Multiple Customer Metering System Installation Requirements

By The Owner

For an Existing Building

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1.0 Introduction

Historically, Hydro Ottawa has required the installation of standard electricity meters in multi-residential units to measure electricity usage of individual suites. However, there has been a trend in technologies that use less space than the standard meter installations. In particular, standard meter bases are too difficult to install in retrofit installations where the electrical secondary distribution room is already allocated for existing electrical equipment.

This specification outlines the minimum technical requirements for an owner of an existing, bulk metered building, where there is interest in individually metering the residential suites using Hydro Ottawa’s suite-metering offering.

2.0 References

- Hydro Ottawa – DFS0008 - Date & Time General Standard
- Hydro Ottawa – DFS0011 - Unit of Standard Measurement – Metric
- Hydro Ottawa – DFS0009 - Civic and Mailing Address Format General Standard
- Hydro Ottawa – DFS0013 - Technical Standards Drawing Structure
- Hydro Ottawa – GCS0008 - Metering Specifications
- Hydro Ottawa – MCS0020 – Typical Secondary Metering Arrangement For Multiple Unit Building – Single Line Diagram
- Hydro Ottawa – MCS0023 – Typical Secondary Metering Arrangement For Multiple Unit Building – Construction Detail
- Measurement Canada LMG-EG-07 - Specifications for Approval Type of Electricity Meters, Instrument Transformers and Auxiliary Devices
- Measurement Canada Procedure P-E-04 - Generic Procedures for Conducting Installation Verifications of Multiple Customer Metering Systems
- Measurement Canada Specification S-E-04 - Installation Requirements for Multiple Customer Metering Systems
- MIL-T-7928/5 – Terminals, Lug and Splices, Conductor, Crimp Style
- Ontario Building Code
- Ontario Electrical Safety Code
- Ontario Fire Code
- Ontario Regulation 442/07 - Installation of Smart Meters and Smart Metering Systems in Condominiums
- UL 94V2 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
3.0 Scope

This specification defines the minimum installation and process requirements for the installation of a Multiple Customer Suite Metering System within an existing building where only a metering upgrade is being undertaken. This specification does not cover the installation requirements for the application of a MCMS within a new building, an existing building with an electrical service upgrade, or metering of embedded generation.

4.0 Definitions

‘Advanced Metering Infrastructure’ or ‘AMI’ refer to GCS0008.

‘Badge Number’ refer to GCS0008.

‘Check Meter’ refer to GCS0008.

‘ESA’ means the Ontario Electrical Safety Authority.

‘HOL’ means Hydro Ottawa Limited

‘LAN’ or ‘Local Area Network’ indicates the network communication that occurs between a building’s MCMS panel meters.

‘MAC address’ means Media Access Control address which is a permanently assigned, unique identifier for a network node.

‘MDM/R’ refer to GCS0008.

‘Mesh Network’ refer to GCS0008.

‘Multiple Customer Metering System’ or ‘MCMS’ refer to GCS0008

‘Multiple Customer Metering Unit’ or ‘MCMU’ refer to GCS0008

‘Power Line Carrier’ or ‘PLC’ means the use of existing electricity wire infrastructure to carry voice and data signals simultaneously by transmitting high frequency data signals through the electric power lines.

“Retrofit Service Provider” means the Hydro Ottawa approved organization responsible for suite meter installation and project management services for retrofit building applications.

‘WAN’ or ‘Local Area Network’ indicates the network communication that occurs between a buildings MCMS panel meters and the host server operating the MCMS meter management software.

“Wi-Fi’ means a wireless broadband communication system that is based on the IEEE 802.11 wireless standards.
“WiMax” means a wireless broadband communication system intended for wireless metropolitan networks. Also known as IEEE 802.16.

5.0 Hydro Ottawa Offering

5.1 MCMU Metering Panel

Hydro Ottawa will provide Multiple Customer Metering System equipment for retrofit installation of the residential suites within an existing condominium property having a minimum of 25 units and is currently bulk-metered.

All public, fire pump, and commercial loads shall be independently metered using conventional glass meters at the expense of the building owner including any required infrastructure upgrades by their electrical contractor. Conventionally metered points may require self-contained or transformer-rated meters as determined by the metered load and as referenced in Hydro Ottawa’s Metering Specification document GCS0008. For buildings that have multiple sources for Public loads the building owner will be required to consolidate the public circuits into one metered point.

The MCMU meter panel selected for the residential suites will operate in a Measurement Canada approved manner for all service amperages up to 200 amperes and capable of monitoring up to:

- 20 single phase 120/240Vac suites, or
- 20 network, two phase with neutral, 120/208Vac suites

The MCMU panel shall be powered from the distribution circuit supplying the group of suites that are being metered by the MCMU. A separate breaker, dedicated for the MCMU(s), shall be installed in the distribution panel. The MCMU supply breaker shall have provisions to be padlock lockable both in the open (OFF) position and in the closed (ON) position while still allowing for trip-free operation of the breaker. The MCMU supply breaker shall have a brightly-coloured, non-removable, water resistant label indicating the MCMU panel identifier and that the breaker is for a Hydro Ottawa metering device with a font of Arial 16 point. If the breaker supplies multiple MCMU panels, each panel identifier (ex. MU001) shall be indicated on the disconnect label in Arial 16 point font.

If the MCMU panel(s) cannot be installed within 3000mm (10ft) or within line of sight to the breaker switch powering the MCMU, a secondary disconnect switch will be required at the MCMU. This disconnect shall have a brightly-coloured, non-removable, water resistant label indicating that the disconnect switch is for a Hydro Ottawa metering device with a font of Arial 36 point.

Each MCMU panel shall be marked with a Hydro Ottawa logo and provide indication that it is an electricity meter. The panel will also be marked with a non-removable label in Arial 12 point font indicating that it is an offence to tamper with a meter.
The MCMU meter panels shall be individually identified using alphanumeric identifiers with the form Tier 1 HOL identifier (vault or pad-mounted transformer) - MU### where ### represents the panel number. The panel number must be unique within a building and range from 001-999. The panel numbering sequence shall start at the first floor where an MCMU is required, incrementing from ground level upwards to the top floor.

The panel identifier label shall be water resistant and have a font of Arial 16 point. In addition the panel identifier will include the meter badge range that is associated with that panel. The meter badge range shall be in the format OTT###### - ### where ###### indicates the starting badge number and -### indicates the last three numbers of the final badge number.

The installer shall ensure that the number of installed MCMU panels is minimized by populating each installed panel with as many metered suites as is reasonable.

5.2 Potential Transformers

As the MCMS solution provided by Hydro Ottawa is intended to meter either single phase 120/240Vac or 120/208Vac network suites, no potential transformers will be required to meter the residential suites.

5.3 80mA Current Transducers

The current sensing elements for the MCMS will be Measurement Canada approved 80mA current transducers. A pair of current transducers will be required for each metered point, where individual transducers would be installed on each power line feeding an individual suite. The preferred location for the mA transducers is within the distribution panel of the metered suites. In installations where the mA transducers are located within the distribution panel, the suite supply wiring shall be continuous and unbroken from the suite breaker in the distribution panel, through the 80mA transducer and to the metered suite.

For retrofit installations where the installation of the mA transducers within the distribution panel would contravene with ESA’s panel space requirements, the mA transducers shall be installed in a separate, lockable enclosure. Any necessary breaks in the suite supply wiring shall be terminated with CSA approved power distribution blocks that will pass ESA requirements. The power distribution block positions and wiring shall be labelled with the corresponding breaker number and suite identification. The terminal block labels shall be water resistant and have a font of Arial 10 point.

Each mA transducer will be labelled with an alphanumeric identifier of the form MU***-CT## where ## represents the transducer number which will be unique to the associated MU panel. MU*** identifies the MCMS meter panel of the associated mA transducer. The transducer identifier label shall be water resistant and have a font of Arial 10 point.
5.4 MCMS LAN Connectivity

The preferred connection type between MCMS metering panels will be hard-wired CAT-5E or CAT-6 Ethernet cable with a FT6 fire rating.

Alternative connection methods within the building include Power Line Carrier or a wireless mesh network. Alternatively multiple technologies may be employed where it is beneficial to do so. An example is hard-wired Ethernet connections to panels on the same floor and PLC to connect panels on other floors. At locations where wired Ethernet is not feasible, Hydro Ottawa will evaluate the most practical alternative.

5.5 MCMS WAN Connectivity

The preferred WAN connection type for a building’s MCMS panels will be via a cellular modem interface. Multiple MCMS panels will be connected to a single wireless modem through the use of Ethernet hubs or Routers. Multiple network hubs may be used if the building topography warrants.

Alternatively, if the cellular modem cannot be placed in an area with good RF reception, the secondary preferred WAN connection will be via a broadband or DSL internet connection. In this case the Internet Service Provider’s modem will be used in place of the cellular modem. Hubs and/or routers will still be used to connect multiple MCMS panels to the modem.

Other WAN connection technologies include Wi-Fi, WiMax, phone line, or RF communication. These technologies may be considered on a case by case basis for installations where cellular or broadband is not practical.

6.0 Installation Technical Requirements

All installations shall conform to Measurement Canada’s document S-E-04 ‘Specifications for the Installation Requirements for Multiple Customer Metering Systems’ and all requirements of the Electricity and Gas Inspection Act. The MCMS system will be installed in a manner that allows for on-site testing of all metering components. All equipment associated with the MCMS will be installed in manner conforming to the Ontario Electrical Safety Code and the Ontario Building Code.

The meter panel and all associated equipment, switches and disconnects shall be sealed with utility seals provided by Hydro Ottawa and marked with the Hydro Ottawa logo.

The voltage sensing circuits and current sensor circuits shall be separate and complete. All voltage and current sensing circuit terminations shall be identified through the use of tamper-proof labels. Measurement Canada has provided MCMS wiring diagram examples for installations with current transducers and for installations using external current transformers.

All MCMS installations must be approved by Hydro Ottawa to energize the service. Hydro Ottawa reserves the right to inspect, test and audit an installation.
6.1 Potential Removal of MCMS Equipment

For an MCMS equipped building, Hydro Ottawa may receive a 90-day equipment removal notice from the building owner to cease suite metering activities.

During the installation process consideration should be given to facilitate an easy removal process of the MCMS. Design points to be considered are:

- Each installation shall have low-impact to the building structure where the removal of the MCMS components will not require repairs to the building structure or for relocation or panels or enclosures.
- Installation of the MCMS equipment shall require minimal or no re-routing of the buildings existing wiring.
- All MCMS equipment wiring shall be labelled to ensure easy identification of metered circuits and their association to the building wiring.
- Current transformers should be installed within the building's distribution panel(s) whenever possible.
- Detailed equipment mapping shall be used to aid in the identification of equipment that may need to be removed.
- An installation log shall be maintained to record any changes to the building during the MCMS installation.
- Before and after installation photos shall be taken for records purposes.
- All installation records shall be submitted to Hydro Ottawa for record keeping.

6.2 Metering Room Requirements

The MCMU panels and associated equipment will be installed within the same electrical room as the distribution panel associated to the suites being metered. Each suite or unit to be metered shall have distinct and separate wiring at the metered panel.

Each service breaker shall clearly identify the suite it supplies with a label that is water resistant and has a font of Arial 16 point or larger. Each service breaker shall have the ability to apply a pad-lock to lock the breaker in the open position.

The electrical room(s) shall have adequate lighting, heating and a 120 Vac receptacle, wired from the public lighting panel, for test purposes.

6.3 MCMU Panel Installation

All MCMU panels will be installed in a safe and secure fashion. A plywood mounting board coated, on all sides, with a fire retardant paint shall be installed for the use of the MCMS panel mounting surface in a location determined by Hydro Ottawa and the building owner. The fire retardant coating shall provide a maximum Flame Spread Rating of 25 (Class A) in accordance with the standard CAN/ULC 4-S102. For retrofit buildings the plywood sheet shall measure 712mm X 712mm X 16mm [28” X 28” X 5/8”] for each individual MCMU panel. An additional plywood mounting panel will be required for mounting the MCMS.
communication equipment. This panel shall measure 712mm X 712mm X 16mm [28” X 28” X 5/8”] and be installed in a location determined by Hydro Ottawa and the building owner.

6.4 80mA Transducer Installation

All wiring to the transducers shall be continuous, with any terminations ending at a CSA approved terminal block with each wire secured by two set screws. In situations where a break in the transducer wiring is necessary and a terminal block cannot be installed in the vicinity, window butt splice connectors conforming to Military Specification MIL-T-7928/5 shall be used.

All mA transducer leads shall be equipped with CSA approved shorting bocks to allow for the transducers to be safely disconnected from the MCMU. The shorting blocks may be part of the terminal block or a separate device. All transducer leads will be either labelled with non-removable labels or colour coded as per Measurement Canada’s requirements.

Any terminal blocks used for the transducer circuits shall have an alphanumeric identifier of the form MU***_TB## where ## represents the terminal block number which will be unique to the associated panel. MU*** identifies the MCMS meter panel that the terminal block is associated with. The terminal block label shall be water resistant and have a font of Arial 10 point.

All metering circuits shall be within an enclosure or conduit to minimize the possibility of tampering. The preferred location for the mA transducers is within the distribution panel of the metered suites. The distribution panel shall have a lockable cover and each breaker within the panel shall have the means to lock the breaker switch in the OFF position.

For retrofit installations where the installation of the mA transducers within the distribution panel would contravene with ESA’s panel space requirements, the mA transducers shall be installed in a separate, lockable enclosure.

Transducers shall be secured with cable ties to make relocation and/or removal difficult. The cable ties will be of a Nylon 6/6 material, self-extinguishing to UL 94V2 standard.

Transducer circuits shall be marked with the Hydro Ottawa logo and indicate that they are part of a metering circuit.

6.5 Check Meter

The building main electrical feed shall be metered by a standard self-contained or transformer-rated check meter ahead of the MCMS equipment. This check meter will be installed according to Hydro Ottawa Metering Specification, GCS0008.

The purpose of the check meter will be to validate the accuracy of the suite metering and to ensure that no un-metered loads are present within the building. The Check meter is not intended to be used as a billing device and Hydro Ottawa will not use deductive/subtractive metering as a method of capturing lost load for revenue metering. All building loads must be
accounted for by the metering installed for residential suites, commercial suites and public loads to comply with Measurement Canada.

6.6 Fire Pump Metering

The Fire Pump circuit shall be separate from all other loads and traditionally metered as specified in the Hydro Ottawa Metering Specification, GCS0008.

6.7 Common Service Metering

All common building and public loads shall be consolidated into a single circuit and metered by a conventional ‘glass’ meter that is separate from the MCMS. The conventional public meter shall be installed as per Hydro Ottawa Metering Specification, GCS0008.

6.8 Commercial Service Metering

All commercial loads shall be individually metered by conventional ‘glass’ metering that is separate from the MCMS equipment. The conventional commercial meters shall be installed as per Hydro Ottawa Metering Specification, GCS0008.

6.9 Equipment Access and Working Space

The MCMS metering panel and associated equipment will be installed within the same electrical room as the distribution panel associated to the suites being metered. The electrical room shall be locked and inaccessible by the general public. Should a building resident need access to view their electrical consumption from the panel, they shall be escorted by a building representative.

Hydro Ottawa staff shall have unrestricted access to all MCMS components and wiring. The access doors to the electrical room shall be equipped with a dual locking system acceptable to Hydro Ottawa. Alternatively, a key may be left in a secure key box installed in an accessible location. A signed waiver form entitled, “ACCESS AND LIABILITY FORM” acknowledging Hydro Ottawa’s possession of the key, shall be given to Hydro Ottawa.

A clear, safe and adequate working space of not less than 1 m [39’’] in front of the installation extending from floor to the ceiling with a minimum ceiling height of 2100 mm [84’’] shall be provided. This is to ensure the safety of Hydro Ottawa and other authorized personnel who may be required to work on the metering installation.
6.10 Building Owner Secondary Equipment MCMS Requirements

With retrofit buildings, the building owner shall provide the following technical requirements with their secondary distribution centres:

- A check meter shall be installed to meter the entire building load in accordance to standard meter installation guidelines listed in the Hydro Ottawa Metering Specification, GCS0008.
- Each suite or unit to be metered shall have distinct and separate wiring at the metered panel.
- All public loads shall originate from a common panel or main circuit that is separate and distinct from the metered residence suites.
- Sufficient wall space will be provided for the required MCMS equipment and communication hardware. Plywood mounting boards shall be provided for the MCMS equipment installation.
- Each suite main supply circuit breaker shall be clearly identified with a water resistant label with a font of Arial 36 point.
- Each suite main supply circuit breaker shall be lockable with a padlock having a 7mm [¼"] shackle.
- Each metering enclosure or device shall be clearly labelled on its outside door or cover.

7.0 Application Process for Retrofit MCMS Installation

7.1 Required Submittals to Hydro Ottawa

In order for Hydro Ottawa to evaluate an existing building for retrofit MCMS installation the following submittals will be required:

1) A current and accurate Single Line Diagram (SLD) of the entire building’s electrical distribution including all of the public loads within the building. The SLD is required to illustrate the metering connections for the fire pump, public loads and commercial loads and shall be stamped by a Professional Engineer.
2) An electrical secondary distribution riser diagram for the building. Detailed requirements for this riser diagram can be referenced in Appendix A.

7.2 MCMS Development and Installation Process

The application process for a new buildings application for suite-metering and the development of the required submittals is as follows:

1. The Building owner selects the Hydro Ottawa MCMS offering as the metering choice for residential suites.
2. The Building owner contacts Hydro Ottawa’s Metering Department indicating the intention of installing suite-metering within the existing building. The Metering
3. The Building owner and Hydro Ottawa’s MCMS Retrofit Service Provider develop the building metering proposal documents.
4. The Building owner submits the required submittals to Hydro Ottawa’s Metering department for review.
5. Hydro Ottawa reviews the proposal and provides feedback as required. Once the proposal meets Hydro Ottawa’s requirements the design will be accepted.
6. Hydro Ottawa metering crews will be scheduled to install the necessary conventional metering, including any required Potential or Current Transformers, for the public, fire pump and commercial loads.
7. Hydro Ottawa’s electrical sub-contractor will be scheduled for the installation of the MCMS equipment in the building as per the developed metering proposal.
8. Once the installation is complete Hydro Ottawa will evaluate the installation to ensure compliance.
9. An ESA inspection is scheduled.
10. Hydro Ottawa’s MCMS Retrofit Service Provider will make arrangements to have the MCMS commissioned as per Measurement Canada’s requirements.
11. With commissioning complete As-Built documentation will be finalized by Hydro Ottawa’s MCMS equipment provider to reflect changes in the original design.
12. Hydro Ottawa will accept the MCMS installation as complete once As-Built documentation has been submitted and approved.
Appendix A – Minimum Permit Drawing Requirements for Proposed Electrical Secondary Distribution Building Riser

1. **Basic Drawing Requirements** (applies to all drawings)
   
a. Title block (name building owner, date, drawing/project number, drawing revision number, civic address of building)
b. Name & phone number of the Project Manager for the specific application
c. Language: English
d. Scale or Dimensions (where applicable): Metric
e. Scale Size (where applicable): Riser drawing is a single line schematic and is normally not to scale
f. Legend of symbols, line style & weights, colour, and nomenclature
g. Two-dimensional format that minimizes the number of cross-overs of lines representing the electrical circuits.
h. Text size and style: when printed/plotted to designed paper size, the font is a minimum of 10 points and is a common legible font style
i. Line style and thickness appropriate to clearly illustrate different objects and area of interest
j. Line and text colour: colours should not be confusing and clearly illustrate different objects and area of interest. Note that colour scheme shall be clearly legible when the drawing is printed/plotted out on white paper in black ink.
k. White space management: the drawing objects and text shall have sufficient space between the different objects and area of interest as not to compress or clutter the drawing
l. Produced in a CAD software with a final non-secure PDF format output.
m. Certified standards that have been applied
n. The identification of the Professional Engineer who approved the plan/design
Appendix A – continued

2. Project Specific Drawing Orientation Requirements

   a. Building elevation separation from bottom to top of the drawing with each floor clearly labelled
   b. Separate buildings separated horizontally across the drawing with each building clearly labelled
   c. Common electrical wiring raceways/risers kept together on the drawing and uniquely identified
   d. Each electrical panel clearly identified
   e. Each room clearly identified
   f. Electrical schematic captures all the electrical branches and their unique nomenclature with their main control points (switches, circuit breakers, fuses, transformers, existing meters) for the building electrical service entrance to each end load/generator to be metered
   g. Correct electrical connectivity and topology with source, loads, and generators
   h. Electrical control points (switches, circuit breakers, fuses, transformers, existing meters) ampacity rating, operating voltage, phasing, and circuit wiring configuration (e.g. 100A, 347/600V, three phase, four wire, grounded wye)
   i. Generators and large motors (>3HP)
   j. Location of known hazardous materials within the building clearly identified