Primary Revenue Metering Specification
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1.0 Introduction

Primary metering may be available for commercial or industrial customers whose supply voltage meets the requirements of HOL’s ECS0012 - Conditions of Service. This specification provides the minimum technical requirements for the design and installation of new Primary revenue metering installations as well as upgrades to existing installations.

Customers or their agents should contact HOL with any inquiries concerning primary services and shall be responsible to ensure they have the current revision of this specification prior to commencing work as amendments may be made from time to time. The latest Metering Specifications is available through the HOL website – refer to HOL’s Conditions of Service under ‘Contact Information’ for more information.

2.0 References

This document refers to the following HOL documents and specifications:

CSA C22.2 No. 211.2 – Rigid PVC (Unplasticized Conduit)
CSA C61869-1 – Instrument Transformers – Part 1: General Requirements
CSA C61869-2 – Instrument Transformers – Part 2: Additional Requirements for Current Transformers
CSA C61869-3 – Instrument Transformers – Part 3: Additional Requirements for Inductive Voltage Transformers
Hydro Ottawa – ECG0005 – Commercial Primary Service Ownership Demarcation, Customer Owned Equipment
Hydro Ottawa – ECG0008 – Distribution System Voltage and Power Quality
Hydro Ottawa – ECS0012 – Conditions of Service
Hydro Ottawa – ECS0013 – 13.2kV Customer-owned Switchgear General Guideline
Hydro Ottawa – EGS0001 – Grounding Stud, Construction Detail
Hydro Ottawa – GCS0002 – Primary Voltage Service General Guideline
Hydro Ottawa – GCS0008 – Revenue Metering Specification
Hydro Ottawa – GDS0003 – Overhead Design Guidelines
Hydro Ottawa – MCS0044 – Overhead Three Phase Primary Metering Installation 7.6/13.2 kV or 16.0/27.6 kV - Construction Detail
Hydro Ottawa – MCS0045 – 44kV Sub-transmission Typical Overhead Wholesale Metering Installation
Hydro Ottawa – MCS0066 – External Modem Enclosure Installation for Indoor Interval Meters - Construction Detail
Hydro Ottawa – MCS0105 – Agr/Com/ERF/Res Minimum Clearance In Front Of Revenue Metering Equipment
Hydro Ottawa – MCS0116 – Primary Metering Arrangement in Switchgear – Construction Detail
Hydro Ottawa – MCS0117 – Primary Metering Pole Mounted Cabinet Layout – Construction Detail
Hydro Ottawa – MTS0005 – Outdoor Overhead Primary Metering 8.32kV, 13.2kV and 27.6kV Potential Transformer
3.0 Scope

This document outlines HOL’s practices regarding primary revenue metering installations. It describes the prerequisites and technical requirements for new Primary revenue metering installations as well as existing Primary installations undergoing upgrade.

The type of Primary revenue metering equipment installed will be determined by the application, voltage, and ampacity of the Service to be metered. For details on Primary Service offerings and requirements please refer to HOL document GCS0002 – Primary Voltage Services and HOL’s Conditions of Service.

4.0 Definitions

‘Cold Metering’ – see definition of “Cold Metering” in HOL’s Conditions of Service.

‘Compartment’ means a subdivision of a switchgear/switchboard unit.

‘CT’ means Current Transformer. A CT is a type of Instrument Transformer and used as part of a metering circuit to detect the flow of current on a Service being metered.

‘Customer’ – see definition of “Customer” in HOL’s Conditions of Service.

‘Demarcation Point’ – see definitions of both “Operational Demarcation Point” and “Ownership Demarcation Point” in HOL’s Conditions of Service.

‘EMT’ means “electrical metallic tubing”.

‘ERF’ means Energy Resource Facility, a term that encompasses any type of generation present on HOL’s grid.

‘GFCI’ – see definition of “Ground Fault Circuit Interrupter” in the OESC.

‘HOL’ means “Hydro Ottawa Limited”.

Society of Automotive Engineers (SAE) – SAE J429 – Mechanical and Material requirements for Externally Threaded Fasteners
Underwriters Laboratories Canada (ULC) – CAN/ULC-S102 – Standard Method Building Materials and Assemblies
‘Instrument Transformer’ refers to a class of devices, often part of a metering circuit, which is used to detect voltage on a medium-voltage or a high-current Service.

‘Interval Meter’ – see definition of “Interval Meter” in HOL Conditions of Service.

‘Lamacoid’ means “a generic term commonly used for specifying 2-ply or 3-ply, laminated engraving stocks and/or the nameplates, tags, or legend plates produced from [plastic] stock.”

‘Line Side’ of a device refers to the point at which utility supplied energy enters the device. Also may be referred to as the “High Side”, “Grid Side”, or “Utility Side” of a device.

‘Liquatite’ refers to a brand name of fitting that can be used to terminate liquid tight, flexible conduit.

‘Load Side’ of a device refers to the point at which utility supplied energy exits the device. Also referred to as the “Customer Side”, “Downstream” side, or “Low Side” of a device.

‘Lock Box’ means a utility owned box for the housing of the Customer’s key which allow HOL entry into normally locked rooms containing HOL owned revenue meter and ancillary equipment. Refer to HOL’s Conditions of Service.

‘Low-Voltage’ – see definition of “Low-Voltage” in the OESC.

‘Maintenance’ means any activity intended to keep equipment in satisfactory working condition, including tests, measurements, replacements, adjustments, and repairs.

‘Meter Socket’ means the mounting device consisting of meter jaws, connectors, and enclosure for receiving a socket-type revenue meter.

‘Mimic Bus’ – A primary Single Line Diagram affixed on the outside face of a Switchboard showing the principle connections and electrical components contained inside.

‘NEMA’ means the “National Electrical Manufacturers Association”.

‘OHSA’ means the Ontario Occupational Health and Safety Act and regulations.

‘Permanent’ means a period of time greater than one (1) calendar year.

‘PMU’ means Primary Metering Unit. Typically refers to a group of six Instrument Transformers (three PTs and three CTs), mounted in a single location, used to provide revenue metering for a 3 Phase Primary Metered Service. Note that 2-element revenue metering is used for delta-connected Services.

‘Primary Metered Service’ means a Service entrance equipped with PMU equipment, whose supply voltage is greater than 750V.

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1 – Adapted from http://www.cuttingedgeinc.com/ref/glm2.htm as of 2015/03/30.
‘Primary Service’ means any electrical service supplied with a nominal voltage greater than 750 volts but less than 50,000 volts.

‘Primary Voltage’ means any voltage between 750 volts and 50,000 volts.

‘PT’ means “Potential Transformer”. A PT is a type of Instrument Transformer and used as part of a metering circuit to detect voltage on a Service being metered.

‘Raceway’ – see definition of “Raceway” in the OESC. The use of raceway includes rigid, flexible, metallic or non-metallic conduit.

‘Schedule 80’ means Schedule 80 PVC conduit, as per document D1785 and CSA document B139.3. A conduit’s schedule refers to the thickness of its walls and is a function of the conduit’s nominal diameter.

‘Sea Can’ (Intermodal Container) means a Customer supplied weatherproof reusable metal box, made of corrugated steel, intended to be used in transporting goods on a ship, rail, or truck. Structures of this type generally do not have either a NEMA or CSA rating.

‘Seal’ means a locking device to secure a meter or other Service equipment against tampering by non-HOL personnel.

‘Standard HOL Padlock’ is a padlock that uses a 9.5 mm [3/8"] shackle; its manufacturer, model, and style is determined by HOL.

‘Supply Point’ – see definition of “Supply Point” in HOL’s Conditions of Service.

‘Test Switch’ means a device used to isolate voltage and current connections between a meter and external Instrument Transformers.

‘Upgrade’ – see definition of “Upgrade” in HOL’s Conditions of Service.

5.0 Primary Metering Fundamental Requirements

5.0.1 The requirements described in this section apply to the entire document. Metering requirements specific to a type of Service may be found in the respective section of the document.

5.0.2 All installations referenced in this document shall comply with the requirements of the latest edition of HOL’s Conditions of Service, the current editions of the Ontario Electrical Safety Code and Canadian Electrical Code, Measurement Canada specifications, and all other applicable federal, provincial, and municipal laws, by-laws, specifications, and codes.

5.0.3 It is the Customer’s responsibility to ensure that all Customer supplied and installed equipment meet the requirements of this document and comply with all applicable laws and codes.
5.0.4 All equipment installed to satisfy the requirements of this document shall be approved by at least one of: ESA, CSA, or ULC and shall carry the markings of the approving organization.

5.0.5 Unless noted otherwise, all mechanical fasteners including bolts, nuts, washers, spacers, etc., used to fulfill the requirements of this document shall meet, or exceed, SAE Grade 5 specifications as per SAE J429-1999.

5.0.6 All Customer constructed structures (used in conjunction with HOL revenue metering or ancillary equipment) that do not adhere to accepted construction or industry standards, statutes, or codes shall be reviewed and approved by a Professional Engineer, prior to energization, at the Customer’s cost. The intent is to verify the structure has adequate strength and to ensure the structure can endure typical conditions for the duration of its useful life.

5.0.7 HOL requires safe and unobstructed access to the revenue metering and ancillary equipment at all times as per HOL’s Conditions of Service. No HOL revenue metering equipment shall be installed in a location that would present a hazard to HOL personnel or the public either while the equipment is in service or undergoing maintenance.

5.0.8 The Customer shall supply and install protective arrangements, to HOL’s satisfaction, to protect workers and metering equipment, from moving machinery, dust, fumes, moisture, excessive noise, or vibration inside the electrical room.

5.0.9 All Customer electrical installations shall meet HOL’s requirements and be approved by ESA prior to energization. The ESA Connection Authorization Certificate shall be provided to HOL and include the Service address (as it appears in HOL’s records), voltage, ampacity of the Service, and any de-rated protective equipment.

5.0.10 Any work performed on a Service requiring an ESA permit, or where a Service has been disconnected for over six (6) months, shall require a review by HOL to ensure that the revenue metering equipment is compliant to current HOL standards.

5.0.10.1 The Customer shall be exempt from meeting current HOL standards if the work performed meets the following requirements:

5.0.10.1.1. Work performed does not alter or affect the metering circuit.

5.0.10.1.2. Work performed does not alter the nominal ampacity of the Service entrance.

5.0.10.1.3. Work performed is limited to maintenance activities including torqueing and cleaning of equipment.

5.0.10.1.4. Work performed does not significantly alter equipment used as part of the Customer’s Service entrance; this shall not include like-for-like replacement of damaged equipment.
5.0.10.1.5. The existing revenue metering equipment is deemed acceptable by Measurement Canada.

5.0.10.2 This includes, but is not limited to, the replacement of non-standard and/or obsolete Services and equipment as per Appendix G of HOL’s Conditions of Service.

5.0.11 Revenue primary metering shall use Cold Metering. The metering equipment shall be installed immediately next to, and within easy and obvious sight of, the Service entrance disconnect it takes supply from.

5.0.12 Visible disconnecting devices that can be locked-out shall be installed both before and after the metering cell for the purposes of isolating the revenue metering circuitry. Both disconnects shall meet the following requirements:

5.0.12.1 Shall have factory installed provisions enabling it to be locked in the “open” position and shall have a visible and obvious means of verifying its state.

5.0.12.2 The owner of the disconnect(s) shall permit HOL personnel to operate or provide staff to operate upon request, these primary disconnect switches to permit HOL personnel to perform work on the metering equipment as necessary.

5.0.13 The location of the revenue metering equipment shall be determined in consultation with, and is subject to approval by HOL. Refer to HOL’s Conditions of Service for more information.

5.0.13.1 There shall be a minimum of 1500 mm [5’] of horizontal and vertical clearance in front of all Service entrance apparatus, disconnection switches, and revenue metering equipment. The area shall be kept free of any obstructions, permitting easy and obvious access to the equipment. Refer to HOL specification MCS0105 for more information.

5.0.13.2 The finished grade, or floor, immediately in front of all Service entrance apparatus, disconnection switches, and revenue metering equipment shall be level for the entire width of the equipment and the entire extent of the clearance specified in this document. The intent is to create a safe surface from which to perform work and operate electrical equipment.

5.0.14 No Customer owned equipment shall be connected to any internal part of HOL owned revenue metering circuitry.

5.0.15 No Customer owned equipment shall be installed on the Line side of HOL revenue metering equipment other than a disconnection device as specified by this document.

5.0.16 The Customer shall not install or operate equipment that interferes with the safety, operation, or accuracy of HOL owned revenue metering and ancillary equipment.
5.0.17 Only an HOL employee or contractor may conduct work on HOL revenue metering equipment. No Customer shall remove, connect, alter, repair, or tamper with HOL’s revenue metering equipment or seals.

5.0.17.1 Customers conducting Maintenance on their electrical systems and require HOL seals to be cut shall contact HOL Metering Services to make arrangements for the existing seals to be removed and install new seals as required.

5.0.17.2 In the event of an accidentally damaged seal, the Customer shall notify HOL Metering Services by the next business day with the Customer’s name, Service address, and the date the Seal was noticed to be missing or damaged. HOL shall dispatch a Meter Technician to inspect the Service and, if found satisfactory, install new seals as needed.

5.0.18 All electrical outlets installed in an outdoor location or that may be exposed to outdoor elements shall have factory installed GFCI capability as per the OESC.

5.1 Service Entrance Eligibility

5.1.1 Primary Metering is subject to availability for commercial or industrial customers with typical supply voltages being 13.2 kV or 27.6 kV. Other Primary voltages may be available subject to approval by both HOL’s Distribution Design and Metering departments.

5.1.2 Primary Metered Services may be provided for conditions that differ from the above criteria at HOL’s determination. Examples may include Services with large or unique loading requirements or in difficult to access locations.

5.1.3 Prior to commencing work or buying equipment, the Customer shall contact HOL’s Distribution Design Department to determine if they are eligible for a Primary Metered service.

5.2 Submission Requirements and Lead-Times

5.2.1 Any new primary metering installation or modification to an existing installation requires consultation with HOL a minimum of 8 months prior to the expected energization date. The customer/consultant shall provide the following information prior to any equipment being ordered:

5.2.1.1 Preliminary single-line diagram indicating the proposed location for the metering equipment

5.2.1.2 Completed Load Summary Form, as per Appendix A of HOL’s Conditions of Service.
5.2.1.3 Construction schedule and timelines, including the switchgear manufacturing and delivery schedule, if applicable.

5.2.2 Primary metering Instrument Transformers are not stocked by HOL for new construction projects and typically require a 4 to 6 month lead-time for procurement.

5.2.3 Two copies of the detailed manufacturer's shop drawings for applicable switchgear shall be submitted to HOL for review prior to manufacture. The drawings shall provide the plan, elevation and cross sectional views of the switchgear including electrical dimensions and working clearances. All components must be clearly identified and properly cross-referenced to a bill of materials. HOL Distribution Design and Metering Departments will review drawings and provide comments as required.

5.2.4 In situations where HOL will ship the Instrument Transformers for factory installation into switchgear, a Pre-paid Bill of Lading shall be provided by the Customer which includes the address and project reference number of the switchgear manufacturer.

5.2.5 HOL reserves the right to inspect completed equipment at the manufacturing plant prior to shipment.

5.3 **Electrical Room Requirements**

5.3.1 Prior to construction, renovation or modification of their electrical room, the Customer shall submit to HOL a detailed proposed layout for their electrical room including dimensioning and clearance allowances.

5.3.2 The electrical room itself:

5.3.2.1 Shall be located indoors, inside a Permanent structure that meets the requirements of the Ontario Building Code and HOL specification GCS0002.

5.3.2.2 Shall not be a Confined Space as defined by OHSA.

5.3.2.3 Shall be kept locked at all times, preventing access by unauthorized personnel.

5.3.2.4 Shall be maintained by the Customer and reserved for the sole purpose of the electrical equipment that it contains. The electrical room shall provide a clear, unobstructed, and safe working space.

5.3.2.5 Shall be equipped with adequate lighting that provides illumination at the working level, in accordance with Illuminating Engineering Society standards. The lighting shall have mechanical protection and be
controlled via a wall switch located adjacent to the electrical room’s outer door.

5.3.2.6 The electrical room shall be heated to keep excess humidity and moisture from damaging the metering equipment. The ambient temperature shall be maintained such that:

5.3.3.7.1 The ambient temperature shall not drop below 10 °C.

5.3.3.7.2 The ambient temperature shall not rise above 30 °C.

5.3.2.7 If not located on the ground floor, the Customer shall provide a stairway to the electrical room’s entrance. The Permanent stairways shall meet the Ontario Building Code requirements. The use of a ladder shall not be acceptable.

5.3.2.8 The electrical room shall be subject to all of the following:

5.3.2.8.1 It shall provide a clear, safe and adequate working space, as determined by HOL.

5.3.2.8.2 Shall be an enclosed space that restricts access to its contents; at a minimum, shall consist of four permanent walls (that meet Ontario Building Code requirements) that continue uninterrupted from the permanent floor to the permanent ceiling, and at least one (1) permanent entrance door used to restrict access.

5.3.2.8.3 Shall have a minimum ceiling height of not less than 2130 mm [7'] above the finished grade or floor.

5.3.2.8.4 It shall be large enough to accommodate the full height and width of the metering installation including a minimum of 1500 mm [5'] of horizontal clearance in front of all revenue metering equipment.

5.3.2.9 Outside doors providing access to electrical rooms must have at least 150 mm [6"] clearance between final grade and the bottom of the door.

5.3.2.10 The electrical room shall be equipped with 120VAC, 15A, grounded convenience outlet located within 1000 mm [3' 4"] of the metering equipment itself.

5.4 Permanent Labels and Tags

5.4.1 Unless noted otherwise, all Customer and HOL provided nomenclature shall meet the following:
5.4.1.1 All nomenclature fonts shall be at least 19 mm [3/4"] in height.

5.4.1.2 The nomenclature shall be resistant to moisture, mechanical wear (i.e. cannot be accidentally removed or rubbed off), and resistant to fading due to age and UV light.

5.4.1.3 The Customer shall provide Permanent, visible, and legible labelling to identify the civic address on the Meter Socket base(s).

5.4.1.4 If the revenue metering equipment is installed within a cell, as part of switchgear, the Customer shall provide Permanent, visible, and legible labelling to identify the cells used for revenue metering.

5.4.1.5 If revenue metering equipment is installed within an external enclosure, the Customer shall provide Permanent, visible, and legible labelling, in the form of a Lamacoid mounted on the outside of the enclosure’s door, to identify the external enclosures as used for revenue metering.

5.4.1.6 The accuracy of the nomenclature shall be verified by the Customer’s electrical contractor prior to the request for energization.

5.4.1.7 HOL shall affix labels to the metering socket and the Instrument Transformer compartment denoting the following:

- Nominal Service Voltage
- Nominal Service Ampacity
- HOL PT Numbers
- PT Serial Numbers
- PT Ratio in Use
- HOL CT Numbers
- CT Serial Numbers
- CT Ratio in Use
- Billing Multiplier
- Government Registration Number

5.4.2 Mimic Bus shall be affixed to the outside of the Customer owned switchgear compartment’s front access door and subject to the following:

5.4.2.1 It shall indicate the internal electrical connections and arrangement of the equipment in each compartment.

5.4.2.2 Shall be mechanically fastened to the front of the panel and be resistant to fading.

5.4.2.3 If the switchgear has rear access doors then an identical copy of the Mimic Bus shall be affixed to the side with the rear access door.
5.5 **Metering Enclosures and Cabinet Requirements**

5.5.1 A heater shall be provided for any primary metering equipment located outdoors. The heater shall be capable of maintaining a minimum ambient temperature of 10 °C.

5.5.2 All metering enclosures and cabinets:

5.5.2.1 Shall be mounted on a Permanent vertical surface (i.e. a Permanent wall) such that the enclosure is level and plumb.

5.5.2.2 Shall be mounted in a location where there is a minimum of 1500 mm [5'] of horizontal and vertical working space and which provides for secure footing.

5.5.2.3 The top of the enclosure shall not be higher than 1800 mm [6'] above finished grade.

5.5.2.4 Shall not be mounted in a location that creates an unsafe environment for HOL employees.

5.5.2.5 Shall be painted with grey baked enamel.

5.5.2.6 Shall come with factory-installed hardware allowing the cabinet to be locked with a single Standard HOL Padlock.

5.5.2.7 Shall be bonded to ground by a Customer supplied ground conductor connected to the service’s main grounding point as per OESC requirements.

5.5.2.8 All enclosures mounted in an outdoor location or in a location that will be subjected to the outdoor elements shall meet, or exceed, the requirements of NEMA Type 4 or NEMA Type 4X specifications.

5.5.2.9 All enclosures mounted in an indoor location, or within an outdoor rated enclosure, shall be subject to all of the following:

5.5.2.9.1 All Meter Socket bases shall meet or exceed the requirements of either NEMA Type 3 or NEMA Type 3R specifications.

5.5.2.9.2 All other enclosures, not with the vicinity of a fire suppression system, shall meet or exceed the requirements of NEMA Type 1 specifications unless noted otherwise.

5.5.2.9.3 In the event that a enclosure is within the vicinity of a fire suppression system, that enclosure shall meet or exceed the requirements of NEMA Type 3 or NEMA Type 3R specifications.
5.5.2.10 All hinged doors shall be factory installed with welded hinges and be capable of opening outward at least 90 degrees with respect to the enclosure.

5.5.2.11 The back mounting plate of the enclosure and all hinged doors shall be electrically bonded to the enclosure with either a minimum #10 AWG stranded copper conductor that is either bare or has a green insulated jacket, using factory installed posts or studs. This shall be done in such a way that it does not interfere with the operation of the hinged door.

5.5.2.12 The enclosure shall be installed in the orientation it was designed for. All hinged doors shall swing from left-to-right or right-to-left.

5.5.3 If an enclosure has been damaged or modified the enclosure shall be considered de-rated from its original NEMA specification.

5.6 Meter Base Mounting Considerations

5.6.1 For indoor meter installations the Customer shall supply and install a plywood mounting surface with a minimum size of (H x W x D) 1200 mm x 1200 mm x 18.5 mm [48” x 48” x 5/8”] as per HOL specification MCS0066. The plywood surface is for the exclusive use of HOL Metering equipment.

5.6.2 The plywood shall be treated for fire resistance and carry a stamp indicating this treatment. Alternatively, the plywood shall be covered on all sides with a fire retardant paint prior to its installation. The fire retardant coating shall provide a maximum flame spread rating of 25 (Class A) in accordance with ULC document CAN/ULC-S102.

5.6.3 All approved Meter Socket bases, and the enclosure it may be installed within, shall meet all of the following:

5.6.3.1 Meter Socket base shall be mounted a minimum height of 1500 mm [60”] to a maximum height of 1700 mm [67”] from the centerline of the Meter Socket base above the finished floor level or finished grade.

5.6.3.2 Shall be mounted plumb and level.

5.6.3.3 Shall not be recessed into the wall it is mounted on.

5.7 Metering Raceway Requirements

5.7.1 Revenue metering conductors shall be housed in a dedicated raceway. Instrument Transformer secondary wiring shall not be combined with other conductors.
5.7.2 Raceways housing revenue metering conductors shall be visually traceable.

5.7.3 All metal raceway shall be bonded to ground as per ESA and OESC requirements.

5.7.4 All raceway that enter, or exit, a NEMA, CSA, or ULC rated enclosure shall do so in a manner that does not de-rate the enclosures’ rating.

5.7.5 All revenue metering conduits shall incorporate no more than three (3) 90-degree bends or 90-degree fittings per run.

5.7.6 Unless noted otherwise, raceway used to house revenue metering conductors shall be sized as follows:

5.7.6.1 35 mm [1-1/4"] conduit shall be used to house conductors connecting the meter socket base to the metering cell.

5.7.6.2 21 mm [3/4"] conduit shall be used to house conductors, within the metering cell.

5.7.7 All metering raceway shall not be longer than 30m [100'] in total length.

5.7.8 All outdoor revenue metering raceway shall be PVC or liquid-tight, CSA approved, and continuous in length (i.e. it shall not use any splice fittings along its run).

5.7.9 When PVC or liquid-tight revenue raceway enters a Permanent structure, it shall transition from PVC to EMT at a point closest to the indoor side of the exterior wall as practicable.

5.7.10 For revenue meters mounted indoors, only EMT conduit shall be used to house conductors entering or exiting an enclosure used to house metering equipment.

5.7.11 All liquid-tight flexible conduits shall have a UV rated sheath and steel core.

5.7.12 All EMT and PVC conduit shall terminate at an enclosure with NEMA rated fittings and bushings.

5.7.13 All liquid-tight flexible conduits shall terminate at an enclosure with liquid-tight fittings.

5.7.14 All newly installed empty metering conduits shall have an industrial-grade polypropylene rope, 6 mm [1/4"] in diameter or more, fished through it in conduit runs longer than 6000 mm [236”].

5.7.15 All conduit entering, or exiting, a meter socket base shall do so using the factory knock-outs located on the bottom-half of the meter socket base.
5.8 **Instrument Transformer Secondary Wiring**

5.8.1 The metering installation shall be connected in accordance with the appropriate diagram established in the Measurement Canada Standard Drawings for Metering Installations. Refer to Figures A-1 and A-2 for details.

5.8.2 The Instrument Transformer secondary wiring shall be a minimum #10 AWG stranded copper conductor and shall comply with Measurement Canada’s meter wiring colour standards. Table S1-5 outlines the standard secondary wiring colours. The colour coding of wires shall be continuous from end to end of the conductor.

5.8.3 Each Current Transformer secondary returns shall be separate from each other. Parallel connected CTs are not permitted.

5.8.4 Voltage Transformer secondary neutral references may be shared via one wire connected from the meter terminals to the test-block/switch provided that the wire is of sufficient gauge so as not to impart a burden which exceeds the burden rating of the transformers.

5.8.5 Instrument transformer secondary wires shall be grounded. Secondary wires that are interconnected shall be interconnected and grounded at only one point. HOL will ground the secondary wires at the test block within the Meter Socket base.

5.8.6 Instrument Transformer secondary wiring shall be continuous and shall not exceed 30m [100’) in length for a single run.

6.0 **Instrument Transformers**

6.0.1 For switchgear mounted primary metering equipment, HOL shall supply and ship the Instrument Transformers, at the customers expense, to the manufacturer for installation in the switchgear. The manufacturer shall not disassemble, tamper with, modify and/or substitute any HOL supplied equipment.

6.0.2 The Instrument Transformers shall be sized in accordance with the Load Summary form provided by the Customer.

6.0.3 For pole-mounted primary metering equipment, HOL shall supply and install the metering Instrument Transformers, secondary wiring and associated hardware.

6.0.4 Where there is potential for lightning, the Instrument Transformers shall be within a lightning arrester’s zone of protection.

6.0.5 Unless specified otherwise, all Instrument Transformers used as part of the revenue metering installation shall be of the ‘bar’ type.

6.0.6 Revenue metering ITs shall be bonded to ground with a minimum 2/0 AWG copper conductor.
6.0.7 The primary sustained current during normal operation shall not be less than 10% of the primary tap for 0.3 accuracy class CTs and 5% for the 0.15 accuracy class CTs. If the installation does not realize these minimum loads within 1 year of energization the current transformers shall be replaced with more appropriate CTs at the customers cost.

6.1 Instrument Transformer Installation Requirements

6.1.1 The Instrument Transformer compartment is for the exclusive use of HOL revenue metering and ancillary equipment. It shall not be used for any other purposes.

6.1.2 The Instrument Transformer compartment shall not be used as a pass through for non-metering conductors.

6.1.3 A minimum clearance of 1500 mm [5'] shall be provided in front of all Instrument Transformer compartments as per HOL specification MCS0105.

6.1.4 The Instrument Transformers shall be installed so that the primary and secondary terminals are readily accessible and the nameplates visible. The installation shall allow for easy replacement of a defective Instrument Transformer.

6.1.5 The Customer is responsible for the Instrument Transformer Primary connections within switchgear applications. The connections shall be properly secured and conductors shall be shaped, formed and supported so that no tension is applied to the Instrument Transformers.

6.1.6 Proper polarity association of the Instrument Transformers is important for the correct operation of the revenue metering equipment, with the polarity marks (i.e. H1 terminal) pointing towards the utility supply.

6.2 Potential Transformer (PT) Requirements

6.2.1 Revenue metering PTs shall meet the requirements of Measurement Canada for use in a revenue metering circuit. Proof of compliance shall be provided in the form of a Measurement Canada Notice of Approval and factory test cards, complete with serial numbers, identifying the ratio correction and phase angle correction factors.

6.2.2 Revenue metering PTs shall comply with the 0.3% accuracy class with a rated burden adequate for the connected load. Typically, primary PTs are rated for 0.3WXY or 0.3WXYZ.

6.2.3 The Measurement Canada Notice of Approval number and the PT accuracy and burden rating shall be present on the PT nameplate.
6.2.4 Outdoor primary revenue metering PTs shall meet the requirements of HOL specification MTS0005.

6.2.5 PTs shall be of a fixed type and permanently connected in a manner allowing for ease of replacement in the event of failure. Draw-out, swing-out, or self-disconnecting primary connection methods are not acceptable.

6.2.6 Revenue metering PTs shall have an 115V or 120V rated secondary winding.

6.2.7 Revenue metering PTs shall be electrically connected on the Line Side of the CTs and connected in accordance to their reference polarity markings (i.e. H1 or • or +) which shall always be oriented to the line side.

6.2.8 For 13.2 kV PTs mounted in switchgear the PT H1 connection shall be a minimum #2 AWG insulated copper conductor.

6.2.9 For 27.6 kV PTs mounted in switchgear the PT H1 Connection shall be via rigid bus due to the need to support the fuse holder. Refer to Section 6.4 for details.

6.2.10 For 3-element metered Services, the PT H2 to neutral connection shall be a white insulated conductor with a minimum #8 AWG wire size. Each PT shall have an individual H2 to Neutral connection.

6.3 Current Transformer (CT) Requirements

6.3.1 Revenue metering CTs shall meet the requirements of Measurement Canada for use in a revenue metering circuit. Proof of compliance shall be provided in the form of a Measurement Canada Notice of Approval and Factory test cards complete with serial numbers, identifying the ratio correction and phase angle correction factors.

6.3.2 Revenue metering CTs shall comply with the 0.3\% or 0.15\% accuracy class with a rated burden adequate for the connected load. Typically, primary CTs are rated for 0.3B0.9 or 0.3B1.8.

6.3.3 The Measurement Canada Notice of Approval number and the CT accuracy and burden rating shall be present on the CT nameplate.

6.3.4 Outdoor mounted revenue metering CTs shall meet the requirements of HOL specification MTS0006.

6.3.5 Revenue metering CTs shall have a 5A rated secondary winding.

6.3.6 Current transformer ratios shall be selected according to the following factors:

6.3.6.1 The maximum sustained primary current in the CT shall not exceed the primary tap multiplied by the continuous current Rating Factor of the CT.
6.3.6.2 The minimum sustained primary current during normal operation shall not be less than 10% of the primary tap for a 0.3 accuracy class CT.

6.3.6.3 The minimum sustained primary current during normal operation shall not be less than 5% of the primary tap for a 0.15 accuracy class CT.

6.4 Potential Transformer (PT) Fusing

6.4.1 All PTs intended for installation within an enclosure or switchgear shall be equipped with integrated protective fusing.

6.4.2 The PTs shall be equipped with 1 or 2 fusing positions, depending on the metering configuration. HOL shall install Type E current limiting fuses.

6.4.2.1 For 13.2kV Services the PTs will be fused with 15.5kV 1A, 1E or equivalent fuses with an interrupting rating of 35kA. The PTs will come complete with integrated fuse holder(s).

6.4.2.2 For 27.6kV Services the potential transformers shall be fused with 25.8kV, 1A, 1E or equivalent fuse with an interrupting rating of 32kA.

6.4.2.2.1 The fuse holder may be installed separate from each respective PT. In this case the fuse holder shall be installed immediately before the PT.

6.4.2.2.2 Alternatively a horizontal fuse holder may be used where one end is secured to the PT and the other cantilevered to the respective phase bus. The customer shall supply a bus connection bracket meant for securing the free end of the fuse holder. The bus bracket shall be sized appropriately to support the fuse holder. A minimum bracket size of 30mm wide x 6.4mm [1-1/4” x 1/4"] is recommended.

7.0 Meter Requirements

7.0.1 HOL will install an interval meter and associated equipment for all new or upgraded primary Services. The interval meter shall be interrogated remotely, using a dedicated analog telephone line that shall be provided and maintained by the Customer.

7.0.2 The Customer shall supply and install an approved transformer-rated meter base appropriate for the requested Service.

7.0.3 The Customer shall supply and install raceway, in accordance to Section 5.8, to house the conductors connecting the Instrument Transformer Compartment, and the transformer rated meter base in the electrical room.
7.1 Meter Types

7.1.1 Primary metering installations with loads less than 5MW shall require a standard HOL interval meter.

7.1.2 Dependant on the type of Service and at HOLs discretion, customers may be required to upgrade to a meter with advanced Power Quality functionality such as an ION series meter. Services that will be required to upgrade to an advanced PQ meter include:

7.1.2.1 Services with loads equal to or greater than 5MW

7.1.2.2 Services with ERFs capable of generating over 2MW

7.1.2.3 Services with large inductive, capacitive or non-linear loads which may impact the user’s ability to meet HOLs Power Quality requirements outlined in ECG0008.

7.1.2.4 Services with unique loading requirements

7.1.2.5 IESO registered market participants

7.1.3 Customers may elect to upgrade to an advanced Power Quality meter, should they wish to take advantage of the additional features. In such cases, the customer would be responsible for additional ongoing maintenance costs of the upgraded meter.

7.2 Revenue Metering Communication Requirements

7.2.1 As per HOL’s Conditions of Service, for each individual meter point the Customer shall provide a dedicated, direct dial analog telephone line for the sole use of HOL Metering. The Service will not be energized until the line is active.

7.2.2 The Customer shall provide and install a continuous 16 mm [1/2"] diameter EMT conduit, complete with bushings at both ends, from the telephone entrance equipment to the enclosure housing the Metering modem. The continuous conduit shall contain the 2-pair analog telephone line. An RJ-11 (4 pin) telephone jack receptacle shall be terminated on the telephone cable within the modem enclosure. The telephone cable shall have 300 mm [12"] to 450 mm [18"] excess length to allow for mounting the telephone jack inside the enclosure.

7.2.3 For switchgear metering applications within an electrical room the Customer shall install an enclosure to house the communications equipment. The enclosure shall meet the requirements identified in Section 5.5.

7.2.4 A tag, or label, bearing the phone number for the telephone circuit shall be attached to the RJ-11 jack at the modem enclosure.
7.2.5 The telephone cable terminating in the telephone room shall be clearly labelled “HYDRO OTTAWA METERING”.

7.2.6 Prior to the interval meter installation by HOL, the dedicated telephone line shall be thoroughly tested by the premise-wiring contractor to verify the following:

7.2.6.1 Dial tone is available.

7.2.6.2 Both inbound and outbound calls can be made.

7.2.6.3 The assigned phone number and extension (if applicable) is correct.

7.2.7 HOL shall schedule a Meter Technician to perform the metering installation once HOL has been notified that the Customer requirements have been met and the dedicated phone line is functioning.

7.3 Manual Collection of Interval Data

7.3.1 If HOL is unable to retrieve the interval meter data using the dedicated telephone line then HOL shall visit the meter location and collect the data using a manual data retrieval system.

7.3.2 If the inability to retrieve meter data is due to a failure of the telephone line or the 120VAC plug powering the communications equipment, HOL shall notify the Customer of the failure and the Customer shall be responsible for repairs within five business days. Thereafter, if the issue has not been remedied to HOL’s satisfaction, HOL shall continue to collect the data manually and charge the Customer a monthly manual meter reading charge as per the OEB approved rate.

7.4 Interval Metering Output Request for Load Analysis

7.4.1 Primary metered Customers may request access to the metering data directly from the metering equipment via an external communications port, or may request from HOL reports containing interval metering data at their expense.

8.0 Primary Switchgear Metering

8.1 Switchgear Instrument Transformer Compartments

8.1.1 Services utilizing metal clad switchgear must provide a separate, lockable, vertically hinged access door to the Instrument Transformer Compartment. The Compartment shall be on the Load Side and immediately adjacent to the switchgear main disconnect Compartment.
8.1.2 Separate Instrument Transformer Compartments shall be provided for each revenue metering point to be installed within the switchboard.

8.1.3 The metering Instrument Transformer Compartment is to be permanently identified “For Supply Authority Use Only”.

8.1.4 The metering Instrument Transformer Compartment shall have barriers between it and other compartments.

8.1.5 A viewing window, or approved alternative, permitting direct view of the Instrument Transformers shall be required.

8.1.6 Provision shall be made for up to three current transformers to be installed within the metering Compartment. Depending on the Service configuration only 2 CTs may be used and the switchgear manufacturer shall ensure that removable bus links are available to ensure continuity of the phase buses.

8.1.7 Grounding studs, meeting the requirements of HOL Construction Detail EGS0001, shall be installed as per the following:

8.1.7.1 One set of grounding studs shall be installed on the bus bars inside the metering compartment at the Line Side of each metering CT.

8.1.7.2 One set of grounding studs shall be installed on the bus bars inside the metering compartment at the Load Side of each metering CT.

8.1.7.3 A ground stud shall be installed on the ground bus and located immediately behind the Instrument Transformer Compartment door.

8.1.7.4 Each ground stud shall be installed in a manner facilitating easy installation of a ground clamp using a hot stick.

8.1.8 Mounting bolts or nuts for support of the base of the Instrument Transformers shall be installed in a manner permitting complete installation and removal of the Instrument Transformers from within the Compartment in which they are installed. Fixed mounting studs using nuts or bolts shall be required for this purpose.

8.2 Meter Base and Communication Enclosure Requirements

8.2.1 Refer to HOL Specifications MCS0116, and MCS0066 for construction details regarding the installation of the meter base(s) and communications enclosure(s).

8.2.2 A plywood mounting surface meeting the requirements of Section 5.6 shall be supplied and installed by the Customer.

8.2.3 The Customer shall supply and install an approved transformer rated meter base, appropriate for the Service being metered. Located at the end of this document,
Table S1-1 identifies the required jaw configuration for the different Primary Service offerings and Table S1-2 or Table S1-3 contains a list of HOL approved Meter Socket bases for Primary Services.

8.2.4 The Customer shall supply and install a 200mm x 200mm x 100mm [8” x 8” x 4”] hinged pull-box for the purpose of housing a fuseblock for the IT secondary wiring. The enclosure shall have provisions for locking with a utility lock and be within 300mm [12”] of the meter base. IT secondary wiring conduit shall run from the Instrument Transformer compartment, to the fusing enclosure and then to the meter base as per MCS0116.

8.2.5 The Customer shall supply and install a 400 mm x 400 mm x 150 mm [16” x 16” x 6”] external modem enclosure which meets the requirements identified in Section 5.6 of this document. The enclosure shall be installed such that the bottom of the enclosure is mounted at the same height as the bottom of the meter base.

8.2.6 The distance from the external modem enclosure to the Meter Socket base shall be between 75 mm [3"] and a maximum of 130 mm [5”].

8.2.7 The external modem enclosure shall contain a dedicated 120VAC, 15A duplex grounded plug, fed from the “public load” panel and protected by a dedicated circuit breaker. The circuit breaker shall be such that it can be locked in the “closed” position with a Standard HOL Padlock while still able to maintain trip-free operation in the event of a Fault.

8.3 Outdoor Style Metal Enclosed Switchgear

8.3.1 Outdoor style metal enclosed switchgear shall have a heater to maintain a minimum ambient temperature inside the Switchboard cells and the space where the Socket Meter base and meter communications equipment are located. The heater shall be powered from the Customers public service and capable of maintaining a minimum ambient temperature as per Section 5.5 of this document.

8.3.2 Outdoor style metal enclosed switchgear shall be ventilated in a manner such that the maximum ambient temperature does not exceed the requirements listed in Section 5.5 of this document.

9.0 Overhead Primary Metering Units (PMUs)

9.0.1 Subject to approval, HOL may permit the use of an Overhead Primary Metering Unit if the metering application is a:

9.0.1.1 Large quarry and/or open pit,
9.0.1.2 Campus type development,
9.0.1.3 Large Industrial, Commercial or Institutional type development,
9.0.1.4 Location that is difficult to access, or
9.0.1.5 Privately owned distribution network supplied by a HOL overhead line.
9.0.2 HOL’s Conditions of Service outline eligibility and conditional requirements for overhead Primary Services.

9.0.3 The PMU shall be installed on a customer owned pole in a location determined during the design review process with HOL’s Design Department.

9.0.4 The Customer owned Primary Service entrance switch shall be visible from the metering point within a pole span.

9.0.5 There shall be direct vehicle access to the overhead metering point and the main site Service entrance disconnect.

9.0.6 Three phase, four wire overhead installations using 3 current transformers and 3 voltage transformers shall be built as per HOL drawing MCS0044.

9.0.7 Three phase, three wire overhead installations using 2 current transformers and 2 voltage transformers shall be built as per HOL drawing MCS0045.

9.1 Instrument Transformer Requirements

9.1.1 For pole-mounted primary metering installations, HOL shall supply and install the required primary metering Instrument Transformers. The PMU unit will include all liquid-tight cables, connectors, and a metering terminal box.

9.1.2 Table S1-4 indicates approximate secondary conductor drop lengths corresponding to specific pole heights.

9.2 Metering Enclosure and Meter Adapter Base Requirements

9.2.1 The Customer shall supply and install a 914mm x 762mm x 406mm [36” x 30” x 16”] enclosure meeting a minimum NEMA 4 rating for the purpose of housing a meter adapter base, test switch and communications equipment. The enclosure shall be installed on the same pole as the PMU as per HOL drawing MCS0044.

9.2.2 HOL will provide and install, at the customer’s cost, a meter socket adapter and test switch. The customer will not be required to supply a transformer rated meter base.

9.2.3 A dedicated 120VAC, 15A circuit shall be provided to the metering enclosure by the Customer and protected by a dedicated circuit breaker installed within the enclosure. The external conductors shall be housed in continuous PVC or liquid-tite raceway meeting the requirements of Section 5.7. The following accessories shall be wired after the breaker, via a din-rail mounted terminal strip, as per HOL drawing MCS0117:

9.2.3.1 A 120 VAC, 15A duplex weatherproof GFCI receptacle,
9.2.3.2 A 120 VAC heater capable of maintaining a minimum of 10°C within the enclosure,

9.2.3.3 All power wiring within the enclosure shall be routed within wire duct troughs as per the drawing.

9.2.4 The Customer shall provide and install a continuous 16mm [1/2"] diameter PVC or liquid-tite raceway to the metering enclosure. The conduit shall contain a 2-pair dedicated, direct dial analog telephone line. A RJ-11 (4 pin) telephone jack receptacle is to be provided and terminated on the telephone cable within the meter’s communications enclosure with 300 mm [12"] to 450 mm [18"] telephone cable to allow for mounting the telephone jack inside the enclosure. The cost of installing and maintaining the telephone line shall be at the Customer’s expense.
### Schedule 1 - Technical Data Tables

#### Table S1-1: Primary Service Meter Socket Types and Required Number of Metering Instrument Transformers

<table>
<thead>
<tr>
<th>Voltage</th>
<th>No. of Phases</th>
<th>No. of Wires</th>
<th>Configuration</th>
<th>Meter Socket Type</th>
<th>Meter</th>
<th>No. of Metering Inst. Transformers (Provisions For)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CTs</td>
</tr>
<tr>
<td>13.2kV</td>
<td>3 Phase</td>
<td>3-Wire</td>
<td>Delta</td>
<td>8-Jaw Meter Socket Base</td>
<td>3 Phase, 2-Element, 10A, 120V, 3-Wire</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-Wire</td>
<td>Grounded-WYE</td>
<td>13-Jaw Meter Socket Base</td>
<td>3 Phase, 3-Element, 10A, 120V, 4-Wire</td>
<td>3</td>
</tr>
<tr>
<td>27.6kV</td>
<td>3 Phase</td>
<td>3-Wire</td>
<td>Delta</td>
<td>8-Jaw Meter Socket Base</td>
<td>3 Phase, 2-Element, 10A, 120V, 3-Wire</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-Wire</td>
<td>Grounded-WYE</td>
<td>13-Jaw Meter Socket Base</td>
<td>3 Phase, 3-Element, 10A, 120V, 4-Wire</td>
<td>3</td>
</tr>
</tbody>
</table>
Table S1-2: HOL Approved Commercial 13-Jaw Transformer Rated Meter Socket Bases For 3 Phase, 4-Wire Primary Services

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Manufacturer</th>
<th>Catalog Number</th>
<th>Meter Socket Base Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Phase, 4 Wire, Wye</td>
<td>CUTLER-HAMMER (EATON)</td>
<td>TSU13</td>
<td>A 13-Jaw Meter Socket base is required for a 3 Phase, 4-Wire, 3-Element, Primary Service.</td>
</tr>
<tr>
<td>Primary Service</td>
<td>DURHAM</td>
<td>RSTL13-2K</td>
<td>CSA approved weatherproof NEMA Type 3R, 20A, 600V Meter Socket base complete with:</td>
</tr>
<tr>
<td></td>
<td>HYDEL</td>
<td>CTS130PW</td>
<td>• Approved for copper only</td>
</tr>
<tr>
<td></td>
<td>THOMAS &amp; BETTS (MICROLECTRIC)</td>
<td>CT113</td>
<td>• Conductor range for #14 AWG to #8 AWG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Metal screw type lock sealing ring</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Provisions for 10-pole metering Test Switch</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Bottom cover is lockable and sealable</td>
</tr>
</tbody>
</table>

Table S1-3: HOL Approved Commercial 8-Jaw Transformer Rated Meter Socket Base for 3 Phase, 3-Wire Primary Service

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Manufacturer</th>
<th>Catalog Number</th>
<th>Meter Socket Base Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Phase, 3 Wire, Delta</td>
<td>CUTLER-HAMMER (EATON)</td>
<td>TSU8</td>
<td>A 8-Jaw Meter Socket base is required for a 3 Phase, 3-Wire, 2-Element, Primary Service.</td>
</tr>
<tr>
<td>Primary Service</td>
<td>DURHAM</td>
<td>RSTL8-2K</td>
<td>CSA approved weatherproof type NEMA Type 3R, 20A, 600V Meter Socket base complete with:</td>
</tr>
<tr>
<td></td>
<td>HYDEL</td>
<td>CTS800PW</td>
<td>• Approved for copper only</td>
</tr>
<tr>
<td></td>
<td>THOMAS &amp; BETTS (MICROLECTRIC)</td>
<td>CT108</td>
<td>• Conductor range for #14 AWG - #8 AWG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Metal screw type lock sealing ring</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Provisions for 10-pole metering Test Switch</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Bottom cover is lockable and sealable</td>
</tr>
</tbody>
</table>
### Table S1-4 - Recommended Potential Transformer (PT) Size by Service Entrance Voltage

<table>
<thead>
<tr>
<th>Service Entrance Configuration</th>
<th>Service Entrance Voltage (kV)</th>
<th>PT Turns Ratio</th>
<th>PT Secondary Voltage (V)</th>
<th>BIL (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3ph Grd-Wye</td>
<td>8.3</td>
<td>4800:120 (40:1)</td>
<td>120</td>
<td>15</td>
</tr>
<tr>
<td>3ph Grd-Wye</td>
<td>13.2</td>
<td>8400:120 (70:1)</td>
<td>108</td>
<td>15</td>
</tr>
<tr>
<td>3ph Delta</td>
<td>13.2</td>
<td>14400:120 (120:1)</td>
<td>108</td>
<td>15</td>
</tr>
<tr>
<td>3ph Grd-Wye</td>
<td>27.6</td>
<td>16800:120 (140:1)</td>
<td>120</td>
<td>28</td>
</tr>
<tr>
<td>3ph Delta</td>
<td>44.0</td>
<td>46000:115 (400:1)</td>
<td>110</td>
<td>46</td>
</tr>
</tbody>
</table>

### Table S1-5 – Measurement Canada Metering Wire Colour Standard

<table>
<thead>
<tr>
<th>Metering Application</th>
<th>Phase</th>
<th>Current Transformer Leads</th>
<th>Voltage Leads</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 3-Phase, 3-Wire, Delta</td>
<td>A</td>
<td>Red – White</td>
<td>Red – Yellow</td>
</tr>
<tr>
<td>• 2-Element Meter</td>
<td>B</td>
<td>Red – Black</td>
<td>Yellow</td>
</tr>
<tr>
<td>• 2 CTs</td>
<td>C</td>
<td>Blue – White</td>
<td>Blue – Yellow</td>
</tr>
<tr>
<td>• 2 VTs</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 3-Phase, 4-Wire, Y</td>
<td>A</td>
<td>Red – White</td>
<td>Red</td>
</tr>
<tr>
<td>• 3-Element Meter</td>
<td>B</td>
<td>Yellow – White</td>
<td>Yellow</td>
</tr>
<tr>
<td>• 3 CTs (Y at transformers)</td>
<td>C</td>
<td>Blue – White</td>
<td>Blue</td>
</tr>
<tr>
<td>• 3 VTs (Y at transformers)</td>
<td>N</td>
<td></td>
<td>White</td>
</tr>
</tbody>
</table>

- Green is used only for non-current carrying ground conductor
- White is used for current-carrying neutral or common conductor

### Table S1-6 - Secondary Metering Drops from Overhead PMU

<table>
<thead>
<tr>
<th>Pole Height</th>
<th>Pole Class</th>
<th>Secondary Drop Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>[50']</td>
<td>Class 2</td>
<td>[35']</td>
</tr>
<tr>
<td>[60']</td>
<td>Class 2</td>
<td>[44']</td>
</tr>
<tr>
<td>[70']</td>
<td>Class 1</td>
<td>[53']</td>
</tr>
</tbody>
</table>
Appendix A – Measurement Canada Standard Drawings

Figure A-1 - Standard Measurement Canada 3-element Wiring Diagram
Figure A-2 - Standard Measurement Canada 2 element Wiring Diagram