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Multiple Customer Metering System Installation Requirements

By The Owner

For a New Building

See Hydro Ottawa's Intranet site
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REVISION SHEET

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0	Original Document	2010-06-29	kem/csm
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1.0 Introduction

Historically, Hydro Ottawa has required the installation of standard ‘glass’ type electricity meters through the use of meter centres 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.

This specification outlines the minimum technical requirements for a building developer that is interested in implementing Hydro Ottawa’s suite-metering solution within a building in construction.

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 – MCS0059 – Individual MCMS Communication Wiring for Electrical Room without Communications Equipment – Construction Detail
- Hydro Ottawa – MCS0060 – MCMS Communication Wiring for Electrical Rooms with Communications Equipment – Construction Detail
- Hydro Ottawa – MCS0061 – MCMS Communication Wiring for Electrical Rooms without Communications Equipment – Construction Detail
- 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
- Ontario Building Code
- Ontario Electrical Safety Code (OESC)
- Ontario Electrical Safety Authority (ESA)
- Ontario Fire Code
- Ontario Ministry of Energy - Functional Specification for Advanced Metering Infrastructure, Version 2, July 5, 2007
- 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

- ULC – CAN/ULC-S102 – Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

3.0 Scope

This specification defines the minimum installation and process requirements for the installation of a Multiple Customer Suite Metering System within a new building in construction. This specification does **not** cover the installation requirements for a retrofit application of a MCMS within an existing building 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.

“Public Load / Meter” refer to GCS0008

‘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 only residential suites within a rental or condominium property having a minimum of 25 residential units within a single, vertically arranged building that is three (3) story or higher.

All check, public, fire pump and commercial loads shall be independently metered using conventional glass meters and associated equipment at the expense of the building developer. The public building load shall be consolidated in a single metered point. 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.

The MCMU panel selected for the residential suites will operate in a Measurement Canada approved manner for all service ampacities 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 shall be powered from the same distribution panel as the suites the MCMU is metering. 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 under fault conditions. 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 cannot be installed within 3000mm (10ft) or within line of sight to the breaker switch powering the MCMU in the electrical room, 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

The MCMU panels 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 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 Hydro Ottawa approved Suite Metering Contractor 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 current transducers will be installed directly after the respective suite's breaker within the distribution panel supplying the metered suite. 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.

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.

Any terminal blocks used 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.

5.4 MCMS LAN Connectivity

The LAN connection wiring between MCMU metering panels will be hard-wired CAT-5E or CAT-6 Ethernet cable with an FT6 fire rating and shall be installed by Hydro Ottawa's approved Suite Metering Contractor. Individual Ethernet cables shall be installed from the electrical room containing the MCMS communications equipment to each of the MCMU panels within the secondary electrical rooms of the building.

The building owner shall supply and install a 25mm [1"] diameter EMT or PVC conduit for the purpose of Ethernet communication wiring between each electrical room containing MCMS equipment. The 25mm [1"] conduit shall also extend into the main electrical room where the Check and Public meters are located.

The building owner shall also supply and install a 19mm [3/4"] diameter EMT or PVC conduit, complete with bushings and parallel with the 25mm [1"] Ethernet conduit for the purpose of analog phone line wiring between MCMU equipped electrical rooms. The 19mm [3/4"] conduit shall also extend into the main electrical room where the Check and Public meters are located.

In each electrical room the 25mm [1"] and 19mm [3/4"] diameter conduit sections shall be terminated at a junction box having the minimum dimensions of 203mm X 203mm X 101mm [8" X 8" X 4"] and located within 458mm [18"] of the MCMU plywood mounting board. The junction box shall have an additional 19mm [3/4"] knock-out for the purpose of routing Ethernet and/or phone cable to the local MCMU panels. When the junction box is located in an electrical room equipped with communication equipment for the MCMS, the required additional knock-out shall be 25mm [1"] in diameter.

In the electrical room where the MCMS communication equipment is present the communications wiring junction box shall be within 458mm [18"] of the communications equipment mounting board. In the main electrical room with the Public meter, the junction box shall be within 458mm [18"] of the Public meter.

5.5 MCMS WAN Connectivity

A dedicated analog telephone line shall be installed and maintained by the building developer/owner for communication with the Public meter and MCMU panel(s). The phone line shall be active 24 hours a day for the exclusive use of Hydro Ottawa. The customer/consumer shall be responsible for the ongoing monthly costs from the telephone company for the operation of the dedicated phone line and maintain its availability so long as the service exists.

The single dedicated analog phone line shall be leveraged between the Check and Public meter and the MCMU panels. The phone line shall be two-pair (4 conductor) and enclosed in a 13mm [1/2"] diameter EMT conduit, complete with bushings, from the telephone entrance equipment to the 203mm X 203mm X 101mm [8" x 8" x 4"] junction box located at the Public Meter.

An RJ-11 telephone jack for the Public meter shall be provided and terminated on the telephone cable at the Public meter location with a length of telephone cable 458mm [18"] long to allow for mounting the telephone jack anywhere near the Public meter socket base. Additional RJ-11 telephone jacks, terminated on the telephone cable, will be required at each

MCMU location and installed within the 203mm X 203mm X 101mm [8" x 8" x 4"] junction boxes.

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, audit, and witness the commissioning of 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 or registered Condominium board 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 shall be installed within the buildings distribution panel(s). These panels will be approved for size by Hydro Ottawa.
- Detailed equipment mapping shall be used to aid in the identification of equipment that may need to be removed.
- All installation records shall be submitted to Hydro Ottawa for record keeping.

6.2 Metering Room Requirements

The MCMU panels and associated equipment shall be installed within the same electrical room as the distribution panel associated to the suites being individually 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 minimum required wall space in an electrical room for the MCMS equipment without communications equipment shall be 2250mm [89"] wide with a minimum floor to ceiling height of 2100mm [83"]. The minimum required wall space for the MCMS equipment in an electrical room with the MCMS communications equipment shall be 3000mm [118"] wide with a minimum floor to ceiling height of 2100mm [83"].

A clear, safe and adequate working space of not less than 1 m [39"] in front of the installation, including the MCMU(s), distribution panel, communication equipment and local disconnect switch (if applicable) shall be provided, extending from floor to the ceiling. This is to ensure the safety of Hydro Ottawa and other authorized personnel who may be required to work on the metering installation.

The electrical room(s) shall have adequate lighting, heating and a 120 Vac @ 15A receptacle for test purposes. The 120 Vac receptacle shall be wired from the public lighting panel and mounted at the lower, right-hand corner of the plywood board intended for the respective MCMU(s).

A second 120 Vac @ 15A receptacle, wired from the public lighting panel, shall be required in the electrical room where the MCMS communication equipment will be installed. The 120 Vac receptacle for the communications gear shall be installed on the communications mounting board with sufficient wiring length to allow for the receptacle to be relocated within the communications enclosure once it is installed by Hydro Ottawa's MCMS installation contractor.

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 developer. The fire retardant coating shall provide a maximum Flame Spread Rating of 25 (Class A) in accordance with the standard CAN/ULC-S102. For new buildings the plywood board shall be a minimum of 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 shall be installed in an electrical room located near the middle floor of the building in order to minimize the length of the required Ethernet cables.

6.4 80mA Transducer Installation

All metering circuits shall be within an enclosure or conduit to minimize the possibility of tampering. The 80 mA transducers shall be installed within the distribution panel of the metered suites. The distribution panel shall have a lockable cover and each suite breaker within the panel shall have the means to lock the breaker switch in the OFF position.

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 shall not 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 and associated equipment 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

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 require access to view their electrical consumption from the MCMS panel, they shall be escorted by a building representative.

Hydro Ottawa staff shall have unrestricted access to all MCMS components and associated 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.

6.10 Building Owner New Secondary Equipment MCMS Requirements

With new buildings, the building owner shall provide the following technical requirements with their new 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.
- The building owner shall procure appropriately sized distribution panels with sufficient space allowance for mounting all the necessary mA current transformers. The panel shall be able to pass ESA free space requirements with all current transformers installed. At a minimum the distribution panel cable channels should have a width of 254mm [10"] between the circuit breaker mounting rails and the side of the distribution panel for mounting the mA transducers.
- Each distribution panel containing MCMS equipment shall have a local disconnection means to disconnect power to the distribution panel and shall be padlock lockable in the open position. The disconnection means shall be either a barriered, rated main service entrance breaker within the distribution panel or a separate lockable disconnect switch immediately before and within the same electrical room as the oversized distribution panel.
- 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 as outlined within this specification.
- Each suite main supply circuit breaker shall be clearly identified with a water resistant label with a font of Arial 36 point.
- Each dedicated suite main supply circuit breaker shall be lockable in the open (OFF) position, with a padlock having a 7mm [¼"] shackle.

- 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 under fault conditions.
- Each metering cabinet or device shall be clearly labelled on its outside door or cover.
- The building owner shall supply and install a 25mm [1"] diameter EMT or PVC conduit, for the purpose of Ethernet cabling, between each electrical room containing MCMS equipment. This conduit shall also extend into the electrical room where the Check and Public meters are located. In each electrical room, including the room with the Public meter, the conduit sections shall be terminated at a junction box having the minimum dimensions of 203mm X 203mm X 101mm [8" X 8" X 4"]. The junction boxes shall be within 458mm [18'] of the MCMU mounting board in MCMU-equipped electrical rooms without communications equipment, or within 458mm [18'] of the communications equipment mounting board in MCMU-equipped electrical rooms with communications equipment. In the main electrical room with the Public meter the junction box shall be mounted within 458mm [18"] of the Public meter.
- The building owner shall supply and install 19mm [3/4"] diameter EMT or PVC conduit, in parallel with the 25mm [1"] diameter conduit, for the purpose of phone cable wiring between each electrical room equipped with an MCMU panel. The 19mm [3/4"] diameter conduit shall be terminated at the 203mm X 203mm X 101mm [8" x 8" x 4"] junction boxes installed in each of the MCMU equipped electrical rooms and the junction box installed at the Public meter.
- The junction boxes shall have an additional 19mm [3/4"] knock-out for the purpose of routing ethernet and phone cable to the local MCMU panels or the Public meter.
- The building owner shall supply and install a 13mm [1/2"] diameter conduit, complete with bushings, between the Check meter and the Public Meter for the purpose of routing communication wiring.

7.0 New Building Application Process

7.1 Individual Metering Type Selection

When individually metering suites within a new building in construction, two choices may be available from Hydro Ottawa:

- 1) Meter Centers using traditional self-contained glass meters may be used to meter the individual residential suites. Such an installation shall follow the guidelines listed in Hydro Ottawa's Metering Specification GCS0008.
- 2) Alternatively, the building owner can chose to install Hydro Ottawa's MCMS solution to meter the individual residential suites. A developer wishing to install Hydro Ottawa's MCMS option shall follow the requirements and guidelines set forth in this document.

7.2 Required Submittals to Hydro Ottawa

In order for Hydro Ottawa to evaluate a new building for suite-metering the following submittals will be required:

- 1) A 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.
- 2) An electrical secondary distribution riser diagram for the building. Detailed requirements for this riser diagram can be referenced in Appendix A.
- 3) A proposed suite-metering overlay to the building SLD for residential suites that will indicate the distribution and risers for the metering equipment, MCMS panel locations, electrical connections and MCMS panel associations for the building.
- 4) Load summary for each of the MCMS panels used throughout the building.

In addition to the submittals for the MCMS proposal the developer will be responsible for providing Hydro Ottawa with the standard documentation for all conventionally metered points. The submittals shall be provided to Hydro Ottawa's Distribution Design Department from the developer.

7.3 Development Process for Required Submittals

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

1. Developer selects the Hydro Ottawa MCMS offering as the metering choice for the residential suites.
2. Developer contacts Hydro Ottawa Distribution Design Department indicating the intention of utilizing suite-metering for the new building. The Distribution Design Department will provide contact info for Hydro Ottawa's MCMS Equipment Provider.
3. The Developer and Hydro Ottawa's MCMS Equipment Provider develop the building metering proposal documents.
4. Developer submits the required submittals to Hydro Ottawa's Design Department for review.
5. Hydro Ottawa reviews the proposal and provides feedback as required. Once the proposal meets Hydro Ottawa's requirements an Offer to Connect will be provided to the developer by the Distribution Design Department.
6. Developer accepts Offer to Connect and submits any required payments.
7. Hydro Ottawa metering crews will be scheduled to install the necessary conventional metering, including any required Potential or Current Transformers, for the Check, Public, Fire Pump and Commercial loads in the building.
8. Hydro Ottawa's approved Suite Metering Contractor will be scheduled for the installation of the MCMS equipment in the building as per the metering proposal developed by the MCMS equipment provider in coordination with the developer.
9. Once the installation is complete, an ESA inspection is required to be scheduled for the MCMS installation.

10. A Hydro Ottawa Metering crew shall witness the commissioning of the MCMS installations for the associated suites.
11. Hydro Ottawa will evaluate the installation to ensure compliance.
12. Hydro Ottawa's MCMS Equipment Provider will make arrangements to have the MCMS commissioned as per Measurement Canada's requirements.
13. With commissioning complete As-Built documentation will be finalized by Hydro Ottawa's MCMS Equipment Provider to reflect changes in the original design.
14. Hydro Ottawa will accept the MCMS installation as complete once the 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 (eg. 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