REQUIREMENTS FOR CUSTOMER-OWNED PRIMARY SERVICES SUPPLIED AT 4 kV TO 35 kV

PRIMARY GUIDE

JULY 2010

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1 Overview

The 2010 revision of the Primary Guide supersedes the 2009 revision.

This document contains the requirements for design, construction, installation, access and connection of customer-owned equipment for primary services supplied by BC Hydro distribution system voltage at 4kV to 35kV.

For electricity supply at voltages of 69 kV and above, refer to BC Hydro's *Guide and Requirements for Service at 69,000 to 287,000 volts*.

In the future, dual radial and double dual radial configurations will not be available for new construction, and BC Hydro primary customers will receive a radial supply. Redundancy of the supply system will be provided by BC Hydro-owned switchgear, which may be located on the customer's property. Furthermore, all new primary service equipment will be rated and certified for operation at 14.4/25 kV although, in some areas, initial operation at 7.2/12.5 kV may be required.

BC Hydro's overriding concern is the safety and reliability of each primary service.

All customer-owned primary service equipment and installations shall be technically compatible with the BC Hydro distribution system, to ensure public safety, and to facilitate safe and reliable delivery of electrical energy. All BC Hydro distribution systems are built in accordance with BC Hydro Distribution Standards, which are developed, maintained and approved by Professional Engineers. Accordingly, customer-owned primary services must also be designed and approved by Professional Engineers. Any deviations from BC Hydro Distribution Standards must be accepted and approved by the BC Hydro Regional Distribution Engineer in charge of the project.

Access to the primary service location on private property, and to the service cable compartment and revenue metering cubicle, including the operation and safe isolation of the main service switch, shall be compliant with BC Hydro Work Methods and WorkSafe BC.

If a customer installs non-compliant primary service equipment, or has extenuating circumstances which result in the need to restrict BC Hydro access to the primary service location, BC Hydro requires a demarcation structure as the point of delivery. This demarcation structure shall be pre-approved by BC Hydro and the local inspection authority, supplied and installed by the customer, and located inside the customer's property line. BC Hydro will supply and install BC Hydro-owned primary service conductors from the utility supply point to the demarcation structure, and the customer will supply and install customer-owned primary service conductors from the demarcation structure to the customer primary service switch. The customer-owned primary service conductors must be compatible with BC Hydro switching and termination equipment. Please contact your BC Hydro designer for approved cable specifications.

The demarcation structure access will be restricted to BC Hydro personnel only. The demarcation structure must accommodate BC Hydro switching equipment and may be an underground concrete vault equivalent to the BC Hydro standard 832 Box. A primary service revenue metering kiosk in accordance with the requirements of Section 7.5 is also acceptable as the point of delivery.

In the event that customer primary service does not meet BC Hydro requirements, the installation may be connected and maintained under a special provision of the Local Operating Order, which may carry extraordinary charges to the customer for each service call, and regular inspection and maintenance as required, by BC Hydro personnel.

2 Standards and Regulations

Notwithstanding the requirements set out in the previous section, requirements for primary services contained in this "Primary Guide" are in addition to the latest revisions of applicable standards and regulations by the regulatory authorities having jurisdiction at the site:

- BC Safety Authority – Safety Standards Act
- BC Safety Authority – Electrical Safety Regulation
- BC Safety Authority – Directive No: D-E3 090313 1 High Voltage Installations
- WorkSafe BC – Electrical Safety
- BC Municipalities that maintain their own electrical inspection services
- City of Vancouver Bulletin 2007-03-EL
- Canadian Electrical Code C22.1 – safety standards for electrical installations
- BC Electrical Code
- National Building Code
- BC Building Code
- BC Hydro Distribution Standards
- BC Hydro Advisory 2006111501: Transfer Switches for Emergency Standby Generators
- BC Hydro Interconnection Requirements for Closed-Transition Transfer of Standby Generators
- BC Hydro Engineering Technical Report ETR No. 20091201
- BC Hydro Safety Practice Regulations
- BC Hydro Electric Tariff
- BC Hydro Requirements for Manually Read Primary Service Voltage Revenue Metering (4kV to 35kV)
- Engineers and Geoscientists Act of BC
- Ministry of Mines of BC

All customer-owned primary services must be installed by a licensed electrical contractor, under an electrical permit, and inspected by the regulatory authority having jurisdiction at the site, such as BCSA, municipalities that maintain electrical inspections, Ministry of Mines, Ministry of Transport Canada, etc. All customer-owned electrical equipment must carry an acceptable mark of approval from the certification agencies recognized in British Columbia by the BC Safety Authority.

BC Hydro requires copies of applicable test reports, a certificate of compliance for primary service equipment and a certified commissioning report, as required by the following:

- Applicable CSA Standards - for each apparatus
- CSA C22.2 No. 31 Switchgear Assemblies - for the Primary Service Kiosk
- Material Safety Data Sheets as applicable
- BCSA Directive No: D-E3 090313 1 High Voltage Installations

Note 1: BC Hydro will not issue an Authorization for Connection for any customer-owned primary service prior to receipt of the current permit from a regulatory authority having jurisdiction at the site.

3 Disclaimer

This Primary Guide is not intended as a design specification nor as an instruction manual for customer-owned primary services, and this document shall not be used by the customer, or his contractors or consultants for such purposes. Persons seeking to use information included in the guide do so at no risk to BC Hydro and they shall rely solely upon themselves to ensure that their use of all or part of this document is appropriate in the particular circumstances.

BC Hydro customers or their servants or agents must recognise the fact that they are, at all times, solely responsible for their own plant design, construction, installation or operation. Neither BC Hydro nor any of their employees or agents shall either be or become the agent of the customer in any manner howsoever arising.

BC Hydro review of the specifications and detailed plans shall not be construed as conforming or endorsing the design, nor as warranting the safety, durability or reliability of the customer-owned primary service. BC Hydro, by reason of such review or lack thereof, shall be responsible for neither the strength, adequacy of design or capacity of equipment built pursuant to such specifications, nor shall BC Hydro or any of their employees or agents, be responsible for any injury to the public or workers resulting from the failure of the customer-owned primary services.

In general, the assertion by BC Hydro, or any of their employees or agents, that the customer-owned primary service equipment design meets certain limited requirements of BC Hydro, does not mean, expressly or by implication, that all or any of the requirements of the law or other good engineering practices have been met by the customer-owned primary service, and such judgement shall not be construed by the customer or others as an endorsement of the design or as a warranty, by BC Hydro, or any of their employees or agents. Furthermore, if the customer opts to install BC Hydro standard products certified for utility use, the customer's engineers and contractors assume full responsibility and liability for the application, installation, approval and use of such products and structures.

It is not the duty or the function of BC Hydro to interpret or enforce the Canadian Electrical Code as applicable to the customer-owned electrical installation.

4 Definitions

Acceptable – to certify that customer-owned primary service design and specifications are in compliance with BC Hydro Requirements for Primary Services Guide.

Approved Equipment – electrical equipment certified by a certification agency accredited by the Standards Council of Canada in accordance with the requirements of CSA standards, or other accredited documents where such CSA standards do not exist or are not applicable.

Authorization for Connection – BC Hydro form, issued by Customer Services, authorizing a customer service connection to the BC Hydro utility distribution system.

BC Hydro Designer – Technologist or Engineer in BC Hydro's employ responsible for processing the customer application for primary service connection and adherence to BC Hydro requirements and Distribution Standards.

BIL – Basic Impulse Level, as defined by CSA Standards.

Conduit – a raceway of circular cross-section into which it is intended that conductors be drawn.

Consumer Service – that portion of customer-owned primary service from the service box, or its equivalent, up to and including the point of delivery at which BC Hydro, as a supply authority, makes a connection.

Current Permit – written permission from the inspection department to a supply authority, stating that electric energy may be supplied to a particular installation.

Customer – any individual, person, partnership, company or other entity receiving services from BC Hydro.

Distribution Standards – standards for construction of BC Hydro electrical distribution plant within the service area of BC Hydro.

Electric Service Agreement – formal, legally-binding contract between BC Hydro and the customer, to set forth the terms of supply of electrical energy.

Instrument Transformer Compartment – a switchgear cell or a section of the primary service assembly, consisting of an enclosed metal box or cabinet constructed so that it may be effectively locked or sealed, containing revenue metering transformers.

Isolating Switch – a switch intended for isolating a circuit or equipment from its source of supply, without interrupting the flow of current.

Licensed Electrical Contractor – a person who holds a licence as a licensed contractor for the class of electrical equipment or electrical installation defined by BCSA

Local Operating Order – a special operating or maintenance procedure issued by BC Hydro to attend to, operate and maintain certain equipment or apparatus connected to the BC Hydro distribution system.

Meter Cabinet – lockable, wall-mounted metal box, containing a Measurement Canada-certified BC Hydro revenue meter, connected to the revenue metering instrument transformer compartment.

Operating Permit – permit to operate, maintain and carry out minor alterations to the customer primary service, per the BCSA Safety Standards Act.

Point of Delivery – a physical location in the primary service equipment where BC Hydro, as a supply authority, terminates service cables or conductors to deliver electrical energy.

Primary Guide – BC Hydro document containing the requirements for design, construction, installation, access and connection of customer-owned equipment for primary services supplied by BC Hydro distribution system voltage at 4 kV to 35 kV.

Primary Service – consumer's service equipment, indoor or outdoor, connected to BC Hydro, as the supply authority, at the primary distribution voltage of 4 kV to 35 kV.

Primary Service Dual Supply – Large loads (exceeding 8 MVA in a 7.2/12.5 kV area or exceeding 16 MVA in a 14.4/25 kV area) may be served by two feeders, or customers requiring extraordinary service reliability.

Primary Service Declaration – BC Hydro form entitled "Statement to BC Hydro Regarding Primary Voltage Service Entrance Equipment" ("Primary Service Declaration"), available at all design offices (see Section 5.3. of this Primary Guide).

Primary Service Kiosk – customer-owned outdoor structure containing incoming service cable compartment, service switch or a breaker, and the outgoing cable compartment for connection of customer-owned cables. The kiosk may also include a revenue metering cubicle, a service transformer and secondary switchgear as complete unitized substation.

Primary Service Switchboard – switchgear assembly or portion thereof, consisting of one or more switchgear cells, containing a primary service cable termination compartment, a service switch or a breaker and associated relaying and, where applicable, a primary revenue metering cubicle.

Primary Service Vault – see Service Vault below.

Primary Voltage – voltage above 750 V measured phase to phase.

Protective Barrier – permanent or removable insulation board or a fitting, mounted separate from exposed electrical components, to prevent contact with energized components.

Professional Engineer – a registered professional engineer with qualifications in electrical engineering and registered with APEGBC in good standing in the Province of British Columbia.

Pull Box – approved metal or concrete box to facilitate installation of service cables or conductors.

Regional Distribution Engineer – Professional Engineer in BC Hydro's employ, responsible for a designated portion or a geographic area of the BC Hydro distribution system.

Registered Class A Electrician – a licensed electrical contractor with unlimited voltage restriction and trade qualification per BCSA Safety Standards Act.

Regulatory Authority – the ministry or local government which provides for inspection services and has the authority to require inspection of electrical work in the area of the Province of British Columbia.

Rigid Metal Conduit – rigid conduit of metal pipe made to the same dimensions as standard pipe and suitable for threading with standard pipe threads.

Secondary Voltage – voltage up to and including 750 V measured phase to phase.

Service Box – an approved assembly consisting of a metal box or cabinet constructed so that it may be effectively locked or sealed, containing either service fuses and a service switch or a circuit breaker, and of such design that either the switch or circuit breaker may be manually operated when the box is closed.

Service Connection – that part of BC Hydro's distribution facilities extending from the first attachment point on BC Hydro's distribution system to the point of delivery.

Service Cable Compartment – a switchgear cell or a section of the primary service assembly, containing primary service cables or conductors, and consisting of an enclosed metal box or cabinet, constructed so that it may be effectively bolted down with three penta bolts, and locked by a BC Hydro padlock or sealed.

Service Vault – a room or a space in a building to accommodate service equipment, and constructed in accordance with the National Building Code of Canada and applicable local legislation and bylaws.

Single Radial Supply – comprising of the incoming cable termination and a gang-operated disconnect or loadbreak switch.

Supply Authority – any individual, person, partnership, company or other entity in British Columbia supplying electric energy.

Visible Disconnection Point – physical location in primary service equipment where supply may be interrupted and which allows direct and safe visual confirmation of separated contact by BC Hydro personnel, without the use of climbing structures.

5 Submission Procedure

5.1 Preliminary Design

When applying for a primary voltage electrical service connection, or alterations or upgrade to the existing primary services, which require an electrical permit per BCSA regulations, the customer or the consultant shall, at the preliminary stage of planning, contact the nearest BC Hydro office and provide the following information to the BC Hydro designer:

1. Total connected load and nature of the load, including a list of:
    - Motors 50 hp and larger in 12.5 kV areas and motors 100 hp and larger in 25 kV areas, which require soft start controllers;
    - Harmonic current generating loads such as solid state drives, rectifiers, UPS, high efficiency lighting etc.
    - Flicker generating loads such as arc furnaces, chippers, crushers, etc.;
2. Preferred service type - overhead or underground;
3. Estimated maximum demand;
4. Emergency standby generators as applicable;
5. Service address, and
6. Planned in-service date.

The BC Hydro designer will, in return, supply the customer with the following information:

1. Primary supply voltage – all new primary service equipment must be rated and certified for operation at 14.4 or 25 kV supply;
2. Service type - overhead, underground, radial, or dual supply;
3. BC Hydro terminal pole, switchgear kiosk, fuse size or BC Hydro substation feeder relay settings;
4. Expected future supply changes for which provision must be included;
5. Details of the BC Hydro Electric Service Agreement;;
6. Status of the available capacity to supply proposed new load from the existing distribution feeder, demand limits, largest allowable motor size and soft start requirements, flicker emission limits, harmonic current limits, etc, and
7. Designated space and registered easement on private property for installation of BC Hydro-owned equipment associated with the primary service.

In addition to the above exchange of information, we recommend our customers to visit the BC Hydro website for further resources.

BC Hydro website: www.bchydro.com

Get Connected: www.bchydro.com/getconnected/

Revenue Metering: http://www.bchydro.com/youraccount/content/forms.jsp

Power Smart: www.bchydro.com/business/

5.2 Formal Application

The formal application for a new primary service connection, or alteration of the existing primary service, must include two copies of the following certified documents and drawings:

1. Completed BC Hydro form entitled "Statement to BC Hydro Regarding Primary Voltage Service Entrance Equipment", per paragraph 5.3. below;

2. Electrical one-line diagram including calculated fault levels, interrupting rating of protective devices and emergency stand-by generation, per paragraph 5.2.1. below;

3. Protective device coordination graph showing coordination between the customer and BC Hydro protective devices, per paragraph 5.2.2. below;

4. Site plan and simplified isometric, i.e. 3D drawing, of the primary conduit run, as applicable, per paragraph 5.2.3. below, and

5. Primary service switchboard drawing, including circuit breaker control wiring diagram and key interlock scheme if applicable, per paragraph 5.2.4. below.

Note 2: An incomplete application or the lack of a final inspection certificate may delay the date of service to the customer.

Note 3: All liability for design and installation of customer-owned primary service rests with the customer's Professional Engineer and Licensed Electrical Contractor.

5.2.1 Electrical One-Line Diagram

See sample drawings PG A1-01 and PG A2-01.

The electrical one-line diagram shall show the connection of all service entrance equipment and emergency stand-by generators, if applicable. In addition, the one-line diagram shall clearly show the cable and conductor sizes, available fault levels and interrupting rating of the overcurrent protection devices, proposed service entrance fuse ratings or proposed relay settings, etc. It shall serve as a supplement to the Primary Service Declaration document described in paragraph 5.3. below. For BC Hydro primary service cable sizes, see the attached BC Hydro drawings PG C1-03 and PG C2-03.

With regards to customer-owned emergency standby generation, BC Hydro requires the following information:

1. Rating, make and model of the emergency standby generator and the associated break-before-make transfer switch, and a copy of the certificate of CSA approval, or equivalent;

2. Details of generator connection, parallel operation with BC Hydro grid and relaying protection for any make-before-break type of automatic transfer switches per CEC Section 84 or bumpless transfer, for review and approval by BC Hydro Planning Department – Interconnection Generation Group. For further information, see the *Interconnection Requirements for Closed-Transition Transfer of Standby Generators* document, available on the BC Hydro website at http://www.bchydro.com/youraccount/content/new_construction_renovation.jsp

and

3. A copy of the Certificate of Final Inspection by the BCSA after completion of installation, to certify that all electrical equipment was installed in accordance with the applicable codes and local bylaws.

Note 4: In the event of any malfunction or improper installation of a customer-owned transfer switch and/or stand-by generator, the owner is responsible for any damage to the BC Hydro revenue metering equipment and to the service connection.

5.2.2 Protective Device Coordination Graph

See sample drawing PG D1-01.

A standard sized 4-½ x 5 cycle log-log graph shall be used for the coordination study. It is mandatory that the customer's service entrance protective device setting be compatible and coordinate with BC Hydro protective equipment. For further information regarding protection requirements, refer to Section 10.

Note 5: For complex or illegible coordination graphs, BC Hydro may request the customer to submit the graph on an 11"x17" sheet instead of a regular 8-1/2"x11" sheet.

5.2.3 Site Plan

See sample drawing PG B1-01.

The site plan shall show all details of the primary service installation, both civil and electrical, overhead or underground. In particular, the plan shall show the location of the building and the primary service vault, the proposed terminal pole or service manhole, and routing of the aerial line or underground cables on private property to the customer primary service. For further information, review Section 7 - Scope of Supply for Primary Services**.**

To expedite project approval, BC Hydro requires the customer or his consultant to show a simplified isometric drawing of the proposed primary service conduit, bends, fittings and pull boxes as an integral detail of the site plan drawing. See Section 8 for further details about underground service requirements and the attached PG B1-01 sample drawing.

5.2.4 Primary Service Switchboard or Service Kiosk

The customer shall submit to BC Hydro for comments and acceptance, prior to manufacturing, two copies of drawings for a proposed primary service switchboard or drawings for a proposed primary services kiosk. The BC Hydro designer will issue a response letter with the referenced drawings, and return them to the customer with applicable comments and a confirmation of acceptance.

To avoid costly changes and field modifications of the customer-owned equipment, no manufacture of the equipment should commence until all drawings and information have been reviewed and accepted by BC Hydro within four weeks from the date of receipt.

BC Hydro is particularly concerned about safety to the public and the service crew. Therefore, customer-owned primary service equipment must be designed, manufactured and installed to meet all pertinent regulations including those of:

1. WorkSafe BC regarding the safe working space, operating access and electrical clearances;

2. BC Hydro Safety Practice Regulations for grounding details, limits of approach and barriers for energized conductors, interlock schemes and lockout provisions, and

3. CSA, CEC, BCSA and local inspection authorities.

> **Note 6:** Each cell, cubicle or compartment of the primary service switchboard, as well as service cable pull boxes, which are for the exclusive use of, and restricted access to, BC Hydro personnel, must be equipped with a padlocking hasp, or BC Hydro proprietary security bolts, or other security restraining means with sealing provisions.

The primary service switchboard or kiosk drawing must show the following:

1. Fully dimensioned switchboard cells and details, access doors and locking provisions;

2. Ground bus layout, equipment grounding pads and personnel safety ground balls;

3. Primary service cable compartment and cable termination provisions – see the attached drawings PG C1-01, PG C1-02, PG C2-01 and PG C2-02;

4. Main switch or a breaker switchboard cell;

5. Wiring diagram of the circuit breaker and protective relaying as applicable;

6. Interlocking diagram, equipment nameplates and “HIGH VOLTAGE” warning signs, and

7. Primary or secondary revenue metering compartment or switchboard cell.

For further design and installation details, please contact your BC Hydro designer, and review the BC Hydro Distribution Standards and other sections of this Primary Guide.

5.3 Primary Service Declaration

See sample form attached in Appendix 2.

The form entitled “Statement to BC Hydro Regarding Primary Voltage Service Entrance Equipment” (“Primary Service Declaration”) shall be fully and properly completed to provide information about customer-owned primary service equipment. This form shall be signed by a registered Professional Engineer, or Licensed Electrical Contractor who is certified to undertake acceptable liability for design and installation of primary services, or be approved by the electrical inspection authority having jurisdiction of the site, as per the BCSA Directive D-E3 090313 1 “High Voltage Installations”, available at:

(http://www.safetyauthority.ca/new/sites/default/files/DE30903131Highvoltage.pdf.) For a free copy of the BC Hydro Primary Service Declaration, please contact your local BC Hydro design office or visit the BC Hydro website at http://www.bchydro.com/youraccount/content/electrical_connections.jsp

5.4 HV Vault Report and Authorization for Connection

Prior to the final inspection for authorization of connection, BC Hydro must receive an HV Vault Report certified by a Professional Engineer, with the following information:

1. Protective relaying study;
2. Fault coordination study;
3. Step and touch voltage study, per CEC Part I, Section 36;
4. Service switch or breaker test report, protective relaying test report, as applicable;
5. Transformer production and commissioning test report for unitized substations, including oil analysis report, if applicable;
6. High voltage cable test report, if applicable;
7. "As Built" engineering drawings;
8. Copy of the Final Inspection certificate from the inspection authority having jurisdiction of the site, and
9. Current Permit.

> **Note 7:** For installation of **used** equipment in customer-owned primary services, the customer shall also provide a copy of certified test results, reviewed by a Professional Engineer, to certify that the proposed equipment has been tested and it is suitable for connection to the BC Hydro distribution system.

5.5 Primary Service Voltage Conversion Requirements and Procedure

BC Hydro is continuously upgrading and expanding the power distribution grid, for improved service reliability and to meet the growing demand for electrical energy. Accordingly, various BC Hydro feeders are being upgraded from 12.5 kV to 25 kV, which may require existing customers to upgrade their customer-owned primary service equipment.

Primary service voltage conversion is a major undertaking, and BC Hydro issues a minimum of six months advance notice to all customers affected by the proposed upgrade, to allow adequate time to make the necessary plans. To complete the conversion, BC Hydro requires a power outage, and the notice clearly states the date and time and duration of the scheduled power outage, as necessary for the planned conversion.

All primary customer-owned equipment must meet the requirements for higher primary supply voltage and increased fault level, overcurrent protection, potential rise of ground grid and step-and-touch voltage requirements per CEC Part I Section 36. Therefore, the customer must follow all steps and obtain the necessary inspections and approvals described in Section 5.4 above.

6 BC Hydro Primary Distribution System

6.1 General

All BC Hydro primary service connections are fed from the BC Hydro primary voltage distribution system, comprising a three-phase, four-wire, multi-grounded common neutral system. The primary distribution voltages are:

1. 2,400 V/4,160 V Grounded Wye;
2. 7,200 V/12, 470 V Grounded Wye;
3. 14,400 V/24, 940 V Grounded Wye, and
4. 19,920 V/34, 500 V Grounded Wye (currently used only in some rural applications in the Central Interior area of the Northern Region).

System frequency is at 60Hz $\pm$ 0.1Hz. Primary voltages may be designated in this guide by their nearest whole number; e.g. a nominal voltage of 12 kV means 7,200 V/12,470 V Grounded Wye.

BC Hydro will determine the voltage of the customer's service. BC Hydro will normally supply a service at a secondary voltage and size as listed below. If the customer requires a larger service, or service at a different voltage, or if it is not feasible for BC Hydro to install the equipment required for a secondary service, then a primary service will be offered. The customer must contact the BC Hydro designer to determine what voltage they will be served at **before** designing the electrical room and the purchase of equipment.

The following are the maximum consumer service switch sizes, rated for 80% continuous operation, to be supplied by BC Hydro at the secondary distribution voltage in areas where the primary service voltage is either 12 kV or 25 kV:

Overhead

- 600 A at 1Ø 3-wire 120/240 V, 80% rated main switch
- 400 A at 3Ø 4-wire 347/600 V, 80% rated main switch
- 1200 A at 3Ø 4-wire 120/208 V, 80% rated main switch

Underground

1. In areas where the primary service voltage currently is 12 kV (may include areas that are 'Designated as 25 kV'):
   - 600A at 1Ø 3-wire 120/240 V, 80% rated main switch
   - 1600A at 3Ø 4-wire 120/208 V, 80% rated main switch
   - 600A at 3Ø 4-wire 347/600 V, 80% rated main switch
2. In areas where the primary service voltage is 25 kV:

- 600 A at 1Ø 3-wire 120/240 V, 80% rated main switch
- 1600 A at 3Ø 4-wire 120/208 V, 80% rated main switch
- 1600 A at 3Ø 4-wire 347/600 V, 80% rated main switch

3. In some rural applications where the primary service voltage is 19,920 V/34,500 V Grounded Wye, the maximum consumer service switch sizes, rated for 80% continuous operation, to be supplied by BC Hydro at the secondary distribution voltage:

- 600 A at 1Ø 3-wire 120/240 V, 80% rated main switch
- 1600 A at 3Ø 3-wire 120/208 V, 80% rated main switch
- 600 A at 3Ø 4-wire 347/600V, 80% rated main switch

For further details and 100% rated services and main switches, please refer to Distribution Instruction S10-4 *Electric Service Connections – Voltages*, available from the BC Hydro designer.

6.2 Supply of Service Transformers

For secondary voltage service, BC Hydro will supply and install the necessary transformers. For primary voltage service, the customer will supply and install customer-owned transformers as required. The exception could be for overhead primary services, usually in rural or industrial areas, where BC Hydro may supply standard overhead transformers up to 167 kVA per phase, if requested by the customer.

Note 8: Parallel connection of BC Hydro transformers is not permitted.

6.2.1 Primary Service Transformer Connections

The customer-owned transformer connections accepted by BC Hydro are:

1. Grounded Wye – Grounded Wye. Primary and secondary transformer neutrals must be connected together, solidly grounded to station ground and connected directly to the BC Hydro service system neutral, to minimize the neutral voltage rise caused by the load imbalance. This is the BC Hydro preferred connection for better ground fault protection and safety of operating personnel.

2. Delta – Grounded Wye. This connection is a common connection for factory-built unit substations with dry-type transformers and solidly grounded wye point. Ferroresonance could be a problem, as with all ungrounded primary transformer connections, wherein voltage feedback will occur when one primary phase opens.

3. Delta – Resistance Grounded Wye. This connection is preferred for limiting the damage to sensitive electronic equipment caused by line-to-ground fault. In addition, mission critical production machinery could continue operating in the presence of a line-to-ground fault until a planned shutdown. In this configuration, secondary windings are relatively disconnected from the station ground, and large service transformers could exhibit similar types of problems, such as overvoltage feedback from the primary side and ferroresonance, if any one primary phase would open circuit.

4. Ungrounded Wye – Delta. The transformer primary neutral is floating and insulated to the service potential to avoid over-voltage feedback and single-phasing problems. Each single-phase transformer requires two

primary bushings, and primary voltage could be present on this floating neutral under certain conditions, for example one phase open caused by a blown primary fuse.

5. Delta – Delta. Two-bushing transformers are required for a three-phase bank of single-phase transformers. If one phase of the primary line opens, a backfeed voltage approximately equal to one-half line-to-line voltage will be impressed on the open phase. Ferroresonance could be a problem, as with all ungrounded primary connections.

Notwithstanding the above, BC Hydro strongly recommends the customer to seek the advice of a Professional Engineer regarding the type of transformer connection to suit the plant operation, specific load requirements and ground fault protection scheme.

6.2.2 Service Neutral Connections

An appropriately sized connector shall be provided on the neutral bus in the service entrance switchboard adjacent to the service conduits.

Regardless of the power transformer primary connection, the BC Hydro service neutral will be terminated at the customer's grounded neutral bus in order to maintain primary ground fault continuity. Where switchgear is used, an appropriately sized connector shall be provided on the customer's grounded neutral bus for this purpose.

Where primary voltage revenue metering is installed, the customer's neutral shall be extended to:

(a) the pole-mounted metering kit, for overhead line construction with a pole top metering kit, or

(b) the revenue metering instrument transformer switchgear cell, if primary switchgear is used.

For further information, please refer to the BC Hydro document *Requirements for Manually Read Primary Service Voltage Revenue Metering (4 kV to 35 kV)*, available from the BC Hydro web site at http://www.bchydro.com/youraccount/content/forms.jsp.

6.2.3 Transformer Taps

BC Hydro recommends that customer-owned transformers use industry-standard 2 x 2.5% primary taps above and below rated voltage. The BC Hydro system operates within the voltage range specified in CSA Standard C235-83. The use of taps on the customer's transformer will allow the customer to adjust the voltage, as required, at the point of utilization.

7 Scope of Supply for Primary Services

7.1 BC Hydro Scope of Supply for Overhead Service Connection

For primary overhead service connection to the customer loadbreak switch located on the first customer-owned pole, BC Hydro supplies the following equipment for installation by the customer's licensed electrical contractor:

(a) Outdoor-type primary revenue metering transformers, complete with a pole mounting bracket and a revenue metering cabinet for primary revenue metering, or

(b) Switchgear-type secondary revenue metering transformers and an indoor revenue metering cabinet for secondary revenue metering.

For primary overhead service connection, BC Hydro normally supplies the following:

1. Fused cutouts on the supply end of the primary service connection;

2. Fused links for overcurrent protection of the BC Hydro primary service conductors;

3. Solid links and BC Hydro feeder protective relaying for large primary services, and

4. Primary overhead service conductors and the primary service connection to the customer-owned loadbreak device. The loadbreak device shall be rated for 600 A continuous and 22 kA fault closing current.

BC Hydro requirements on private property extend to the installation of primary or secondary revenue metering, which must comply with BC Hydro metering requirements listed on the BC Hydro web site at http://www.bchydro.com/youraccount/content/forms.jsp, and Section 6 of this Primary Guide.

Note 9: All revenue metering equipment and necessary conduits must be installed by the customer on the second customer-owned pole, or as agreed with the BC Hydro designer. All control and interconnection wiring is supplied and installed by BC Hydro.

Note 10: Location of the first customer-owned pole, as the point of delivery, must be selected in agreement with BC Hydro. Thereafter, the pole lines on private property, pole dip, customer-owned unit substations, etc. are installed, owned and maintained by the customer under the jurisdiction of the BCSA or other authority having jurisdiction.

To minimize the effect of transient switching surges and lightning strikes, the customer must install adequate surge arresters near the primary revenue metering apparatus.

7.2 BC Hydro Scope of Supply for Underground Service Connection

For primary underground service connection, BC Hydro will supply and install the primary service cables, pulled inside customer-owned cable conduit, and corresponding service cable terminators installed inside the utility service cable compartment of the customer-owned primary service switchboard, as the point of delivery. BC Hydro may install the following types of cable terminators:

(a) Cable terminators for XLPE cables, per attached BC Hydro drawing PG C1-02 and

(b) Potheads for PILC type cables, per attached BC Hydro drawing PG C2-02 (PILC cable is obsolete and very seldom used for new primary service connection).

For primary underground services, BC Hydro will supply the following equipment for installation by the customer's Licensed Electrical Contractor:

(a) Switchgear type primary revenue metering transformers and revenue metering cabinet for the primary revenue metered service, or

(b) Switchgear type secondary revenue metering transformers and revenue metering box for the secondary revenue metered service.

BC Hydro requirements on private property extend to the installation of primary or secondary revenue metering, which must comply with the BC Hydro metering requirements listed on the BC Hydro web site at http://www.bchydro.com/youraccount/content/forms.jsp, and Section 6 of this Primary Guide.

Note 11: All revenue metering equipment and necessary conduits must be installed by the customer, whereas all control and interconnection wiring is supplied and installed by BC Hydro.

Upon receipt of the application for a new service, BC Hydro will, in consultation with the customer, determine the best available form of underground service, in accordance with a designated BC Hydro primary distribution system:

(a) **Single Radial Supply** – comprising the incoming cable termination and a gang-operated disconnect or loadbreak switch, as per the attached drawing PG A1-01. The demand load range is 40 A to 375 A with transformer sizes of 500 kVA to 8 MVA for 12 kV supply. For 25 kV supply transformer sizes are 500 kVA to 16 MVA.

(b) **Primary Service Dual Supply** - Comprising two radial supplies, as per the attached BC Hydro drawing PG A2-01. This configuration may be required for:

- High reliability primary services with a standby feeder, and
- Large loads exceeding the limits stated in paragraph (a) above, in consultation with the BC Hydro designer.

(c) **Other** – customer special request (for example, dedicated standby supply).

The procedure for transferring customers from the normal feeder to the standby feeder involves momentarily paralleling both circuits in the customer's vault. For a detailed description of the switching procedure, please contact BC Hydro's Work Methods department.

7.3 Customer Scope of Supply for Indoor Primary Service Vaults

The customer shall supply and install the following:

1. Primary service vault located at the side of the slab-on-grade building adjacent to the BC Hydro underground supply point – refer to attached drawing PG B2-01. For a "parkade" type building, the

customer shall locate the primary service vault in agreement with the BC Hydro designer or Regional Distribution Engineer;

2. Primary service vault access door key;

3. Cable pull pit (with pulling iron, removable cover plates and drainage) located directly below the primary service switchboard, with minimum dimensions as shown on the attached drawing PG B2-01;

4. All primary service cable ducts, conduits and fittings on the customer's property;

5. Engineered structural supports for the service cable ducts and conduits;

6. Metal cable pull boxes with hinged cover doors equipped with penta bolts and padlocking hasp, as per attached drawings PG C1-01.01 and PG C2-01;

7. Primary service cable compartment(s) with grounding balls and safety insulation barriers per Section 9.1.1, busbar phasing ABC, left to right;

For further details, see the attached drawing PG B2-01.

7.4 Customer Scope of Supply for Outdoor Primary Service Kiosks

A customer-owned outdoor-type "primary service kiosk" includes the incoming service cable compartment, the service switch or a breaker and the outgoing cable compartment for the connection of customer-owned cables. In some cases, the kiosk may include a primary revenue metering cubicle, a service transformer and secondary switchgear, as a complete unitized substation.

The customer shall supply and install the following:

1. Concrete pad for the primary service kiosk with conduit stubs located to align with the primary service cable compartment busbars; see attached drawing PG B3-01;

2. Concrete cable pull box with pulling iron located near the primary service kiosk for longer service cable runs;

3. All primary service cable conduits located on the customer's property;

4. Primary service cable compartment(s) with grounding balls and safety insulation barriers per Section 9.1.1, busbar phasing ABC left-to-right, and

5. Customer power supply for service kiosk heaters, lights and convenience plugs after the revenue metering point. The customer is required to show such a dedicated supply circuit on the one-line diagram.

For further details, see the attached drawing PG B3-01.

Subject to acceptance by BC Hydro and approval by the local authority having jurisdiction at the site, the customer-owned cable pull box, referred to in the attached drawing PG B3-01, may be designated as a demarcation structure and a point of delivery. This concrete cable pull box shall meet all requirements stated above and have access restricted to BC Hydro personnel only. In agreement with BC Hydro, the customer shall locate the cable pull box or demarcation structure on private property, and supply and install all supply and load

side conduits and outgoing service conductors, as described above. BC Hydro will supply and install the supply side conductors, and supply and install all J-bars and loadbreak or deadbreak elbows for service cable terminations.

7.5 Customer Scope of Supply for Primary Revenue Metering Kiosks

The customer, with BC Hydro's approval, may opt to install the primary revenue metering kiosk, outside the customer's primary service vault or private overhead line, as a designated demarcation structure and a Point of Delivery. This configuration may be suitable for distributed industrial plants having multiple distribution transformers, strip malls, etc., or special installations requiring restricted access to BC Hydro personnel on private property.

A primary service metering kiosk includes all requirements and equipment listed in Section 7.4. above, with the addition of a primary revenue metering cubicle, as described in Section 10.8. In addition to other requirements, the revenue metering cubicle shall have a mechanical key interlock with a primary service switch(es) on the line side and on the customer load side if applicable, for safe access into the cubicle when the switches are locked out in the OFF position only.

8 Guidelines for Primary Service Construction

8.1 General

Customer-owned high voltage installations must comply with the applicable rules and regulations of the BCSA, BC Electrical Code and other regulatory authorities having jurisdiction at the site. In addition, the CSA Standard C22.1 (CEC Part I) makes the following references:

1. Rule 36-000, Scope, paragraph (2): "The supply authority and the Inspection Department must be consulted before proceeding with any such installation";

2. Rule 36-200, Service Equipment Location: “Service equipment shall be installed in a location that is in compliance with the requirements of the supply authority and, in the case of a building, shall be the point of service entrance, and

3. Rule 36-202, Rating and Capacity, paragraph (b): The type and rating of circuit breakers, fuses and switches, including the trip settings of circuit breakers and interrupting capacity of overcurrent devices shall be in compliance with the requirements of the supply authority for consumer’s service equipment.

Notwithstanding the above, all BC Hydro primary distribution systems are engineered and constructed in accordance with the certified BC Hydro Distribution Standards pertinent to BC Hydro as a self-regulating utility. Therefore, all customer-owned primary services connected directly to the BC Hydro distribution system must be engineered and certified to be compatible with this system, including all electrical equipment, support structures and the method of primary service connection, as well as service isolation, to ensure public safety. Accordingly, customer-owned primary installations must be installed by a licensed electrical contractor, registered and licensed by the BCSA.

> **Note 12:** In the event that customer-owned equipment poses a safety or operational issue to the BC Hydro distribution system, BC Hydro may disconnect such primary service until the issue has been resolved.

For more information, see BC Hydro Distribution Instruction S10-4 *Electric Service Connections – Voltages*, available from the BC Hydro designer.

8.2 Underground Service Cables and Overhead Service Conductors

BC Hydro will supply and install all primary service conductors, including all cable terminators, from the BC Hydro system to the customer point of delivery. BC Hydro requires a communication duct, and provisions must be made to allow for a separate conduit to be used for communications cables. The majority of BC Hydro primary service cables are cross-link polyethylene concentric neutral cables or paper-insulated, lead-sheath covered cables.

BC Hydro shall determine the number and size of cables, conductors and conduits, based on the information received about the load profile and size of the primary service. For detailed information about overhead conductors, underground cables and installation costs, please contact the BC Hydro designer.

8.2.1 Cable Protection

Service cable runs on private property shall be kept to a minimum to reduce the possibility of cable damage and subsequent disturbance to other services fed from that same circuit.

Primary service cables shall be adequately supported and protected from mechanical damage at all times. Cables located on walls inside a vault shall be protected either by suitable metal covers or by fences. All exposed cable pits shall be covered by suitable steel or aluminium checker plates, as shown on the attached drawing PG B2-01. All plates shall be sized and located for easy removal, taking into account weight restrictions. In addition, each plate shall be bolted down for safety and shall restrict access to unauthorized persons.

A solid concrete barrier is required to separate BC Hydro service and customer distribution cables, if both sets of cables are in the same cable pit.

8.2.2 Cable Termination

As stated in section 7.2 above, BC Hydro will supply and install the following types of service cable terminators:

(a) Termination kits for XLPE concentric neutral cables, for live front equipment, or

(b) Potheads for PILC type cables, for live front equipment.

Note 13: All service cables must enter the primary service compartment from the bottom and all cable terminators and potheads must be installed and secured in the upright position. BC Hydro will not accept inverted cable connections or inverted cable terminators.

8.2.2.1 Potheads for Paper-Insulated Lead-Sheathed Cables

Space shall be provided in the service cable compartment of the service entrance switchboard to accommodate the BC Hydro pothead. Typical pothead dimensions are shown on the attached drawing PG C2-02 but customers must check with BC Hydro for the actual pothead size and type that will be used. The height of the BC Hydro pothead fixing centres shall be 1200 mm minimum, above the electrical room finished floor. Inverted pothead arrangements are not acceptable to BC Hydro for PILC cables under any circumstances.

To avoid damage to the porcelain insulators of the pothead, the clearance between the pothead to the switch or bus work shall be a minimum of 150 mm and the connection shall be made with flexible stranded tinned copper braid, with two-hole bolted connector ends to allow for easy disconnection. The flexible braid shall be rated for 400 A and positioned such that the braid is not stretched and there is an "S" shaped bend in the braid when installed. The braid shall be supplied and owned by the customer.

8.2.2.2 Cable Terminators for Concentric Neutral Service Cables

Appropriately-sized split wood blocks with hole-sizing set out on attached drawing PG C1-01, or CSA approved cable restraining fixtures, shall be provided at a minimum 900mm above the centre line of the cable entry conduit, for short circuit bracing and to support the XLPE concentric neutral cables in the service entrance switchboard. Concentric neutral cable terminations shall be in accordance with the attached drawing PG C1-01.

Note 14: The customer shall contact the BC Hydro designer regarding the design and spacing of the incoming service cable compartment, per the attached drawing PG C1-01.

BC Hydro's prevailing standard is to install 25 kV rated service cables, and the service cable compartment must be suitable for longer cable terminators.

To ensure safety for limits of approach, the customer shall install removable insulation protective barriers or removable insulation booths, as described in paragraph 9.1.1 below.

8.3 Service Conduits, Manholes, Pull Boxes and Pull Pits

All service conduits, manholes, pull boxes and pull pits on private property shall be installed by the customer in accordance with the latest editions of BC Hydro's ES54 BC Hydro Underground Civil Standards and BC Government regulations, with particular reference to the latest revision of the CSA Standard C22.3 No. 7 – Underground Systems.

For further design details, refer to drawings ES54 S3-01.01 and ES54 S3-01.02 from the BC Hydro Underground Civil Standards manual, available from the BC Hydro designer.

8.3.1 Joint Usage

Primary service cables and third-party communication cables shall normally be maintained in separate duct banks, but joint use is acceptable to BC Hydro under the following conditions:

1. Adequate protection to the communication cables exists, i.e. cable insulation, duct bank construction, etc.;
2. The communication cables occupy separate and individual assigned ducts, and
3. If BC Hydro allows a communication cable sub-duct, it will be inside the BC Hydro neutral duct only.

Please contact BC Hydro regarding construction and work practices for work in a manhole.

8.3.2 Drainage

The customer shall ensure a downward sloping grade towards drain locations and provide proper drainage to the underground service entrance conduits/ducts, including cable pits, within his property. BC Hydro will seal the conduits at the BC Hydro vault, to prevent the entrance of moisture or gases and the spread of fire.

Note 15: The customer shall contact the local inspection authority and building department for compliance of the drainage connection of service conduits and pulling pits to the building drainage system.

8.3.3 Primary Service Conduits

The customer shall consult with BC Hydro to determine the number and size of the primary service entrance conduits and design details of the duct bank to be installed. Proper drainage shall be provided for each conduit run.

BC Hydro is particularly concerned with the installation of underground conduits for primary service cables, to minimize cable damage from pulling stress and abrasion caused by the conduit walls. Therefore, BC Hydro may require the installation of pull boxes, if the length of service run is longer than 50 m (150 ft) or if the total number of conduit bends exceeds 135 degrees. For outdoor installation, BC Hydro may require a concrete pull box equivalent to the BC Hydro standard 832 Box. For indoor installation, a metal pull box may be used, 36"W x 72"H x 12"D in dimensions and equipped with:

1. cable bracing blocks;
2. a hinged cover door;
3. shrouded penta bolts, and
4. a padlock hasp for the BC Hydro lock.

BC Hydro line crews use standard pulling harnesses and mandrels, which are best suited for the unrestricted diameter of the conduit. For this reason, conduits shall be installed using factory standard bends, with a 900mm minimum radius, and sealed fittings to prevent ingress of sand and other sedimentary materials depositing inside the conduits.

> **Note 16:** BC Hydro does not accept thin-wall EMT as a substitute for rigid steel conduits with threaded fittings inside buildings.

All portions of the customer-installed service conduit run must be "proven" by having a suitable mandrel pulled through in the presence of a BC Hydro representative, and all conduits shall be left with an acceptable #8 polypropylene pulling string in place.

In all cases, the service conduits shall be finished with an acceptable factory or machined bell end inside pull boxes, pull pits or transformer pads.

8.3.3.1 Concrete Encasing

Where conduits are specified to be encased in concrete, these conduits shall be corrosion-resistant with concrete tight couplings, have a minimum covering thickness of 75 mm and a minimum separation, both horizontally and vertically, of 45 mm. The concrete shall be in accordance with CSA Specification A23, latest revision, and a have minimum strength of 20 MPa at 28 days.

8.3.3.2 Structural Supports

Extended runs of exposed rigid steel conduits inside the buildings must be installed with support structures to hold the weight of the cables and conduits, and to withstand the required cable pulling forces, during the installation and removal of service cables. Therefore, these exposed conduit support structures shall be engineered.

Except for installation in the service conduit, the service cable shall be adequately supported with fixed clamps at suitable intervals, by the customer.

8.3.4 Cable Pits

BC Hydro requires construction of cable pits for indoor vaults, and all service entrance conduits shall terminate in a cable pit under the primary service switchgear cubicle, unless otherwise advised by BC Hydro. The pit shall have sufficient dimensions to provide a minimum 900 mm radius bend to train the cable to the cable terminator.

Cable pits shall extend outside the primary service switchgear to permit easy installation of service cables. For further design details, see the attached drawings PG B2-01 and PG B3-01 showing typical installations.

Cable pits shall be covered by steel or aluminum checker plates in areas not under the cubicle. In addition, where the cable pit extends underneath the cubicle, all cells (other than the cable entry compartments) must

have a metal base barrier installed to prevent possible worker exposure to live parts when working in a pit. This barrier may be an integral part of the switchgear. For further reference, see Section 8.2.1. above.

BC Hydro has specific weight requirements for cable pit covers, namely 25kg maximum for a removable section and 40kg maximum for a hinged section, pursuant to WCB regulations and BC Hydro work methods, above energized cable pits. For this reason, a site meeting between the BC Hydro civil inspector and the electrical contractor shall be necessary to firm up the cable pit cover layout and details before manufacturing.

Weight and grounding of individual steel checker plates present a safety issue if individual plates are installed improperly or grounding jumpers are left out. Therefore, as an alternative to the steel checker plates, BC Hydro encourages all customers to propose installation of approved composite material covers, such as fibre concrete or other materials suitable for live load and weight/size limitations. Prior to manufacture of such composite cable pit covers, the customer shall submit the proposed design with material specifications to BC Hydro for acceptance and to the **building department having jurisdiction of the site**.

For service with future expansion requirements, the cable pit shall be sufficiently large with suitably placed pulling eyes and removable checker plate covers to enable the cables to be pulled and trained to enter existing or future switch locations without difficulty. It is the customer's responsibility to provide an adequate number of conduits to allow for future expansion in consultation with BC Hydro.

Proper drainage shall be provided in each cable pit, as per Section 8.3.2. above.

8.4 Indoor Primary Service Vaults

Every electrical equipment vault, including the doors, ventilation and drainage, shall be constructed in accordance with the applicable requirements of the current BC Building Code Section 9.5.3 or applicable local legislation and the authority having jurisdiction at the site.

All primary service vaults must be built to accommodate 14.4/25 kV primary supply, although BC Hydro supply in the area may currently be 7.2/12 kV. This is required to minimize the impact of the future voltage conversion from 7.2/12 kV to 14.4/25 kV.

The vault shall provide safe working space in the vicinity of the service entrance equipment including the metering provisions in accordance with the latest revision of the CEC, Part 1, Rule 2-308. In addition, BC Hydro requires a minimum of 1.5 m clearance in front of the service cable compartment to apply safety grounds in accordance with BC Hydro Work Methods.

Adequate illumination shall be provided to allow for proper operation and maintenance of electrical equipment, and the lighting shall be controlled by wall switches located at the entrance to these areas.

The primary service vault shall have an unobstructed means of egress in compliance with the National Building Code of Canada. Where compartment hinged doors or drawout components block the exit route, then a clear minimum space of 0.6 m must be maintained from the edge of the access door or components when in the fully open position.

The passageways and working space around the electrical equipment shall not be used for storage, and they shall be kept clear of obstruction and arranged so as to give BC Hydro ready access to the service entrance and metering compartments.

8.4.1 Height

Vault height shall be of such dimensions as to accommodate the installed equipment with at least the minimum headroom of 2.2 m. All clearances must meet the requirements of the BCSA, BC Building Code and applicable local jurisdiction.

For slab-on-grade buildings, the primary service vault shall be located at the side of the building adjacent to the BC Hydro underground supply point with unrestricted access to the vault door directly from outside. For parkade type buildings, the primary service vault must be in a location approved by the BC Hydro designer or Regional Distribution Engineer. In either case, the location shall also provide satisfactory access to allow unobstructed movement for replacement of equipment and access for personnel. All doorways shall be a minimum of 1.22 m in width. Depending on equipment size, a larger doorway may be required. The vault door must open outwards. The vault shall be at sufficient elevation to allow natural drainage to the building drain.

Customers shall provide BC Hydro with the necessary access keys to the vault.

The BC Hydro preferred method for termination of primary service cables is to use cable terminators, as indicated in the attached drawing PG C1-01, and as described in Section 8.2.2.above.

8.5 Outdoor Primary Service Kiosks

BC Hydro's preferred method for primary service kiosk connection is to eliminate the cable pull pit below the service kiosk, and replace it with a cable pull box located approximately 3.0 m (10 ft) from the kiosk concrete pad, as shown on the attached drawing PG B3-01. This allows adequate sealing of the service conduits and prevents ingress of earth gases into the service kiosk, which reduces deterioration of components and extends the life expectancy of the service kiosk. For further information, contact the BC Hydro designer.

BC Hydro will neither accept nor operate customer-owned loadbreak elbow cable terminators.

A specific type of primary service kiosk design, which has an integral oil-immersed loadbreak switch inside the transformer tank as a primary service switch, does not comply with BC Hydro Work Methods' requirements, nor with this Primary Guide. BC Hydro line crews rely on a Class A electrician, who holds an annual permit for the customer-owned primary service, to operate customer-owned equipment for single radial supply. Location of the viewing window and the switch operating handle must meet applicable CSA standards, and requirements of the local inspection and regulating authorities. For these types of installations, BC Hydro may accept a primary service cable pull box, equipped with loadbreak or deadbreak elbows. Loadbreak or deadbreak elbows will be supplied, installed, and operated by BC Hydro.

> **Note 17:** A limited number of customer-owned primary service kiosks with loadbreak elbows and oil immersed service switches have been installed in the past, under special Local Operating Order provisions. However, such installations are no longer acceptable to BC Hydro.

8.5.1 Sulfur Hexafluoride (SF_6) Filled Equipment in Outdoor Kiosks

For improved safety, reliability and reduced cost of ownership, BC Hydro will accept SF_6-insulated customer-owned primary service switches installed in outdoor kiosks. However, the switch and the enclosure shall conform to the following BC Hydro requirements:

1. The customer shall provide a certified test report, which includes the initial volume of SF_6 gas, expected leakage rates and proof of load make-and-break capabilities at expected end-of-life gas volume;

2. Switches with an integral filling port shall be equipped with a pressure indicating device for low SF_6 gas pressure;

3. The service switch shall be equipped with integral viewing ports for a clear view of the contacts in each pole in the open/closed/grounded positions, similar to BC Hydro's standard deadfront switchgear;

4. There shall be an integral grounding switch for each pole, mechanically interlocked to prevent direct switching from the grounded into closed position;

5. Each switch enclosure shall contain screened and louvered ventilation ports on the front and back baseboards as means of egress for leaked-out SF_6 gas – minimum $1cm^2$ port per 1 litre volume of SF_6 gas contained inside the switch, and

6. The service kiosk shall be installed on a flat concrete pad with no cable pits below the switchgear. All cable conduits shall be sealed with an approved duct seal (See drawing PG B3-01).

9 Primary Service Switchboard Construction

9.1 General

Construction of the entire primary service switchboard shall comply with CSA C22.2 No. 31, current edition.

> **Note 18:** The incoming switchboard cell shall be designated as the consumer service box and shall contain service fuses, a service switch or a breaker, and associated relaying and power monitoring devices. Consumer branch feeders and apparatus not related to the primary service supply shall not be installed inside the incoming consumer primary switch cell. BC Hydro relies on the customer's isolation switch for the point of isolation to work on the service cable.

Switchboard cells shall be constructed so that access to individual components can be readily obtained. Access to service cable terminations, loadbreak switches, disconnects (where required) and metering compartments shall be through single hinged panels, which are securely fastened by bolting and locking. For the outdoor- type primary services kiosk, BC Hydro requires "shoebox" type door panels with neoprene gasketing and three penta type bolts for full height 80" door panels. Hinges shall permit the full panel to swing open. For restricted access to the service cable compartment, the external cover door shall be equipped with a padlocking hasp and three penta bolts with welded pipe shrouds 34 mm I.D. (1-5/16") and 40 mm long (1-9/16").

Where heaters are required to maintain temperature and control moisture inside the switchboard cells, a 120/ 240V source shall be provided from downstream of the metering supply point. The heaters shall be controlled by a humidistat and rated for 120/240 V supply.

To minimize customer outage time caused by fuse operation, it is strongly recommended that spare fuses shall be supplied and stored in a separate wall mounted cabinet accessible to operating personnel. If access to the spare fuse storage pouch, mounted inside the switchgear fuse compartment, requires a power outage to inspect, test or replenish spare fuses, this is not acceptable.

The service cable compartment shall be restricted for BC Hydro access only and reserved solely for mounting service cable terminations. Also, the service cable compartment shall remain free of junction boxes, terminal blocks, surge arresters or other ancillary devices.

The inside surfaces of compartments which have viewing windows shall be painted a light colour, to aid visual inspection of switch/breaker status.

For existing dual radial primary services, the service switchgear arrangement shall permit manual momentary paralleling of the two BC Hydro circuits during load transfer. Similarly, for existing double dual radial services, manual momentary paralleling of either of the two normal BC Hydro circuits and the standby circuit during load transfer is permissible. Such operations shall only be performed by BC Hydro personnel. There are exceptions for customers to operate these switches under a special agreement with BC Hydro. See Sections 9.3. and 9.4.

9.1.1 Additional Safety Requirements for Service Cable Compartments

As required by WorkSafeBC and BC Hydro Work Methods for installation of personnel safety grounds, a ball-stud (e.g., AB Chance Catalog No. C600-2102 or equivalent) shall be permanently mounted on each of the phase bus bars, as well as the equipment ground bus in the service entrance compartment. Ball-studs shall be

positioned such that they will accept universal grounding ball clamps operated from hotsticks. This safety grounding provision will enable BC Hydro line crews to install safety grounds on each of the main bus bars.

With primary revenue metering, BC Hydro requires the extension of ground bus and additional seven grounding ball studs in the revenue metering cubicle – one grounding ball stud on either side of three CT's and one grounding ball stud bolted to the ground bus. BC Hydro requirements are available from the BC Hydro web site at: http://www.bchydro.com/youraccount/content/forms.jsp.

BC Hydro personnel require safe access into the customer-owned primary service cable compartment and instrument transformer compartment. For this purpose, BC Hydro personnel must be able to complete a visual inspection of the primary service visible disconnection point, i.e. the isolation switch open and switch blades pulled down from the line contacts above. For customer-owned primary services with oil-filled or vacuum type circuit breakers or switches as the customer primary service disconnecting device, BC Hydro accepts draw-out-type switchgear. Alternatively, such disconnecting devices must be preceded with an air-insulated disconnect switch as an acceptable safety barrier and visible disconnection point.

> **Note 19:** Open contacts inside an oil-filled or vacuum bottle, as a primary service disconnecting device, are not an acceptable safety barrier for safe access into a primary service cable compartment or instrument transformer compartment.

To comply with the regulations governing the limits of approach, WorkSafe BC and BC Hydro Work Methods, all exposed cable connections and buswork inside the primary service cable compartment must be covered with a removable insulation board, to prevent accidental contact with energized live parts. Alternatively, the buswork may be covered with rated polymer-based material, whereas cable connections and grounding balls may be covered with adequately rated, removable insulation boots. For design and installation details, please refer to for the attached drawing PG C1-02 and Photograph 1.

For further information, see BC Hydro Safety Practice Regulations, Rule 401.

9.1.2 Viewing Window

Viewing windows are required to enable BC Hydro personnel, for safety reasons, to ascertain the status of all switches and circuit breakers – refer to "Visible Disconnection Point" in the Definitions section of this guide. The windows shall be of wired glass or heat-tempered plate glass, and shall be sized and positioned such that a viewer can conveniently observe all switch blade status with the access door closed. If one window is supplied for an indoor type air-rated switch, it shall have a minimum dimension of 250 x 380mm.

For SF_6 insulated outdoor kiosks, primary service switches must incorporate integrated viewing ports to allow for visual inspection of the switch contacts, with moving and stationary contacts clearly visible, similar to BC Hydro standard deadfront switchgear. The viewing ports must meet the requirements of applicable CSA, CEC and BCSA regulations and carry the certification mark of approval. In addition, viewing ports shall be accessible from the ground level without the use of a ladder and must be acceptable to BC Hydro.

9.1.3 Operating Handle

The height for the operating handle pivot point for loadbreak switches operated by BC Hydro line crew shall not be more than 1.5 m above the vault floor.

Where a chain is used between an operating handle and a loadbreak **or** disconnect switch, a guard shall be provided such that, if the chain breaks, it will not come into contact with any live parts.

9.1.4 Interlocks

Interlocks shall be provided between the service loadbreak switches, disconnect switches and primary metering compartments or cells (if provided), in accordance with CSA C22.2 No. 31, latest edition.

See enclosed drawing PG A2-02 for typical interlocking details for dual supply.

9.1.5 Bolted Bus Bar Sections

To minimize customer outage time, it is recommended that, for existing dual radial configurations where sections of bus are required to be bolted and removable for equipment maintenance purposes, a sheet metal barrier shall be provided for insertion in the gap when bus sections are removed. The metal barrier shall be of a slide-type and suitably fastened in storage in the loadbreak switch compartment when not in use.

CSA-standard phase-to-ground clearance shall be observed between the bus or component ends and the inserted metal barrier.

9.2 Service Entrance Cell – Single Radial Supply

For single radial supply service, separate compartments in the service entrance cell are required for the service cable terminations and customer's loadbreak switch. Also:

1. Loadbreak switches and fuses shall be installed in separate compartments connected by bus bar sections;

2. Proper termination space and support shall be provided, as detailed on enclosed drawing PG C1-01 – base spacers, compartmented to match each enclosure, can be used to increase the cable termination height to meet BC Hydro height requirements, and

3. Key interlocks shall be provided between the loadbreak switches and fuses so that the fuse compartment cannot be opened unless the loadbreak switches are locked open.

See enclosed drawing PG A1-01 for a one-line diagram.

> **Note 20:** BC Hydro line crews will rely on a Class A electrician holding an annual permit for the customer-owned primary service installation, to operate customer-owned equipment for single radial supply. Location of the viewing window and the switch operating handle must meet applicable CSA standards and requirements of the local inspection and regulating authorities.

9.3 Service Entrance Cell – Dual Radial Supply

The existing dual radial service entrance equipment shall have an arrangement and layout such that it shall be possible to safely service or replace the following components of the service entrance switchgear with minimum interruption of service:

1. service cable termination;

2. service disconnect switch, and

3. service loadbreak switch or a breaker.

This shall be made possible by the operation of switches and mechanical removal of bolted bus bar sections. A brief outage will be required to allow safe isolation of the components for servicing.

The following should be noted for the existing dual radial supply switchboards:

1. Cable terminations, disconnect switches, loadbreak switches and the fuse/circuit breaker shall be installed in separate compartments connected by bus bar sections (removable bus links as required);

2. Viewing windows shall be provided (See Section 9.1.2.);

3. Provision shall be made for padlocking the loadbreak and disconnect switches with BC Hydro standard padlocks when the switches are in the open position, and

4. Dual supply switches, forming a part of customer-owned switchgear, shall be equipped with acceptable locking provisions for restricted access and operation by BC Hydro personnel only.

9.4 Service Entrance Cell - Dual Supply

The dual supply service entrance equipment shall meet all requirements in Section 9.3. Refer to the attached drawing PG A2-02, which shows a typical layout of the service entrance switchboard.

Provision shall be made for padlocking the loadbreak and disconnect switches, and tie switch with BC Hydro standard padlocks when the switches are in the open position.

> **Note 21:** All dual radial supply customer-owned switches and associated equipment shall be maintained by the customer, in accordance with regular Maintenance Notices issued by BC Hydro to the customer.

10 Primary Service Protection Requirements

10.1 Equipment Rating

10.1.1 Current

The equipment shall be rated in accordance with the applicable CSA Standards.

10.1.2 Voltage

The equipment shall be rated to BC Hydro's system voltage.

> **Note 22:** Where the service entrance equipment is installed in an area scheduled for future voltage conversion to 25 kV, provisions shall be made to the equipment, such as fuse holders, etc., so that it could operate at 25 kV, with minimal modifications necessary, in the future. Equipment for 25 kV conversion, not in use at 12 kV, is to be stored in a clearly labelled and accessible compartment.

10.1.3 BIL

The minimum BC Hydro requirement for BIL rating of customer-owned equipment is:

(a) 60kV BIL on the 4.16 kV system;

(b) 95kV BIL on the 12.5 kV system;

(c) 125kV BIL on the 25 kV system, and

(d) 150kV BIL on the 34.5 kV system.

10.1.4 Interrupting Rating

Customers' service entrance interrupters shall have the following minimum interrupting capabilities, fault withstand and short circuit bracing:

	Interrupting Capacity		
	Circuit Breakers/Reclosers	Fuses	
Type of Service	Symmetrical MVA	Asymmetrical rms Amperes	Symmetric rms Amperes
4.16 kV, 3Ø 4-Wire	50	12,000	7,500
12.5 kV, 3Ø 4-Wire	250	20,000	11,500
25 kV, 3Ø 4-Wire	500	20,000	11,500
34.5 kV, 3Ø 4-Wire	300	9,000	5,000

10.2 Protection with Relays and Circuit Breakers

10.2.1 Current Transformers

Current transformers shall have mechanical and thermal ratings adequate for the expected fault duty. It should be noted that, for low ratio current transformers, special designs may have to be ordered to achieve an adequate mechanical rating.

Where current transformers and relays are used to provide overload protection in conjunction with fuses, the fuses must limit the prospective short-circuit current to the mechanical rating of the current transformer.

The current transformers shall be adequately rated to operate the relays and the breaker trip coil if an AC trip scheme is adopted. The success of the AC trip scheme depends primarily on the capability of the current transformers to provide enough transfer of energy to the trip mechanism of the breaker when a primary fault current is flowing under all practical conditions. Saturation of the current transformers, with high impedance secondary circuits, can be experienced, not only due to the DC component of the fault current, but also due to a high magnitude of AC symmetrical fault current. The secondary current through the trip coil under such conditions cannot always be assumed to be able to activate the breaker trip mechanism.

Because of the difficulty in predicting the performance of current transformers, relays and trip coils in the presence of large offset fault currents, it is recommended that fused installations be used on loads requiring less than a 50 A fuse size.

BC Hydro requires that the current transformer be located at the source side of its associated circuit breaker, but at the load side of the disconnect switch. – see enclosed drawing PG A1-01.

10.2.2 Relays

BC Hydro does not require that the customer's service entrance protective relays be tested and approved by BC Hydro, provided that the relays meet with minimum requirements specified in ANSI/IEEE C37.90, latest edition. However, BC Hydro will require that the customer performs a commissioning test to verify the customer's relays perform as specified, including a primary or secondary injection test (pick-up, reset and timing) and tripping test. A copy of the relay commissioning report, signed by a Professional Engineer, shall be submitted to BC Hydro prior to energization. For special applications, BC Hydro reserves the right to request that the customer has the protective relays tested for acceptability by an independent test facility, such as Powertech.

The overcurrent relays may be arranged as three-phase relays, or as two-phase relays and one ground relay. The latter arrangement will be required for larger installations for coordination with BC Hydro ground relays and is generally preferable. The ground relay can be as sensitive as unbalanced loading and inrush will permit.

The minimum separation of 0.4 seconds between the characteristics of the customer's relay and BC Hydro's feeder relay at maximum fault current at the customer's installation shall be maintained.

Differential relay protection alone on the customer's main breakers is not acceptable. It must be accompanied by overload protection.

10.2.3 Circuit Breakers

Circuit breakers shall have a blade opening time of not more than eight cycles. Circuit breakers may be equipped with either an AC trip coil or DC voltage shunt trip coil. If the latter is applicable, the customer shall be responsible for adequate maintenance of its battery supply. If a stored energy voltage trip scheme is applied,

such as a capacitor trip, the voltage supply for charging the capacitors must come from the source side of its associated circuit breaker.

A single shot recloser approved by the electrical inspection authority having jurisdiction is also acceptable as a circuit interrupter.

10.3 Protection with Fuse and Loadbreak Switch

10.3.1 Fuse Size

Fuses shall have time-current characteristics that will coordinate with BC Hydro service fuses. In areas such as downtown Vancouver, where services are provided direct from substation feeders through the underground cable system at primary potential, there will be no BC Hydro service fuses. The customer's fuse size must coordinate with BC Hydro feeder protective settings. At the time of submission (see section 5.2.2) consult the BC Hydro designer for the exact BC Hydro service fuse size.

It is not feasible to prepare a table of fuse sizes for each transformer size, but the following criteria should serve as a guide. The fuse:

1. Shall be sized as small as possible and shall conform with the latest Canadian Electric Code and the BC Amendments;

2. Shall withstand magnetizing inrush current. This varies from 10 to 12 times the rated current of oil filled transformers for 0.1 to 0.2 seconds. The transformer design greatly affects the magnitude of the inrush current;

3. Shall withstand overload currents of five times full load or less for at least 5 seconds, and

4. Shall coordinate with BC Hydro service fuses.

See attached drawing PG D2-01 for BC Hydro “preferred” type T fuse curves. T type fuse curves have a built-in de-rating factor of approximately 75 percent, such that the maximum clearing time of the customer’s fuses will be no greater than 75 percent of the minimum melting times of BC Hydro’s fuses. Corresponding type E fuses do not require de-rating. The purpose of the de-rating is to compensate for ambient temperature variance, pre-loading and pre-damage effects on fuses. For type E fuse curves, see attached drawings PG D3-01, PG D3-02 and PG D3-03.

10.3.2 Loadbreak Switch

The use of loadbreak switches as a primary circuit opening device for secondary ground fault protection application is **not** acceptable in all applications.

10.4 Customer-Owned Standby Generation

10.4.1 Transfer Arrangement

For details of open transfer requirements/restrictions between the BC Hydro supply and customer-owned standby generating plants, refer to Section 10.4.2 for customer standby generation. For closed transition transfer, refer to the document *Interconnection Requirements for Closed-Transition Transfer of Standby Generator* available on the BC Hydro web site at http://www.bchydro.com/youraccount/content/electrical_connections.jsp.

10.4.2 Standby Generator Operation

The customer may operate a standby generator as an emergency power supply disconnected from the BC Hydro service. The generator must not operate in parallel with the BC Hydro service without formal acceptance and approval by BC Hydro, per CEC Part I Section 84. Details of such a generator connection, operation and protection must be forwarded for acceptance to the BC Hydro Distribution Planning department, as stated in Section 10.4.1. above.

For further details regarding the BC Hydro submission and approval procedure, please refer to Paragraph 5.2.1. Electrical One-Line Diagram.

10.5 Power Line Disturbances

Customers requiring special quality service for the supply of computers or similar particularly sensitive equipment may be advised to buffer their equipment against the natural transients that may occur on the BC Hydro transmission and distribution system.

10.6 Surge/Lightning Arresters

For overhead line primary services, the customer shall install surge arresters in close proximity to the load side of the pole-top loadbreak switch, i.e. the opposite side of the H-Frame overhead span, when it is near the primary revenue metering cluster, crossarms of the cable pole dip, etc.

For underground primary services located inside the electrical indoor vault, or inside the outdoor primary service kiosk, the customer shall install surge arresters on the load side of the loadbreak type service switch (ahead of the fuses) or the load side of the incoming isolation switch ahead of the main breaker.

10.7 Testing and Maintenance

The protective relay settings, operation and circuit breaker operation shall be set and tested by the customer, and accepted by BC Hydro prior to initial energization. BC Hydro reserves the right to inspect and test the system at any time, and to request any necessary maintenance. This inspection shall not relieve the customer of any or all responsibility for maintenance of the customer's plant.

10.8 Revenue Metering

Where practicable, the point-of-metering (POM) shall be on the service transformer secondary side.

However, subject to BC Hydro's approval, the POM may be on the primary side under special circumstances, including:

(a) Multiple service transformers;

(b) A single service transformer with multiple secondary windings;

(c) A single service transformer with non-standard secondary voltage, or

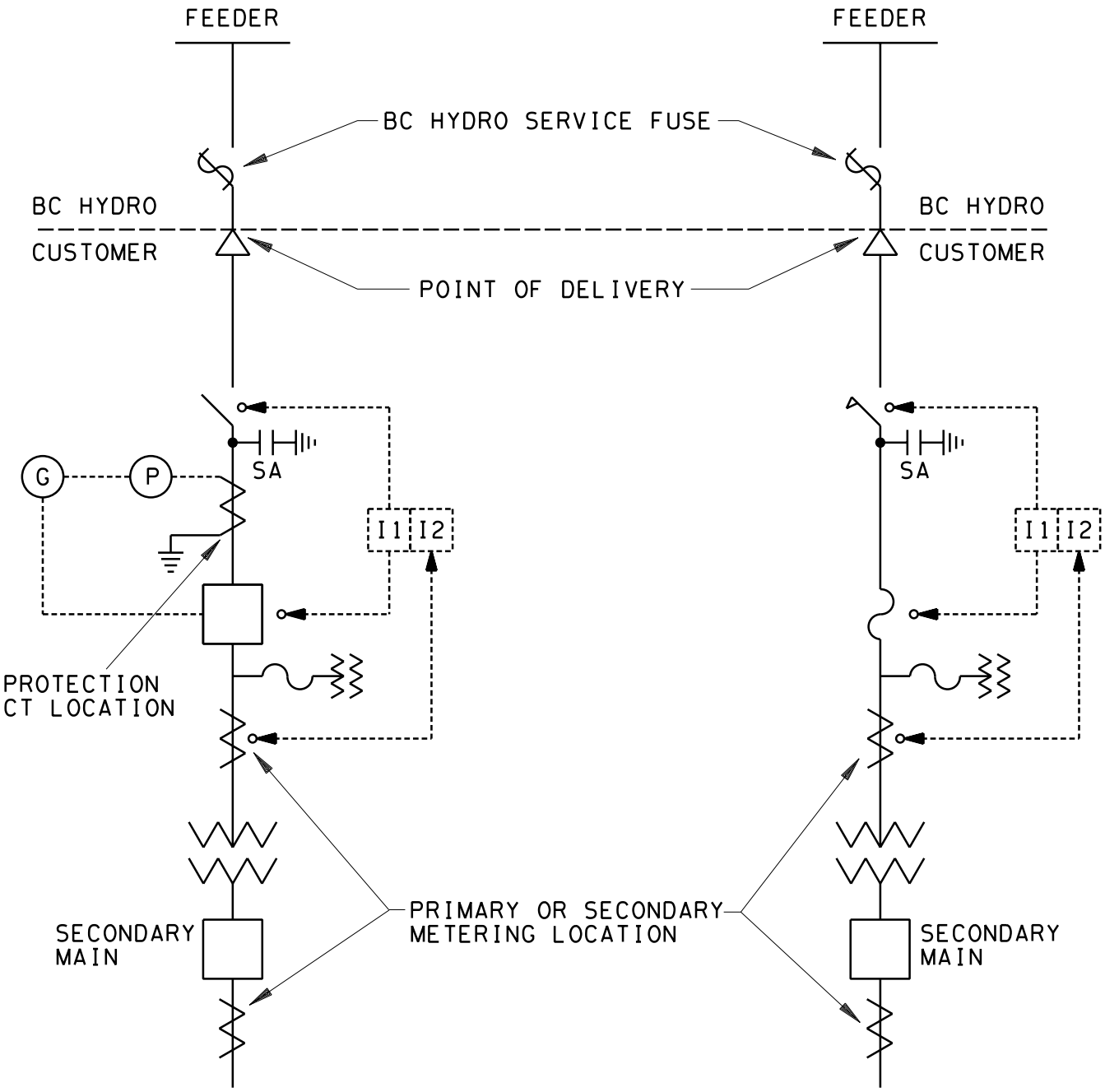
(d) A customer-owned primary voltage power line.

Where the POM is on the service transformer secondary side, the revenue metering shall be in accordance with the BC Hydro document *Requirements for Secondary Metering Installations (750 V and Less)*.

Where the POM is on the primary side, the revenue metering shall be in accordance with the BC Hydro document *Requirements for Manually Read Primary Service Voltage Revenue Metering (4 kV to 35 kV)*.

Copies of these documents may be obtained from the BC Hydro web site at:
http://www.bchydro.com/youraccount/content/forms.jsp,

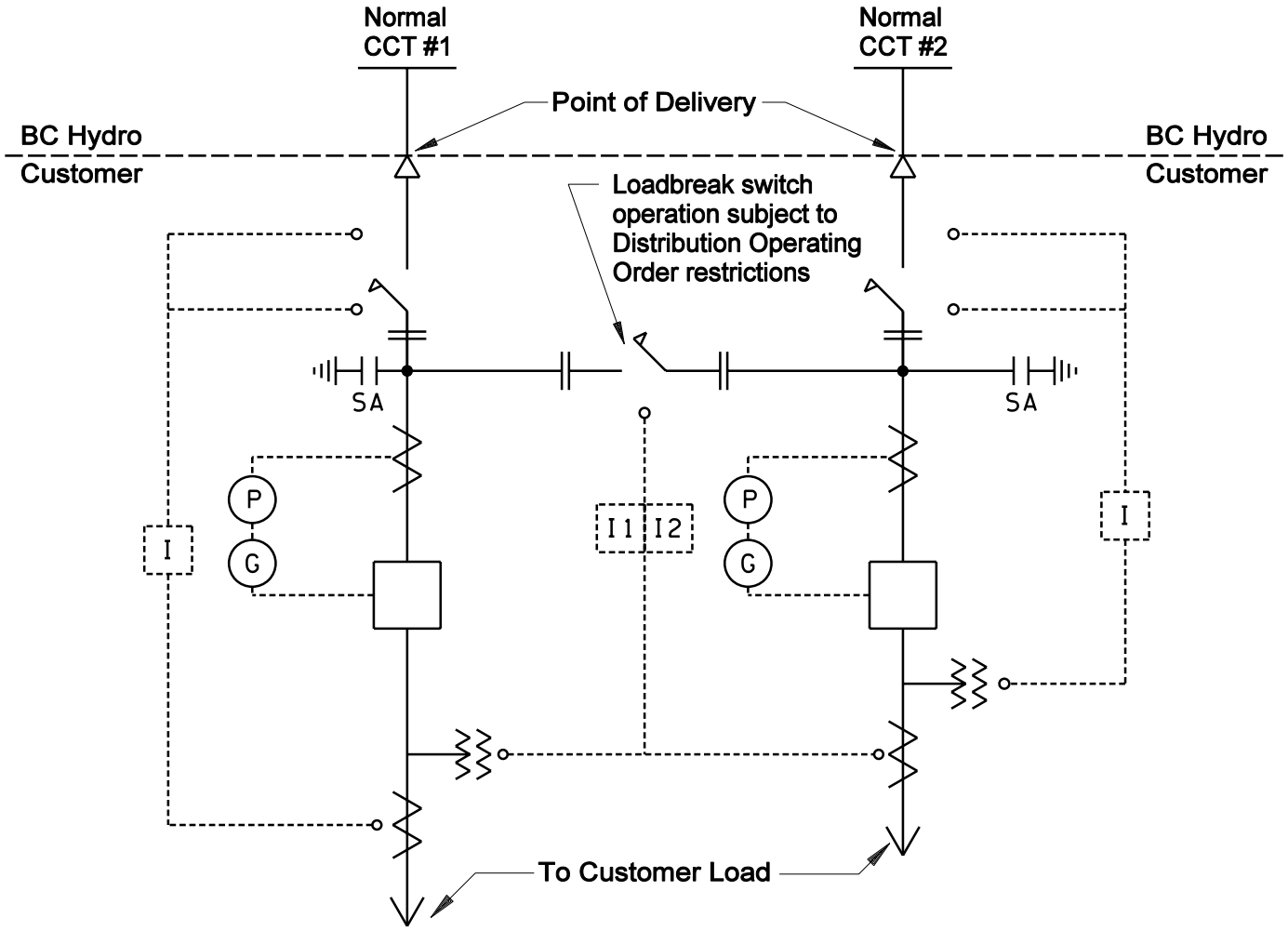
11 APPENDIX 1 LIST OF FIGURES



Notes:

1. **Loadbreak switch or isolation switch is required ahead of the circuit breaker for visual isolation.**
2. **Key interlock is required between the circuit breaker and switch if an isolation switch is used.**
3. **For drawing legend refer to PG Z1-01.**

DRAFTER: DC	DESIGNER	RECOMMENDED	APPROVED	ONE LINE DIAGRAM SINGLE RADIAL SUPPLY	
	original signed by M. KELVIN	C. PICASSI	F. DENNERT		
	ORIGINAL ISSUE DATE: JUNE 2010				
	BC hydro DISTRIBUTION STANDARDS	PAGE 1 OF 1		PG A1-01	R. 0



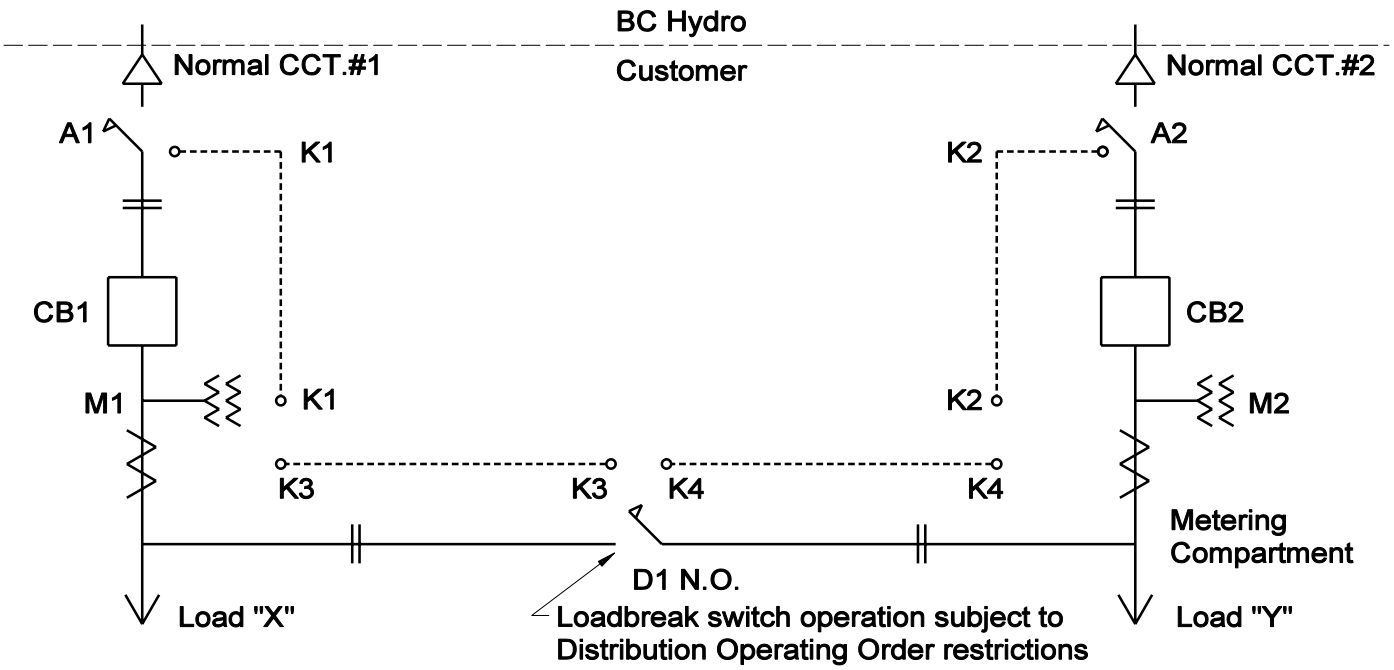
Notes:

1. For drawing legend, refer to PG Z1-01.
2. For key interlock schematic, see PG A2-02.

DESIGNER	RECOMMENDED	APPROVED	ONE LINE DIAGRAM DUAL SUPPLY
original signed by M. KELVIN	C. PICASSI	F. DENNERT	
ORIGINAL ISSUE DATE: JUNE 2010			

DRAFTER: DM

BC hydro DISTRIBUTION STANDARDS | PAGE 1 OF 1 | PG A2-01 | R. 0



Purpose of Key Interlock System

1. Allows momentary paralleling of either of the circuits during load transfer.
2. Prevents unsafe operation of disconnect switches and unsafe access to circuit breaker or metering compartment.

Key Interlock Sequence:

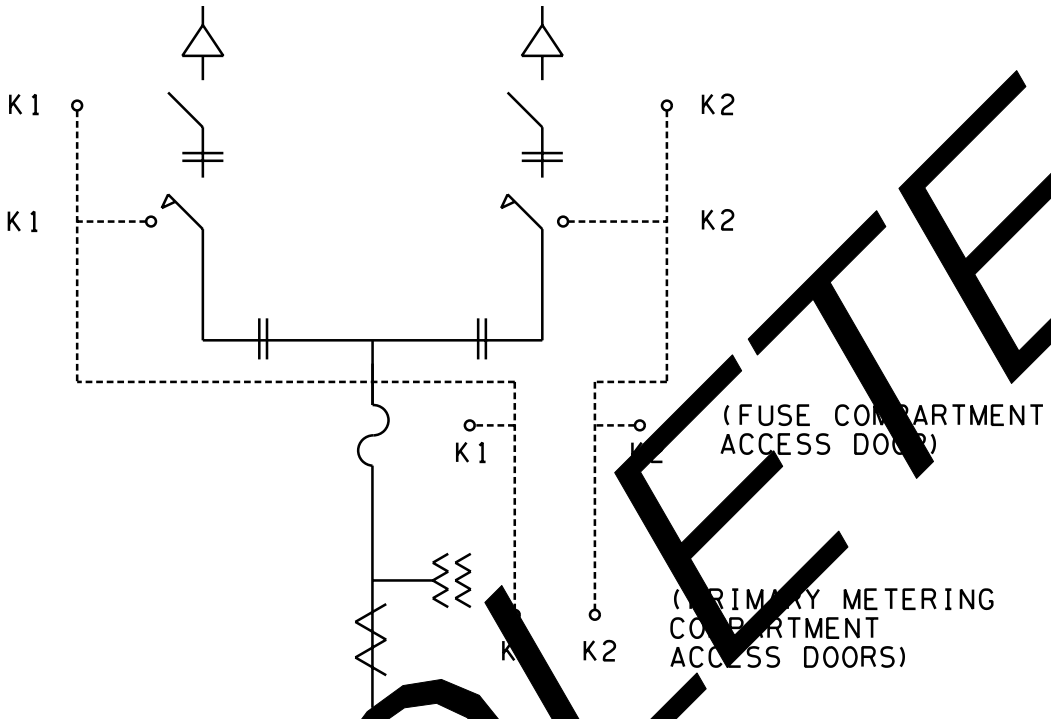
I. Access to BC Hydro metering compartment M1:
Open load-break switch A1 and release key K1. Retrieve K3 from D1 which is locked open. Insert K1 and K3 into M1 and open BC Hydro metering compartment M1. Follow the same procedure to access metering compartment M2.

II. To feed load "X" by normal circuit #1:
Open D1. Remove K1 from metering compartment M1. Insert K1 into A1 and close loadbreak switch A1 to feed load "X". Close circuit breaker CB1. Energizing the circuit follow the same procedure when feeding load "Y" by normal circuit #2.

III. To transfer load "X" from normal circuit #1 to circuit #2:
Close load-break D1 (K3 held captive). Momentarily parallel normal circuit #1 with circuit #2. Open load-break A1 and release key K1. Load "X" is now transferred to CCT #2. Similar procedure applies when transferring load "Y" from normal circuit #2 to circuit #1.

Note:

1. Loadbreak switch or isolation switch is required ahead of the circuit breaker.
2. Key interlock is required between the circuit breaker and switch.
3. Distribution Operating Order (DOO) is required for Dual Supply installations.
4. For drawing legend refer to PG Z1-01.



KEY SEQUENCE:

1. ONLY TWO INDIVIDUAL KEYS K1 AND K2 ARE PROVIDED.
2. KEYS K1 AND K2 ARE HELD CAPTIVE WHEN THEIR RESPECTIVE LOAD-BREAK SELECTOR SWITCHES ARE IN THE CLOSED POSITION. THEY CAN BE RELEASED ONLY WHEN THE LOAD-BREAK SELECTOR SWITCH IS LOCKED IN THE OPEN POSITION.
3. THE KEY FROM THE RESPECTIVE LOAD-BREAK SELECTOR SWITCH IS REQUIRED TO OPERATE THE DISCONNECT SWITCH, OPEN OR CLOSE. THE KEY IS REMOVABLE WITH THE DISCONNECT SWITCH IN EITHER POSITION.
4. BOTH KEYS K1 AND K2 ARE REQUIRED TO OPEN EITHER THE FUSE COMPARTMENT DOOR OR THE PRIMARY METERING COMPARTMENT DOOR. THE KEYS ARE HELD CAPTIVE WHEN THE DOOR IS IN THE OPEN POSITION. (ONLY ONE DOOR CAN BE OPEN AT A TIME).

PURPOSE OF THE INTERLOCK SYSTEM

1. ALLOWS MOMENTARILY PARALLELING OF THE TWO INCOMING CIRCUITS DURING TRANSFER OF SERVICE CIRCUIT.
2. PREVENTS OPENING THE DISCONNECT SWITCHES UNDER LOAD.
3. ALLOWS OPERATION OF THE LOAD-BREAK SWITCH WHEN IT HAS BEEN ISOLATED FOR SERVICE REASONS.
4. PREVENTS ACCESS INTO THE FUSE CELL OR PRIMARY METERING COMPARTMENT WITHOUT FIRST OPENING BOTH LOAD-BREAK SWITCHES.

NOTE:
FOR DRAWING LEGEND REFER TO PG Z1-01

FOR REFERENCE ONLY

R3- TITLE REVISED. JAN. '09MK | R.4- DWG. NO. CHANGE. FOR REFERENCE ONLY. JUNE '10 KM

DRAFTER: DC

DESIGNER	RECOMMENDED	APPROVED
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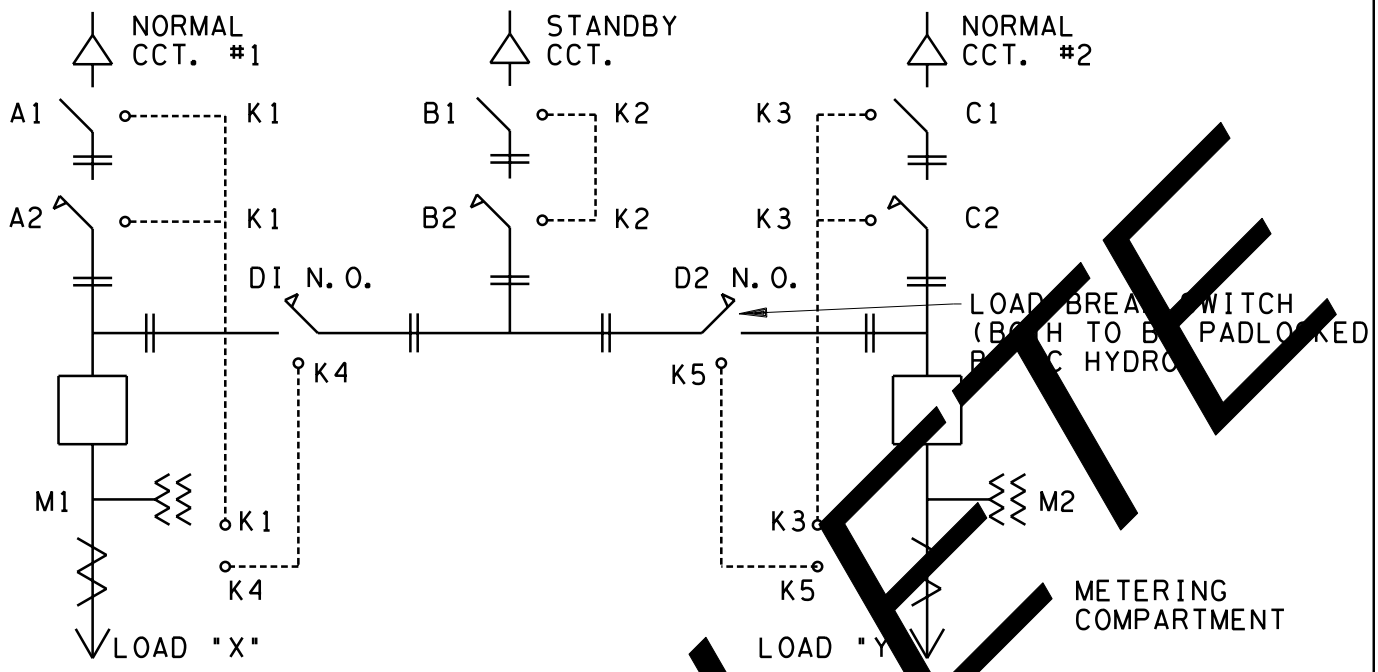
M. KELVIN	C. PICASSI	F. DENNERT

ORIGINAL ISSUE DATE: NOVEMBER 1984

DUAL RADIAL SUPPLY SWITCHBOARD TWO KEY INTERLOCK



PURPOSE OF KEY INTERLOCK SYSTEM

1. ALLOWS MOMENTARY PARALLELING OF EITHER OF THE NORMAL CIRCUITS WITH THE STANDBY DURING LOAD TRANSFER.
2. PREVENTS OPERATION OF DISCONNECT SWITCHES AND ACCESS TO CIRCUIT BREAKER OR METERING COMPARTMENT UNDER LOAD. (KEYS K1, K2, K3, K4 AND K5 ARE HELD CAPTIVE WHEN USED FOR CLOSING THEIR RESPECTIVE LOAD-BREAK SWITCHES AND DISCONNECT SWITCHES OR OPENING THE METERING COMPARTMENT DOORS.)

KEY INTERLOCK SEQUENCE
(FIVE INDIVIDUAL KEYS K1, K2, K3, K4 AND K5 ARE PROVIDED)

I. ACCESS TO BC HYDRO METERING COMPARTMENT M1:
OPEN LOAD-BREAK SWITCHES A1 AND B2, THUS RELEASING KEYS K1 AND K2. OPEN DISCONNECTS A1 AND B1 WITH K1 AND K2 FOR POSITIVE ISOLATION. RETRIEVE K4 FROM D1 WHICH IS NORMALLY OPEN. THEN OPEN BC HYDRO METERING COMPARTMENT M1 WITH K1 AND K4. SIMILAR PROCEDURES APPLY WHEN ACCESS TO METERING COMPARTMENT M2 IS REQUIRED.

II. TO FEED LOAD "X" BY NORMAL CIRCUIT #1:
ENSURE B1, B2 AND D1 AND D2 ARE OPEN. REMOVE KEY K1 FROM METERING COMPARTMENT M1. WITH KEY K1, CLOSE DISCONNECT A1 AND CLOSE CIRCUIT TO FEED LOAD "X" BY CLOSING LOAD-BREAK SWITCH A2. SIMILAR PROCEDURE APPLIES WHEN FEEDING LOAD "Y" BY NORMAL CIRCUIT #2.

III. TO TRANSFER LOAD "X" FROM NORMAL CIRCUIT #1 TO STANDBY:
ENSURE D1, D2 AND B1, B2 ARE OPEN. CLOSE LOAD-BREAK D1 (K4 WILL BE HELD CAPTIVE). WITH KEY K2 CLOSE B1. MOMENTARILY PARALLEL NORMAL CIRCUIT #1 WITH STANDBY CIRCUIT BY CLOSING B2 WITH KEY 2. OPEN LOAD-BREAK A2, THUS RELEASING KEY K1. OPEN DISCONNECT A1 FOR POSITIVE ISOLATION. LOAD "X" IS NOW TRANSFERRED TO STANDBY CIRCUIT. SIMILAR PROCEDURE APPLIES WHEN TRANSFERRING LOAD "Y" FROM NORMAL CIRCUIT #2 TO STANBY.

NOTE:
FOR DRAWING LEGEND REFER TO PG Z1-01

FOR REFERENCE ONLY

R.2- TITLE REVISED. JAN. '09 MK | R.3- DWG. NO. CHANGE. FOR REFERENCE ONLY. JUNE '10 KM

DRAFTER: DC

DESIGNER	RECOMMENDED	APPROVED
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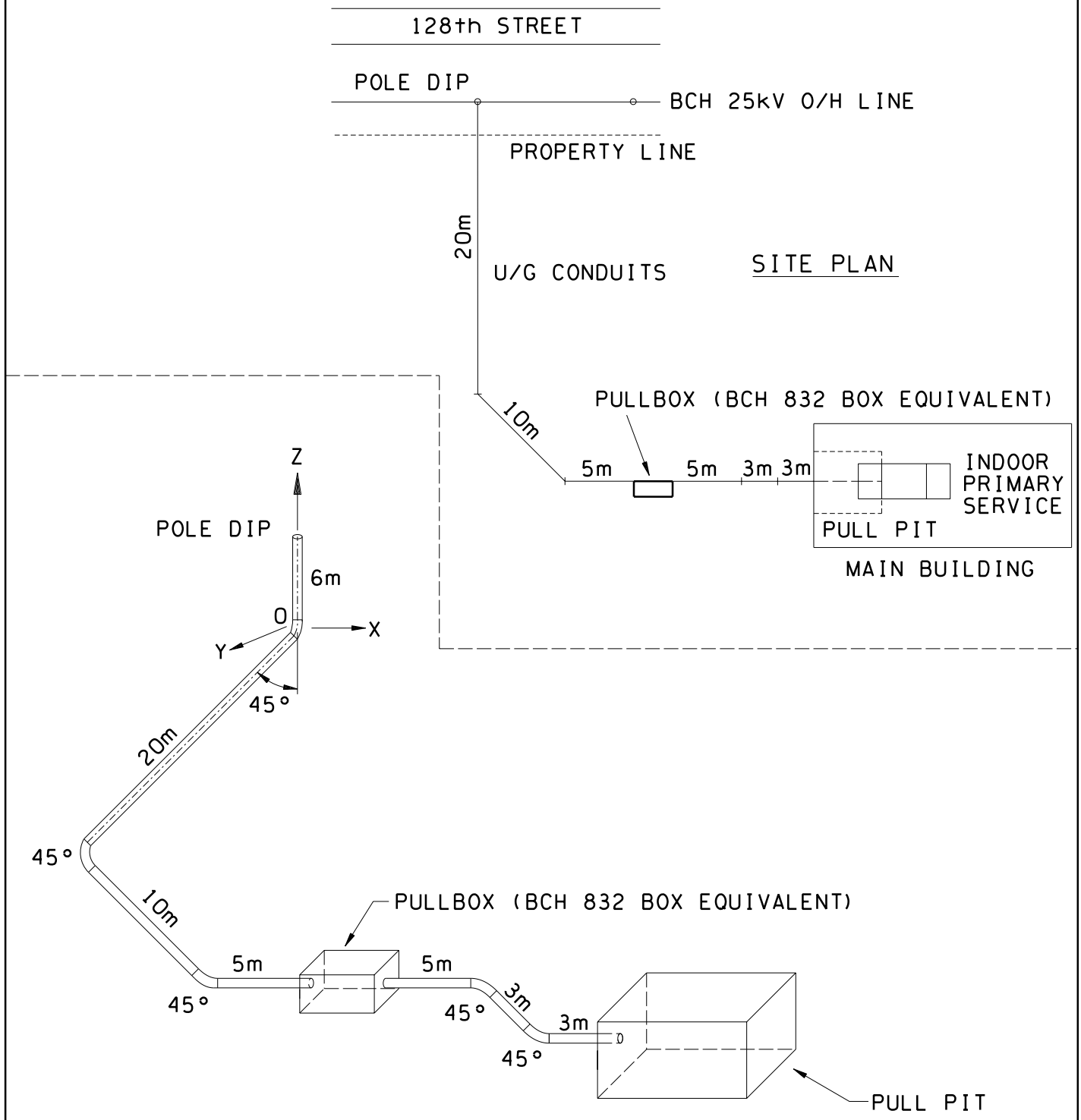
ORIGINAL ISSUE DATE: NOVEMBER 1984

DOUBLE DUAL RADIAL SERVICE FIVE KEY INTERLOCK

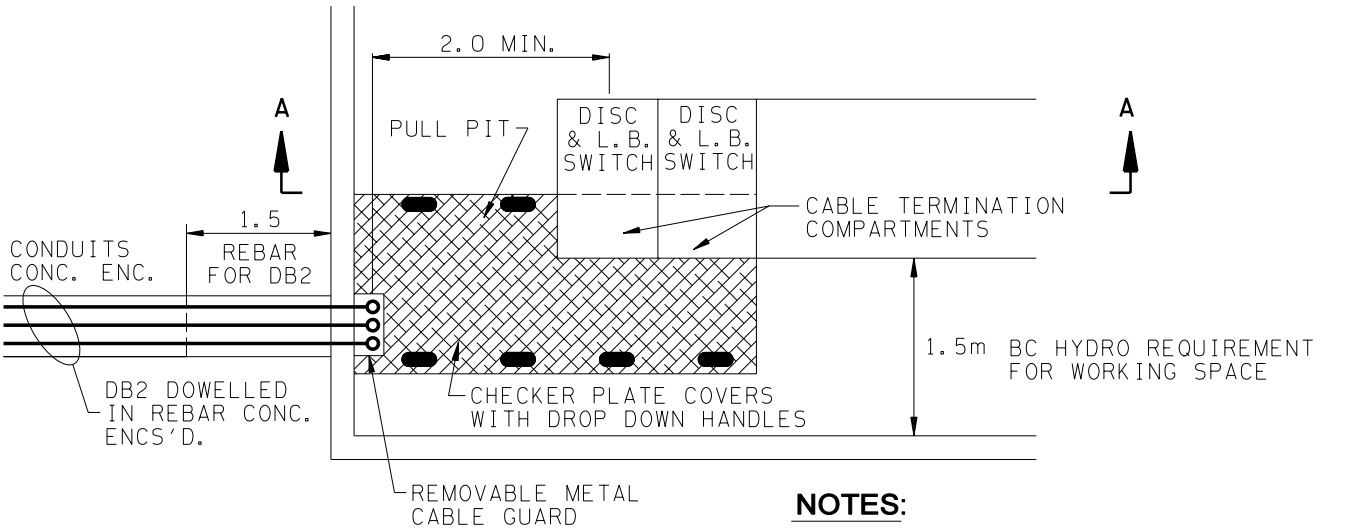


ISOMETRIC DIAGRAM

DESIGNER	RECOMMENDED	APPROVED	SIMPLIFIED SITE PLAN AND ISOMETRIC DIAGRAM OF SERVICE DUCT
original signed by			
M. KELVIN	C. PICASSI	F. DENNERT	
ORIGINAL ISSUE DATE: JUNE 2010			

DRAFTER: DC

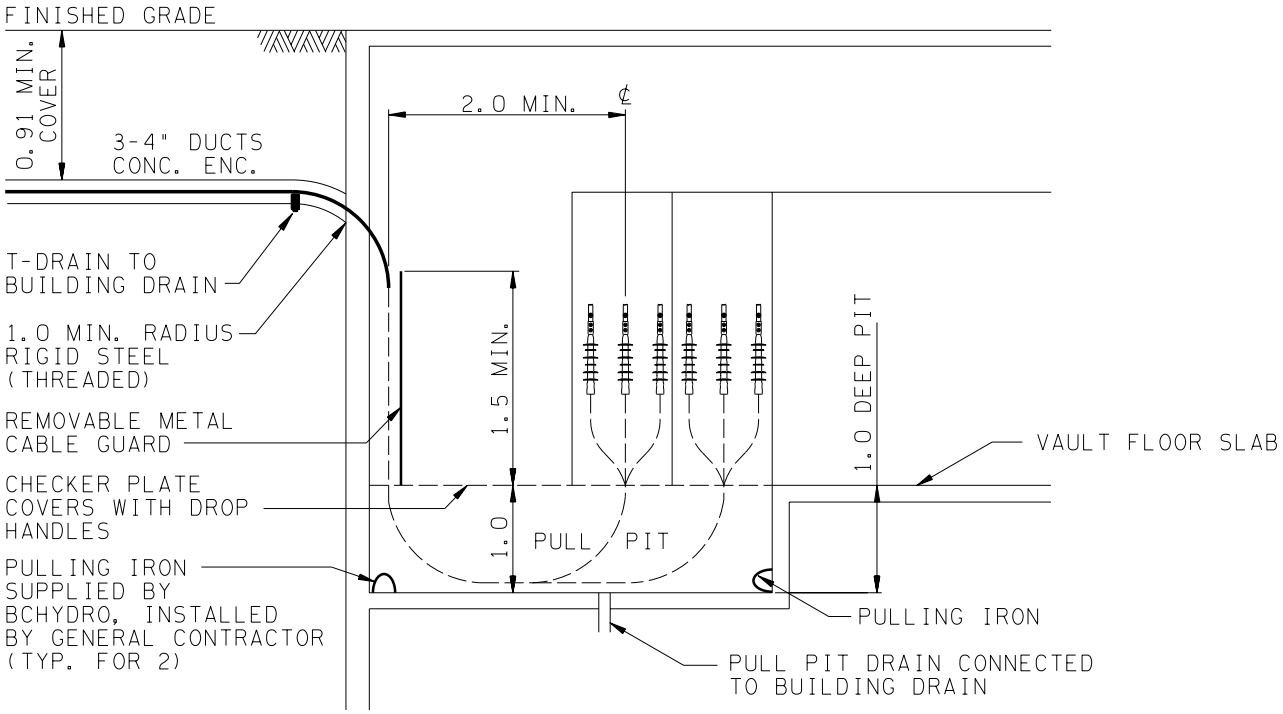
BC hydro DISTRIBUTION STANDARDS | PAGE 1 OF 1 | PG B1-01 | R. 0



PLAN

NOTES:

- PLATES TO BE 50lbs EA.
- 80lbs EA. IF HINGED.
- 0.9m x 0.9m ACCESS PLATE MIN.
- CEC RULE 2-308(1) REQUIRES MINIMUM 1m SPACE AROUND EQUIPMENT



SECTION A-A

NOTE: **For further notes and installation details see ES54 S3-01.01 through S3-03.04**

DRAFTER: JMW

DESIGNER	RECOMMENDED	APPROVED
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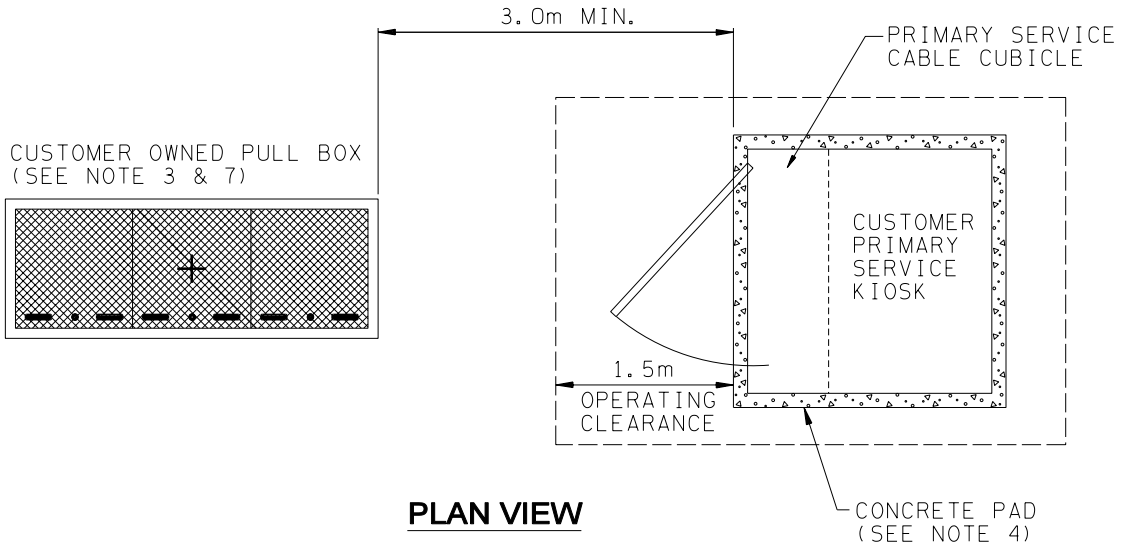
ORIGINAL ISSUE DATE: JUNE 2010		

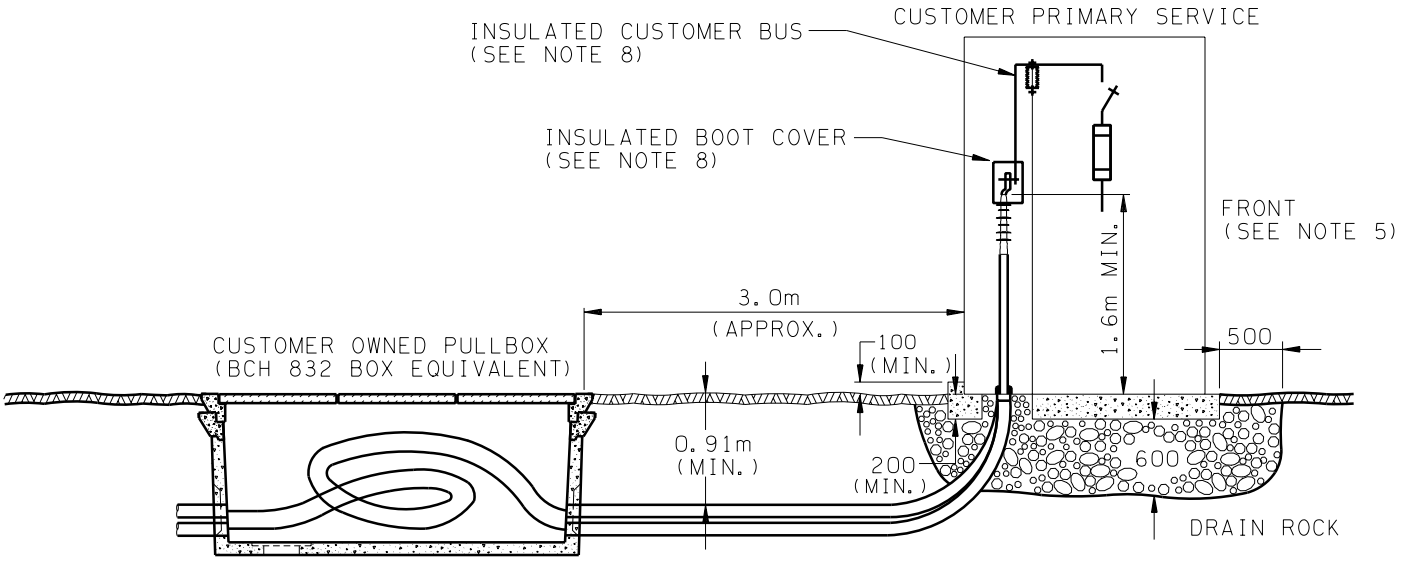
PRIMARY VAULT BELOW GRADE WALL CABLE ENTRY & PULL PIT DETAIL



PLAN VIEW

NOTES:

1. Meters expressed in decimals.
2. Millimetres in whole numbers.
3. Primary service kiosk to be located per CEC rules.
4. For further installation details, see ES54 S3-01.01 through S3-01.04.
5. Exact location of pullbox must be accepted by BC Hydro designer.
6. For details of bus insulation and termination, see PG C1-01 drawing.
7. Incoming conduits inside cable entrance cubicle shall align directly below corresponding bus bars.
8. Install sump and drain pipe as shown on ES54 G3-01 if requested by BC Hydro designer.
9. Install duct seal as per ES53 T7-01 if requested by BC Hydro designer.



CROSS SECTION

DESIGNER	RECOMMENDED	APPROVED
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M. KELVIN	C. PICASSI	F. DENNERT

ORIGINAL ISSUE DATE: JUNE 2010

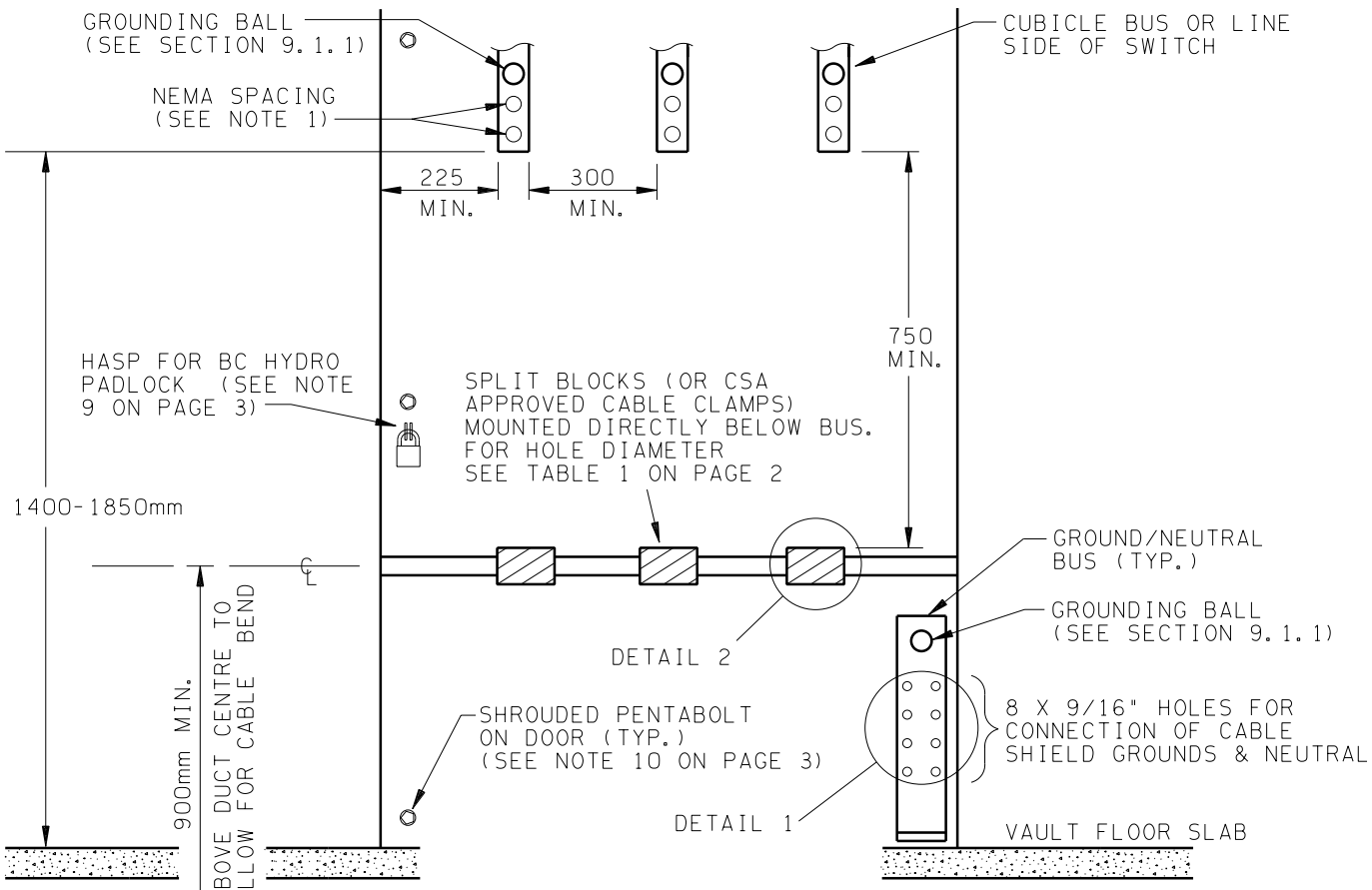
OUTDOOR PRIMARY SERVICE KIOSK CONCRETE SLAB & CABLE PULLING DETAILS

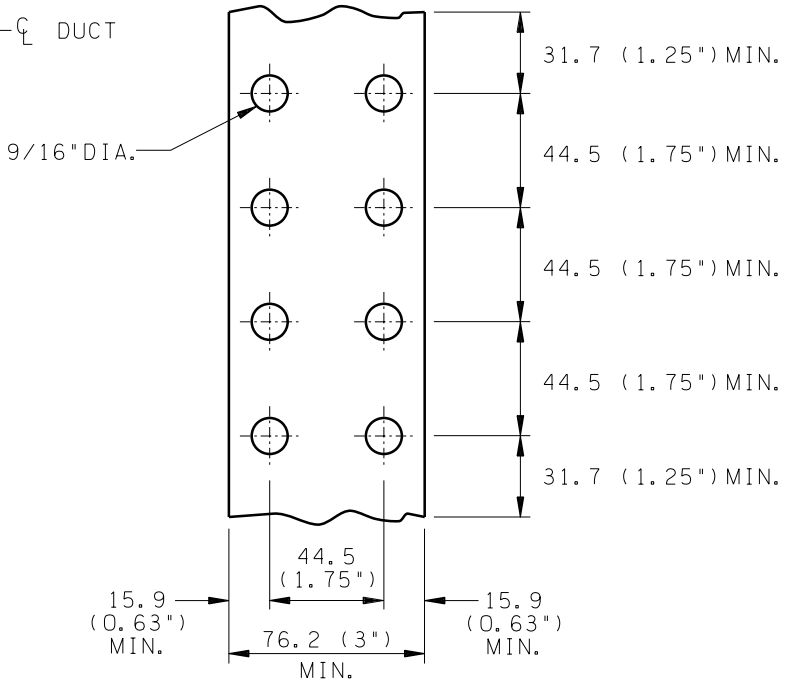
DRAFTER: JMW

BC hydro DISTRIBUTION STANDARDS

PG B3-01

R. 0





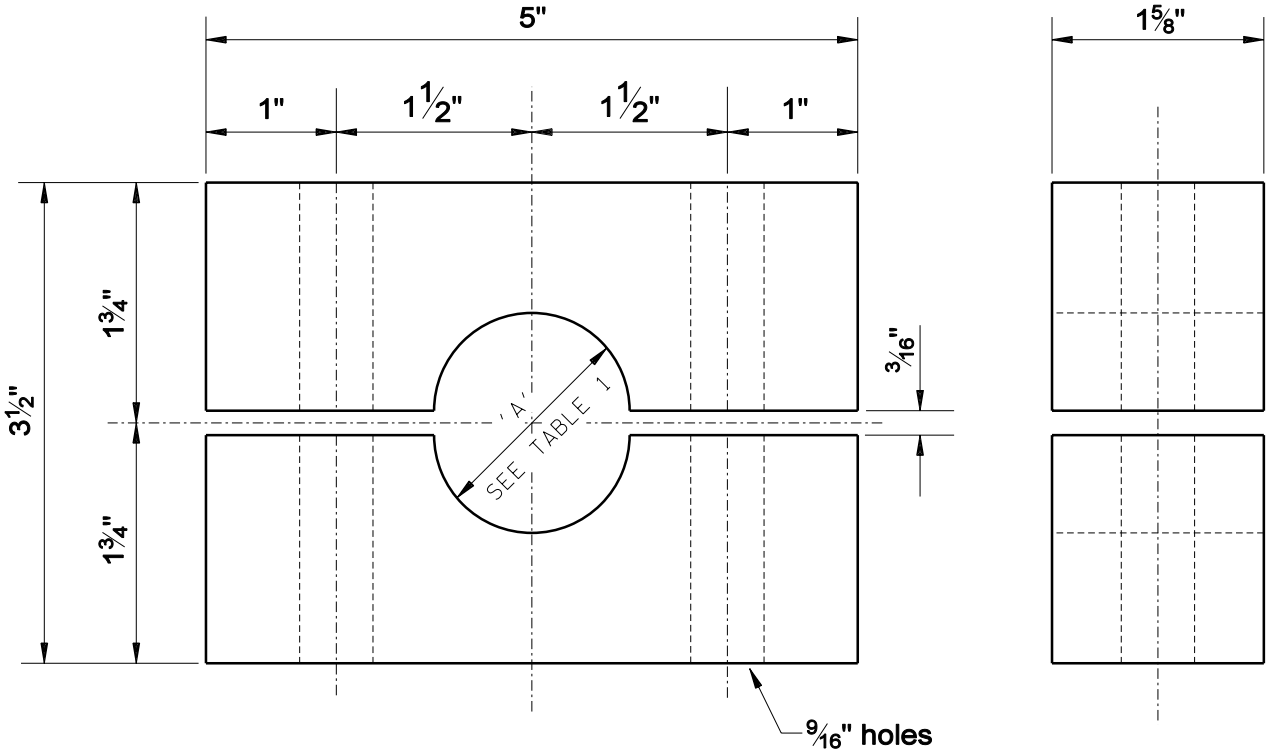
DETAIL 1
(SEE NOTE 5)

DESIGNER	RECOMMENDED	APPROVED
original signed by A. NORRIS	C. PICASSI	F. DENNERT

ORIGINAL ISSUE DATE: JUNE 2010

EXTRUDED DIELECTRIC SERVICE CABLE ENTRANCE CUBICLE REQUIREMENTS

DRAFTER: DC/DM



Material = Hardwood

Finish = Two Coats Varnish

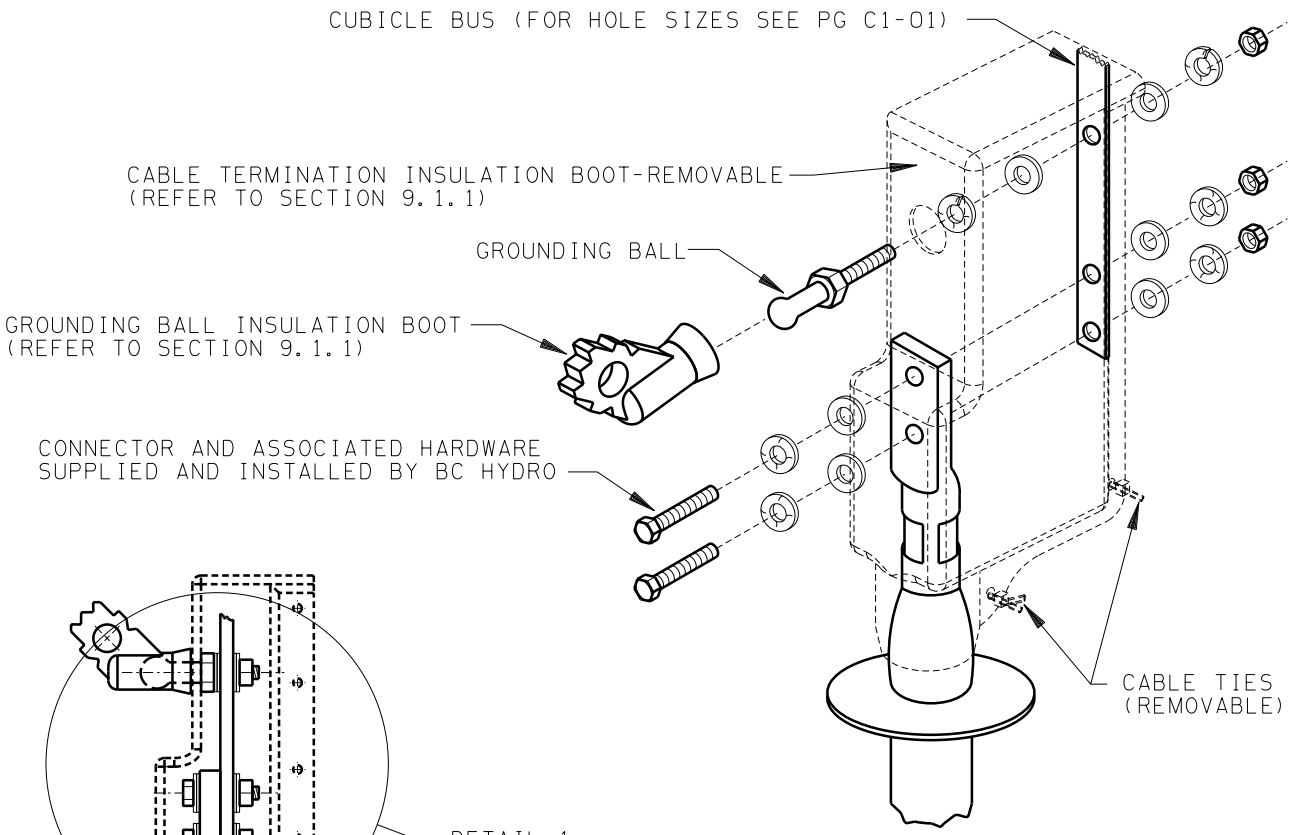
DETAIL 2

Cable Size and Type	Voltage (kV)	Clamp Hole Diameter (Dim 'A')
#1 AWG Al	25	1¼"
#4/0 AWG Al	25	1½"
500 kcm Al	25	1½"

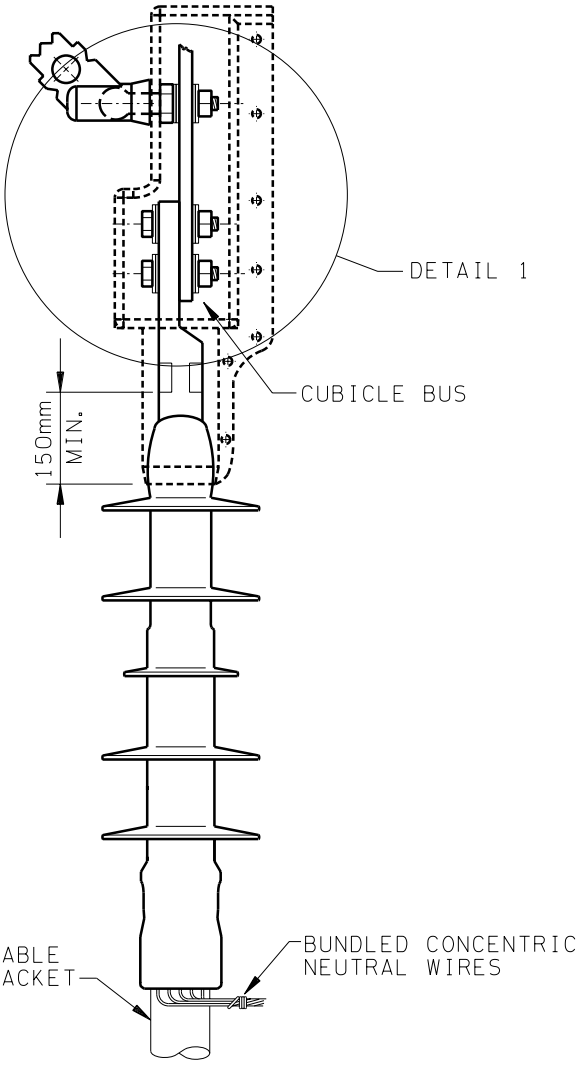
TABLE 1

Notes:

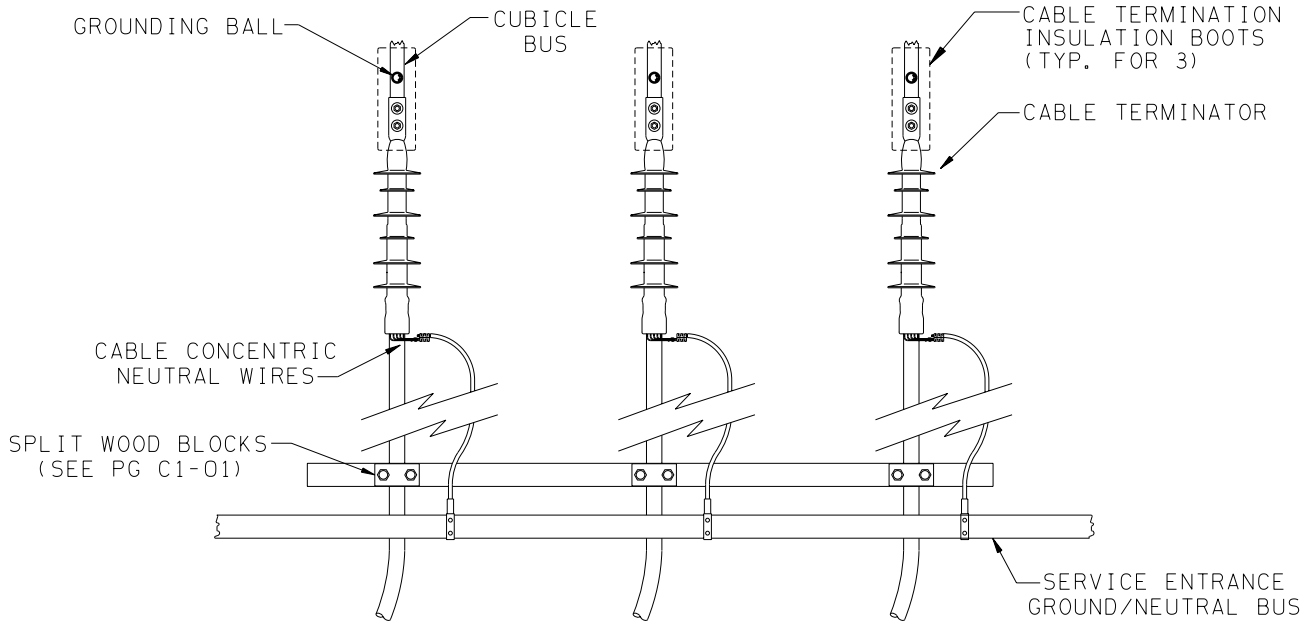
1. Cubicle bus or line side of switch shall be furnished with a NEMA 2-hole pattern as per NEMA CC-1-2005, Figure B-2.
2. Ground/neutral bus shown as typical; it may be located in any easily accessed area of the cubicle. It shall be designed to allow installation of grounding/neutral connectors and associated hardware.
3. BC Hydro will not accept inverted cable terminations.
4. For termination installation, refer to PG C1-02.
5. DETAIL 1 shows the most compact arrangement, the individual 2-hole NEMA patterns may be spread out for more convenient attachment of cable shields and/or neutral conductor(s) as suggested by PG C1-02. There shall be a minimum of 4, 2-hole NEMA patterns on the neutral/ground bus.
6. BC Hydro will supply connector hardware (bolts, washers and nuts) as per drawing PG C1-02.
7. Minimum clearance between assembled termination, including high-side grounding ball, and the compartment door shall be 225mm.
8. Cable clamps or wood blocks shall be mounted using 1/2" hardware.
9. The customer shall include a hasp that is compatible with BC Hydro standard padlocks.
   BC Hydro standard lock dimensions:
   Shackle diameter: 9mm
   Shackle vertical clearance: 25mm
   Shackle horizontal clearance: 25mm
10. 3 Pentabolts shall be used to secure the entrance cubicle door.
    Pentabolt shroud dimensions:
    30mm ID x 30mm long
    The customer is responsible for supply and install of Pentabolt.



DETAIL 1



DRAFTER: DM/DC	DESIGNER	RECOMMENDED	APPROVED	EXTRUDED DIELECTRIC SERVICE CABLE TERMINATION DETAILS
	original signed by A. NORRIS	C. PICASSI	F. DENNERT	
	ORIGINAL ISSUE DATE: JUNE 2010			



COMPLETE TERMINATOR ASSEMBLY TYPICAL

Notes:

1. **Service cables, terminators, cable bonding & grounding conductors, connectors and associated connector hardware supplied and installed by BC Hydro.**
2. **Service ground/neutral bus is shown as typical, for illustration only. Refer to drawing PG C1-01 for requirements.**
3. **Customer shall supply grounding balls and insulating boots. Refer to Section 9.1.1.**

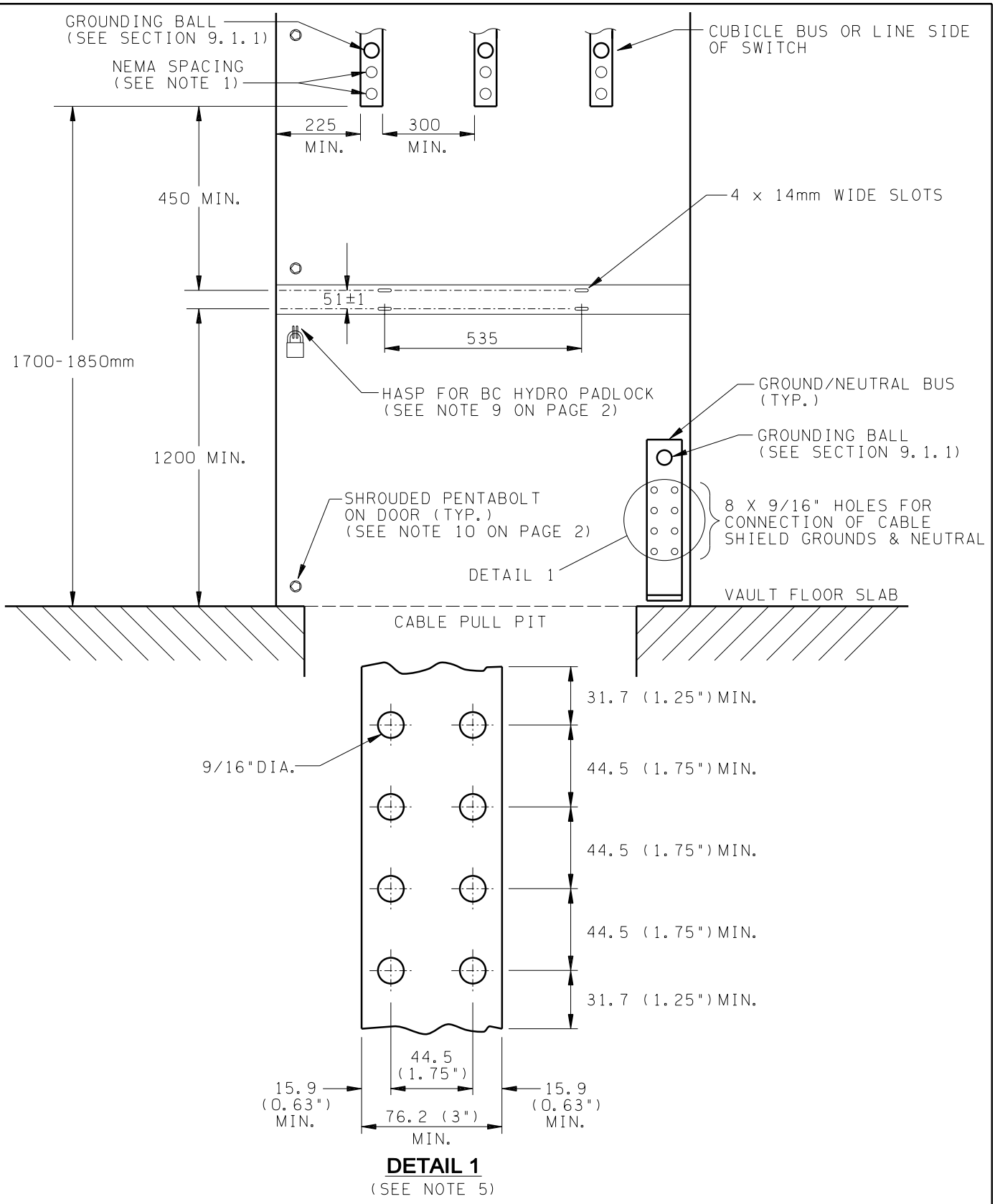
RECOMMENDED SIZE OF EXTRUDED DIELECTRIC SERVICE CABLES

12.5kV Unit Substations

Unit Substation kVA Size	Underground Supply		Dip from O/H Supply	
	Cables per Phase	Size of Al. Cond.	Cables per Phase	Size of Al. Cond.
1000	1	#1	1	#1
1500	1	#1	1	#1
2000	1	#1	1	4/0
2500	1	#1	1	4/0
3000	1	4/0	1	500 kcm
4000	1	4/0	1	500 kcm
5000	1	500 kcm	1	N/A

25kV Unit Substations

Unit Substation kVA Size	Underground Supply		Dip from O/H Supply	
	Cables per Phase	Size of Al. Cond.	Cables per Phase	Size of Al. Cond.
1000	1	#1	1	#1
1500	1	#1	1	#1
2000	1	#1	1	#1
2500	1	#1	1	#1
3000	1	#1	1	#1
4000	1	#1	1	4/0
5000	1	#1	1	4/0



DETAIL 1
(SEE NOTE 5)

DESIGNER	RECOMMENDED	APPROVED
original signed by		
A. NORRIS	C. PICASSI	F. DENNERT

ORIGINAL ISSUE DATE: JUNE 2010

PILC SERVICE CABLE ENTRANCE CUBICLE REQUIREMENTS

DRAFTER: DC/DM

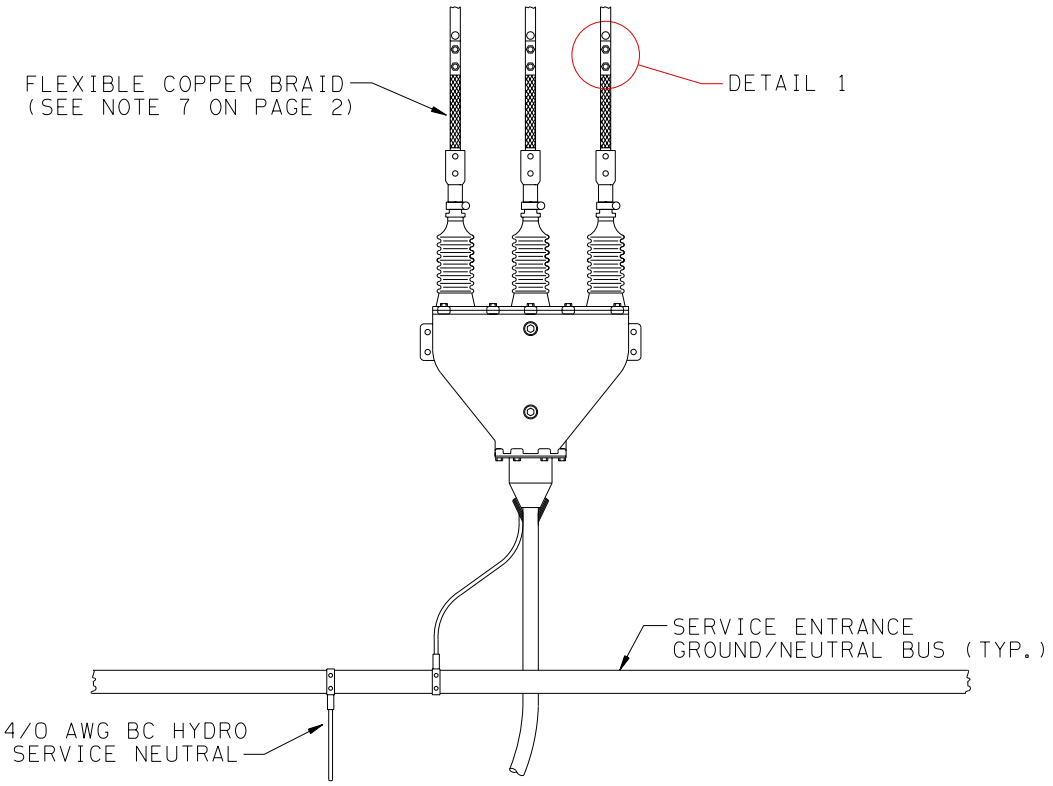
BC hydro DISTRIBUTION STANDARDS

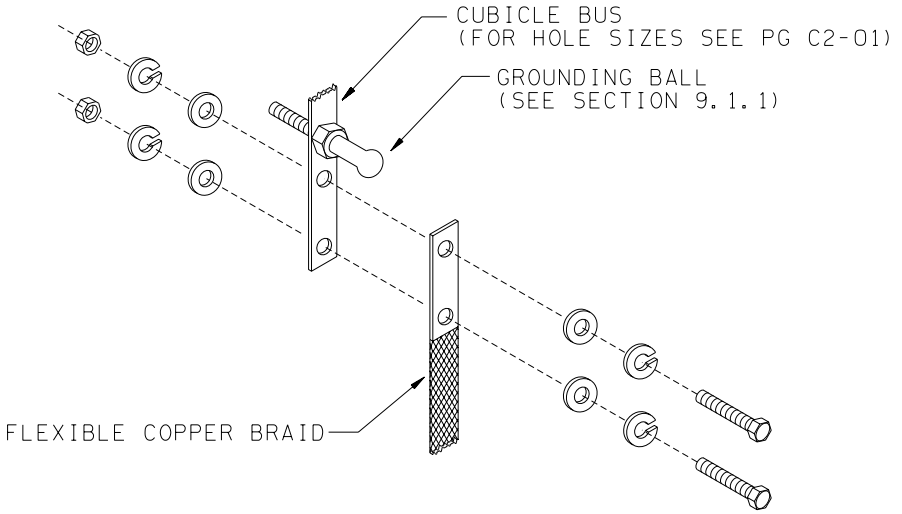
PG C2-01.01

R. 0

Notes:

1. Cubicle bus or line side of switch shall be furnished with a NEMA 2-hole pattern as per NEMA CC-1-2005, Figure B-2.
2. Ground/neutral bus shown as typical; it may be located in any easily accessed area of the cubicle. It shall be designed to allow installation of grounding/neutral connectors and associated hardware.
3. BC Hydro will not accept inverted cable terminations.
4. For pothead installation, refer to PG C2-02.
5. DETAIL 1 shows the most compact arrangement, the individual 2-hole NEMA patterns may be spread out for more convenient attachment of cable shields and/or neutral conductor(s) as suggested by PG C2-02. There shall be a minimum of 4, 2-hole NEMA patterns on the neutral/ground bus.
6. Minimum clearance between assembled pothead, including high-side grounding ball, and the compartment door shall be 225mm.
7. BC Hydro will supply connector hardware (bolts, washers and nuts) and flex braids. Flex braid will be 12" min., 18" max. Ground clearance to compartment door as per Note 6 shall be maintained with installation of flex braid.
8. All PILC entrance compartments shall be designed and constructed such that conversion to extruded deilectric service cable is possible without any structural modification. Therefore, all PILC entrance compartments shall also meet the requirements of drawing PG C1-01. Extruded dielectric cable supports are not required at time of construction and are the responsibility of BC Hydro in the event of conversion to extruded dieletric cable.
9. The customer shall include a hasp that is compatible with BC Hydro standard padlocks.
   BC Hydro standard lock dimensions:
   Shackle diameter: 9mm
   Shackle vertical clearance: 25mm
   Shackle horizontal clearance: 25mm
10. 3 Pentabolts shall be used to secure the entrance cubicle door.
    Pentabolt shroud dimensions:
    30 ID x 30mm long
    The customer is responsible for supply and install of Pentabolt.





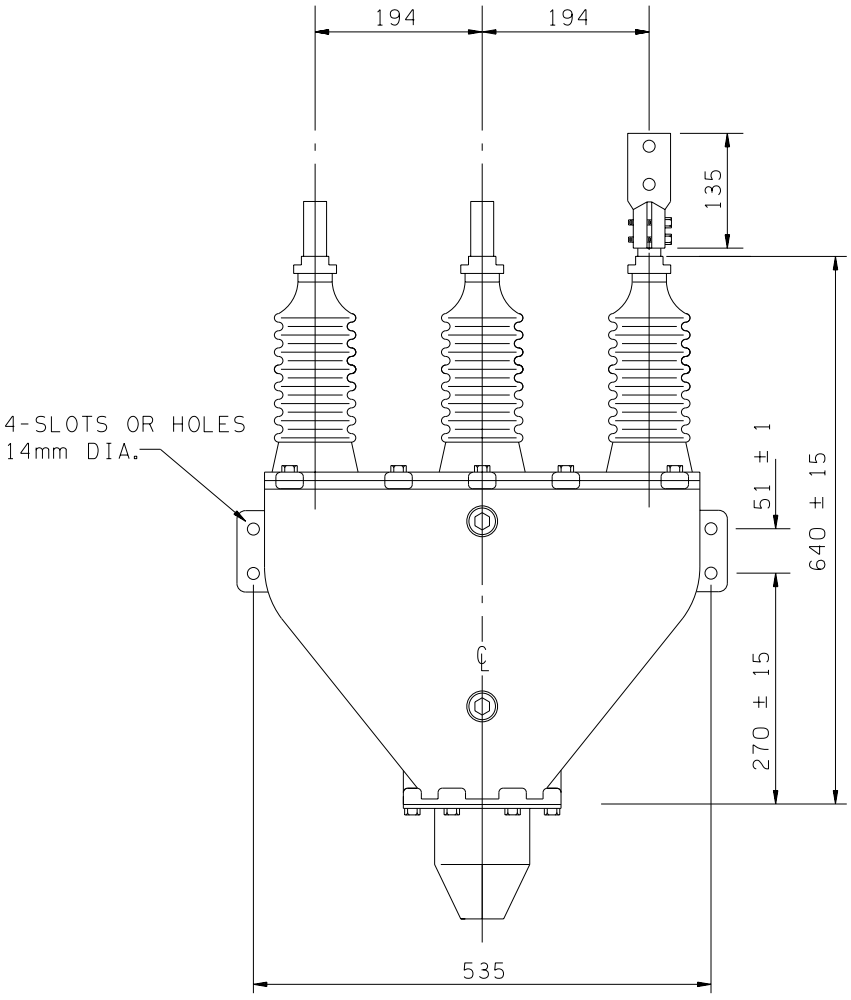
DETAIL 1
(SEE NOTE 1)

DESIGNER	RECOMMENDED	APPROVED
original signed by		
A. NORRIS	C. PICASSI	F. DENNERT

ORIGINAL ISSUE DATE: JUNE 2010

PILC SERVICE CABLE POTHEAD DETAILS

DRAFTER: DM



POTHEAD DIMENSIONS

NOTES:

1. **Service cable, pothead, cable bonding & grounding conductors, service neutral, flexible copper braids, connectors and associated connector hardware supplied and installed by BC Hydro.**

2. **Service ground/neutral bus is shown as typical, for illustration only. Refer to drawing PG C2-01.**

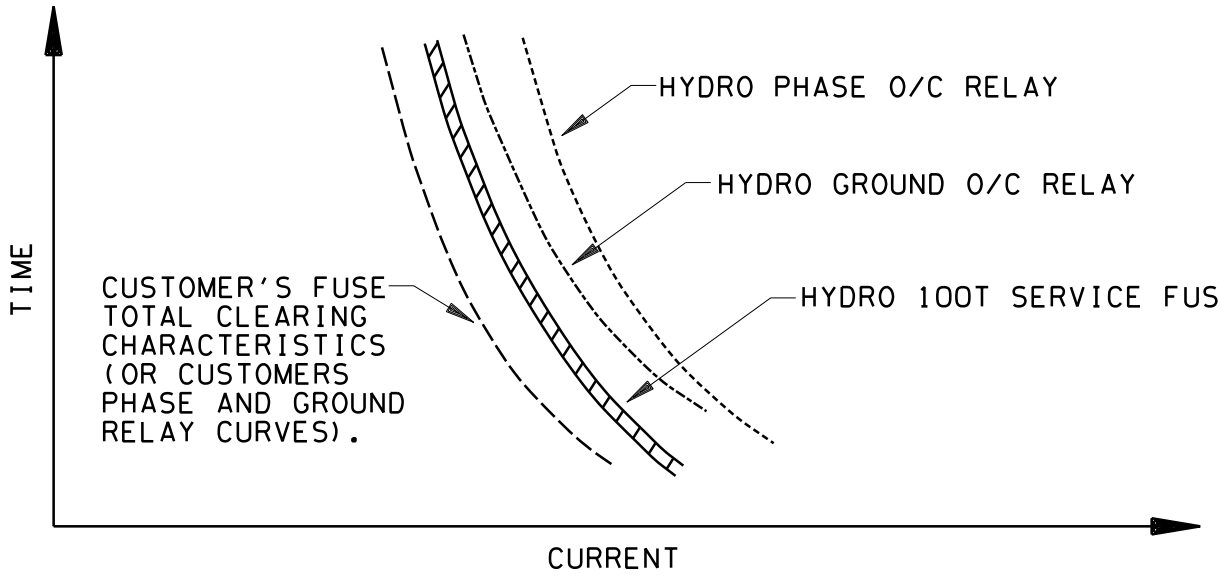
RECOMMENDED SIZE OF PILC SERVICE CABLES

12.5kV Unit Substations

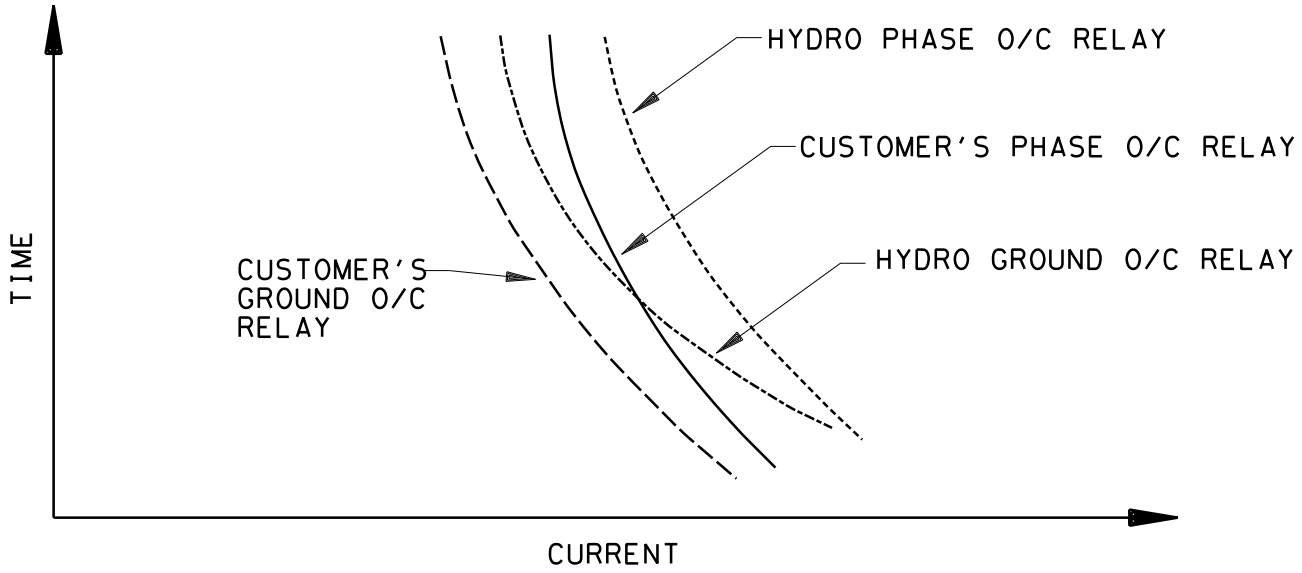
Unit Substation kVA Size	Underground Supply	Dip from O/H Supply
1000	4/0 12kV	4/0 12kV
1500	4/0 12kV	4/0 12kV
2000	4/0 12kV	4/0 12kV
2500	4/0 12kV	4/0 12kV
3000	4/0 12kV	400kcm 12kV
4000	4/0 12kV	400kcm 12kV
5000	4/0 12kV	N/A

NOTES:

1. 25kV Unit Substations shall not be supplied with PILC cable.
2. All PILC service cables are three-conductor.



BC HYDRO SUPPLY WITH SERVICE FUSE

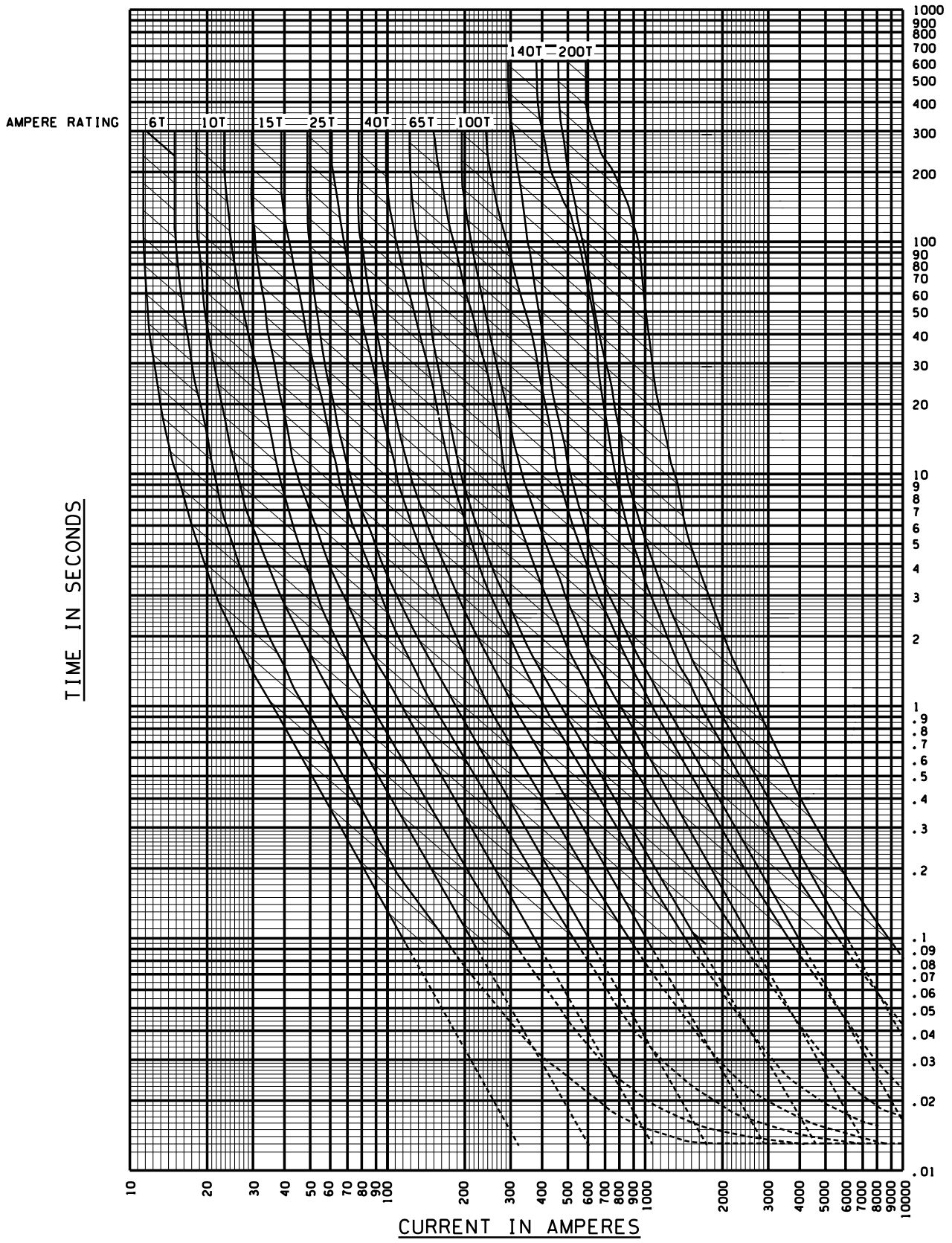


BC HYDRO SUPPLY WITHOUT SERVICE FUSE

DESIGNER	RECOMMENDED	APPROVED	SAMPLE PROTECTION CURVES CUSTOMER SERVICES AND BC HYDRO
original signed by M. KELVIN	C. PICASSI	F. DENNERT	
ORIGINAL ISSUE DATE: JUNE 2010			

DRAFTER: DC

BC hydro DISTRIBUTION STANDARDS | PAGE 1 OF 1 | PG D1-01 | R. 0



DESIGNER	RECOMMENDED	APPROVED
original signed by		
M. KELVIN	C. PICASSI	F. DENNERT

ORIGINAL ISSUE DATE: JUNE 2010

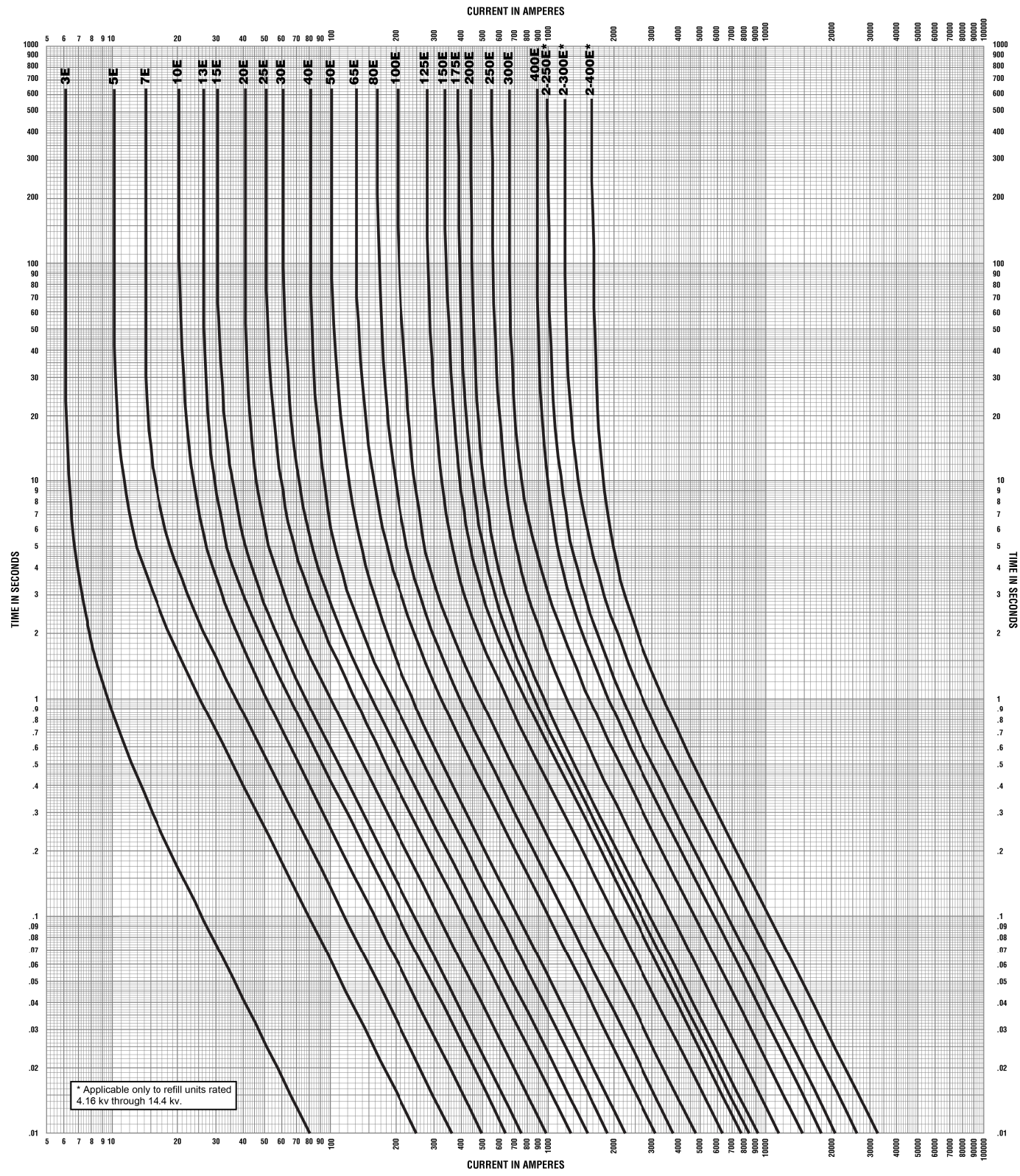
TYPE T FUSE
TIME-CURRENT CURVES

DRAFTER: DC

BC hydro DISTRIBUTION STANDARDS

PG D2-01

R. 0



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DRAFTER: DM

DESIGNER	RECOMMENDED	APPROVED
original signed by		
M. KELVIN	C. PICASSI	F. DENNERT

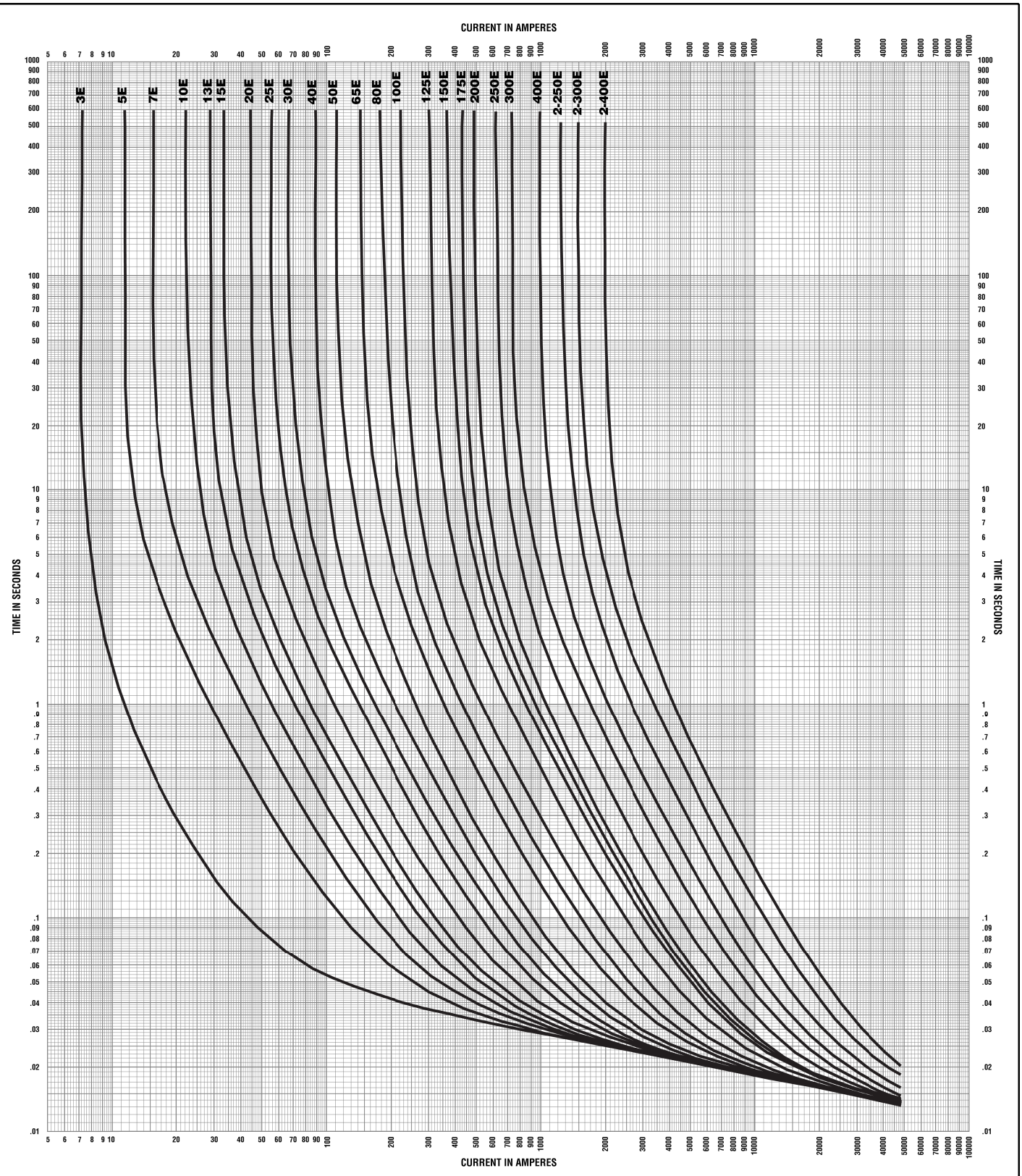
ORIGINAL ISSUE DATE: JUNE 2010

TYPE E FUSE
MINIMUM MELTING TIME-CURRENT CURVES
ALL VOLTAGE RATINGS

BC hydro DISTRIBUTION STANDARDS

PG D3-01

R. 0



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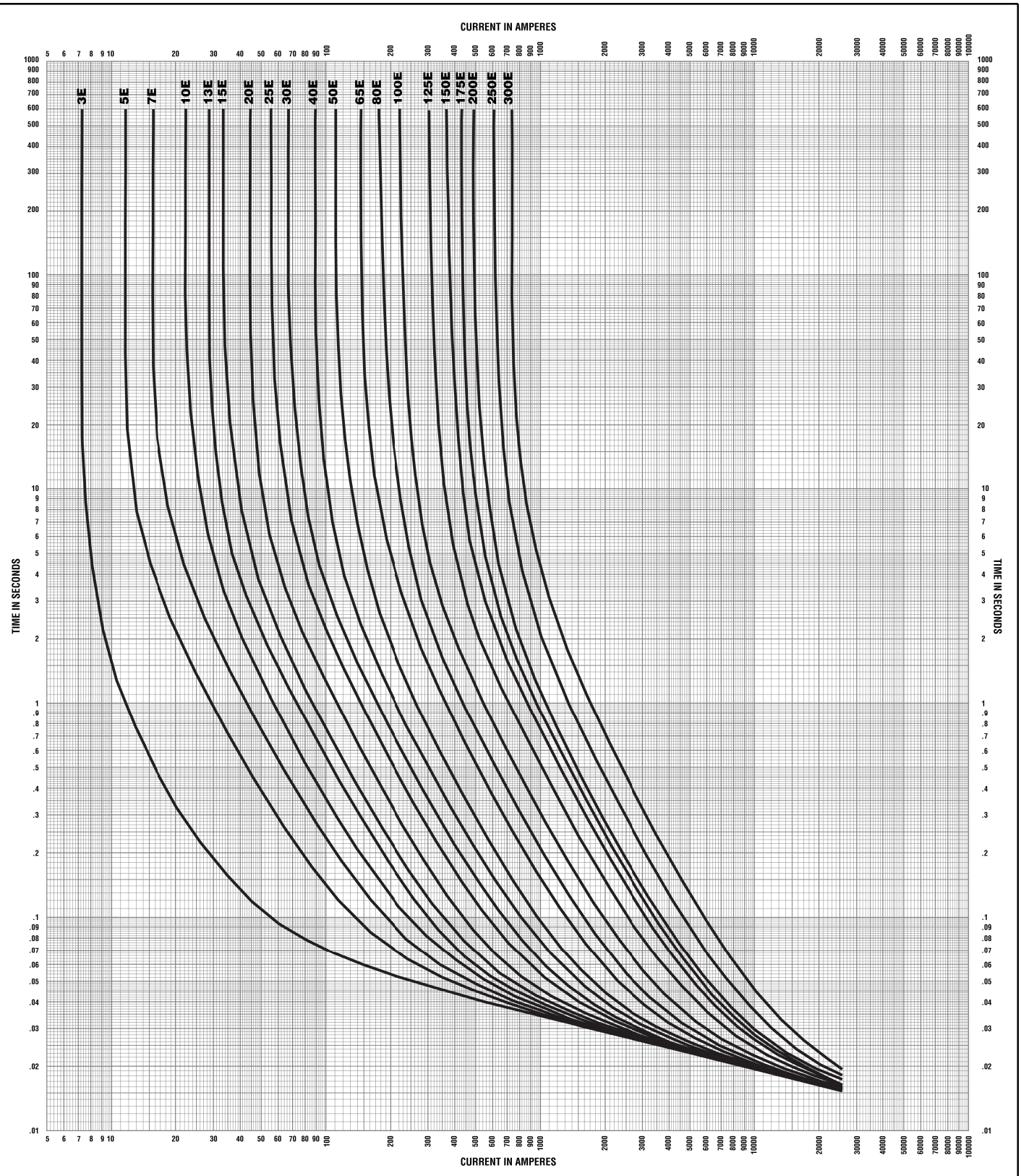
ORIGINAL ISSUE DATE: JUNE 2010

DRAFTER: DM

TYPE E FUSE
TOTAL CLEARING TIME-CURRENT CURVES
4.6kV THROUGH 14.4kV RATINGS

BC hydro DISTRIBUTION STANDARDS



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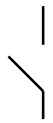
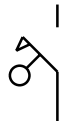
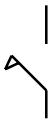
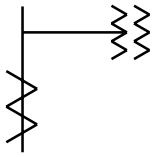
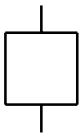
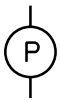
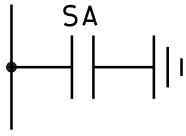
DESIGNER	RECOMMENDED	APPROVED
original signed by		
M. KELVIN	C. PICASSI	F. DENNERT

ORIGINAL ISSUE DATE: JUNE 2010

TYPE E FUSE
TOTAL CLEARING TIME-CURRENT CURVES
25kV AND 34.5kV RATINGS

 GANG-OPERATED DISCONNECT SWITCH	 BC HYDRO CABLE TERMINATION
 MOTORIZED GANG-OPERATED LOAD-BREAK SWITCH	 KEY INTERLOCK
 MANUAL GANG-OPERATED LOAD-BREAK SWITCH	 BC HYDRO METERING TRANSFORMERS
 FUSED DISCONNECT SWITCH OR CUTOUT	 BOLTED BUSBAR SECTION
 FUSE	POWER CIRCUIT
 POWER CIRCUIT BREAKER OR SINGLE SHOT CIRCUIT RECLOSER	PROTECTION AND METERING CIRCUIT
 OVERCURRENT PHASE RELAY	KEY INTERLOCKING CONNECTION
 OVERCURRENT GROUND RELAY	 RECLOSER
 SURGE ARRESTER	

DRAFTER: DC

DESIGNER	RECOMMENDED	APPROVED
original signed by		
M. KELVIN	C. PICASSI	F. DENNERT

ORIGINAL ISSUE DATE: JUNE 2010

PRIMARY VOLTAGE SERVICES DRAFTING LEGEND

12 APPENDIX 2 BULLETIN/STATEMENT/PHOTOGRAPHS

BCSA DIRECTIVE D-E3 090313 1	High Voltage Installations
PRIMARY SERVICE FORM 11 June 2002	Statement to BC Hydro Regarding Primary Voltage Service Equipment
PHOTOGRAPH 1	Insulated Buswork and Removable Termination Insulation Boots in Service Cable Compartment]

DIRECTIVE

No: D-E3 090313 1

HIGH VOLTAGE INSTALLATIONS

This Directive is being issued by a Provincial Safety Manager pursuant to section 30 of the Safety Standards Act. Stakeholders should consult with local authorities having jurisdiction prior to undertaking work, to determine local requirements.

Date of Issue: March 13, 2009

Scope

1. This directive provides guidance on the interpretation and application high-voltage installations operating, or designed to operate, in excess of 750V.
2. Utilities exempted from regulation by Electrical Safety Regulations Section 3 are not bound by this directive. This includes any work done on behalf of the Utility, when the contract is direct with the Utility, and the work is within the scope of the exemption in ESR (3).

Permits

3. All new high-voltage construction requires an installation permit obtained by a licensed contractor with an unrestricted 'A' FSR or restricted 'LI' FSR.
4. All high-voltage installations require an operating permit per Directive D-E3 070801 7 (Electrical Operating Permit Requirements) prior to energization. Installations that have a Utility take-over agreement do not require an operating permit.
5. If approved by variance, an operating permit with a 'B' class FSR is acceptable to operate the high-voltage equipment if that installation is a minor portion of the installation covered by the permit. In this case, maintenance or alteration of high-voltage equipment must be done by a licensed 'A' contractor under a separate permit.

Plans, Specifications, and Service Reports

6. Any plans and specifications required to be submitted must be approved by a Professional Engineer in good standing with the Association of Professional Engineers and Geoscientists of BC.
7. Plans and specifications may not be required to be submitted for installations being built under an approved variance for Utility take-over.
8. As per Directive D-E3 070302 3 (Section 2—General Rules), the following plans and specifications must be submitted with the permit application to the authority having jurisdiction:
   a) A one-line diagram of the installation from the utility connection to the main low voltage distribution point, including connections to any alternate power sources;
   b) Transformer ratings and ratios;
   c) Conductor types and sizes;
   d) Switch, fuse and circuit breaker ratings;
   e) Fault current levels available at the utility connection and at any low voltage distribution point; as well as any fuse co-ordination documents;
   f) Relay and tripping device settings; and
   g) Grounding system details including station grounds.
   h) Declarations from a Professional Engineer for the suitability of equipment, as outlined below.

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Toll Free: 1-866-566-SAFE (7233) Fax: 604 660-6215 Web Site: www.safetyauthority.ca E-mail: info@safetyauthority.ca

FRM-1126-00 (2007/02/07)

9. Any revisions to plans and specifications ("as built" condition) must be submitted with other related documents (such as service reports, ground resistance tests, equipment acceptance reports) when the final declaration is submitted.

Acceptance of High-Voltage Equipment

10. High-voltage equipment will be accepted for service if:
    a) it bears an approval mark issued by an accredited certification or testing agency per Electrical Safety Regulations section 21(1);
    b) it is for privately built installations intended for Utility take-over; or
    c) it is declared to be suitable for the intended use by a Professional Engineer in good standing with the Association of Professional Engineers and Geoscientists of BC if:
        i) no approval program is available from an accredited certification agency;
        ii) the equipment is of a design that can be installed according the BC Electrical Code
        iii) the equipment is designed, built, and tested to the applicable CAN or CSA standard(s), where such a standard exists;
        iv) the equipment is labelled in accordance with Rule 2-100, except for the approval mark required in 2-100(l); and,
        v) specifications for the equipment have been submitted with the permit application.
11. For equipment accepted for service through a declaration by a Professional Engineer and installed at a specific location under an installation or operating permit, an approval label may not be required if a variance has been obtained per Safety Standards Act s. 32.
12. For equipment accepted for service through a declaration by a Professional Engineer but not installed at a specific location under permit, a BC Safety Authority Equipment Approval Label may be applied to the equipment. Requests for this service must be submitted on an "Electrical Product Approval" form.
13. Consumer high-voltage service entrance and protective equipment connected to the Utility system must be acceptable to the Utility.

Overhead Lines

14. Overhead lines are normally constructed to CEC Part III rules, as well as any applicable BC Electrical Code requirements. Information Bulletin **B-E3 090312 1** provides information that may assist in the design and construction of overhead lines, whether operating at high or low voltage.
15. Private high-voltage overhead lines are required to have a disconnecting means with overcurrent protection, in accordance with Rule 36-204, at the point of connection to the utility.
16. Private high-voltage installations connected to the Utility must be acceptable to the Utility.

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Utility Take-over

17. Privately built installations intended for Utility take-over may be exempted from some requirements of the BC Electrical Code, including submission of plans, specifications, and service reports, if, prior to construction,
    a) an installation permit exists, and
    b) a variance has been granted. The variance request must include a copy of the Take-over Agreement, approved by the Utility, including the effective date for take-over, and any conditions for take-over.
18. Privately built installations intended for Utility take-over shall be acceptable to the Utility.

Stephen Hinde
Provincial Safety Manager, Electrical

References:

Bill 19 – 2003	Safety Standards Act
B.C. Reg. 100/2004	Electrical Safety Regulation
B.C. Reg. 105/2004	Safety Standards General Regulation

For more information on the British Columbia Safety Authority, please visit our web site at:
www.safetyauthority.ca

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Statement to BC Hydro Regarding Primary Voltage Service Entrance Equipment

BC hydro

The Customer, or representative, provides this Statement to BC Hydro knowing that BC Hydro intends to rely upon it.

BC Hydro may refuse to supply Electricity to the Customer or suspend or discontinue the supply if, in BC Hydro's judgment, the Equipment is not compatible with or suitable for the BC Hydro electrical system.

The judgment by BC Hydro of the Equipment shall not be construed by the Customer or others as an endorsement of the design or as a warranty by BC Hydro of the Equipment for the purpose of the Customer or others than BC Hydro.

Project	**Location**	**Owner/Developer**

Service: U/G ☐ O/H ☐	**At** kV	**Expected Service Date:**

Type of Service Equipment: O/H Structure ☐ Unit Sub. ☐ Outdoor ☐ Indoor ☐ Vault ☐

Required Drawings: One-Line Drawing Number _____ Site Plan Drawing Number _____

Equipment Layout Drawing Number _____

Transformers:

Bank kV•A	H.V. Winding				L.V. Winding				High Voltage Taps				On-load Tap Changer ± ____ %	Impedance % ____ on bank kV•A base (ONAN)
	Volts	Δ	Y	Y Grounded	Volts	Δ	Y	Y Grounded	Above Rated Volt. No.	Above Rated Volt. %	Below Rated Volt. No.	Below Rated Volt. %		

Service Entrance: (Complete I or II)

(I) Circuit Breaker:

Voltage Rating kV	Current Rating Amps	Interrupting Rating KA SYM RMS	Clearing Time Cycles	Trip Coil - Current Trip Amps (ac) - or Shunt Trip Volts (dc)

(II) Fuse Protection: Either Load Break Switch, or Disconnect Switch Interlocked with Secondary Breaker.

(A) Switch (Specify Mounting): Pole ☐ Structure ☐ Cubicle ☐

Voltage Rating kV	Load Interrupting Rating Amps	At % P.F.	Momentary Rating Amps	At % P.F.	Manufacturer (if known)	CSA Approval Yes ☐ No. ☐

(B) Fusing

Manufacturer	Manufacturer Type Designation	Rated Continuous Current	Rated Maximum Voltage	Fuse Characteristics

Interconnection Protection:

Protection	Manufacturer	Type/Style	Timed Element Setting Range	Inst. Element Setting Range
Ground Overcurrent				
Phase Overcurrent				
☐ Over ☐ Under Voltage				
☐ Over ☐ Under Frequency				
Synchronizing Check				
Reverse Power				
Differential				
Under Frequency Load Shedding				

Are C.T.'s adequate to operate relays and current trip coils where applicable for all current magnitude from minimum trip to maximum fault duty?

☐ Yes ☐ No based on maximum fault duty of _____ MV•A

Metering:

Pole Metering.	Yes ☐	No ☐
Vault or Indoor Unit Sub.	Yes ☐	No ☐
Outdoor or Unit Sub	Yes ☐	No ☐

Estimated Maximum Demand	
Initial	Future
_____ kW	_____ kW

Metered Voltage
Rate Schedule

Customer Generation:

☐ No Customer generation.

☐ Customer generation not parallel to BC Hydro supply, transfer switch type: _____

☐ Customer generation parallel to BC Hydro supply but with no agreement to sell electricity to BC Hydro.

☐ Customer generation parallel to BC Hydro supply with intent to sell electricity to BC. Hydro.

} If selected, complete Generators Section.

Generators:

Type	Energy Source	Manufacturer	Rated Output in kW	Rated Output Voltage	Power Factor	3 PH or 1 PH	Total Harmonic Content		Reactance in % Machine kV•A Base			Machine Inertia Constant H
							Current	Voltage	Xd	Xd'	Xd''	

1. Synchronous Generator 2. Induction Generator 3. Other: _____

1. Hydraulic 2. Gas 3. Woodwaste 4. Diesel 5. Other: _____

If the above space is insufficient for all generators, please provide remaining generator information separately.

Seal of Professional Engineer

	BC Hydro
Company	
Signature	Received By
Date	Date

Primary cable compartment

Primary cable compartment showing disconnect switch and primary bus work

Close up of termination with ground stud boot removed

Customer-owned primary fuse compartment

Note: All photographs are courtesy of Schneider Electric