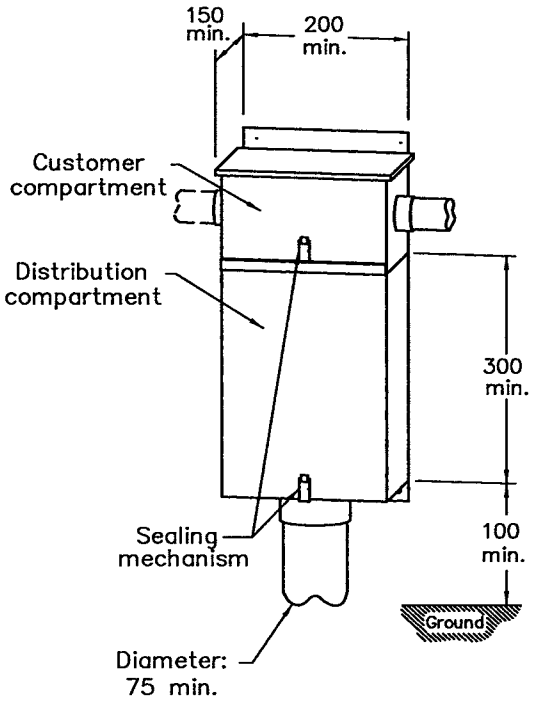
RÉGIE DU BÂTIMENT DU QUÉBEC

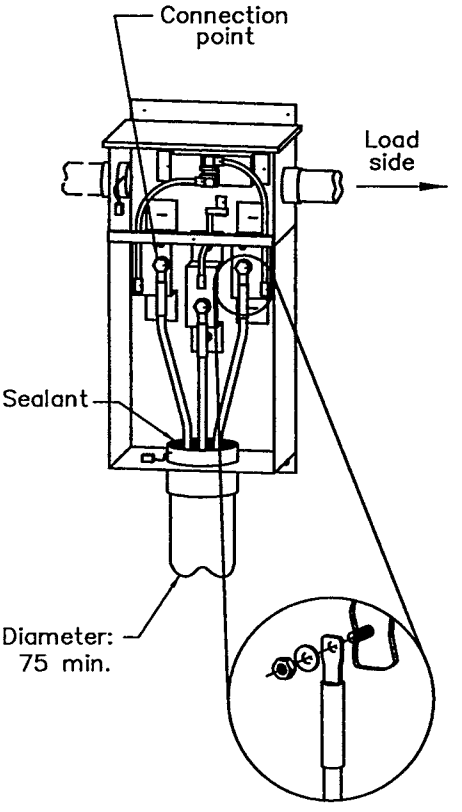
Standardization

Operations

Standard: E.21-10
9th edition
Updated
May 2008

Figure: 3.10

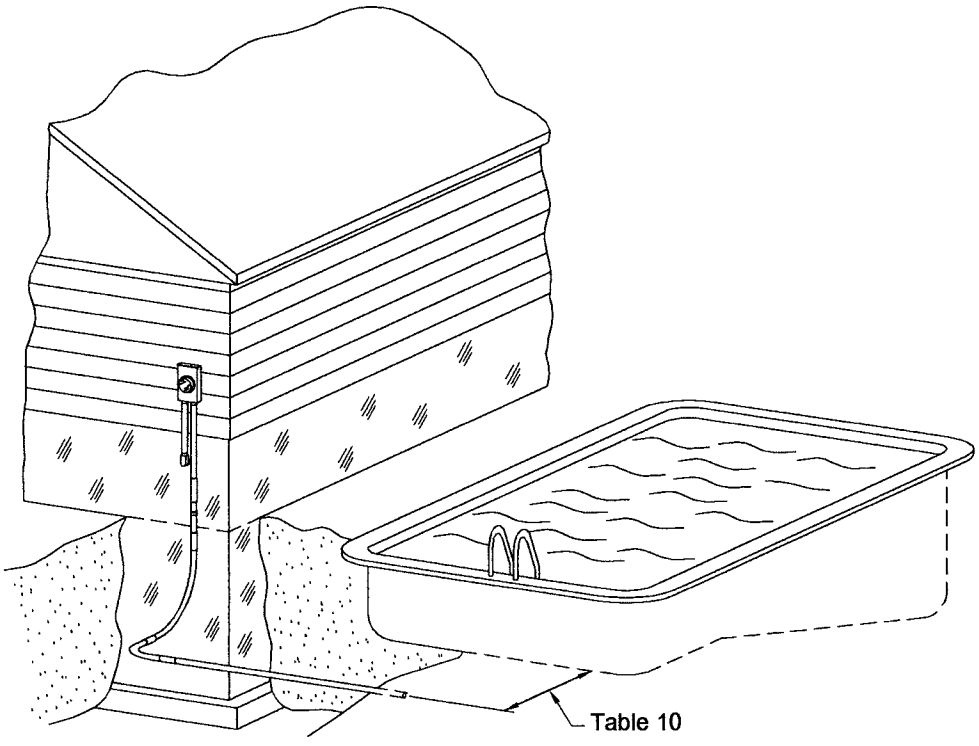




Connection lug
with one-hole
NEMA terminal

Ref.: Sections 0.3, 3.1.4, 3.2.1, 3.2.1.4, 3.4.1, 3.6.2 and 3.6.3

Hydro Québec	CONNECTION BOX FOR FLAT-RATE SERVICE	
Technical validation INGÉNIEUR Jacques Côté 99299 QUÉBEC Date: 2009/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 3.11

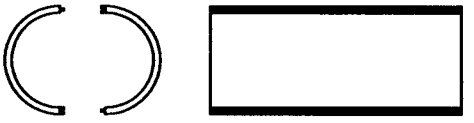
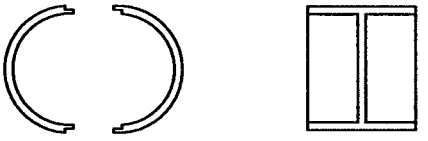
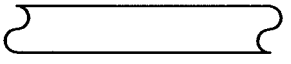


Note: For customer conductors, the master electrician must comply with *Code* requirements.

Ref.: Section 3.7.5

Hydro Québec	MINIMUM CLEARANCE BETWEEN CONDUCTORS AND POOL	
Technical validation INGÉNIEUR Jacques Côté 99299 QUÉBEC Date: 10/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 3.12

COMPONENTS

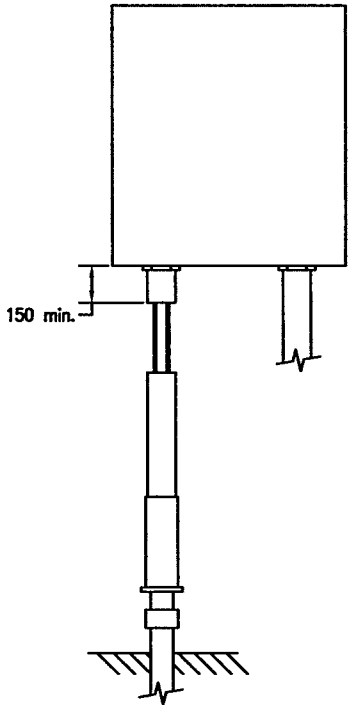
Illustration	Description
	Split conduit, rigid Variable diameter
	Two split couplings, rigid PVC Variable diameter Generally a coupling need not be added if conduit with mating ends is used
	9 mm (3/8 in.) stainless steel clamp ring
	Clasp for 9 mm (3/8 in.) stainless steel clamp ring

Ref.: Section 3.4.10

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 precautions to avoid damaging the live cables it contains. Adjust the expansion joint opening to meet manufacturer recommendations.

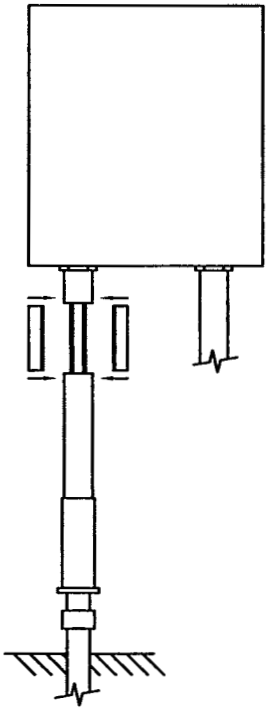


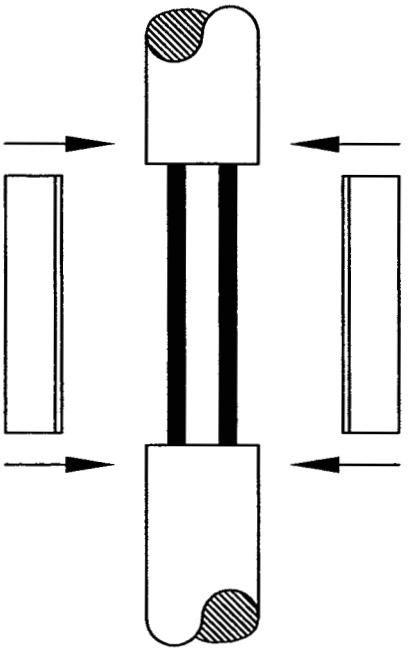
Ref.: Section 3.4.10

Hydro Québec	REPAIR OF EXISTING ABOVE-GROUND CONDUIT	
Technical validation INGÉNIEUR – EXPERT Claude Tremblay 112085 QUÉBEC Date: 2009/02/14	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 3.13 Page 2 of 5

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 if necessary. Install the conduit so it covers the exposed cables beneath the junction box or meter socket.





* If conduit with mating ends is used, consult manufacturer instructions to determine the length.

Ref.: Section 3.4.10

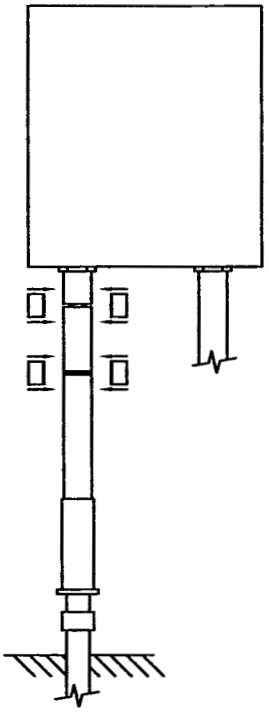
Hydro Québec	REPAIR OF EXISTING ABOVE-GROUND CONDUIT	
Technical validation Claude Tremblay 112085 QUÉBEC Date: 2009 07 14	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 3.13 Page 3 of 5

3. Preparing and installing the split coupling

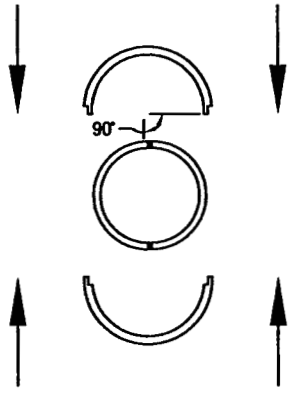
For each end of the split conduit without mating ends, proceed as follows:

- Clean the inside of the couplings.
- Apply a layer of solvent primer and then solvent cement on the outside of the conduit to match the size of the split coupling.
- Do likewise for each half of the split coupling, making sure to cover the mating edges.
- Install the coupling on either side of the split conduit so their respective mating edges are at 90°.

N.B.: Install the male half of the coupling before the female half.



1) Insert the male half of the coupling.



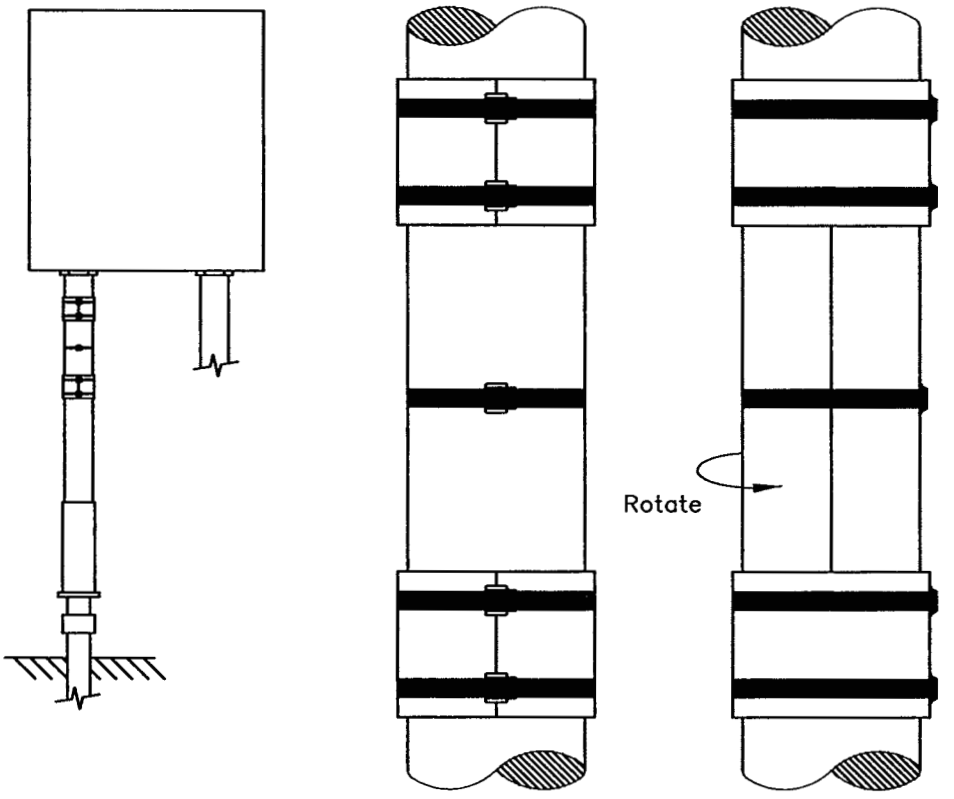
2) Insert the female half of the coupling.

Ref.: Section 3.4.10

Hydro Québec	REPAIR OF EXISTING ABOVE-GROUND CONDUIT	
Technical validation Claude Tremblay 112085 QUÉBEC Date: 2009/07/14	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 3.13 Page 4 of 5

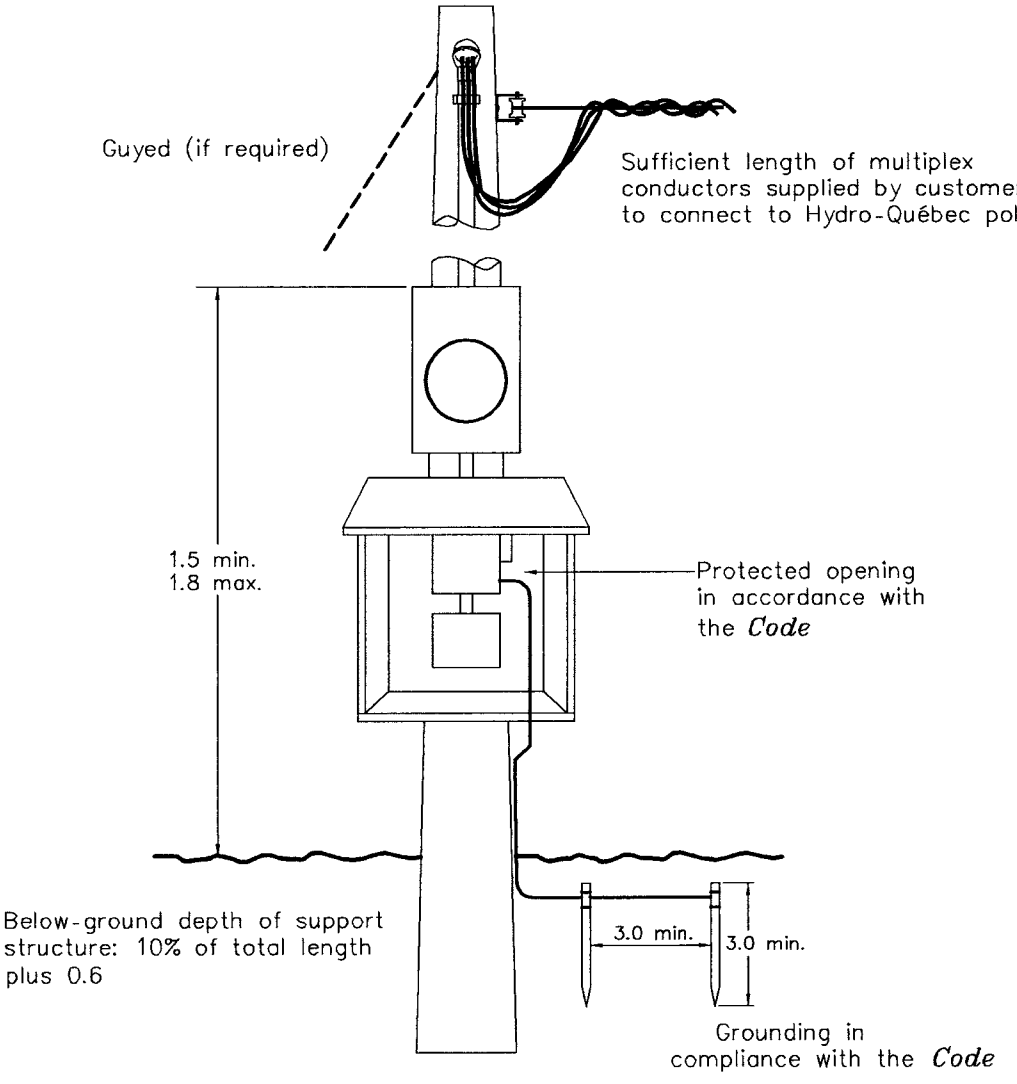
4. Installing the stainless steel ring clamps and rotating the service conduit

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



Ref.: Section 3.4.10

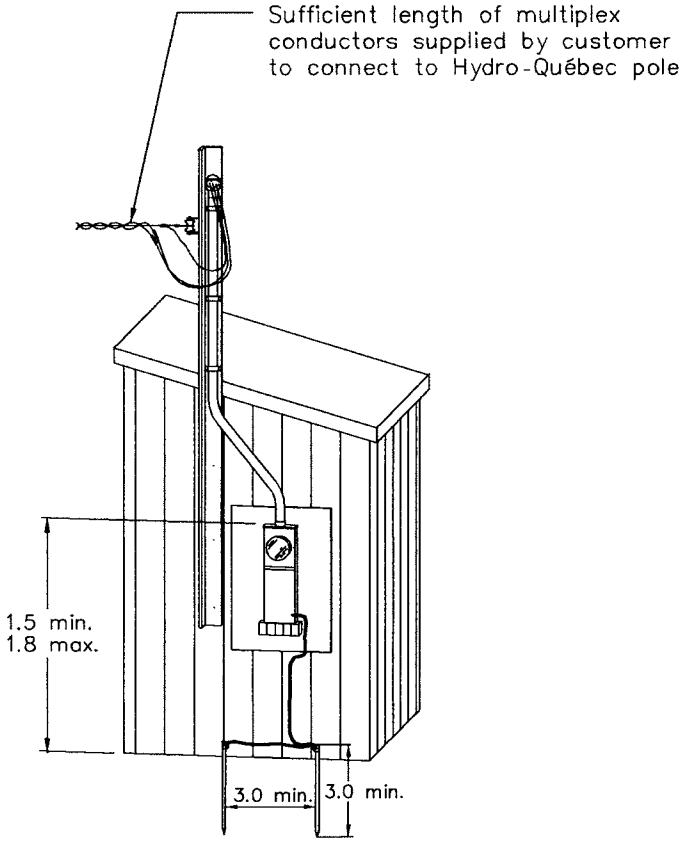
Hydro Québec	REPAIR OF EXISTING ABOVE-GROUND CONDUIT	
Technical validation Claude Tremblay 112085 QUÉBEC Date: 2009/07/14	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 3.13 Page 5 of 5



Note: Dimensions are in metres.

Ref.: Section 4.2 e)

Hydro Québec	TEMPORARY SERVICE ENTRANCE ON A SUPPORT STRUCTURE	
Technical validation INGÉNIEUR Roger Desbiens 35448 QUÉBEC Date: 16/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 4.01

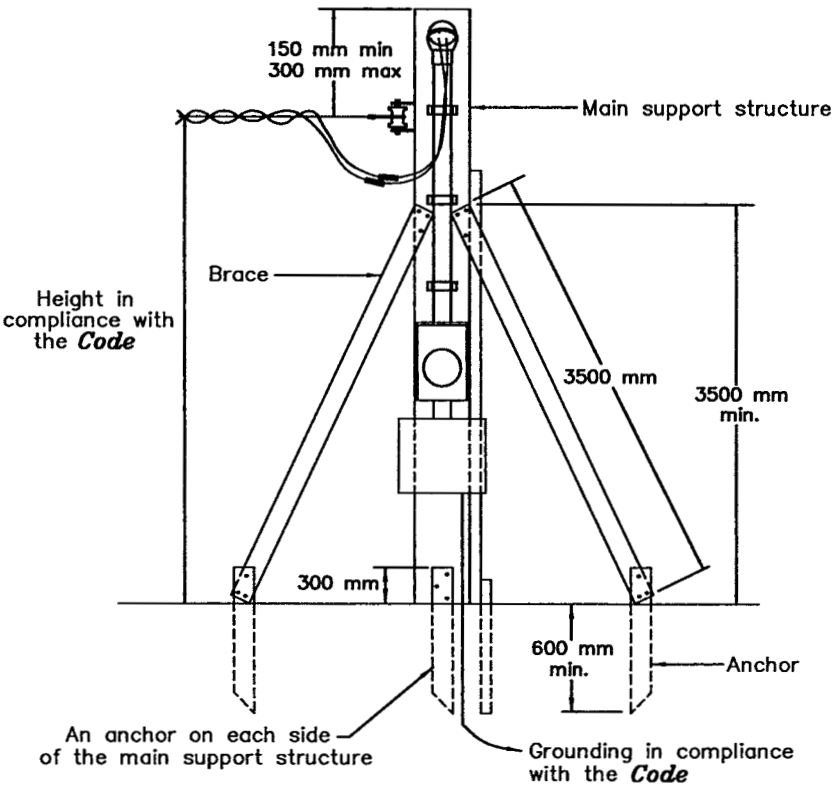


Grounding in compliance with the *Code*

Note: Dimensions are in metres.

Ref.: Section 4.2 e)

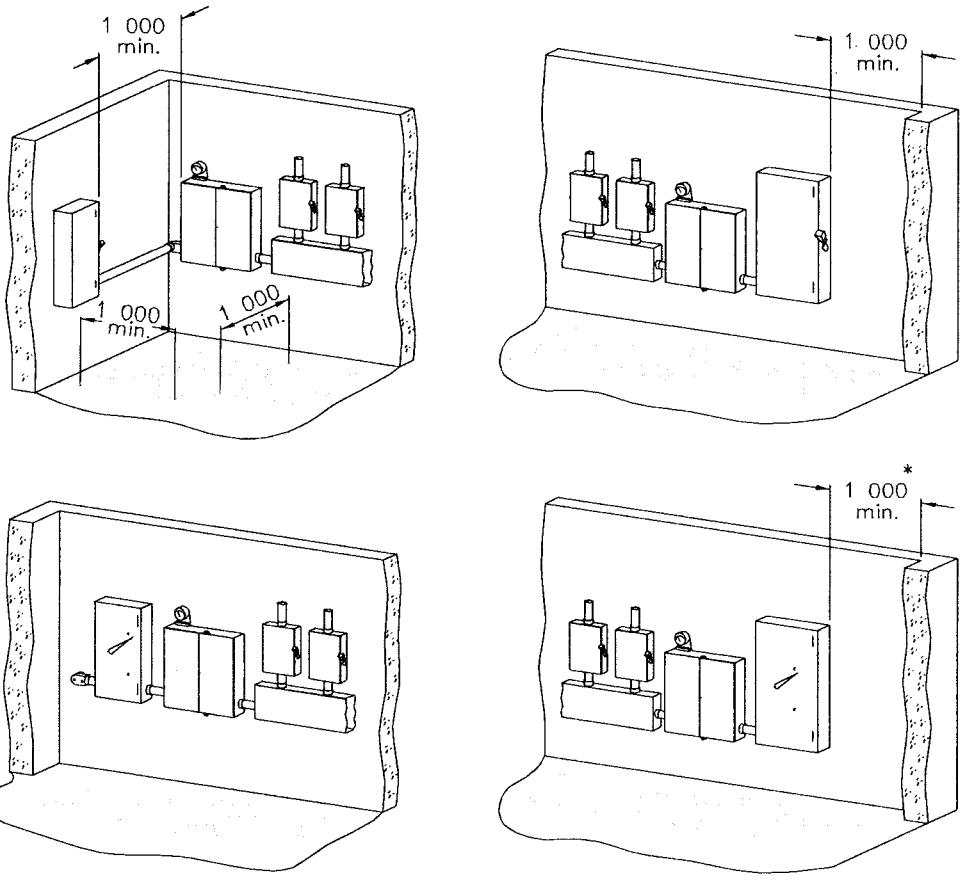
Hydro Québec	TEMPORARY PREFABRICATED SERVICE MAST	
Technical validation INGÉNIEUR Roger Desbiens 35448 QUÉBEC Date: 16/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 4.02



- The main support structure must consist of at least two 2 in. x 6 in. planks nailed together along their entire length.
- At least three 2 in. x 6 in. braces must be attached to the main support structure and to anchors using two 3/8 in. bolts or three nails at least 3 in. long.
- At least one brace must be parallel to the service entrance conductors.
- The anchors must be of 2 in. x 2 in. stud wood.
- All wood must be in good condition, free of rot and solid (not jointed).
- The service head must not be higher than the main support structure.
- The requirements in Standard E.21 10 and the ***Code*** apply.
  Any other arrangements must be accepted by a competent authority.

Ref.: Section 4.2 b)

Hydro Québec	TEMPORARY SERVICE ENTRANCE ON A SUPPORT STUCTURE (ACCEPTABLE ARRANGEMENT)	
Technical validation INGÉNIEUR Roger Desbiens 35448 QUÉBEC Date 2009 07 09	Approved Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 4.03

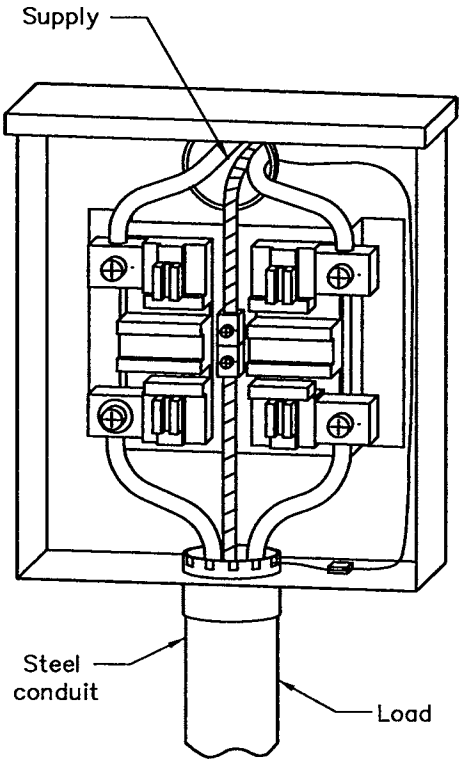


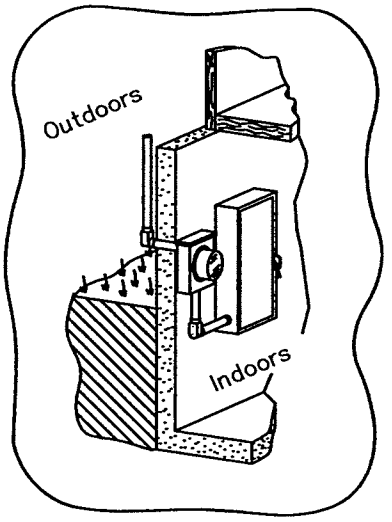
* This clearance is not required if the switching operation can be done from the left as specified in Section 5.7.

Minimum 1-m clearance for switching operations and access to splitter and transformer boxes

Ref.: Section 5.7 and 7.3.2.6 a)

Hydro Québec	CLEARANCE IN FRONT OF SERVICE, SPLITTER AND TRANSFORMER BOXES	
Technical validation INGÉNIEUR JEAN JOLY 30601 QUÉBEC Date: 09/11/2006	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 5.01

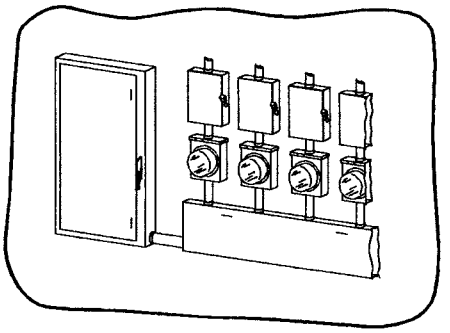


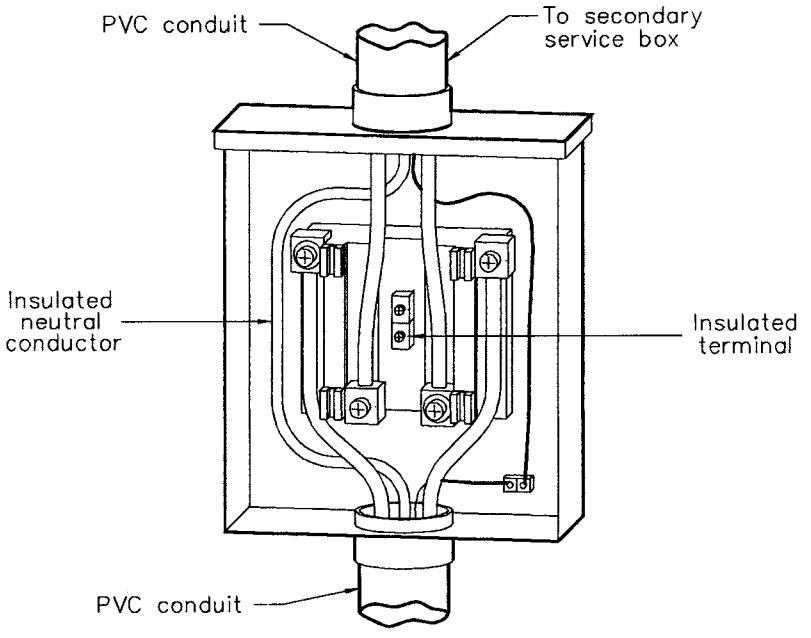


Notes: For PVC conduits, see Figure 6.03.
Conduits need not be attached to the meter socket as illustrated.
The bare neutral conductor must be insulated with tape inside the meter socket.
If it must be cut, the neutral conductor must then be connected to a terminal bolted to the meter socket.

Ref.: Sections 0.3, 6.2 h) and 6.3.7.1

Hydro Québec	INDOOR 120/240-V METER SOCKET ON SUPPLY SIDE OF SERVICE BOX	
Technical validation INGÉNIEUR DENIS DESLAURIERS 42178 QUÉBEC Date: 09/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization | Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 6.01

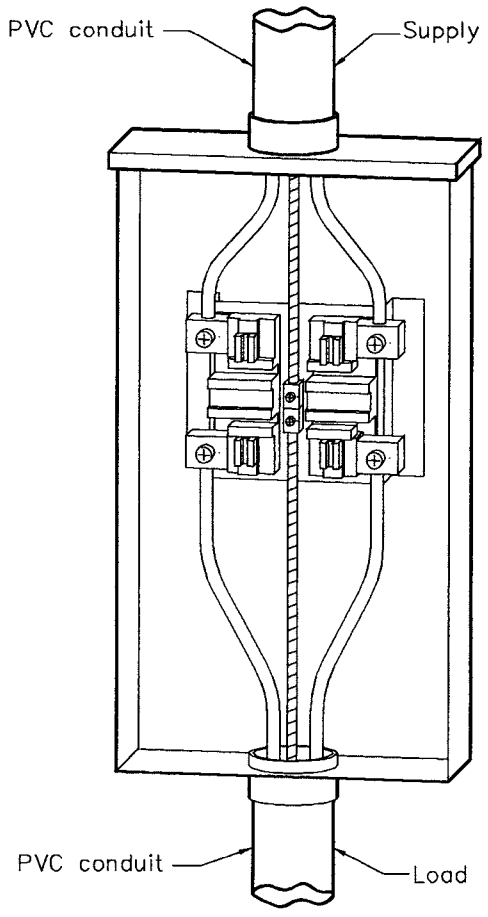




Notes: For steel conduit, see Figure 6.01.
Conduits need not be attached to the meter socket as illustrated.
If it must be cut, the neutral conductor must then be connected to an insulated terminal inside the meter socket.

Ref.: Sections 0.3, 6.2 h) and 6.3.7.3

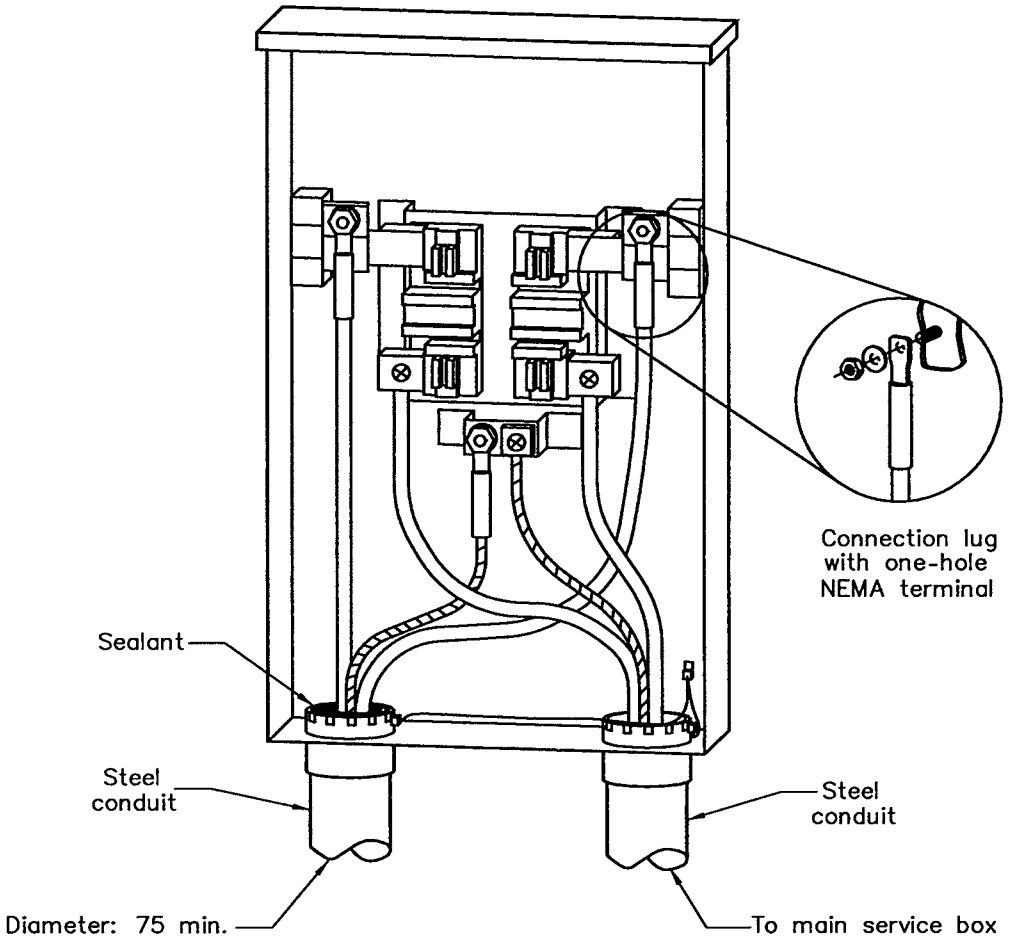
Hydro Québec	INDOOR 120/240-V METER SOCKET ON LOAD SIDE OF SERVICE BOX	
Technical validation INGÉNIEUR DENIS DESLAURIERS 42176 QUÉBEC Date: 03/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 6.02



Notes: For steel conduits, see Figure 6.01.
Conduits need not be attached to the meter socket as illustrated.
The bare neutral conductor must be insulated with tape inside the meter socket.
The neutral conductor must be connected to a terminal bolted to the meter socket.

Ref.: Sections 0.3 and 6.2 h)

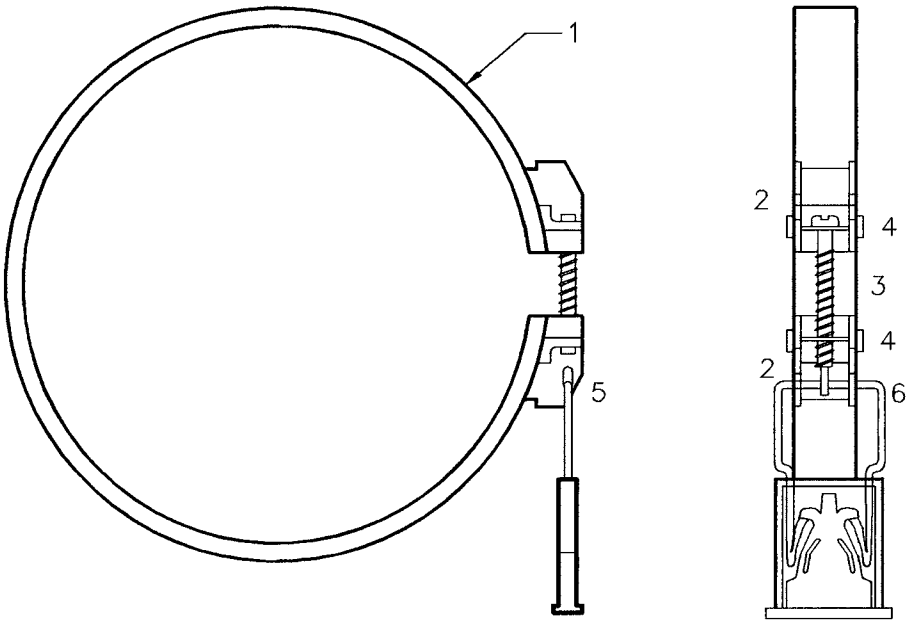
Hydro Québec	OVERHEAD CONNECTION OUTDOOR 120/240-V METER SOCKET	
Technical validation INGÉNIEUR DENIS DESLAURIERS 42176 QUÉBEC Date: 03/11/'06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 6.03



Note: The bare neutral conductor must be insulated with tape inside the meter socket.

Ref.: Sections 6.2 c) and 6.2 h)

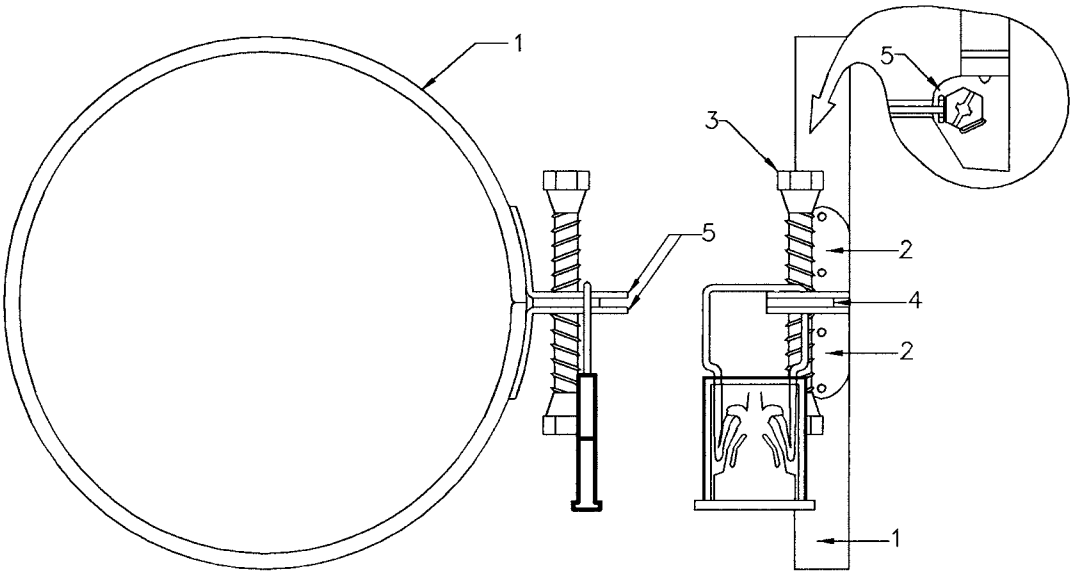
Hydro Québec	UNDERGROUND CONNECTION OUTDOOR 120/240-V METER SOCKET WITH ONE-HOLE NEMA TERMINALS	
Technical validation INGÉNIEUR DENIS DESLAURIERS 42178 QUÉBEC Date: 09/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 6.04



Notes:
1. Stainless steel screw clamp, including mounts. Edges must be at least 6 mm thick.
2. Electrically welded mounts
3. Zinc-plated brass clamp screw with fixed head and hole at the other end
4. Captive clamp nuts preventing sides of the mount from spreading apart
5. End mount for clamp screw with hole
6. Holes in mount and screw for installing seal

Ref.: Section 6.2 e)

Hydro Québec	SCREW CLAMP FOR PLUG-IN METER	
Technical validation INGÉNIEUR DENIS DESLAURIERS 42176 QUÉBEC Date: 03/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 6.05 Page 1 of 2



Notes: 1. Stainless steel screw clamp
2. Electrically welded mounts
3. Captive clamp screw
4. Disk with holes for installing a seal
5. Hole in mount for installing a seal

Ref.: Section 6.2 e)

Hydro Québec

SCREW CLAMP FOR PLUG-IN METER

Technical validation

INGÉNIEUR
DENIS DESLAURIERS
42176
QUÉBEC

Date: 03/11/06

Approved by

Hydro-Québec

RÉGIE DU BÂTIMENT DU QUÉBEC

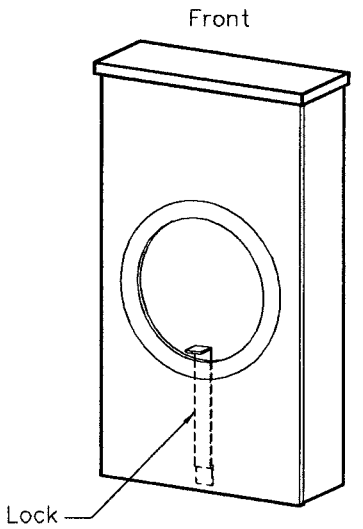
Standardization

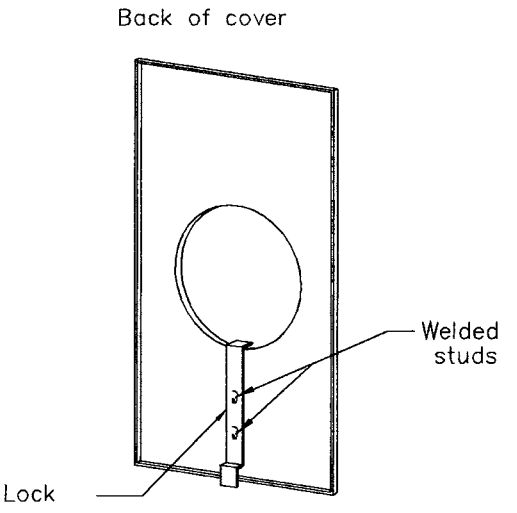
Operations

Standard:
E.21-10
9th edition

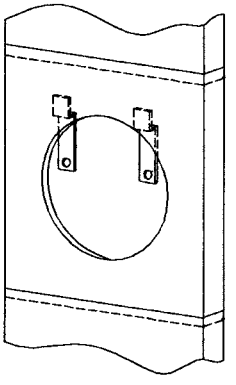
Figure:
6.05
Page 2 of 2

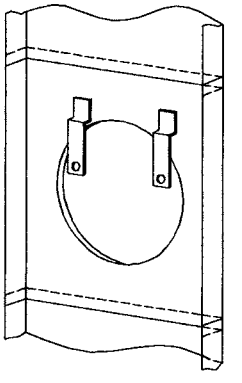
A: Example of cover with lock





B: Example of another acceptable cover

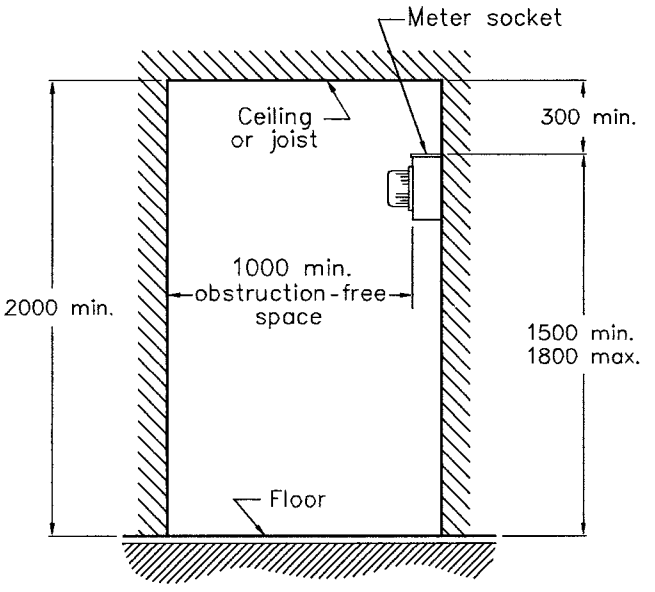




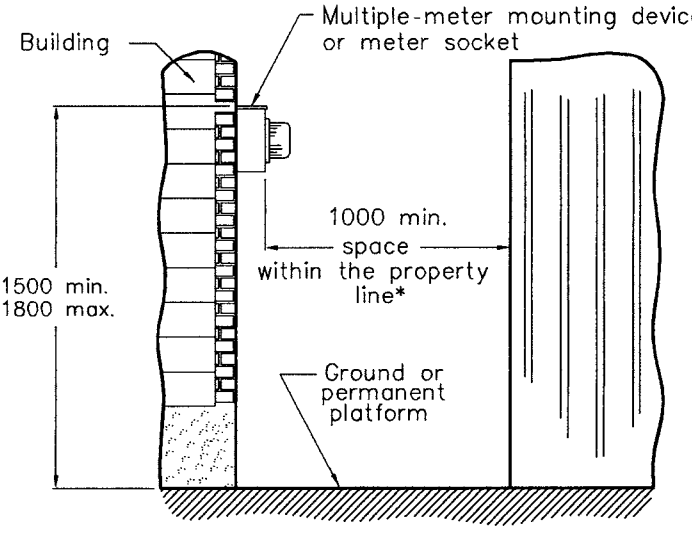
Ref.: Section 6.2 i)

Hydro Québec	REMOVABLE METER SOCKET COVER WITH HIDDEN LOCK	
Technical validation INGÉNIEUR DENIS DESLAURIERS 42176 QUÉBEC Date: 03/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 6.06

A: Indoor installation



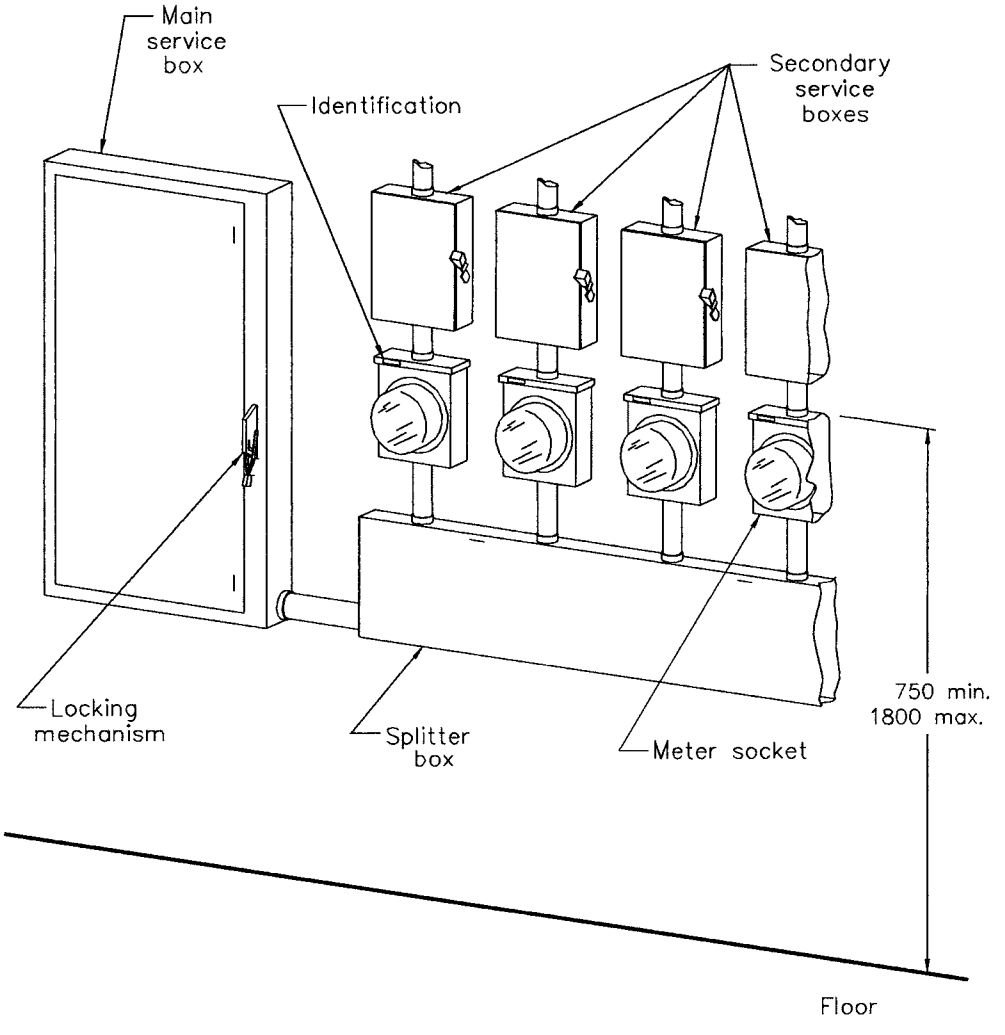
B: Outdoor installation



* This space must be free of obstructions.

Ref.: Section 6.3.6.1 a)

Hydro Québec	CLEARANCES INSTALLATION OF MULTIPLE-METER MOUNTING DEVICES OR INDIVIDUAL METER SOCKETS	
Technical validation INGÉNIEUR DENIS DESLAURIERS 42176 QUÉBEC Date: 03/11/06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 6.07



Ref.: Sections 0.3, 5.9.1, 6.3.6.1 b) and 6.3.7.3

Hydro Québec

INDOOR 120/240-V INSTALLATION
GROUPED SUPPLY WITH SPLITTER BOX

Technical validation

INGÉNIEUR
DENIS DESLAURIERS
42176
QUÉBEC

Date: 03/11/06

Approved by

Hydro-Québec

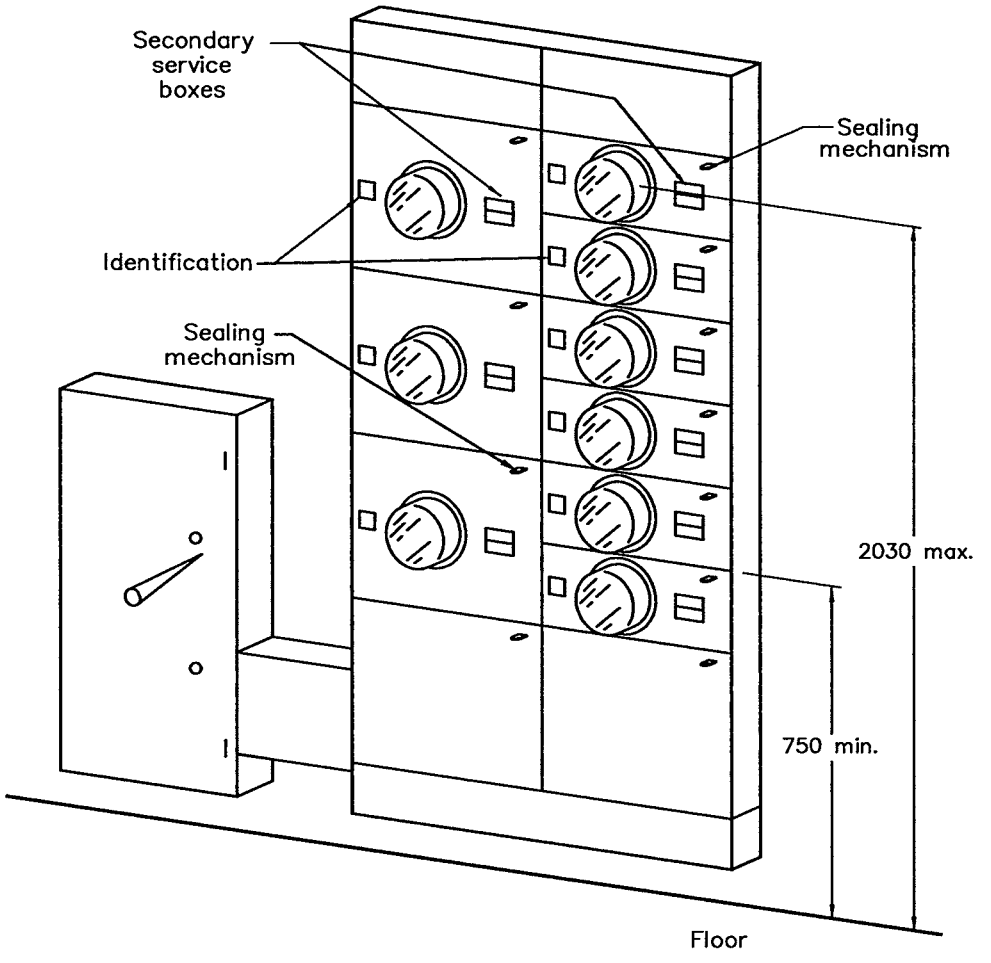
RÉGIE DU BÂTIMENT DU QUÉBEC

Standardization

Operations

Standard:
E.21-10
9th edition

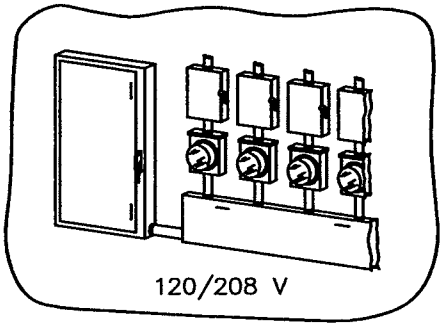
Figure:
6.08



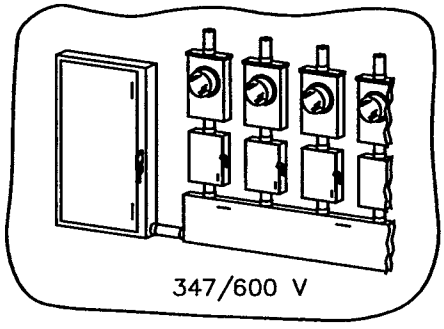
Note: Secondary service boxes may be on the line or load side of meters.

Ref.: Sections 0.3, 5.9.1, 5.9.2, 6.3.6.1 b) and 6.3.7.3

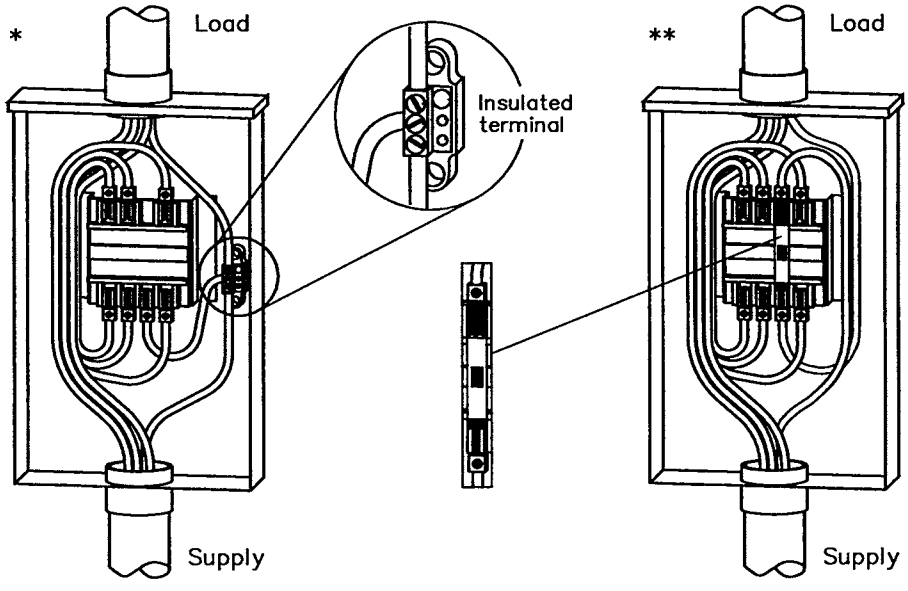
Hydro Québec	INDOOR 120/240-V INSTALLATION FOR GROUPED SUPPLY METERING CENTRE	
Technical validation INGÉNIEUR DENIS DESLAURIERS 42178 QUÉBEC Date: 09/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 6.09



120/208 V



347/600 V

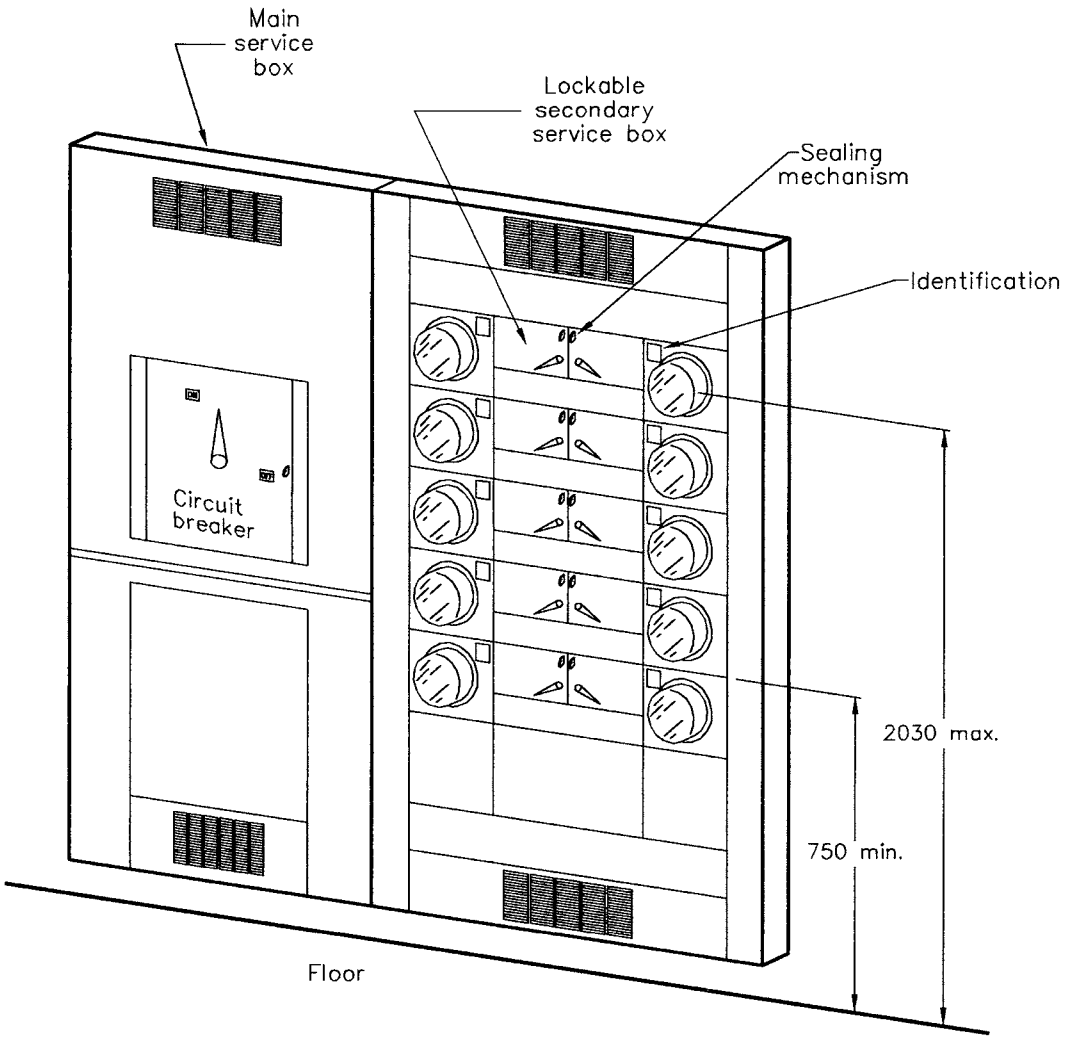


* The neutral must be connected to the insulated terminal and an insulated neutral conductor must run from jaw seven to the insulated terminal.

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

Ref.: Sections 6.4.2, 6.5.1, 6.5.2 and 6.5.3

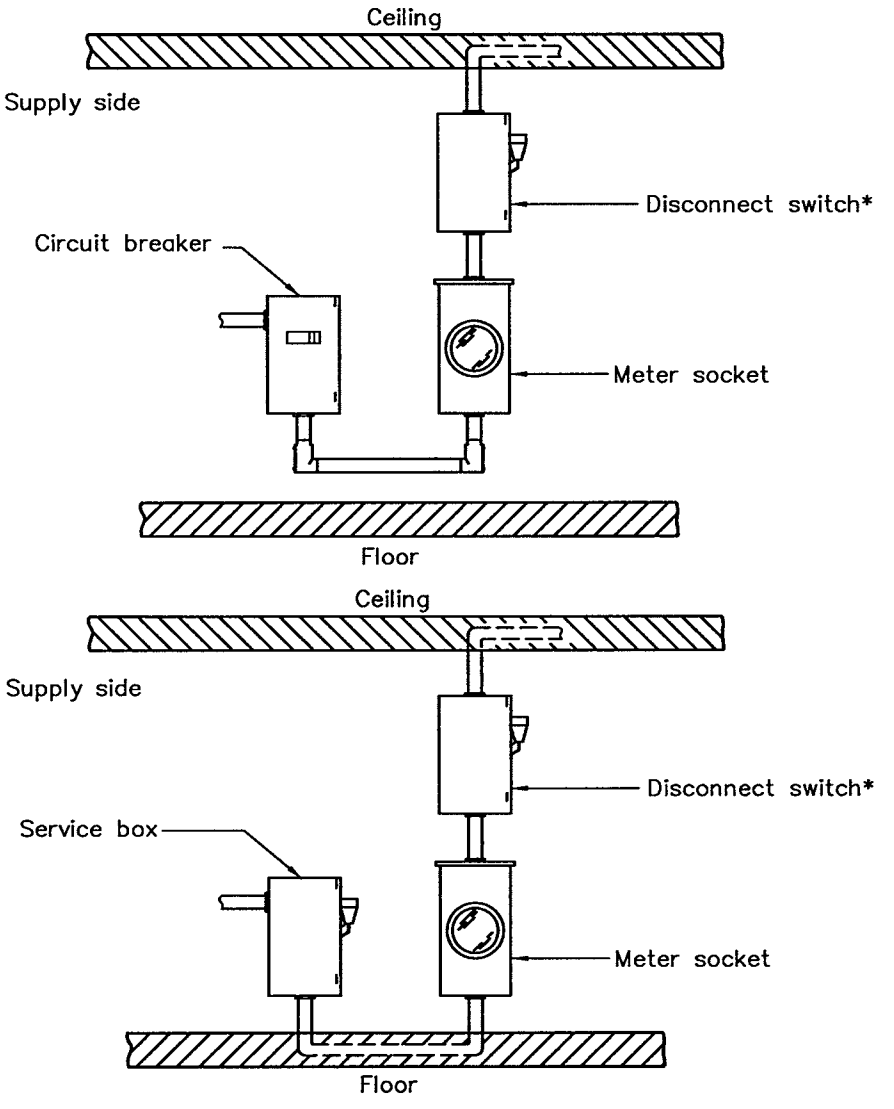
Hydro Québec	SOCKET FOR THREE-PHASE 347/600-V OR 120/208-V FOUR-CONDUCTOR METERS WITHOUT TRANSFORMATION	
Technical validation INGÉNIEUR DENIS DESLAURIERS 42176 QUÉBEC Date: 09/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Updated May 2008 Figure: 6.10



Note: Secondary service boxes must be on the supply side of meters.

Ref.: Sections 0.3, 5.9.1, 5.9.2, 6.2, 6.5.1 and 6.5.5

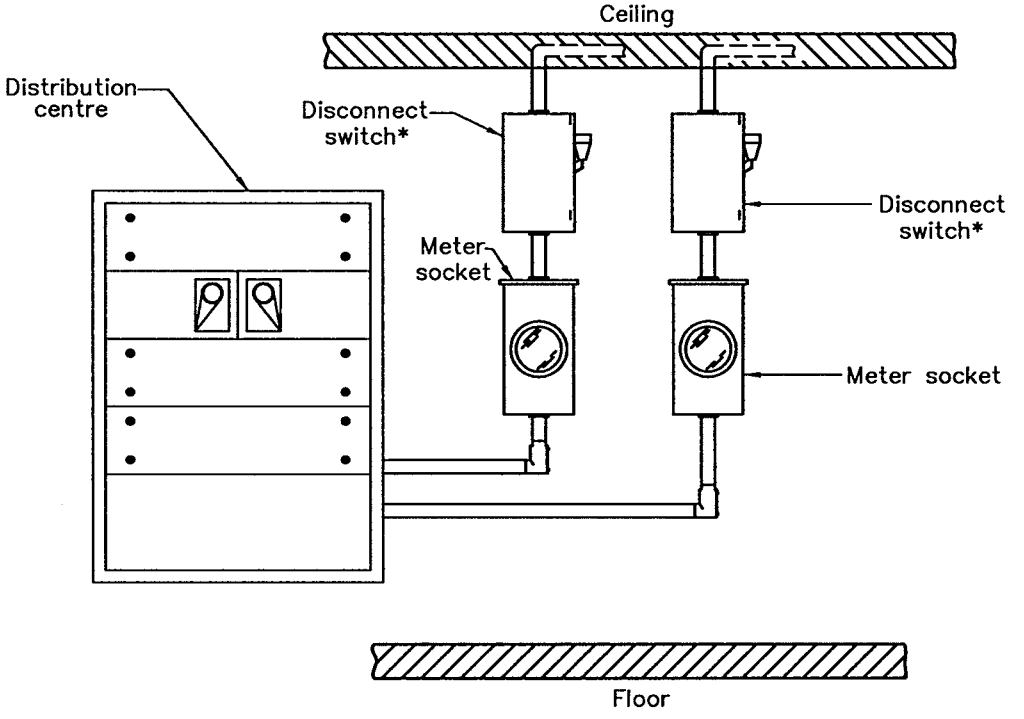
Hydro Québec	INDOOR 347/600-V INSTALLATION FOR GROUPED SUPPLY METERING CENTRE	
Technical validation INGÉNIEUR DENIS DESLAURIERS 42176 QUÉBEC Date: 03/11/'06	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 6.11



*The disconnect switch must allow voltage testing if such testing cannot be done on the supply side of the meter socket.

Ref.: Section 6.5.4

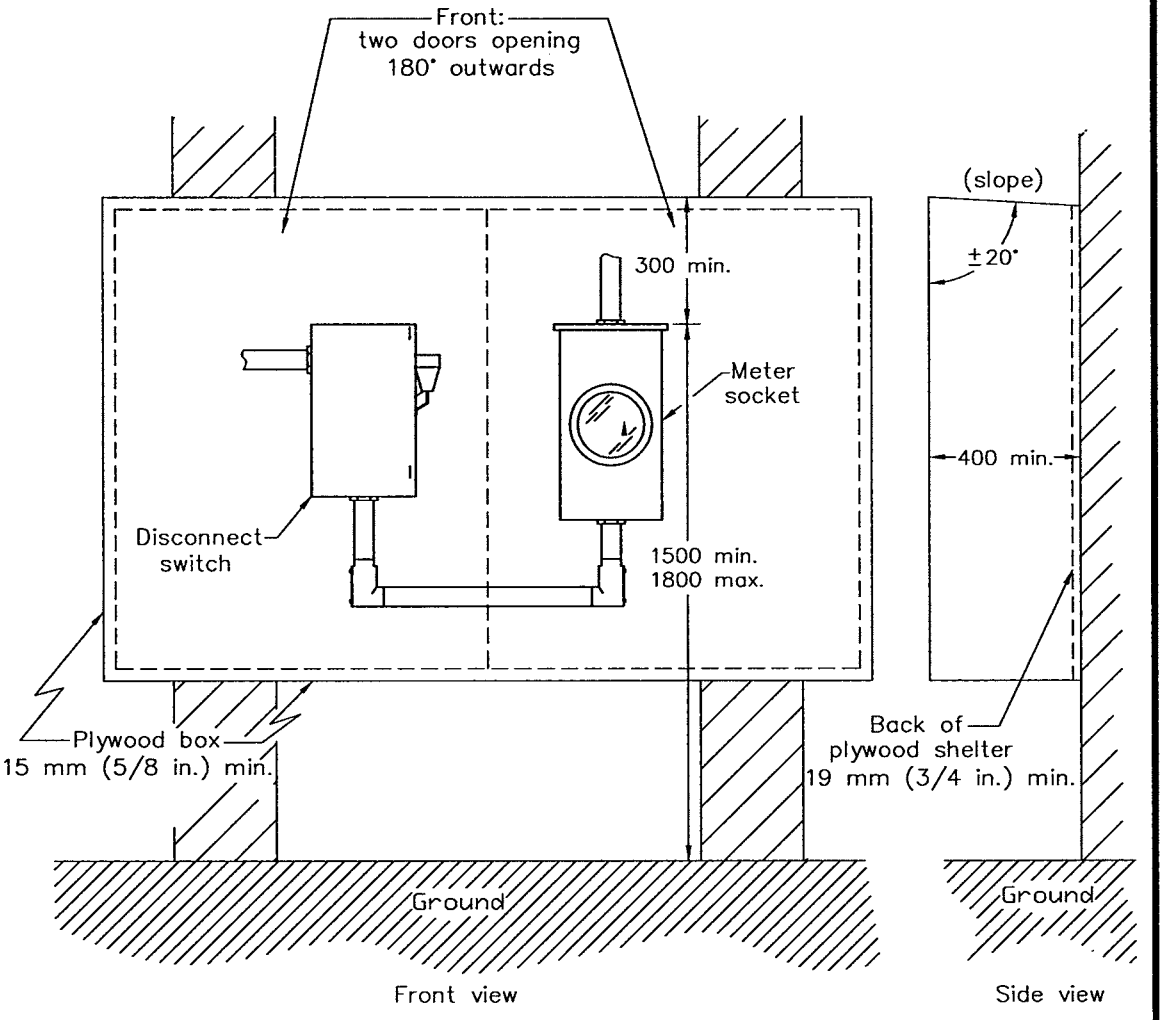
Hydro Québec	VOLTAGE TESTING ARRANGEMENTS ON LOAD SIDE OF THREE-PHASE 347/600-V METER SOCKET	
Technical validation INGÉNIEUR Sébastien Fiset-Cayer 131781 QUÉBEC Date: 09/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Updated March 2009 Figure: 6.12



*The disconnect switch must allow voltage testing if such testing cannot be done on the supply side of the meter socket.

Ref.: Section 6.5.4

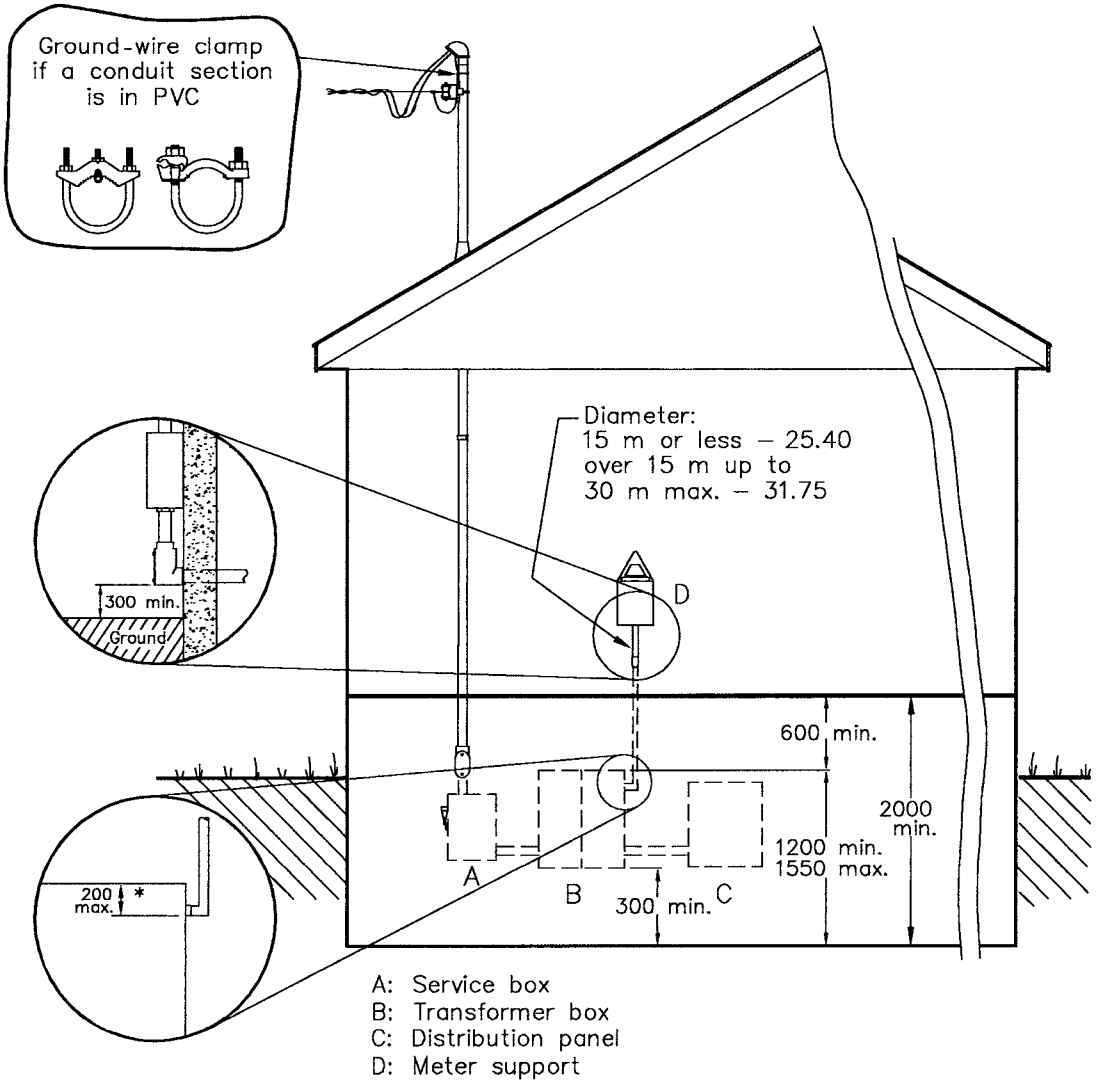
Hydro Québec	VOLTAGE TESTING ARRANGEMENTS ON LOAD SIDE OF THREE-PHASE 347/600-V METER SOCKET	
Technical validation INGÉNIEUR Sébastien Filion-Cloutier 131781 QUÉBEC Date: 2009/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Ing. Operations	Standard: E.21-10 9th edition Updated March 2009 Figure: 6.13



Notes: Make sure the installation complies with the ***Code.***
Cover the shelter with vinyl or some other weatherproof material.
Label the shelter with the street address.

Ref.: Section 6.5.2

Hydro Québec	METERING EQUIPMENT SHELTER FOR 347/600-V METER SOCKETS	
Technical validation INGÉNIEUR Sébastien Filteau-Gagnon 131781 QUÉBEC Date: 2009/07/09	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Updated March 2009 Figure: 6.14



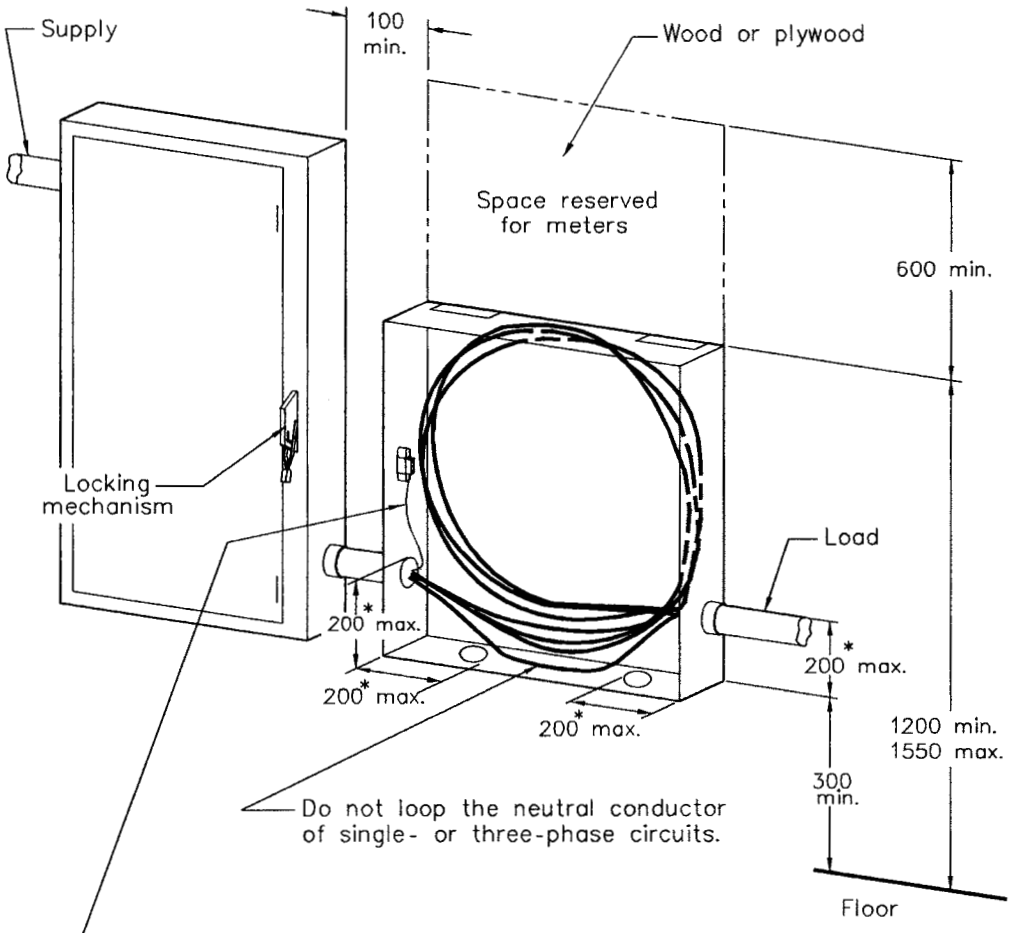
A: Service box
B: Transformer box
C: Distribution panel
D: Meter support

* This distance is 300 mm for boxes whose main switch is 600 A or higher.

Note: The conduit must enter the support from below.

Ref.: Sections 7.1.2, 7.1.2.1, 7.3.2.5 and 7.3.2.8

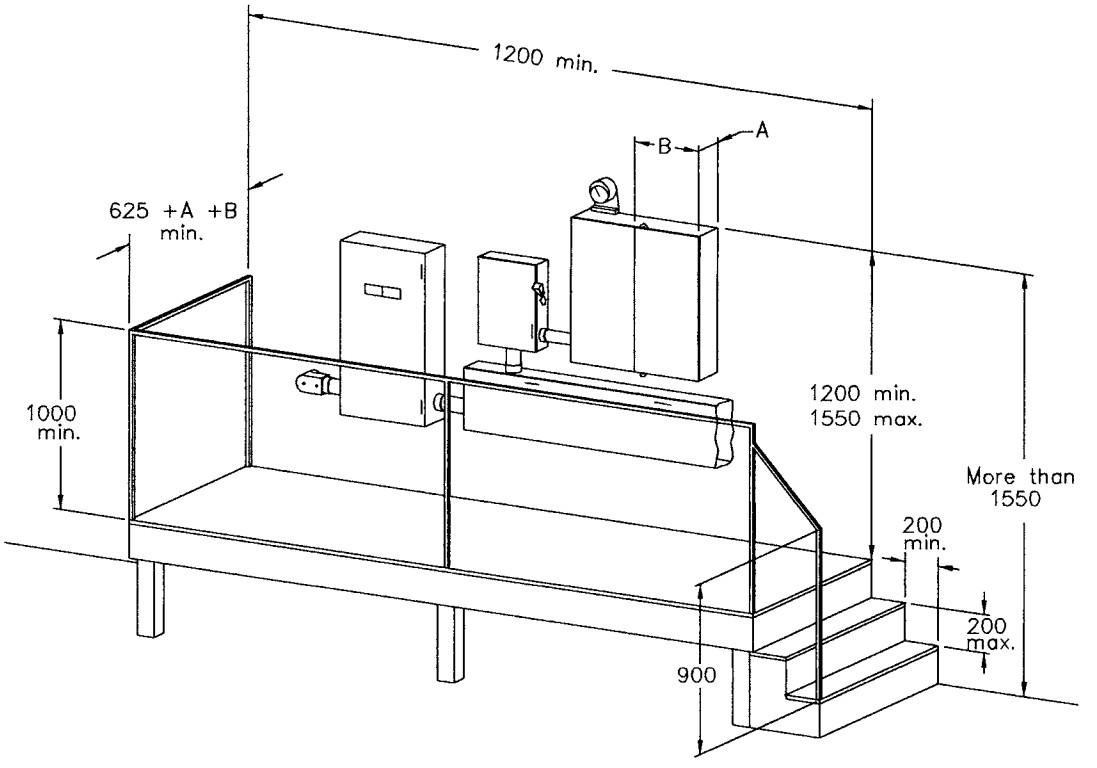
Hydro Québec	120/240-V INSTALLATION SUPPORT FOR TYPE-A METER WITH INDOOR TRANSFORMER BOX	
Technical validation INGÉNIEUR JEAN JOLY 30601 QUÉBEC Date: 09/11/2006	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 7.01



* This distance is 300 mm for transformer boxes whose main switch is 600 A or higher.

Ref.: Sections 7.3.2.4, 7.3.2.5, 7.3.2.8, 7.3.2.9 a), b) and c) and 7.3.3.1

Hydro Québec	ARRANGEMENT OF CONDUCTORS IN A TRANSFORMER BOX	
Technical validation INGÉNIEUR JEAN JOLY 30601 Date: 09/11/2006	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 7.02

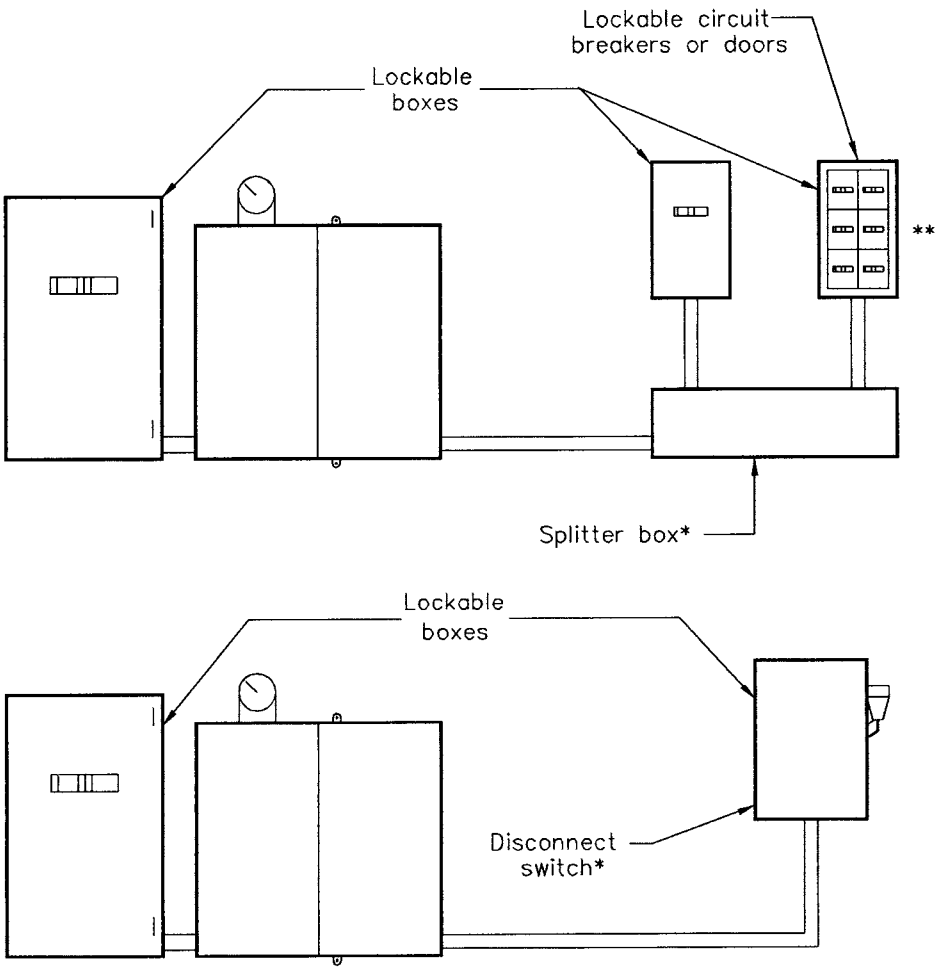


Note: Steps, a handrail and a guard rail are required if the platform is 600 mm or more above the floor.

Ref.: Section 7.3.2.5

Hydro Québec	PLATFORM TRANSFORMER BOX MORE THAN 1500 mm ABOVE FLOOR	
Technical validation INGÉNIEUR JEAN JOLY 30601 Date: 09 / 11 / 2006	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 7.03

Cabled boxes and panels in the same room

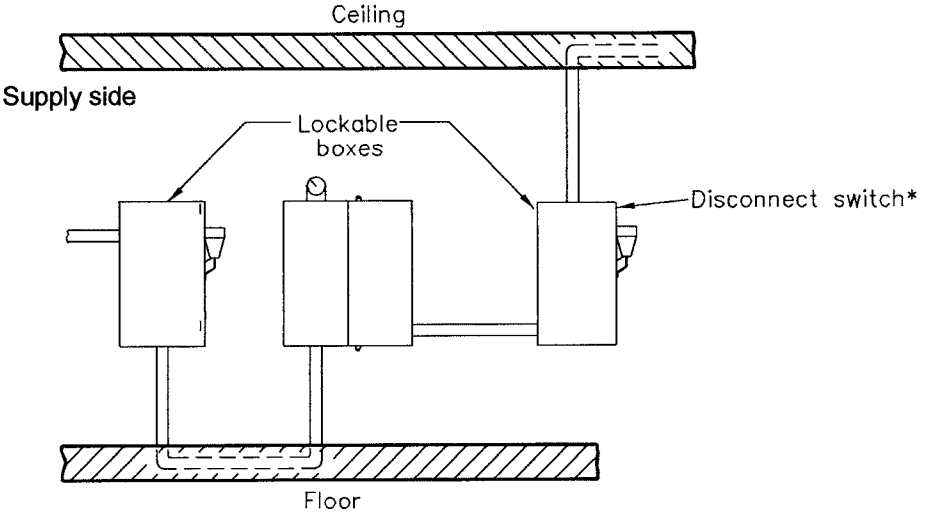


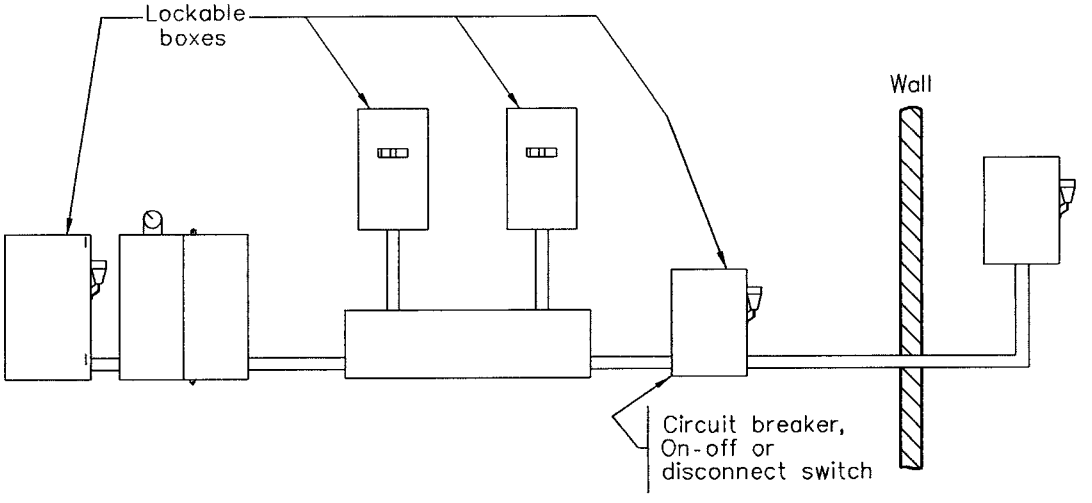
* The disconnect switch must provide for voltage testing if such testing cannot be done on the supply side of the transformer box.

** The circuit breaker panel may be equipped with a lockable door.

Ref.: Sections 7.3.4.1 and 7.3.4.2 a), b) and c)

Hydro Québec	VOLTAGE TESTING AND LOCKING ARRANGEMENTS ON SUPPLY AND LOAD SIDES OF THE TRANSFORMER BOX	
Technical validation INGÉNIEUR JEAN JOLY 30601 Date: 09/11/2006	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 7.04



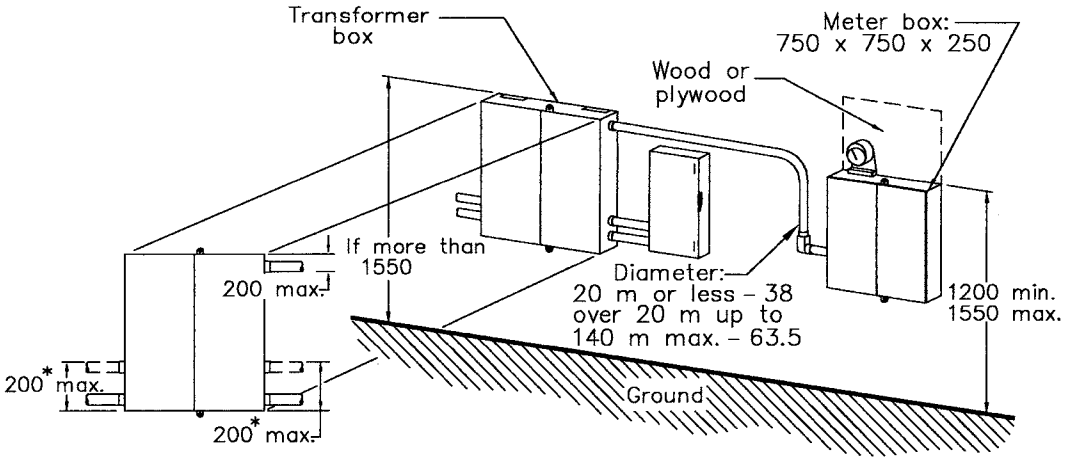


* The disconnect switch must provide for voltage testing.

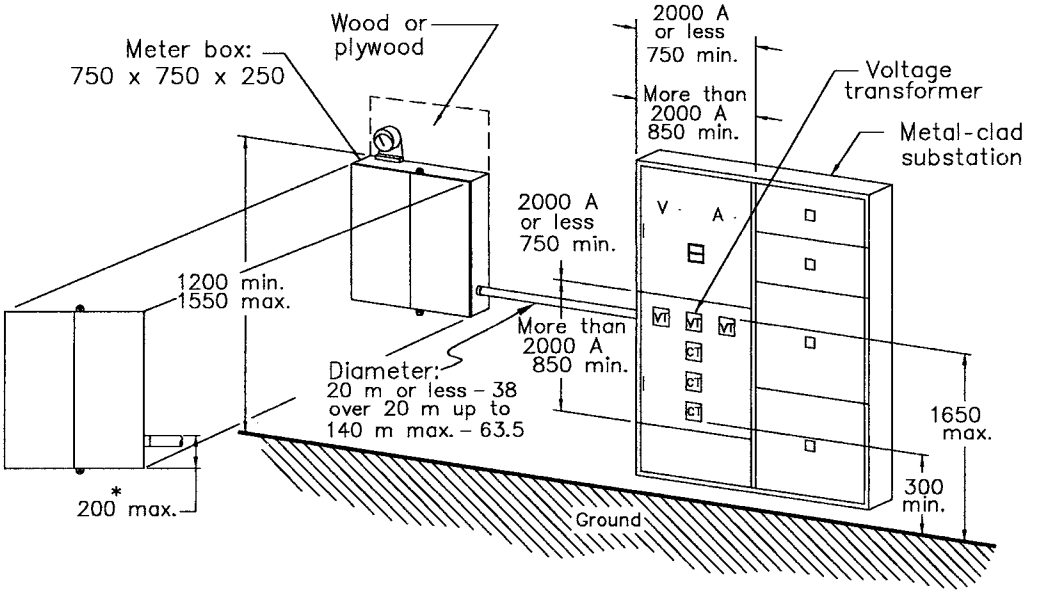
Ref.: Sections 7.3.4.1 and 7.3.4.2 a) and b)

Hydro Québec	VOLTAGE TESTING AND DISCONNECT ARRANGEMENTS ON LOAD SIDE OF THE TRANSFORMER BOX	
Technical validation INGÉNIEUR JEAN JOLY 30601 QUÉBEC Date: 09/11/2006	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 7.05

A: Metering with transformer box and meter box



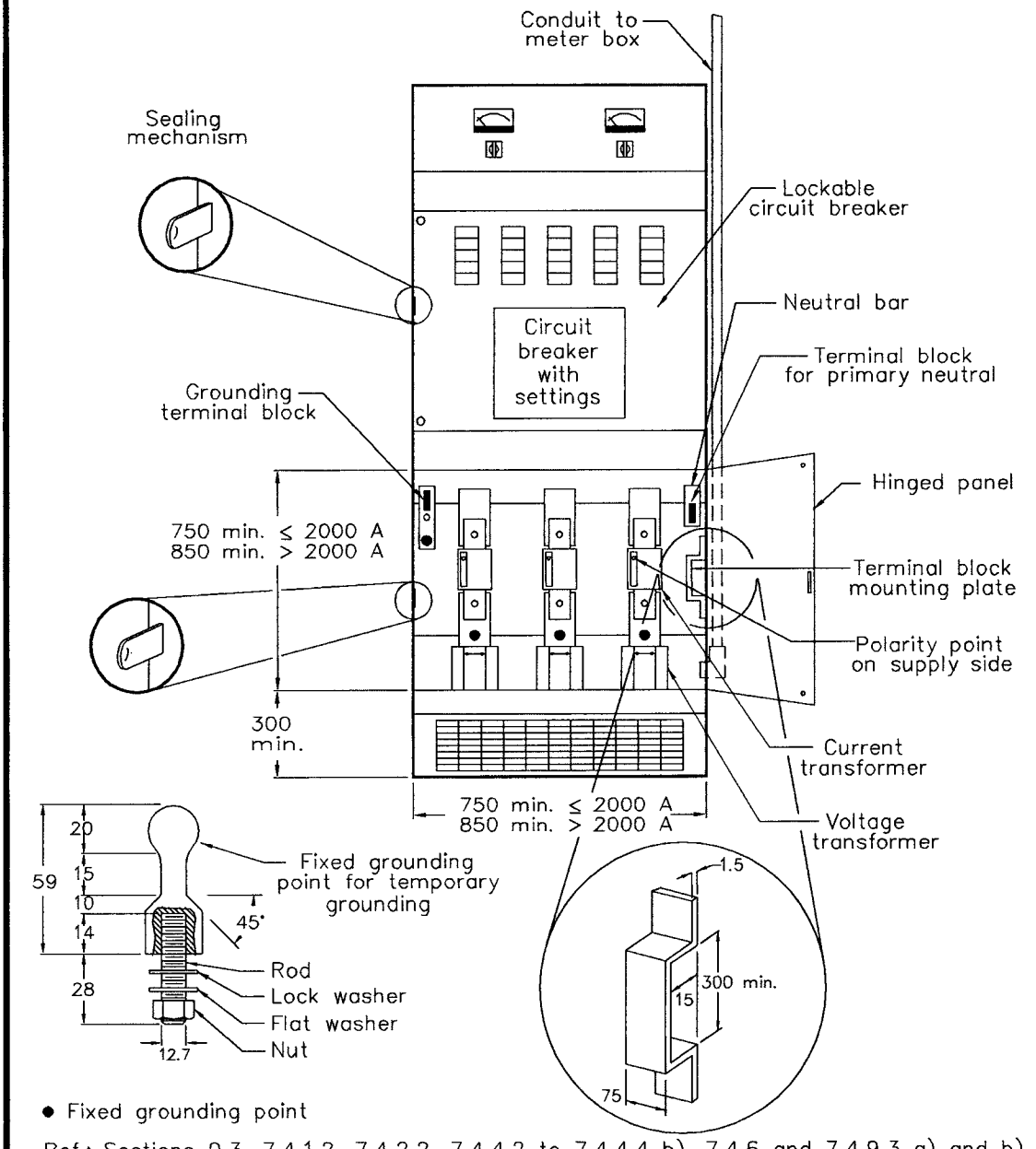
B: Metering with transformers in a metal-clad substation and meter box



* This distance is 300 mm for transformer boxes whose main switch is 600 A or higher.

Ref.: Sections 0.3, 7.3.2.8, 7.3.3.1, 7.3.3.2, 7.4.1.2, 7.4.3.1 and 7.4.4.4 b)

Hydro Québec	METERING EQUIPMENT	
Technical validation INGÉNIEUR JEAN JOLY 30601 QUÉBEC Date: 09/11/2006	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization / Operations	Standard: E.21-10 9th edition Figure: 7.06



● Fixed grounding point

Ref.: Sections 0.3, 7.4.1.2, 7.4.2.2, 7.4.4.2 to 7.4.4.4 b), 7.4.6 and 7.4.9.3 a) and b)

Hydro Québec

TRANSFORMER COMPARTMENT IN A METAL-CLAD SUBSTATION WITH SUPPLY FROM ABOVE

Technical validation

INGÉNIEUR
JEAN JOLY
30601
QUÉBEC

Date: 09/11/2006

Approved by

Hydro-Québec

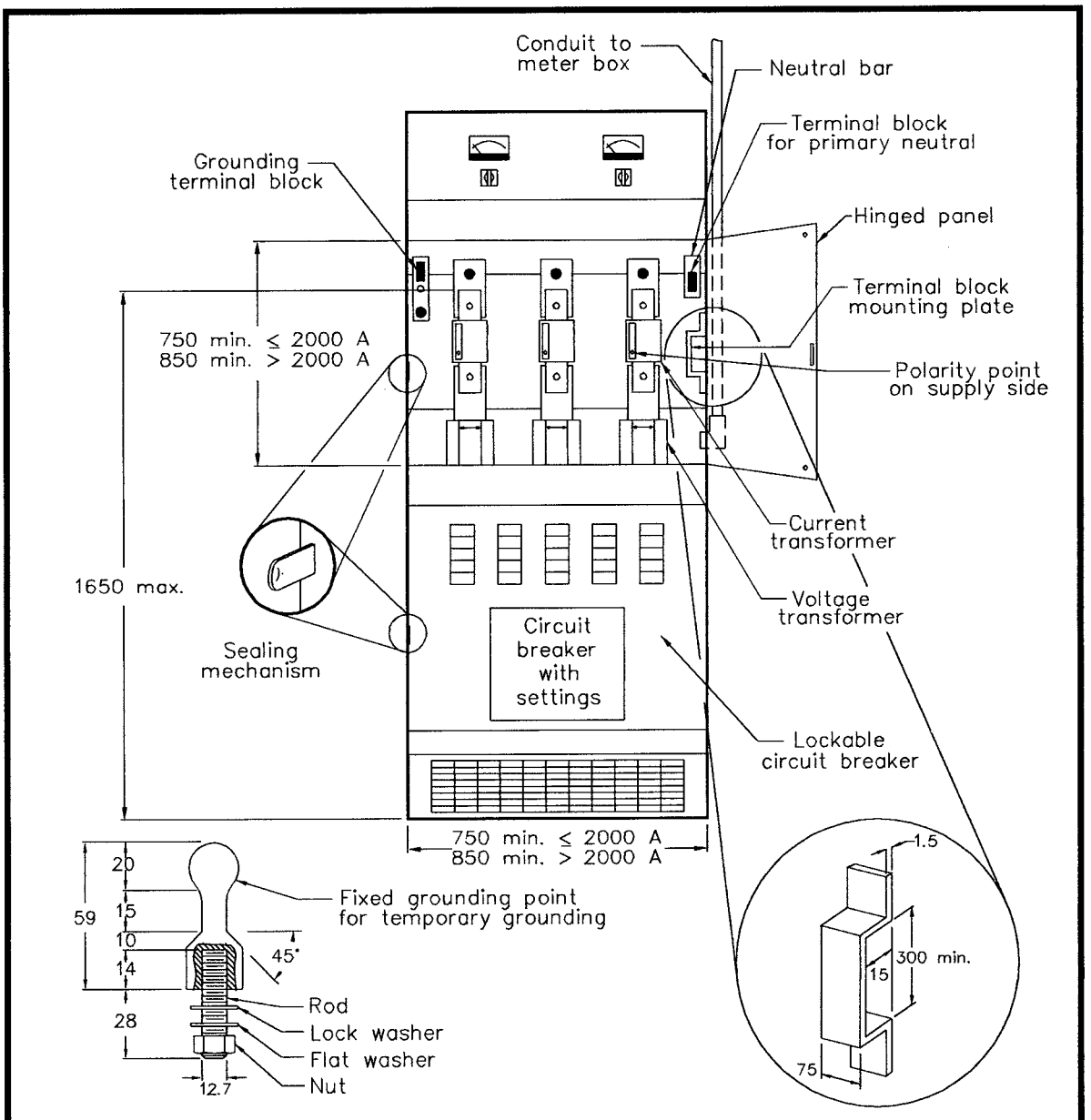
RÉGIE DU BÂTIMENT DU QUÉBEC

Standardization

Operations

Standard: E.21-10 9th edition

Figure: 7.07



- Fixed grounding point

Ref.: Sections 0.3, 7.4.1.2, 7.4.2.2, 7.4.4.2 to 7.4.4.4 b), 7.4.6 and 7.4.9.3 a) and b)

Hydro Québec

TRANSFORMER COMPARTMENT IN A METAL-CLAD SUBSTATION WITH SUPPLY FROM BELOW

Technical validation

INGÉNIEUR
JEAN JOLY
30601
QUÉBEC

Date: 09 11 2006

Approved by

Hydro-Québec

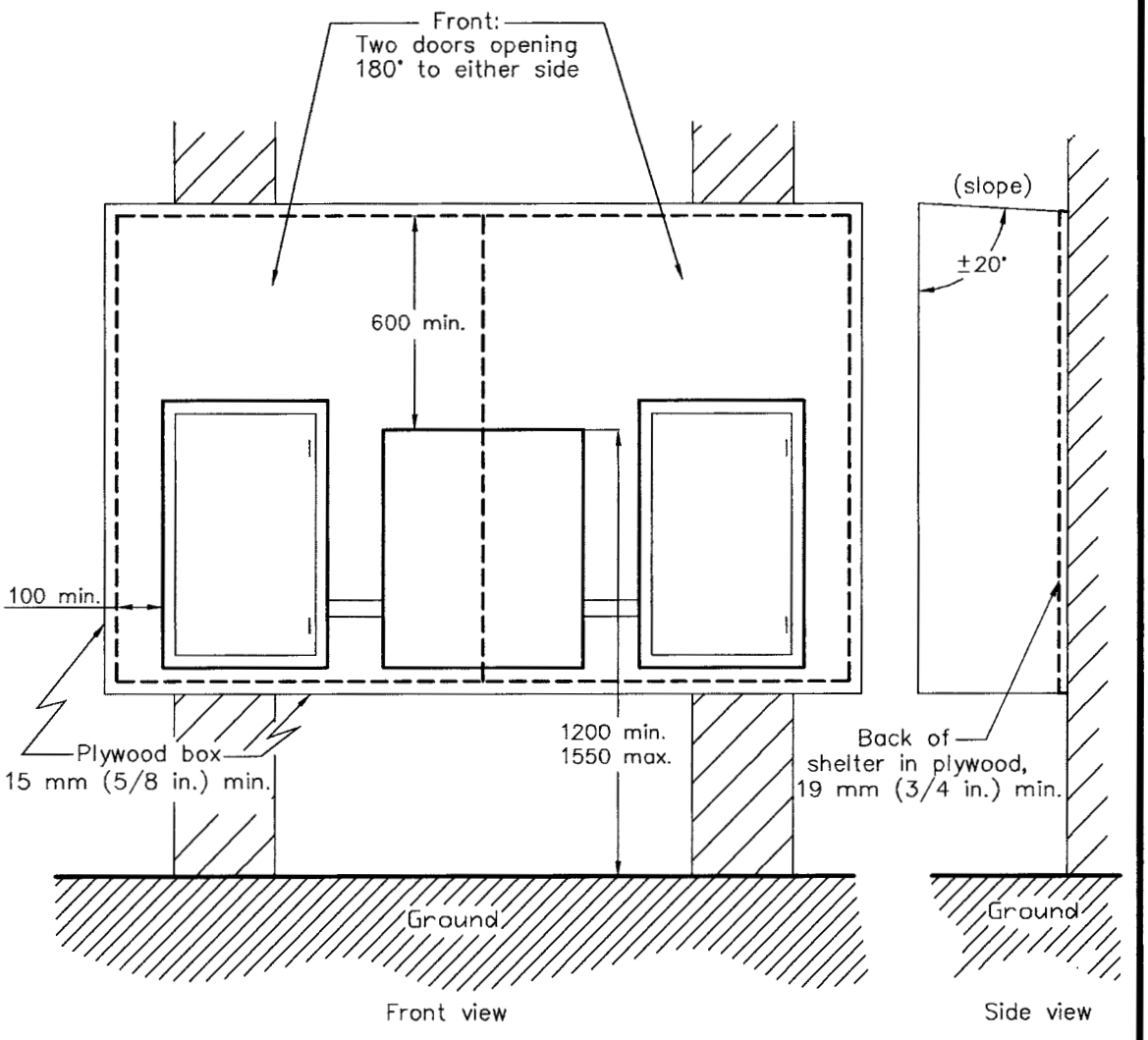
RÉGIE DU BÂTIMENT DU QUÉBEC

Standardization

Operations

Standard: E.21-10 9th edition

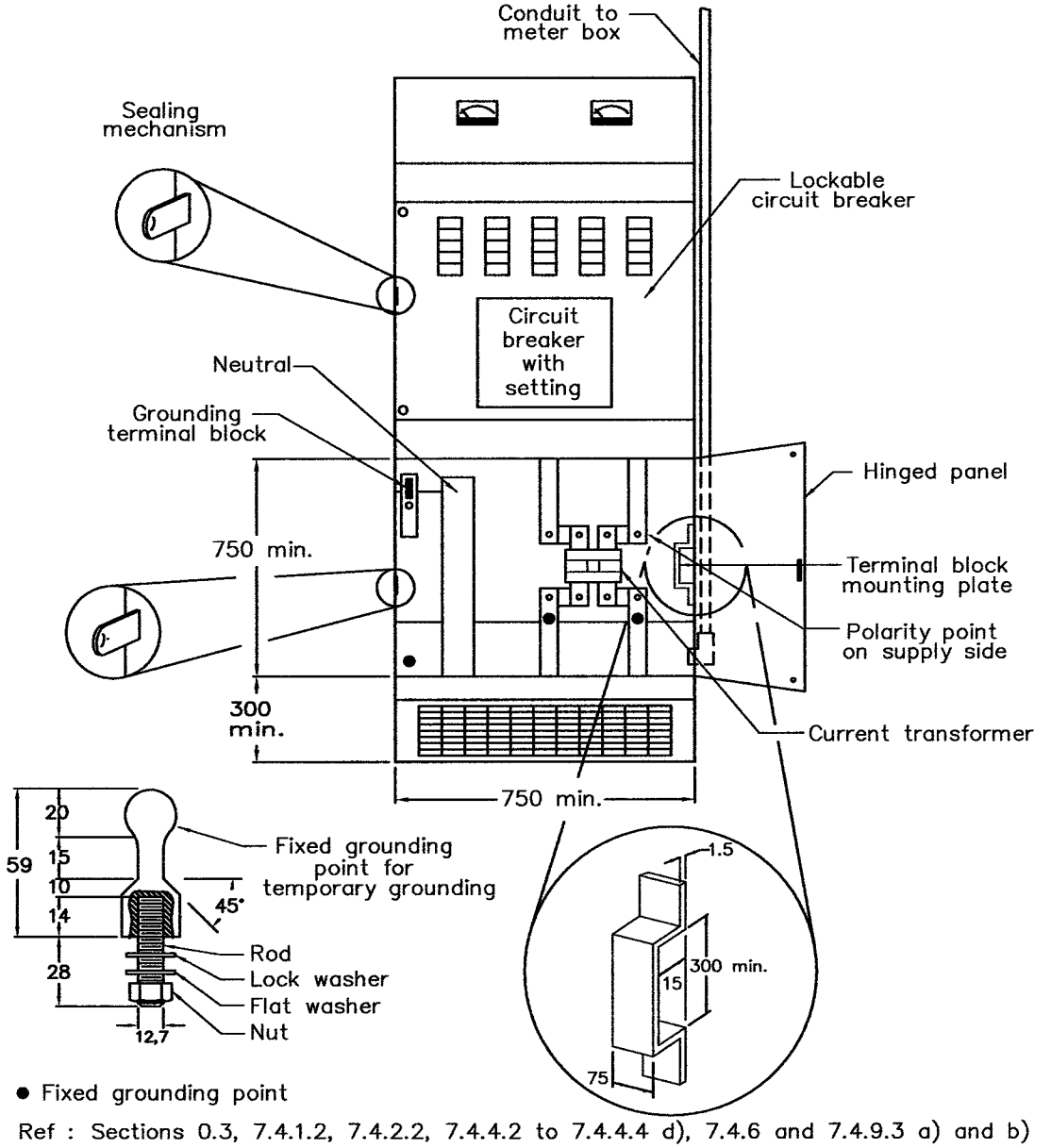
Figure: 7.08



Notes: Make sure the installation complies with requirements of the *Code*.
Label the shelter with the street address.
Weatherproof the shelter with vinyl or some other covering.

Ref.: Section 7.1.1

Hydro Québec	SHELTER FOR METERING EQUIPMENT	
Technical validation INGÉNIEUR JEAN JOLY 30601 Date: 09 / 11 / 2006	Approved by Hydro-Québec RÉGIE DU BÂTIMENT DU QUÉBEC Standardization Operations	Standard: E.21-10 9th edition Figure: 7.09



● Fixed grounding point

Ref : Sections 0.3, 7.4.1.2, 7.4.2.2, 7.4.4.2 to 7.4.4.4 d), 7.4.6 and 7.4.9.3 a) and b)

Hydro Québec

120/240-V INSTALLATION TRANSFORMER COMPARTMENT
IN A METAL CLAD SUBSTATION WITH SUPPLY FROM ABOVE

Technical validation

INGÉNIEUR DENIS DESLAURIERS 42176 QUÉBEC

Date 17/08/2009

Approved by

Hydro-Québec

RÉGIE DU BÂTIMENT DU QUÉBEC

Standardization

Operations

Standard : E.21-10 9th edition

Figure : 7.10

Tables

Table 1

Conversion table

Dimensions		
Millimetres	**Approximate equivalent in inches**	**Exact millimetre equivalent of inches given**
6	1/4	6.35
9	3/8	9.53
10	3/8	9.53
12.7	1/2	12.70
13	9/16	14.29
14	9/16	14.29
15	5/8	15.88
17	11/16	17.46
19	3/4	19.05
20	3/4	19.05
25	1	25.40
25.4	1	25.40
26	1	25.40
28	1 1/8	28.57
31.75	1 1/4	31.75
35	1 7/16	36.51
38	1 1/2	38.10
40	1 5/8	41.28
44	1 3/4	44.45
50	2	50.80
52	2 1/8	53.98
59	2 3/8	60.33
61	2 7/16	61.91
63.5	2 1/2	63.50
70	2 13/16	70.00
75	3	76.20
78	3 1/8	79.38
87	3 7/16	87.31
96	3 13/16	96.84
100	3 15/16 (4)	100.01 (101.60)
105	4 3/16	106.36
114	4 1/2	114.30
122	4 13/16	122.24
131	5 3/16	131.76
140	5 9/16	141.29

Note: This table only includes dimensions used in this Standard.

Table 1

Conversion table (cont.)

Dimensions		
Millimetres	**Approximate equivalent in inches**	**Exact millimetre equivalent of inches given**
149	5 7/8	149.23
150	5 15/16 (6)	150.81 (152.40)
157	6 3/16	157.16
166	6 9/16	166.69
175	6 15/16	176.21
180	7 1/8	180.97
184	7 1/4	184.15
190	7 1/2	190.50
192	7 9/16	192.09
200	7 7/8 (8)	200.02 (203.20)
201	7 15/16	201.61
210	8 5/16	211.14
219	8 5/8	219.08
227	8 15/16	227.01
236	9 5/16	236.54
245	9 11/16	246.06
250	9 7/8 (10)	250.82 (254.00)
254	10	254.00
262	10 3/8	263.53
300	11 13/16 (12)	300.04 (304.80)
400	15 3/4 (16)	400.05 (404.40)
450	17 3/4	450.85
500	19 11/16	500.06
600	23 5/8 (24)	600.07 (609.60)
625	24 5/8	625.48
685	27	685.80
700	27 9/16	700.08
750	29 9/16 (30)	750.88 (762.00)
760	29 15/16	760.04
800	31 1/2	800.10
850	33 1/2	850.50
900	35 7/16 (36)	900.11 (914.40)
915	36 1/16	915.99
975	38 7/16	976.31

Note: This table only includes dimensions used in this Standard.

Table 1

Conversion table (cont.)

Dimensions		
Millimetres	**Approximate equivalent in inches**	**Exact millimetre equivalent of inches given**
1,000	39 3/8	1,000.12
1,050	41 3/8	1,050.93
1,100	43 5/16	1,100.14
1,125	44 5/16	1,125.54
1,200	47 1/4 (48)	1,200.15 (1,219.20)
1,275	50 1/4	1,276.35
1,300	51 3/16	1,300.16
1,350	53 3/16	1,357.00
1,400	55 1/8	1,400.18
1,425	56 1/8	1,425.58
1,500	59 1/16 (60)	1,500.19 (1,524.00)
1,575	62 1/8	1,577.98
1,600	63	1,600.20
1,650	65	1,651.00
1,700	66 15/16	1,700.19
1,725	67 15/16	1,725.61
1,800	70 7/8 (72)	1,800.22 (1,828.80)
1,875	73 7/8	1,876.43
1,900	74 13/16	1,900.24
1,950	76 13/16	1,951.04
2,000	78 3/4	2,000.25
2,025	79 3/4	2,025.65
2,030	79 15/16 (80)	2,030.41 (2,032.00)
2,100	82 11/16	2,100.26
2,200	86 5/8	2,200.28
2,300	90 9/16	2,300.28
2,400	94 1/2	2,400.30
2,500	98 7/16	2,500.31
2,600	102 3/8	2,600.32
2,700	106 5/16	2,700.33
2,800	110 1/4	2,800.35
2,900	114 3/16	2,900.36
3,000	118 1/8 (120)	3,000.37 (3,048.00)

Note: This table only includes dimensions used in this Standard.

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	530	550	625	635

Type of line Nominal voltage (volts)	**At point of use** (at load point) (in volts)			
	Extreme operating conditions			
		Normal operating conditions		
Single-phase 120/240	104/208	108/216	125/250	127/254
Three-phase 4 conductors 120/208Y 347/600Y	108/187 300/520	110/190 312/540	125/216 360/625	127/220 367/635
Three-phase 3 conductors 600	520	540	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 2.6.2 and CAN3-C235-83 (C2000)

Table 3

Mechanical strength of supports and spool racks

Rated ampacity or total rated ampacity of service box(es)	Type of distribution 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)

Ref.: Sections 2.2.7, 2.2.12 a), 2.3.3 and 4.2 b), 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
Up to 30 m (98 ft.)	6.5 m (21.3 ft.)	5.6 m (18.4 ft.)	5.0 m (16.4 ft.)
Up to 25 m (82 ft.)	6.5 m (21.3 ft.)	5.6 m (18.4 ft.)	5.0 m (16.4 ft.)
Up to 20 m (66 ft.)	6.4 m (21 ft.)	5.4 m (17.7 ft.)	4.8 m (15.8 ft.)
Up to 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, at its expense, to allow the connection.

** This assumes that ground level is at the same elevation at both the line supply point and connection point. The spool rack must not be more than 8 m above ground level.

Heights must be increased by at least 0.61 m if telecommunications cabling is to be run beneath the distribution service loop.

Ref.: Sections 2.2.8.1, 2.2.8.3, 2.7.2.1, 2.7.2.5, 2.8, 4.2 e) and 4.2 f)

Table 5

Connections by the distributor over public thoroughfares

Rated ampacity or total rated ampacity of service box(es)	Distance Y	Distance X + Y	Additional pole needed to cross public thoroughfare***		
			Connection made entirely by the distributor	Connection made by customer on own property	
			Distributor (free of charge)	Distributor (free of charge)	Customer pole
Up to 200 A	≤ 30 m	≤ 30 m	0*	0*	0
		> 30 m	1	1	0
	> 30 m	> 30 m	1**	1	1 or more
Over 200 A	≤ 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 supplies a pole free of charge.

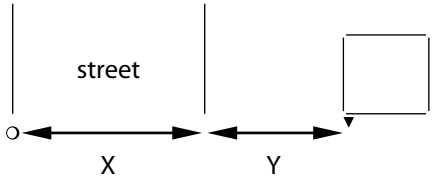
** A connection over 30 m long requires erecting one or more poles and possibly one or more guy wires, depending on the configuration. Charges established under the *Conditions of Electricity Service* in force are then payable. For some connection configurations, erecting an additional pole to cross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

*** The distributor also supplies 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

ʘ Power line pole

Table 6

Last span of overhead service entrance

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)*
Three-phase 347/600 V and 600 V	Quadruplex 2 NS75 (NS1) NS75 FT1 (NSF2)	 30 28
	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, 4.2 e) and Figure 2.17

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

Table 7

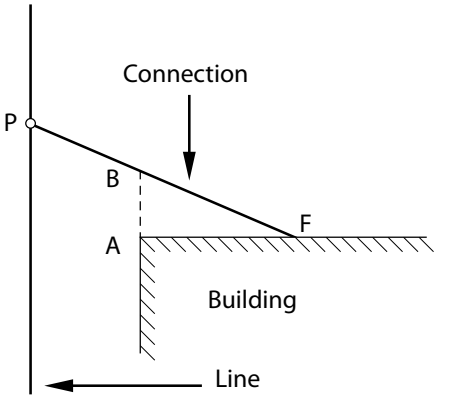
Clearance between overhead connection and building

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 or more	---		

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

Clearance (AB) = tan x adjacent wall (AF)

tan of 5° = 0.087
tan of 15° = 0.267



Ref.: Section 2.7.2.2 and Figure 2.18

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 2.21

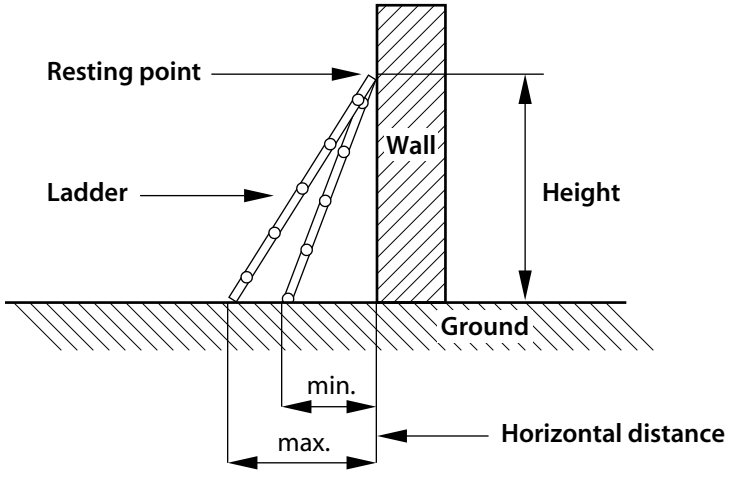


Table 9

Junction box and pullbox characteristics

Rated ampacity or total rated ampacity of service box(es)	Box dimensions (mm)			Number of sealing mechanisms	Gauge of metal enclosure*
	Height	Width	Depth		
≤ 200 A	500	500	250	1	16
> 200 to 400 A	750	750	250	1	16
> 400 to 600 A	900	900	300	2	14
> 600 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 installing a seal.

≤ Less than or equal to

> Greater than

Ref.: Sections 3.5.3.1 and 3.5.3.2

Table 10

Clearance between underground conductors and pools

Type of installation	Minimum horizontal clearance (m)	
	Conductors with bare neutral buried directly in soil	Conductors with a non-conductive outer jacket or in a non-conductive conduit
Telecommunications cabling	1.0	1.0
0 to 750 V	1.0	1.0
751 to 15,000 V	3.0	1.0
15,001 to 28,000 V	6.0	2.0

Ref.: Section 3.7.5 and CSA C22.3 No. 7

Note: Voltages are line-to-line

Table 11

Transformer boxes

A – Choice of transformer box type						
Rated ampacity of box	**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**	**120/240 V**	**120/208 V**	**347/600V**
≤ 100 A	Socket	Socket	Socket* or type A	–	–	–
> 100 to 200 A	Socket	Type A	Type A***	–	–	–
> 200 to 400 A	Type A	Type B	Type B	Type A	Type B	Type B
> 400 to 600 A	–	–	–	Type B	Type C	Type C
> 600 A	–	–	–	Type C	Type C	Type C

* Meter sockets are allowed only at 347/600 V (Section 5.5 and 5.6).

** Section 7.3.2.9 d)

*** Except for boxes dedicated to fire pumps for which a meter socket is allowed (Section 5.5)

≤ Less than or equal to

> Greater than

B – Characteristics of transformer box types					
Type of box	**Dimensions**	**Gauge of box metal**	**Gauge of plate metal**	**Number of bolts***	**Number of sealing mechanisms***
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 sealing mechanisms may be combined in the same device.

** Type-A boxes are also used as meter boxes.

Ref.: Sections 7.3.2.2 and 7.3.3.2

Table 12

Compression connectors

Combinations: aluminum-aluminum or aluminum-copper

Customer conductor	Distribution conductor							
Tap A	Main B				Insulating cover			
	4 Al or 4 ACSR or 2 Al or 2 ACSR							
	Manufacturer				Manufacturer	Compression tool		
	Blackburn	Homac	Ilsco	Kearney	Thomas & Betts	Manual	Hydraulic 12 t	
	Catalogue number				Catalogue No.	No. indents		Die
10, folded in two			HT-6	506-82	C5C	4	2	O
8, folded in two			HT-6	506-82	C5C	4	2	O
6			HT-6	506-82	C5C	4	2	O
4			HT-6	506-82	C5C	4	2	O
3		OB-101	HT-6	506-82	C5C	4	2	O
2	WR-189	OB-101	HT-8	508-82	C7C	5	2	O
1	WR-189	OB-101	HT-8	508-82	C7C	5	2	O
1/0	WR-189	DB-202	HT-8	508-82	C7C	5	2	O
2/0	WR-189	DB-202	HT-8	508-82	C7C	5	2	O
3/0	WR-289	DB-202	HT-2	502-82	C7C	5	2	D
4/0	WR-379		HT-3	503-82	C7C	5	2	D
250 kcmil	WR-379		HT-3	503-82	C7C	5	2	D

- Conductors must be brushed before connection.
- Copper conductor must be placed beneath aluminum conductor.
- Cables to replace: conductors thinner than 2 AWG
- Compliant cables: 1 No. 2 ACSR neutral messenger and 2 No. 2 Al conductors (200 A or less)

Ref.: Section 1.2.2.4

Table 13

Insulation-piercing connectors (saline environment)

Combinations: aluminum-aluminum or aluminum-copper

Customer conductor	Distribution conductor	
Tap A	Main B	
	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 thinner than 2 AWG
- Compliant cables: 1 No. 2 ACSR neutral messenger and 2 No. 2 Al conductors (200 A and less)
- Single-use connector

Ref.: Sections 1.2.2.4 and 2.3.5

Work at the Connection Point

Reconnection

1 Open customer's main switch.

2 Connect customer's neutral.
- 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 entrance conductor.
- Length must match connector size.

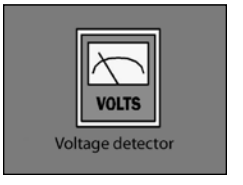
5 Strip one live service loop conductor.
- Length must match connector size.

6 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
- connector compression tool
- connector brush
- knife
- voltage detector
- fiberglass ladder
- tape

Protective equipment
(mandatory on job site)
- safety goggles
- safety hat
- shoes
- flame-resistant garments
- insulating gloves
- insulating blanket

Hydro Québec	Work at the Connection Point: Overhead Connection 120/240 V (200 A or less) – Reconnection
INGÉNIEUR Alain Charron 30547 Date: 2001/07/12	Approvals Corporation des maîtres électriciens du Québec Pierre Riberdy, ing.

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.

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.

5 Repeat steps 3 and 4 for other phase.

6 Remove protective equipment.

7 Disconnect customer's neutral.
- Cut conductor.

Requirements
- electrical contractor's licence
- journeyman construction electrician's certificate

Tools
- cable cutter
- fiberglass ladder
- tape

Protective equipment
(mandatory on job site)
- safety goggles
- safety hat
- shoes
- flame-resistant garments
- insulating gloves
- insulating blanket

Hydro Québec	**Work at the Connection Point: Overhead Connection 120/240 V (200 A or less) – Disconnection**
INGÉNIEUR Alain Charron 30547	Approvals
Date: 2001/07/12	Corporation des maîtres électriciens du Québec

Reconnection (saline environment)

1 Open customer's main switch.

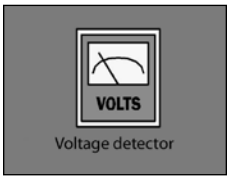
2 Connect customer's neutral.
- Install appropriate insulation-piercing connector (see Table 13).
- Tighten until rupture nut/bolt breaks.

3 Install protective equipment.
- Cover neutral with insulating blanket.

4 Connect one service entrance 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 switch.

Requirements
- electrical contractor's licence
- journeyman construction electrician's certificate

Tools
- 9/16" ratchet wrench
- fiberglass ladder
- voltage detector

Protective equipment
(mandatory on job site)
- safety goggles
- safety hat
- shoes
- flame-resistant garments
- insulating gloves
- insulating blanket

Hydro Québec	**Work at the Connection Point: Overhead Connection 120/240 V (200 A or less) – Saline Environment – Reconnection**
INGÉNIEUR Alain Charron 30547 Date: 2001/07/12	Approvals Corporation des maîtres électriciens du Québec Pierre Tibert, ing.

Disconnection (saline environment)

1 Open customer's main switch.

2 Install protective equipment.
- Cover neutral and one service entrance conductor with insulating blanket.
- Leave only conductor being worked on exposed.

3 Disconnect one service entrance phase.
- Unbolt insulation-piercing connector or cut conductor if necessary.

4 Insulate end of service entrance conductor.
- Insulate conductor on supply and load sides with insulating tape.

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.

Requirements
- electrical contractor's licence
- journeyman construction electrician's certificate

Tools
- 9/16" ratchet wrench
- cable cutter
- fiberglass ladder
- tape

Protective equipment
(mandatory on job site)
- safety goggles
- safety hat
- shoes
- flame-resistant garments
- insulating gloves
- insulating blanket

Hydro Québec	**Work at the Connection Point: Overhead Connection 120/240 V (200 A or less) – Saline Environment – Disconnection**
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Index

Index

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