



*Based on
the 2018*

*Canadian
Electrical
Code*

*Effective:
January 1,
2019*

V4.0

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Preface and Scope

The Canadian Electrical Code, Part 1, Twenty-Fourth Edition, as interpreted by these requirements, issued under Section 5 of *The Electrical Inspection Act, 1993*, shall govern the workmanship and all other matters pertaining to electrical equipment and the installation of electrical equipment in or upon any land, buildings, structures, and premises. All previously issued bulletins are superseded by these interpretations.

This document contains supplementary information to clarify the requirements of the 24th edition of the Canadian Electrical Code (CEC), and by their inclusion herein is adopted as requirements under Section 5 of *The Electrical Inspection Act, 1993*.

Report of Accident

The Electrical Inspection Act, 1993 c.E-6.3 s.27 requires:

“Where an accident involving an electrical installation or electrical equipment occurs and results in a death or injury of a person or in a fire or an explosion, the contractor or the contractor’s agent or the owner of the electrical equipment or the owner’s agent shall immediately notify the Chief Electrical Inspector, stating the precise location of the accident, its general nature and results”.

Investigation of Accident

The Electrical Inspection Act, 1993 c.E-6.3 s.28 requires:

The accident site is to be preserved, “no part of any electrical plant or electrical equipment involved is to be removed or its position altered by any person”, “until the written permission of an Inspector has been obtained”.

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Website information

Electrical Inspection Act: <http://www.qp.gov.sk.ca/documents/English/Statutes/Statutes/E6-3.pdf>

Electrical Inspection Regulations: <http://www.qp.gov.sk.ca/documents/English/Regulations/Regulations/E6-3R1.pdf>

Electrical Licensing Act: <http://www.qp.gov.sk.ca/documents/English/Statutes/Statutes/E7-2.pdf>

Electrical Licensing Regulations: <http://www.qp.gov.sk.ca/documents/English/Regulations/Regulations/E7-2R2.pdf>

SaskPower New Connect Process: <https://www.saskpower.com/Accounts-and-Services>

<https://www.saskpower.com/Accounts-and-Services> now contains the following information:

2018 CEC Saskatchewan Interpretations and Information

District Inspector Contact Numbers

District Inspector Territory Maps

Electrical Fee Schedule

Code for Electrical Installations at Oil & Gas Facilities

Link to Electrical Inspection Act and Electrical Inspection Regulations

SaskPower Electric Service Requirements

Approved Field Inspection Agencies and Certification Bodies

Generator Brochure

Wind & Solar Information

Bond notice administration fees

When defects are due, a bond notice will be issued and a \$125.00 administration fee as per Table 4 of the electric fee schedule will be incurred. The invoice will be issued to the contractor at the same time the bond notice is issued to the applicable bond company for completion of said defect.

Unreported work penalty – Electrical Inspection Regulation

The Electrical Inspection Regulations have changed the un-reported work penalty from **\$250 to a maximum of \$2500.**

Energization stickers

As a reminder, energization stickers shall not be applied to any meter socket unless **a paid Electrical Permit has been obtained for the service.**

Failure to comply with the specific requirements listed for the application of energization stickers by the Electrical Contractor will result in fines and penalties being assessed against the contractor.

Electrical Inspections Registered Electrical Contractor Program

Electrical contractors may be eligible for a 10 percent discount for customer electrical permits.

To improve and maintain safety and consistency of electrical installations, Electrical Inspections has introduced the Registered Electrical Contractor Program to electrical contractors who meet the following criteria on an annual basis:

- a) Participate in a continuing education program under the umbrella of the Electrical Contractors Association of Saskatchewan;
- b) Maintain a defect ratio of four percent or below on all inspected permits and have a minimum of 20 inspected permits per year;
- c) Have no incidents of unreported work and disclose all information related to the electrical installation/permit;
- d) Take out online permits only; and
- e) Correct any defects within the date of expiry and have no incidents of bond action (an incident of bond action will result in the immediate loss of status).

How does it work?

- a) Beginning January 1, 2018, contractors will have their history tracked to verify that all requirements have been met;
- b) Successful contractors will be notified in February that they have achieved registered contractor status;
- c) Once a contractor has reached registered status, the 10 percent rebate is applied to all permits starting the following February; and
- d) Contractors will be required to meet the standards annually to remain a registered contractor and will continue to have their history tracked.

Inquiries

Contact Scott McCorriston at 306-566-2516 or Rod Pack at 306-934-7720 for more information.

Journeyman License (see The Electrical Licensing Act E-7.2)

8(1) Subject to Subsection (2), no person shall do any work of electrical installation unless he holds a license.

Employer's License (see The Electrical Licensing Act E-7.2)

23(1) No employer shall do any work of electrical installation unless he holds an employer's license.

(2) An employer's license may be issued to a person who employs at least one individual who holds a journeyman's license;

(3) No employer shall require or permit any apprentice or other unlicensed individual to perform any work of electrical installation except as an assistant to, and under the supervision of, a journeyman.

SECTION 2 - GENERAL RULES**2-004 - Permit****Permit information**

It is the responsibility of the contractor to ensure that the information given on the permit application is accurate and complete. Inaccurate details may result in delayed service connects. In an effort to make the permit process more efficient, please follow these simple rules:

1. **Ensure the address where the work being performed is accurate and complete.** Additional information is required where no civic address is available (i.e. beaches, new subdivisions, oilfield lease sites, reserves, etc.).
2. **Supply work/cell contact phone number and name for the owner. Failure to provide accurate and legible information on any permit application could result in the following:**
 - a. a **\$125.00** assessment fee may be charged to locate missing or inaccurate information; or
 - b. the application and payment may be returned to the contractor to update missing or inaccurate information. A fine (\$250.00 to \$2,500.00) for unreported work as per *The Electrical Inspection Regulations* may be assessed for any work that is not authorized by a valid permit.

Section 16 of *The Electrical Inspection Act, 1993* and Section 7 of *The Electrical Inspection Regulations* specifies that **all permit applications must be accompanied by the appropriate permit fee.**

Commencement of work

In accordance with Section 10 of the Electrical Inspection Regulations:

- 1) Work for which a permit is granted must be started within 90 days after the date of issuance.
- 2) If work authorized by a permit is not started within this timeframe, the permit expires at the end of that period.
 - Permits may be cancelled by the contractor if work has not been started within 90 days and a refund will not be issued unless requested by the contractor; administration fees may apply to the refund.
 - If a permit is over 90 days old and work has not been started, the permit will be cancelled; no refund will be issued.

Permit expiry date

Permits shall expire one year after the issuance of a permit. Permits shall continue to be valid beyond one year by special permission. *Supplemental permits* must be submitted within 3 years of the permit issue date. After that time a new permit must be obtained.

2-004 - Permits for low voltage and extra low voltage installations

All low voltage and extra low voltage installations including lighting, home automation control wiring, power over ethernet (POE), process controls, fire alarm systems, heating/cooling control wiring, control/communication cable tray and conduit systems, solar powered systems, cathodic protection and SCADA systems require permits. *The Electrical Inspection Regulations* (available at Publications Saskatchewan <https://publications.saskatchewan.ca/#/freelaw/acts>) have been amended to exempt the requirement of an electrical permit for the installation of communication cabling.

E-6.3 REG 1 - 6.1(1) In this Section:

- a) “code” means the latest prescribed edition of the CEC within the meaning of subsection 5(2) of the Act;
- b) “communication system” means a communication system as defined in Section 0 of the code;
- c) “control circuit” means a control circuit as defined in Section 0 of the code;
- d) “hazardous location” means a location to which Section 18 of the code applies;
- e) “patient care area” means an area to which Section 24 of the code applies.

E-6.3 REG 1 - 6.1(2)

Subsection 16(2) of the Act does not apply to the following types of work of electrical installation:

- a) the replacement of switches, receptacles, ballasts, lighting fixtures or motors, in single-family dwelling units and in non-detached dwelling units with separate entrances that are intended for the use of one family; and
- b) the installation of a communication system, other than a communication system:
 - i. that is located in a hazardous location;
 - ii. that is located in a patient care area; or
 - iii. in which control circuits operate the electrical equipment i.e. home automation or SCADA systems.

Notes:

- 1) This exemption also applies to security systems, except that permits will still be required under the following conditions:
 - security systems installed in hazardous locations;
 - security systems installed in patient care areas; or
 - security systems that have a hard-wired 120-volt supply (not a plug-in device).
- 2) **6.1(1) d)** “hazardous location” described in REG 6.1(1) shall also include a location to which Sections, 19 (Oil & Gas Code) 20 and 22 of the code apply.
- 3) The installation of the associated equipment, conduit system, etc. still requires a permit.
- 4) 6.1(2) Subrule a) is for replacement only without altering the existing wiring installation.

2-004 - Permits for signs and outline lighting

Permits are required for the connection of all signs and outline lighting. The permit fee shall include the wiring to the sign **and the cost of the sign as per the Fee Schedule**. See [Section 34](#).

2-012 - Inspection request required

For scheduling purposes, a two-week notice is required for an inspection of the following installations prior to concealment, operation and/or utility connection, and the contractor may be requested to be present for:

- a. main service and/or feeders 600 amps or larger;
- b. medical facilities that contain patient care areas;
- c. high voltage installations, including grounding;
- d. renewable energy production such as solar and wind;
- e. buildings housing livestock or poultry;
- f. high voltage neon signs and outline lighting;
- g. sewage lift and treatment facilities; and
- h. irrigation systems.

Note:

To facilitate the inspection of the installations, contractor photos can be attached to the permit in the Permit System or available at the time of the inspection to show the wiring installation, bonding of the equipment and installation of the equipment.

2-014 - Plans and specifications

1. One set of construction electrical plans and specifications, as required by Section 19 of *The Electrical Inspection Act, 1993* or as requested by the Electrical Inspections department, shall be submitted to and reviewed by the Electrical Inspections department for:

- a. main service and or feeders where ampacity is 600A or larger;
- b. all renewable energy systems installations (**Note:** Only 5 KW and larger will be reviewed with Plans Review Letter);
- c. sewage lift and treatment facilities;
- d. Class A, B and C health care facilities as indicated by the current edition of the Z32 Standard, including identification of the patient care areas (See [Section 24](#) in the Saskatchewan Interpretations for definitions);
- e. installations covered by Sections 18, 19 (Oil & Gas Code - excluding single oil well sites <750 V) 20 and 22 (**Note – Reclassification of areas must be performed by a Professional Engineer complete with an assessment report and stamped drawings**);
- f. high voltage services and feeders;
- g. generator systems over 12 KW; or
- h. any other installation as deemed necessary by the Electrical Inspections department (i.e. large renovations of public buildings).

2. Submissions shall include the following information:

- a) submitter (consultant/contractor/client) contact information:
- company name,
 - mailing address,
 - phone number,
 - e-mail address.
- b) project name, construction site address and/or land location.
- c) clearly specify the scope of the work.
- d) clearly identify existing, new and future part of the project.
- e) electrical plans shall include the following:
- 1) Detailed site plan;
 - 2) An overall single line diagram complete with:
 - main service ampacity, voltage and phase;
 - main and feeder conductor type and sizes including installation method i.e. underground (as per the D Tables and Diagrams), conduit, free air, bundled or raceway;
 - panel schedules indicating current and voltage ratings;
 - breaker/fuse size;
 - conductor material (copper or aluminum);
 - maximum short circuit current available at main service;
 - transformer ratings, primary and secondary overcurrent protection devices and conductor sizes; and
 - grounding and bonding details;
 - 3) Hazardous area classification drawings, which shall include the auto ignition temperature (AIT) of the hazardous product present at the site;
 - 4) Patient care areas (clearly identify the different patient care levels);
 - 5) Calculated loads;
 - 6) Cable schedule;
 - 7) Cablebus;
 - 8) Electrical equipment layout; and
 - 9) Voltage drop calculation for services and feeders.
- f) For **high voltage** (*over 750 V*) installations, in addition to the applicable items in (E), the following information shall be submitted:
- 1) Electrical equipment arrangement complete with elevation, profile views and physical arrangement of the electrical equipment dimensions to clearly indicate the electrical, physical and work clearances and relative locations of the equipment;
 - 2) Fencing arrangement and details (see [36-312](#));
 - 3) Grounding and bonding details (including impedance grounding wiring details);
 - 4) Ground potential rise (GPR) study;
 - 5) Provisions for metering equipment; and
 - 6) Other design information and documents as requested by Electrical Inspections.

g) Plans submission for *renewable energy system* shall include, but not limited to:

- 1) [Renewable Energy Information Check Sheet](#) which must be submitted with all renewable energy installation plans; Please visit <https://www.saskpower.com/Accounts-and-Services>.
- 2) manufacturers specification or data sheets for racking systems, PV modules, DC combiners, inverters, rapid shutdown, etc.;
- 3) a detailed site plan showing the relative locations of all electrical equipment including the length of all feeders and any applicable voltage drop calculations; and
- 4) an overall single line diagram shall contain the following:
 - all electrical equipment (new and existing) and where this equipment connects to any electrical systems on the property such as PV array, DC combiner, inverter, disconnect, breaker/fuse, panel, etc.
 - show all specific wiring and installation methods for the entire electrical installation (i.e. copper or aluminum conductors, PVC conduit, EMT, ACWU or TECK cables, underground, indoor/outdoor location, etc.)
 - all grounding and bonding details of any new electrical equipment.
 - the interactive point of connection as applicable in Rule 64-112 shall be shown. For example, if the connection is on the load side of the service disconnecting means such as a panelboard, splitter or other distribution equipment, provide bus amperage rating, utility source breaker and the renewable energy system input breaker ratings.
- 5) solar array details required are:
 - the maximum photovoltaic source circuit voltage as calculated by Rule [64-202](#) (N/A for micro-inverters, optimizers);
 - the rated short-circuit current (N/A for micro-inverters);
 - the rated operating current and voltage;
 - the type and number of PV modules connected in each series string;
 - the specific wiring methods for the solar array as applicable in CEC Rules [64-210](#), [64-212](#), & [64-220](#); and
 - for rapid shutdown initiation devices, show the location of equipment placards as per the local fire department (see [Appendix M](#)).

Renewable Energy Information Check Sheet

Customer Name _____ Contractor Name _____

Address of Installation _____ City / RM _____

Type of Renewable:

☐ Solar ☐ Wind ☐ Other Please Specify _____

Generation: _____ KW (DC)

Maximum AC Output Current: _____ A

(Maximum continuous output current from all inverters)

Operating AC Voltage: _____ V

Interactive Point of Connection

- ☐ F200A Farm Service Centre
- ☐ Farm – Service center for Interactive Point of Connection (Maximum renewable input = 64A)
- ☐ Farm – With Splitter for Interactive Point of Connection (Max renewable input = 160A)

☐ Line Side (before main breaker)

☐ Line Side (double lug meter socket)

Note: the sum of all renewable energy overcurrent protection devices connected must not exceed the rating of the consumer service.

☐ Load Side (after main breaker)

Main Panel Bus Rating (required if Load Side): _____ A

Overcurrent - Main (required if Load Side): _____ A

Renewable Input Breaker (required if Load Side): _____ A

Manufacturers Specification Sheets Shall be Provided for All Equipment

	Quantity	Make	Model
Solar Modules			
Racking System			
Micro-Inverter			
String Inverter			
Power Optimizer			
Wind Turbine			
D.C. Combiner			
D.C. Recombiner			
Factory Wiring Harness or Trunk Cables			
Energy Storage			
Charge Controller			
Rapid Shutdown			

See 2-014 in the Saskatchewan Interpretations for additional submission requirements.

3. Submit plans to:

SaskPower
Gas & Electrical Inspections Division
#177-1621 Albert Street
Regina, SK S4P 0S1

Telephone: 1-888-757-6937 (option 5)

Fax: 1-306-566-2906

E-mail: electricalplansreview@saskpower.com

4. Plans review fees are as follows:

- 750V systems or less – no fees.
- Expedite - for 120/240 or 120/208V up to 800A - \$375 plus GST.
- Expedite - for installations over 300V or 800A - \$500 plus GST.
- High voltage system (over 750V) – minimum \$375 plus GST; additional \$125.00/hr plus GST may apply.

Notes:

1. The **electrical contractor shall ensure** that the plans have been submitted to Electrical Inspections.
2. The **electrical contractor shall ensure** that any main service and/or feeder conductor/cable changes made during construction be re-submitted to Electrical Inspections.
3. **Each electrical contractor, for a complex industrial installation, shall ensure** that plans are submitted covering the portion of the installation they are responsible for including the permit number and project designation/name/number, etc.
4. **Where plans have not been submitted and reviewed by Electrical Inspections, service energization may be denied.**
5. **Plans are entered in the queue and reviewed in the order they are received.**
Submissions missing any required information will be moved back in the queue.
6. Construction set of electrical plans should be submitted prior to construction or at least 6 weeks prior to the required pre-inspection and the service energization. The standard turnaround time for review process is approximately four to six (4 to 6) weeks. For high voltage submissions, the review process is approximately six to eight (6 to 8) weeks. The review process timeline may be longer depending on the number of submissions received.
7. Upon completion of review, the Plans Review letter will be issued to the submitter.
NOTE – A copy of Plans Review letter should be made available at the time of the inspection.
8. **Contractor/designer/engineer shall ensure that the customer has a utility interconnection agreement with the utility.**
9. **Contractor/designer/engineer shall ensure that the customer has a utility letter of acceptance for the installation of closed transition transfer switches as per Rule 84-002.**

10. Provide overcurrent protection for emergency power supply;
 - where an emergency generator is installed to supply power to life safety systems as defined in Rule 46-002, a selective coordination report will be required to be submitted to Electrical Inspections.

2-022 - Renovations of existing installations

Connection or reconnection (see [10-102](#))

A permit is required, and the service shall be made to comply with the requirements of the current edition of the Canadian Electrical Code where the service:

- has been disconnected for more than twelve (12) months;
- has been disconnected due to a fire or flood; or
- requires reconnection due to an upgrade, alteration or repair (i.e. main breaker failure...).

Notes:

- **Installation of a meter mounted transfer switch device shall require verification of the service grounding and bonding.**
- **Wooden masts will no longer be connected when a permit is required.**
- **A pre-inspection and plans may also be required in accordance with [2-012](#) and [2-014](#).**
- **All meter sockets shall have a fixed wood backing minimum 19mm (3/4") thickness, at least the same width as the meter socket, and pressure treated or clad for protection.**

Flood procedures

When restoring power to a flood damaged premise, there are several conditions to be aware of and processes to comply with. All work must meet the requirements of the current CEC. When electrical equipment is exposed to water, corrosion is enhanced rapidly. The equipment may look safe on the outside, but it can be extremely dangerous to reuse. **The Local Electrical Inspector must be notified before reconnection.**

1. Circuits and equipment that were subjected to the flood must be disconnected and isolated before power can be restored.
2. If the service (panelboard, etc.) has been exposed to water, it must be replaced or completely disassembled and cleaned (re-approval by manufacturer required after reassembly). All the submerged breakers must be replaced and destroyed. When service equipment is replaced, the entire service must be brought up to the current CEC.
3. All meter sockets must be securely mounted.
4. Grounding must be checked and if repairs are required, they must meet the requirements of the current CEC. Ground clamps should be cleaned or replaced.
5. All submerged conductors, cable, equipment, receptacles, switches, etc. must be replaced and the damaged material destroyed.
6. Conduit systems that have been flooded shall be cleaned and a bond wire shall be installed with the new conductors.
7. Furnaces and water heaters must be checked over by a qualified gas contractor.

Electrical systems exposed to fire

When a building has had a fire and the panelboard has been exposed to smoke and/or water, all of the breakers must be replaced, and the old ones destroyed. If the panelboard has not been damaged by heat etc. it may be thoroughly cleaned and reused (re-certification required or a letter of acceptance from manufacturer after reassembly). All receptacles, switches, lighting and heating fixtures that have been exposed to the smoke and/or water must be replaced and the old ones destroyed. Any wiring that may have been exposed to flames or heat in excess of its maximum temperature rating must be replaced. All repair/replacement work must meet the requirements of the current CEC.

Renovating of existing installations

Where during a renovation or repair work, the walls are opened up or if cabinetry is removed/replaced, then every effort shall be made to ensure that the electrical wiring and circuitry for all outlets is brought up to the current CEC. Electrical Inspections may be consulted for clarification on what is required specifically to satisfy this policy.

2-024 - Use of approved equipment

All electrical equipment shall be approved as per Rule 2-024 and Appendix B note with the exception as per Rule 16-222.

Labels required for manufactured homes and movable equipment wired under a Saskatchewan electrical permit.

Skids and movable equipment that have been wired off site shall have a suitable, weatherproof if required, label affixed to the electrical panel or skid. The label shall include the Saskatchewan electrical contractor's name, the permit number that was issued for the installation and the date.

Manufactured homes [ready to move homes (RTM)] shall have a label affixed to the electrical panelboard or the inside of the kitchen cabinet. The label shall include the Saskatchewan electrical contractor's name, the permit number that was issued for the installation and the date. If you require labels, please contact your **Local Electrical Inspector**.

Equipment approval certification



All electrical equipment requires an overall approval from a Saskatchewan recognized certification body prior to being sold, advertised, electrically connected or reconnected. This includes locally manufactured products, used or rebuilt equipment, solar powered generating units used for temporary construction power or lighting, and may also include mobile homes, and RTM's. For a complete list of approved certification bodies and certification marks, please visit the SaskPower website at <https://www.saskpower.com/Accounts-and-Services>.

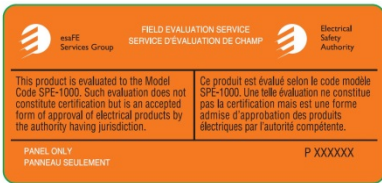


Field inspection certification

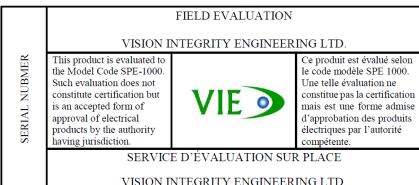
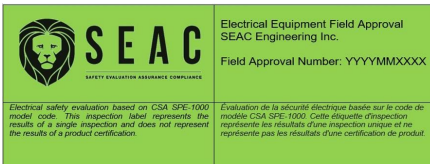
For a list of current recognized field certification labels for the Province of Saskatchewan, contact Electrical Inspections at our toll-free number 1-888-757-6937, or visit us online at <https://www.saskpower.com/Accounts-and-Services>.

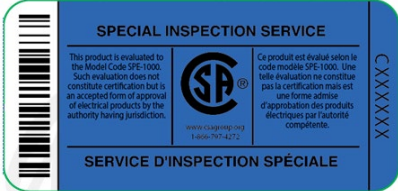
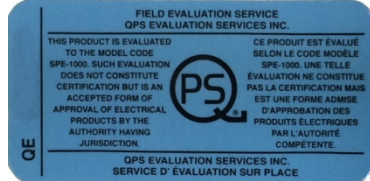
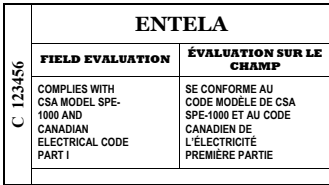

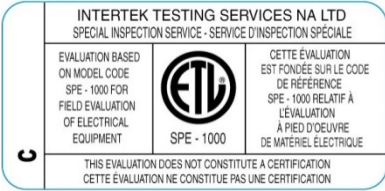


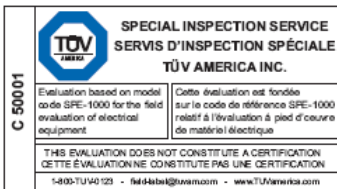

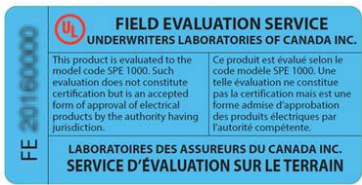

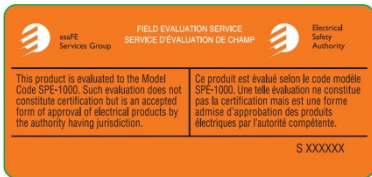
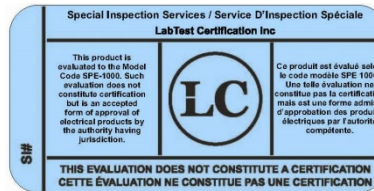
Field inspection / Field evaluation reports




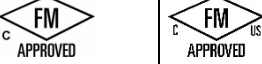


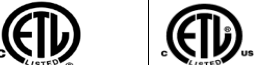
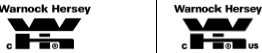
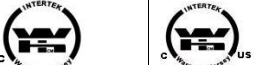


Field Inspection reports on skids or moveable equipment shall become part of the equipment and shall be made available on request. Report shall remain with the equipment.










Name of Field Inspection Agency	Special Inspection <u>Medical Equipment Label</u> All labels must read: “ <u>SPE-3000</u> ”	Name of Field Inspection Agency	Special Inspection <u>Medical Equipment Label</u> All labels must read: “ <u>SPE-3000</u> ”
CSA Group		QPS	

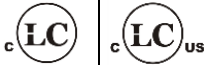



Name of Field Inspection Agency	Special Inspection <u>Panel Label</u> All labels must read: “ <u>SPE-1000</u> ”	Name of Field Inspection Agency	Special Inspection <u>Panel Label</u> All labels must read: “ <u>SPE-1000</u> ”
ELECTRICAL SAFETY AUTHORITY FIELD EVALUATION (ESAFE)		CSA Group	
QPS			


Name of Field Inspection Agency	Special Inspection <u>Product Label</u> All labels must read: “ <u>SPE-1000</u> ”	Name of Field Inspection Agency	Special Inspection <u>Product Label</u> All labels must read: “ <u>SPE-1000</u> ”
Vision Integrity Engineering Ltd.		SEAC Engineering Inc.	

Name of Field Inspection Agency	Special Inspection Product Label All labels must read: “SPE-1000”	Name of Field Inspection Agency	Special Inspection Product Label All labels must read: “SPE-1000”
CSA Group		QPS	
ETL Intertek Entela		INTERTEK TESTING SERVICES	
ETL Intertek Semko		QAI Laboratories Ltd.	 
TÜV America Inc.		TÜV Rheinland of North America, Inc.	
Underwriter's Laboratories of Canada		Nemko Canada Inc.	
ELECTRICAL SAFETY AUTHORITY FIELD EVALUATION (ESAFE)		LabTest Certification	

Name of Certification Body	<u>Certification Marks</u>	
CSA International		The CSA certification mark alone without any identifier indicates products approved to Canadian National Standards. If another country's identifier is present (i.e. US, NRTL), then the small 'c' Canadian identifier is required to indicate that the product also complies with Canadian National Standards.
		The 'Blue Flame' certification mark is a Canada only mark indicating compliance to Canadian National Standards. They do not require a small 'c' Canadian identifier.
QPS Evaluation Services Inc.		The QPS certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required
FM Approvals		The FM certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
Met Laboratories		The MET certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
Intertek Testing Services NA Ltd. (ETL) (Entela)		The ETL Intertek Entela certification mark requires the small 'c' Canadian identifier at the 8 o'clock position to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
		ETL Intertek Semko has 2 certification marks; the ETL mark and the WH mark. Each mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
		
		
QAI Laboratories Ltd.		The QAI certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
		The QAI <u>Hazardous Equipment field certification</u> will certify the equipment to the part 2 standard

Name of Certification Body	<u>Certification Marks</u>	
TÜV Product Service		The TÜV Product Service certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
TÜV Rheinland of North America		The TÜV Rheinland certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
Underwriter's Laboratory		The UL certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
		The ULC certification mark is a Canada only mark indicating compliance to Canadian National Standards. It does not require a small 'c' Canadian identifier.
		The ULC certification mark is a Canada only mark indicating compliance to Canadian National Standards. It does not require a small 'c' Canadian identifier.
Curtis-Straus LLC		The Curtis – Straus LLC certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
NSF International		The NSF International certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
Nemko North America, Inc.		The Nemko North America, Inc. certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
OMNI Environmental Services Inc.**		The OMNI Environmental certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.

Name of Certification Body	<u>Certification Marks</u>	
LabTest Certification Inc.		The LabTest certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
ENEFEN Energy Efficiency Engineering Ltd.		The ENEFEN certification mark is a Canada only mark indicating compliance to Canadian National Standards. It does not require a small 'c' Canadian identifier.
SGS NORTH AMERICA, INC.		The SGS North America Inc. certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.
ELECTRICAL SAFETY AUTHORITY Field Evaluation (ESAFE)		The ESAFE certification mark requires the small 'c' Canadian identifier to indicate compliance to Canadian National Standards. Identifiers for other countries may be present but, in all cases, the small 'c' is required.

<u>Certification Body</u>		SPECIAL/FIELD INSPECTION AGENCIES
Vision Integrity Engineering Ltd. Suite 301, 620-12 Ave SW Calgary, AB T2R 0H5 Canada	SPE 1000 General Queries – (587) 353-6630	Trevor Davies P.Eng. SI consultant Calgary, AB. Office Phone # (587) 353-6630 Cell Phone # (403) 473-1184 E-mail: TrevorDavies@visionintegrity.ca
SEAC Engineering Inc. 43 Carringvue Drive NW Calgary, AB T3P 0W4 Canada	SPE 1000 Commercial and Gas fired Appliances 	Muhammad Tauseef, P.ENG., FS.ENG. Field Evaluations Calgary, AB. Office Phone # (587) 999-6961 Web Site: seacengineering.com E-mail: mutauseef@seacengineering.com

<u>Certification Body</u>		SPECIAL/FIELD INSPECTION AGENCIES
CSA Group 1707 94th Street NW Edmonton, AB T6N 1E6 Canada	General Queries – (780) 450-2111 Standard Sales & Seminars - (780) 490-2007 1-800-463-6727 Fax: (780) 490-2059 E-mail: info@csagroup.org Website: http://www.csagroup.org	Dora Vendrig SI Field Representative II Regina & Saskatoon, SK Office Phone # (306) 882-3448 Cell Phone # (306) 301-0049 E-mail: dora.vendrig@csagroup.org . Jeff Tuttle Field Service Representative, Factory Inspections Saskatoon, SK Office Phone # (306) 882-3399 Cell Phone # (306) 716-2306 E-mail: jeff.tuttle@csagroup.org
CSA Group 178 Rexdale Boulevard TORONTO, ON M9W 1R3 Canada	Mr. Stephen Morley, Senior Manager, Field Evaluations and Verifications (416) 747-4144 Fax: (416) 747-4149 E-mail: stephen.morley@csagroup.org Website: http://www.csagroup.org	See link for applicable marks: http://www.csagroup.org/service/certification/north-american-field-evaluation-services/
QPS Evaluation Services Inc. Units 7-10 81 Kelfield St. Toronto, ON M9W 5A3 Canada	P: 416-241-8857 F: 416-241-0682 1-877-746-4777 Website: http://www.qps.ca E-mail: info@qps.ca	Performs field inspections Testing Tech #150-3919 Arthur Rose Avenue Saskatoon, SK S7P 0C8 P: 306-664-2415 F: 306-934-1004 E-mail: inspections@testing-tech.com
Intertek Testing Services NA Ltd. (ETL) 1500 Brigantine Drive Coquitlam, BC V3K 7C1 Canada	Mr. Heiko Neugebauer Inspections Body Program Manager Electrical Safety Manager 12010 – 111 Ave. Edmonton, Alberta T5G 0E6 Phone: (604) 520-3321 Fax: (604) 524-9186 Toll-Free: (800) 668-8378 Sales: (778) 903-1180 E-mail: heiko.neugebauer@intertek.com Website: http://www.intertek.com Hazardous Locations Brian Whittle Edmonton, Alberta Office (780) 440-4455	Collin Sinclair Saskatoon, Saskatchewan Mobile: (306) 277-5484 1-800-668-8378 Website: http://www.intertek.com E-mail: collin.sinclair@intertek.com Brad Helgason Regina, Saskatchewan Phone (306) 545-3551 Fax (306) 790-7267 Website: http://www.intertek.com E-mail: brad.helgason@intertek.com
FM Approvals 1151 Boston Providence Turnpike; P.O. Box 9102 Norwood, MA 02062 USA	Technical Auditing Services Ph: (781) 762-4300 Fax: (781) 762-9375 E-mail: information@fmapprovals.com E-mail: servicedeskglobal@fmglobal.com Website: http://www.fmglobal.com	

<u>Certification Body</u>		SPECIAL/FIELD INSPECTION AGENCIES
MET Laboratories, Inc. 914 West Patapsco Avenue Baltimore, MD 21230-3432 USA	Mr. R. Frier, President Ph: (410) 949-1805 Fax: (410) 354-3313 E-mail: rob.frier@metlabs.com Website: http://www.metlabs.com	
QAI Laboratories Ltd. 3980 North Fraser Way Burnaby, BC V5J 5K5 Canada	Mr. Lawrence Gibson, Exec. V.P. Ph: 604-527-8378 Fax: 604-461-8378 E-mail: Lgibson@qai.org E-mail: info@qai.org Website: www.Qai.org	
TÜV Product Service, a division of TÜV America Inc. 5 Cherry Hill Drive Danvers, MA 01923 USA	Mr. G. Minks, Director Certification Body Ph: (978) 739-7000 Fax: (978) 777-8441 E-mail: gminks@tuvam.com Website: www.tuvamerica.com	Performs field inspections.
TÜV Rheinland of North America, Inc. 12 Commerce Road Newtown, CT 06470 USA	Mr. T. R. Calland, P.E., Program Manager Product Safety and Quality International Approvals Ph: (203) 426-0888 Fax: (203) 426-4009 E-mail: tcalland@us.tuv.com Website: http://www.us.tuv.com	
Underwriters' Laboratories of Canada 7 Underwriters Road Toronto, ON M1R 3B4 Canada	Mr. Gunsimar Paintal Regional Quality Manager & UL Mark Program Owner Ph: (416) 757-5250 Fax: (416) 757-1781 E-mail: gunsimarbir.paintal@ca.ul.com Website: http://www.ulc.ca	Mr. Andrew Saunders CAS Manager & IB Program Owner Ph: (416) 757-5250 Fax: (416) 757-1781 E-Mail: andrew.saunders@ca.ul.com Website: http://www.ulc.ca
CURTIS-STRAUS LLC 527 Great Road Littleton, MA 01460 USA	Mr. Jon D. Curtis, P.E. Director of Operations Ph: (978) 486-8880 Fax: (978) 486-3529 E-mail: jcurtis@curtis-strauss.com Website: http://www.curtis-strauss.com	
NSF INTERNATIONAL 789 Dixboro Road Ann Arbor, MI 48105 USA	Mr. Craig S. Morr, CEI/CEM Q A & Organization Safety Manager Ph: (734) 769-5143 Telefax: (734) 827-6849 E-mail: information@nsf-isr.org	
Nemko North America, Inc. 303 River Road, Ottawa, ON K1V 1H2	Mr. Stuart Beck Director of Certification Ph: (613) 737-9680, ex. 246 Fax: (613) 737-9691 E-mail: stuart.beck@nemko.com	Performs field inspections

<u>Certification Body</u>		SPECIAL/FIELD INSPECTION AGENCIES
Canada	Website: http://www.nemko.com	
OMNI-Test Laboratories, Inc. 5465 SW Western Avenue Suite G Post Office Box 743 Beaverton, OR 97075 USA	Ms. Alana Smith Accreditation Manager Ph: (503) 643-3788 Fax: (503) 643-3799 E-mail: asmith@omni-test.com Website: http://www.omni-test.com	
ELECTRICAL SAFETY AUTHORITY FIELD EVALUATION (ESAFE) 4043 Carling Avenue, Suite 106 Ottawa, ON K2K 2A4 Canada	Jacques Martin Technical Manager Field Evaluation Services Ph: (613) 292-1372 E-mail: jacques.martin@electricalsafety.on.ca	Jacques Martin Technical Manager PH: (613) 292-1372 E-mail: Jacques.martin@electricalsafety.on.ca URL: www.esafieldevaluation.ca Application form (inspection): https://www.esafieldevaluation.ca/en/inspection-form/
LabTest Certification Inc. 205-8291 92 Street Delta, BC V4G 0A4 Canada	Toll Free: 1-855-346-0444 Tel: (604) 247-0444 Website: www.labtestcert.com E-mail: info@labtestcert.com	
ENEFEN Energy Efficiency Engineering Ltd. 9865 West Saanich Road, Suite 201, North Saanich, BC V8L 5Y8 Canada	Tel: (780) 665-2863 Ext 17 Fax: 1-866-583-0520 E-mail: info@enefen.com	Performs field inspections
SGS NORTH AMERICA, INC. 5825 Explorer Drive Mississauga, ON L4W 5P6 Canada	Telephone: (905) 364-3771 Fax: (973) 575-7175	

2-024 - Use of approved equipment - exceptions

There may be occasions where certification standards do not exist for approval of electrical equipment. A deviation shall be applied for in accordance with Rule 2-030.

Liquid-filled Transformers

In the specific situation of liquid-filled transformers, certification organizations have yet to identify a demand for developing a product certification program around this particular electrical equipment. Consequently, certified liquid-filled transformers are not available.

Conditions

Owners/users required to use liquid-filled transformers are permitted to deviate from Rule 2-024 of the CEC provided they meet the following conditions:

1. a) Manufactured to Canadian standards

Liquid-filled transformers are acceptable when the manufacturer declares that they have manufactured, inspected and tested the transformer to the requirements of the appropriate and current Canadian standards. These standards include, but are not limited, to:

CAN/CSA-C2 Single Phase and Three Phase Distribution Transformers

CAN/CSA-C88 Power Transformers and Reactors

CAN/CSA-C227.3 Low Profile, Single Phase, Dead Front Pad-mounted, Distribution Transformers

CAN/CSA-C227.4 Three Phase, Dead Front Pad-mounted, Distribution Transformers

b) Manufactured to other than Canadian standards

Where liquid-filled transformers are manufactured to other than Canadian standards, the manufacturer must declare that the product has equivalent safety performance as one manufactured to Canadian standards. Alternatively, a Professional Engineer may evaluate and accept the product standard to which the liquid-filled transformer was manufactured if it compares favorably with the appropriate Canadian standards concerning safety performance.

2. Product identification

In addition to meeting the requirements of Rule 2-100 of the CEC, the liquid-filled transformer must identify the standard to which it was manufactured. The following documentation of appropriate marking must also accompany the product:

- a) a manufacturer's declaration stating that they have manufactured the product to one or more appropriate Canadian standards; or
- b) when manufactured to other than Canadian standards:
 - i) a manufacturer's declaration that the product has equivalent safety performance as one manufactured to the appropriate Canadian standards; or
 - ii) a Professional Engineer's evaluation report indicating the product as having equivalent safety performance as one manufactured to appropriate Canadian standards.

3. Maintenance

The owner of the equipment shall ensure the product is maintained to industry standards and manufacturer's specifications.

HV Downhole ESP's (Electrical Submersible Pumps)

Manufacturers, distributors, owners and installers of ESPs and associated down-hole cables shall be permitted to deviate from Rule 2-024 of the Canadian Electrical Code provided they meet the following conditions:

Conditions

1. a) Manufactured to North American Standards

ESP's and/or associated down hole cables are acceptable when the manufacturer declares that they have manufactured, inspected and tested the ESP's and/or associated down-hole cables to the requirements of the appropriate and current standards. These standards include but are not limited to:

IEEE 252	Standard Test Procedure for Polyphase Induction Motors having Liquid in the Magnetic Gap.
IEEE 1017	Recommended Practice for Field Testing Electric Submersible Pump Cable.
IEEE 1018	Recommended Practice for specifying Electric Submersible Pump Cable Ethylene-Propylene Rubber Insulation.
IEEE 1019	Recommended Practice for specifying Electric Submersible Pump Cable Polypropylene Rubber Insulation.

b) Manufactured to Other than North American Standards

Where ESP's and/or associated down-hole cables are manufactured to other than North American standards, the manufacturer must declare that the product has equivalent safety performance as one manufactured to North American standards. Alternatively, a licensed engineering professional may evaluate and accept the product standard to which the ESP's and/or associated down-hole cables were manufactured to, if it compares favourably with the appropriate North American standards concerning safety performance.

2. Product Identification

The following documentation for ESPs and associated down-hole cables must be readily accessible:

- a manufacturer's declaration stating that the product meets industry recognized standards; and
- specification sheets stating the product's electrical ratings and characteristics.

3. Additional Requirements

- The installation is bonded to ground in accordance with Section 10;
- Proper overcurrent and overload protection must be provided in accordance with the CEC, Part 1; and
- All above ground components associated with the installations meets the requirements of the CEC Part 1.

2-030 - Deviation or postponement

Requests for special permission shall be made in writing to the Chief Electrical Inspector, giving all details pertaining to the requests. If acceptable, permission applying to that installation only will be confirmed in writing.

2-100 - Marking of equipment

Permanent labels shall be required based on Table 39 & Section 8 maximum continuous load.
See also [Appendix M](#).

2-106 - Rebuilt equipment

Retrofit kits and installation requirements

With the application of energy efficiency programs in Saskatchewan, high efficiency lighting technologies and various lighting retrofit kits are popular. There are several options for retrofitting standard **tubular fluorescent luminaries**, with more energy efficient lamps.

The retrofit of luminaries and signs may be accepted under the original certification when the following conditions apply:

- the work is covered by an electrical permit;
- the replacement equipment bears the mark of a recognized certification agency; or
- the replacement equipment is rated for the application and draws no more power than the original equipment.

Please note that in all cases, each retrofitted luminaire or sign must be provided with a label containing the following information:

- voltage;
- amperage;
- date of install;
- installed by (contractor name);
- permit number, and
- over 150 V to ground on the socket for double ended lamps, a label shall be installed stating,
Caution - De-energize prior to changing tubes.

Some retrofit options are:

- **Fluorescent retrofit kit** – consists of fluorescent tube and electronic ballast that is an integral part of the device.
- **LED retrofit kit** – consists of a LED retrofit tube and the LED driver components that are remote from (not an integral part of) the device.
- **LED retrofit kit with integral driver** – consists of a LED tube and the LED driver components that are an integral part of the device.

Retrofit kits specified above require a luminaire conversion and usually involve replacing the lamp, rewiring the luminaire and in some cases, replacing an existing ballast with an LED driver, or directly connecting the lamp to the supply circuit.

Although there are differences in installation of various retrofit kits, for all of them it is very important to consider that the retrofit kits are certified as assemblies to appropriate Canadian standard(s).

Hazardous location luminaires

Hazardous location luminaire certifications investigate all components to ensure they are not or will not become an ignition source.

Electrical Inspections requires that luminaire retrofit kits be certified to the appropriate standard.

Field modifications to luminaires including internal wiring re-work bypassing existing ballast and wiring directly to the socket with phase voltage, shall be field certified by an approved certification body.

2-200 - Protection of equipment

8-400 Commercial automobile receptacles 8-500 Electric Vehicle charging stations

Receptacles shall be installed with mechanical protection to prevent damage by vehicles by one of the following or other equivalent means:

- a. approved manufactured pedestals provided with mechanical protection or flexibility;
- b. where mechanical protection is not utilized, the receptacles and conduit shall be installed on structures of adequate strength, such as fences, or walls and the receptacles and conduit shall be installed no less than 750 mm (30") above finished grade;
- c. a reinforced concrete post with a dimension of not less than 300 mm (12") may be used and shall be installed to a height of not less than 750 mm (30") and to a depth of not less than 750 mm (30") below grade. The receptacles and conduit shall be installed on the face of the post not exposed to vehicular damage. The receptacles may, if desired, be installed on the face of the post exposed to vehicles provided the conduit and outlet box are installed within the post. Mounting height of the receptacles shall not be less than 750 mm (30") above finished grade. As an alternate to the concrete post, a treated wooden post of minimum 150 mm x 150 mm (6x6) may be used; or
- d. bollards or permanently installed curb stops, mounted 1.2 m (4') from the center of the curb stop to the pedestal or receptacle, for drive in parking locations and placed in front of the receptacles to prevent vehicles from damaging receptacle pedestals, shall be accepted as mechanical protection.

Conductors for wiring of these receptacles shall have insulation or covering suitable for installation and use at temperatures down to -40 °C except for conductors approved for and installed underground.

A separate bonding conductor is required in metal raceway as per Rule [10-606](#) & [12-1414](#).

2-300 - General requirements for maintenance and operation

Currently there is a concern with free standing services falling over from a lack of support and services **not** being adequately protected against weather. Free standing services shall meet the following minimum requirements with all posts set into a minimum depth of 750 mm (30") and additional support to deal with any cantilever forces placed upon the structure.

- a) 100 A – 200 A services shall be supported on a minimum of 2 pressure treated 100 mm x 100 mm (4x4) posts with a 21 mm ($\frac{3}{4}$ ") pressure treated backing.
- b) 300 A – 800 A services shall be supported on a minimum of 3 pressure treated 150 mm x 150 mm (6x6) posts with a 21 mm ($\frac{3}{4}$ ") pressure treated backing.
- c) 1000 A and larger - same as (b) and shall have additional support as required.

Outdoor services shall require substantial weather resistant construction.

2-326 - Electrical equipment near combustible gas equipment (see also [6-408](#))

The clearance around a natural gas regulator relief vent to arc-producing electrical equipment shall be 1 meter (39") and 3 meters (10') for propane regulator relief vents as per CSA B149.1-15.

Notes:

- This clearance is a spherical radius.
- Revenue meters, hot tub and air-conditioning disconnects are examples of arc-producing electrical equipment.

2-400 - Enclosures, type, designation, and use (see Appendix B)

When entering a weatherproof cabinet being used outdoors, from the underside, non-weatherproof connectors shall be acceptable as the integrity of the enclosure is not compromised by this installation.

SECTION 4 - CONDUCTORS

4-004(22) - Service conductors for common residential services

See Table 39

Minimum permitted size for 3-wire 120/240 V and 120/208 V service conductors for single dwellings, or feeder conductors supplying single dwelling units of row housing, apartments or similar buildings and terminating on equipment having a conductor termination temperature of not less than 75 °C. Labelling shall be installed in accordance with [2-100](#).

4-004, 4-006 & 8-104 - Application of new changes to conductor sizing

Plans review required for all installations of feeders or services 600A or larger

Find the minimum size conductor cable required for a service or feeder	Example 1 4-004 2(d)	Example 2 4-004 1(d)	Example 3 4-004 2(d)	Example 4 4-004 1(d)
Service or feeder criteria	800 A 120/208 V 3PH/4W 4-004 1(d) & 2(d)		1200 A 347/600 V 3PH/4W 4-004 1(d) & 2(d)	
Multi or single conductor	Multi-Conductor		Single-Conductor	
Cable / conductor selection	ACWU90 / USE1 Aluminum	TECK90 Copper	CORFLEX RA90 Aluminum	TECK90 Copper
4-004 (16) more than 1 ampacity may apply [more than 4 conductors total so 4-004(17) does not apply]	2C/PH	3C/PH	4C/PH	6C/PH
Maximum conductor temperature rating 4-006 (2) see also 4-004 1(d) & 4-004 2(d)	Not marked ∴ 75° C	Marked 75° C	Not marked ∴ 75° C	Marked 75° C
Breaker - continuous operation rating	100% - 800 A	80% - 640 A	100% - 1200 A	80% - 960 A
Ampacity ÷ Number of conductors per phase	800A / 2C	800A / 3C	1200 A / 4C	1200A / 6C
= Minimum ampacity per conductor	400 A	267 A	300 A	200 A
Direct buried U/G D Tables ∴ derated to 75° C x .886	D10B Detail 2	D10A Detail 3	D8B Detail 4	D8A Detail 6
Interpretation Tables 75° C A per conductor	750 kcmil = 424 A	250 kcmil = 271 A	600 kcmil = 342 A	250 kcmil = 235 A
Maximum circuit loading % as per 8-104	5(a) – 100%	6(a) – 80%	5(b) – 85%	6(b) – 70%
Maximum circuit loading % X conductor ampacity	100% x 424 A = 424 A	80% x 271 A = 217 A	85% x 342 A = 291 A	70% x 235 A = 165 A
Maximum conductor ampacity rating	424 A x 2 = 848 A	217 A x 3 = 650 A	291 A x 4 = 1164 A	165 A x 6 = 990 A
SERVICE or FEEDER Ampacity Rating 8-104(1)	800 A	640 A	1164 A	960 A
	∴	∴	∴	∴
RESULTS	800 A 100% Breaker 2 - 4c/750 kcmil ACWU90	800 A 80% Breaker 3 - 4c/250 kcmil TECK90	1200 A 100% Breaker, 4 - 4c/600 kcmil CORFLEX RA90	1200 A 80% Breaker 6 - 4c/250 kcmil TECK90
2-100 PERMANENT LABELING REQUIREMENT			MAXIMUM LOADING NOT TO EXCEED 1164A	
Or Increase conductor size				
Table 16 Bonding Requirement – Service or Feeder	Cable bonds	Cable bonds	Cable bonds	Cable bonds
4-008 Induced Voltages	N/A	N/A	Welded sheath bond	Wrapped armour w/concentric bond

D8 Tables with 75° calculations

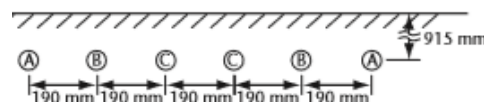


Table D8A

**Allowable copper conductor ampacities for cables
rated not more than 5000 V and unshielded for the
installation configurations of Diagram D8**

(see Rule 4-004.)

Size, AWG or Kcmil	1/phase, Detail 1		2/phase, Detail 2		2/phase, Detail 3		4/phase, Detail 4		4/phase, Detail 5		6/phase, Detail 6		6/phase, Detail 7	
	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C
1 / 0	315	279	269	238	288	255	204	181	221	196	171	152	186	165
2 / 0	357	316	304	269	326	289	230	204	249	221	192	170	209	185
3 / 0	405	359	343	304	369	327	259	229	281	249	217	192	236	209
4 / 0	458	406	388	344	418	370	292	259	317	281	244	216	265	235
250	499	442	422	374	454	402	317	281	344	305	265	235	289	256
300	550	487	464	411	500	443	348	308	378	335	291	258	317	281
350	597	529	503	446	543	481	376	333	409	362	314	278	342	303
400	642	569	540	478	582	516	403	357	439	389	336	298	366	324
500	721	639	605	536	654	579	451	400	491	435	375	332	409	362
600	790	700	662	587	716	634	493	437	536	475	410	363	447	396
750	885	784	740	656	801	710	549	486	598	530	457	405	498	441
900	972	861	810	718	877	777	599	531	653	579	498	441	543	481
1000	1020	904	850	753	921	816	629	557	686	608	522	462	570	505
1250	1132	1003	941	834	1020	904	694	615	757	671	576	510	629	557
1500	1227	1087	1017	901	1104	978	749	664	817	724	621	550	678	601
1750	1308	1159	1083	960	1176	1042	796	705	869	770	659	584	720	638
2000	1376	1219	1138	1008	1236	1095	835	740	911	807	691	612	755	669

Notes:

- (1) This table gives the allowable current for 90 °C rated single copper conductors with spacings directly buried in earth.
- (2) Underground ampacities for a conductor temperature of 75 °C may be obtained by multiplying the appropriate ampacity at 90 °C conductor temperature by the derating factor 0.886.
- (3) See Rule 4-006 for equipment termination temperature requirements.

Table D8B

**Allowable aluminum conductor ampacities for cables
rated not more than 5000 V and unshielded for the
installation configurations of Diagram D8**

(see Rule 4-004.)

Size, AWG or Kcmil	1/phase, Detail 1		2/phase, Detail 2		2/phase, Detail 3		4/phase, Detail 4		4/phase, Detail 5		6/phase, Detail 6		6/phase, Detail 7	
	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C
1 / 0	244	216	208	184	223	198	158	140	172	152	133	118	144	128
2 / 0	276	245	236	209	253	224	179	159	194	172	150	133	163	144
3 / 0	313	277	266	236	286	253	201	178	218	193	169	150	183	162
4 / 0	356	315	302	268	325	288	227	201	247	219	190	168	207	183
250	387	343	328	291	353	313	247	219	268	237	206	183	225	199
300	427	378	361	320	389	345	271	240	294	260	226	200	247	219
350	464	411	391	346	422	374	293	260	319	283	245	217	267	237
400	498	441	420	372	453	401	314	278	342	303	262	232	286	253
500	561	497	472	418	509	451	352	312	383	339	293	260	320	284
600	617	547	518	459	559	495	386	342	420	372	321	284	350	310
750	694	615	581	515	628	556	432	383	470	416	359	318	392	347
900	764	677	638	565	691	612	473	419	515	456	393	348	429	380
1000	807	715	673	596	729	646	498	441	543	481	414	367	452	400
1250	906	803	753	667	817	724	556	493	606	537	461	408	503	446
1500	992	879	822	728	893	791	605	536	661	586	502	445	548	486
1750	1068	946	884	783	960	851	649	575	709	628	538	477	588	521
2000	1134	1005	937	830	1018	902	687	609	751	665	569	504	622	551

Notes:

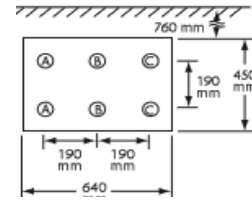
- (1) This table gives the allowable current for 90 °C rated single aluminum conductors with spacings directly buried in earth.
- (2) Underground ampacities for a conductor temperature of 75 °C may be obtained by multiplying the appropriate ampacity at 90 °C conductor temperature by the derating factor 0.886.
- (3) See Rule 4-006 for equipment termination temperature requirements.

D9 Tables with 75° calculations

Table D9A

Allowable copper conductor ampacities for cables rated not more than 5000 V and unshielded for the installation configurations of Diagram D9

(see Rule 4-004.)



Size, AWG or Kcmil	1/phase, Detail 1		2/phase, Detail 2		4/phase, Detail 3		6/phase, Detail 4	
	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C
1/0	258	229	221	196	181	160	165	146
2/0	293	260	250	222	205	182	186	165
3/0	333	295	283	251	231	205	210	186
4/0	378	335	321	284	261	231	237	210
250	414	367	351	311	285	253	258	229
300	458	406	387	343	313	277	284	252
350	499	442	420	372	339	300	307	272
400	537	476	451	400	364	323	329	291
500	607	538	507	449	408	361	369	327
600	669	593	558	494	447	396	404	358
750	754	668	626	555	500	443	451	400
900	832	737	687	609	547	485	492	436
1000	875	775	722	640	574	509	517	458
1250	978	867	803	711	635	563	572	507
1500	1065	944	870	771	687	609	617	547
1750	1140	1010	928	822	731	648	656	581
2000	1203	1066	976	865	767	680	689	610

Notes:

- (1) This table gives the allowable current for 90 °C rated single copper conductors with spacings installed in non-metallic underground raceways.
- (2) Underground ampacities for a conductor temperature of 75 °C may be obtained by multiplying the appropriate ampacity at 90 °C conductor temperature by the derating factor 0.886.
- (3) See Rule 4-006 for equipment termination temperature requirements.

Table D9B

Allowable aluminum conductor ampacities for cables rated not more than 5000 V and unshielded for the installation configurations of Diagram D9

(see Rule 4-004.)

Size, AWG or Kcmil	1/phase, Detail 1		2/phase, Detail 2		4/phase, Detail 3		6/phase, Detail 4	
	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C
1/0	199	176	171	152	141	125	128	113
2/0	226	200	194	172	159	141	145	128
3/0	257	228	219	194	179	159	163	144
4/0	293	260	249	221	203	180	184	163
250	321	284	272	241	221	196	201	178
300	355	315	300	266	243	215	221	196
350	386	342	326	289	264	234	239	212
400	416	369	351	311	283	251	256	227
500	471	417	395	350	318	282	288	255
600	521	462	435	385	350	310	316	280
750	590	523	491	435	392	347	354	314
900	652	578	540	478	431	382	388	344
1000	690	611	570	505	454	402	409	362
1250	783	694	643	570	509	451	458	406
1500	861	763	703	623	555	492	499	442
1750	930	824	757	671	596	528	536	475
2000	991	878	804	712	632	560	567	502

Notes:

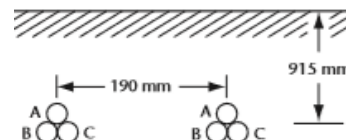
- (1) This table gives the allowable current for 90 °C rated single aluminum conductors with spacings installed in non-metallic underground raceways.
- (2) Underground ampacities for a conductor temperature of 75 °C may be obtained by multiplying the appropriate ampacity at 90 °C conductor temperature by the derating factor 0.886.
- (3) See Rule 4-006 for equipment termination temperature requirements.

D10 Tables with 75° calculations

Table D10A

Allowable copper conductor ampacities for cables rated not more than 5000 V and unshielded for the installation configurations of Diagram D10

(see Rule 4-004.)



Size, AWG or Kcmil	1/phase, Detail 1		2/phase, Detail 2		3/phase, Detail 3		4/phase, Detail 4		5/phase, Detail 5		6/phase, Detail 6	
	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C
1 / 0	262	232	221	196	195	173	181	160	170	151	163	144
2 / 0	298	264	250	222	220	195	205	182	192	170	184	163
3 / 0	337	299	282	250	248	220	230	204	216	191	207	183
4 / 0	382	338	319	283	280	248	260	230	244	216	233	206
250	418	370	348	308	306	271	283	251	265	235	253	224
300	462	409	382	338	336	298	310	275	291	258	278	246
350	500	443	413	366	362	321	335	297	314	278	300	266
400	538	477	443	392	388	344	358	317	336	298	320	284
500	602	533	494	438	432	383	398	353	373	330	356	315
600	658	583	538	477	470	416	433	384	405	359	387	343
750	731	648	595	527	518	459	478	424	447	396	426	377
900	795	704	643	570	560	496	515	456	481	426	458	406
1000	827	733	669	593	582	516	535	474	500	443	476	422
1250	907	804	728	645	632	560	581	515	542	480	516	457
1500	966	856	772	684	670	594	615	545	574	509	546	484
1750	1017	901	809	717	702	622	643	570	600	532	571	506
2000	1060	939	840	744	728	645	667	591	622	551	591	524

Notes:

- (1) This table gives the allowable current for 90 °C rated copper conductor cables, or single copper conductors in contact, or multiplexed single copper conductors, directly buried in earth.
- (2) Underground ampacities for a conductor temperature of 75 °C may be obtained by multiplying the appropriate ampacity at 90 °C conductor temperature by the derating factor 0.886.
- (3) See Rule 4-006 for equipment termination temperature requirements.

Table D10B

Allowable aluminum conductor ampacities for cables rated not more than 5000 V and unshielded for the installation configurations of Diagram D10

(see Rule 4-004.)

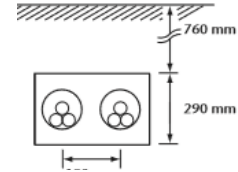
Size, AWG or Kcmil	1/phase, Detail 1		2/phase, Detail 2		3/phase, Detail 3		4/phase, Detail 4		5/phase, Detail 5		6/phase, Detail 6	
	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C
1 / 0	203	180	172	152	152	135	141	125	132	117	127	113
2 / 0	230	204	193	171	171	152	159	141	149	132	143	127
3 / 0	261	231	219	194	193	171	179	159	168	149	161	143
4 / 0	298	264	249	221	219	194	203	180	190	168	182	161
250	324	287	270	239	238	211	220	195	207	183	197	175
300	359	318	298	264	262	232	242	214	227	201	217	192
350	390	346	323	286	284	252	262	232	246	218	235	208
400	419	371	347	307	304	269	281	249	263	233	251	222
500	473	419	389	345	340	301	314	278	294	260	281	249
600	522	462	428	379	374	331	345	306	323	286	308	273
750	586	519	478	424	417	369	384	340	359	318	342	303
900	643	570	522	462	455	403	418	370	391	346	373	330
1000	677	600	548	486	477	423	439	389	410	363	391	346
1250	757	671	608	539	528	468	485	430	453	401	431	382
1500	819	726	655	580	568	503	521	462	487	431	463	410
1750	873	773	695	616	602	533	552	489	515	456	490	434
2000	917	812	727	644	630	558	577	511	538	477	512	454

Notes:

- (1) This table gives the allowable current for 90 °C rated aluminum conductor cables, or single aluminum conductors in contact, or multiplexed single aluminum conductors, directly buried in earth.
- (2) Underground ampacities for a conductor temperature of 75 °C may be obtained by multiplying the appropriate ampacity at 90 °C conductor temperature by the derating factor 0.886.
- (3) See Rule 4-006 for equipment termination temperature requirements.

D11 Tables with 75° calculations

Table D11A
Allowable copper conductor ampacities for cables
rated not more than 5000 V and unshielded for the
installation configurations of Diagram D11
(see Rule 4-004.)



Size,AWG or Kcmil	1/phase, Detail 1		2/phase, Detail 2		3/phase, Detail 3		4/phase, Detail 4		5/phase, Detail 5		6/phase, Detail 6		8/phase, Detail 8	
	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C
1 / 0	205	182	185	164	169	150	158	140	147	130	139	123	130	115
2 / 0	233	206	210	186	192	170	179	159	166	147	157	139	147	130
3 / 0	266	236	239	212	218	193	202	179	188	167	178	158	166	147
4 / 0	303	268	271	240	247	219	229	203	212	188	201	178	187	166
250	335	297	298	264	271	240	251	222	232	206	219	194	204	181
300	370	328	329	291	298	264	276	245	255	226	241	214	224	198
350	403	357	357	316	323	286	299	265	276	245	261	231	242	214
400	434	385	384	340	347	307	320	284	295	261	279	247	259	229
500	489	433	430	381	388	344	357	316	329	291	310	275	288	255
600	539	478	472	418	424	376	390	346	359	318	339	300	314	278
750	601	532	524	464	470	416	431	382	397	352	374	331	346	307
900	655	580	569	504	509	451	466	413	428	379	403	357	373	330
1000	683	605	593	525	530	470	485	430	445	394	419	371	388	344
1250	752	666	649	575	578	512	528	468	484	429	455	403	421	373
1500	804	712	691	612	614	544	561	497	513	455	482	427	445	394
1750	847	750	726	643	644	571	587	520	537	476	504	447	466	413
2000	901	798	744	659	659	584	601	532	549	486	515	456	476	422

Notes:

- (1) This table gives the allowable current for 90 °C rated multiple copper conductor cables, or single copper conductors in contact, or multiplexed single copper conductors, installed in underground raceway.
- (2) Underground ampacities for a conductor temperature of 75 °C may be obtained by multiplying the appropriate ampacity at 90 °C conductor temperature by the derating factor 0.886.
- (3) See Rule 4-006 for equipment termination temperature requirements.

Table D11B
Allowable aluminum conductor ampacities for cables
rated not more than 5000 V and unshielded for the
installation configurations of Diagram D11
(see Rule 4-004.)

Size,AWG or Kcmil	1/phase, Detail 1		2/phase, Detail 2		3/phase, Detail 3		4/phase, Detail 4		5/phase, Detail 5		6/phase, Detail 6		8/phase, Detail 8	
	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C	90 °C	75 °C
1 / 0	157	139	143	127	131	116	122	108	114	101	108	96	101	89
2 / 0	179	159	162	144	148	131	138	122	129	114	122	108	114	101
3 / 0	205	182	184	163	168	149	157	139	146	129	138	122	129	114
4 / 0	235	208	210	186	192	170	178	158	165	146	156	138	146	129
250	258	229	231	205	210	186	195	173	180	159	171	152	159	141
300	286	253	255	226	232	206	215	190	199	176	188	167	175	155
350	312	276	278	246	252	223	233	206	215	190	204	181	189	167
400	337	299	299	265	271	240	250	222	231	205	218	193	203	180
500	382	338	337	299	305	270	281	249	259	229	245	217	227	201
600	424	376	373	330	336	298	309	274	285	253	269	238	249	221
750	478	424	419	371	376	333	346	307	318	282	300	266	278	246
900	527	467	459	407	412	365	378	335	347	307	327	290	303	268
1000	555	492	483	428	433	384	397	352	364	323	343	304	318	282
1250	626	555	541	479	482	427	441	391	404	358	380	337	351	311
1500	679	602	585	518	520	461	475	421	435	385	409	362	377	334
1750	724	641	621	550	552	489	503	446	461	408	432	383	399	354
2000	777	688	646	572	573	508	522	462	477	423	448	397	413	366

Notes:

- (1) This table gives the allowable current for 90 °C rated multiple aluminum conductor cables, or single aluminum conductors in contact, or multiplexed single aluminum conductors, installed in underground raceway.
- (2) Underground ampacities for a conductor temperature of 75 °C may be obtained by multiplying the appropriate ampacity at 90 °C conductor temperature by the derating factor 0.886.
- (3) See Rule 4-006 for equipment termination temperature requirements.

4-006 - Temperature limitations (see Appendix B)

Where a conductor is terminated on equipment with a 60 °C or 75 °C rating, the maximum conductor ampacity shall be based on the 60 °C or 75 °C column of Tables 1, 2, 3 or 4.

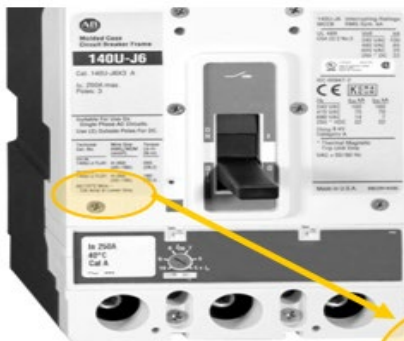
When equipment termination temperature rating is not marked on the equipment, it shall be:

60 °C for equipment:

- rated not more than 100 A; or
- marked for use with a No. 1 AWG or smaller conductor; and

75 °C for equipment:

- rated more than 100 A; or
- marked for use with conductors larger than No. 1 AWG.
- All relevant correction factors being determined from Rule 4-004, such as Table 5A, will apply to ampacity rating from the equipment termination temperature rating **not** the insulation temperature rating when the equipment termination temperature rating is required to be used.
- For high voltage equipment's termination temperature rating when not marked, consult the manufacturer and provide documentation to the Electrical Inspections department.
- Equipment termination temperature rating applies to the first 1.2 m (4') of conductor from the connection point on the equipment.



"60/75 °C Wire –
125 Amp & Lower Only"



When not listed,
refer to
Rule 4-006(2)(a)(b)



"Use 75 Degrees C
conductors"

**4-008 - Induced voltages and currents in metal armour or sheaths of single conductor cables
(see Appendix B)**

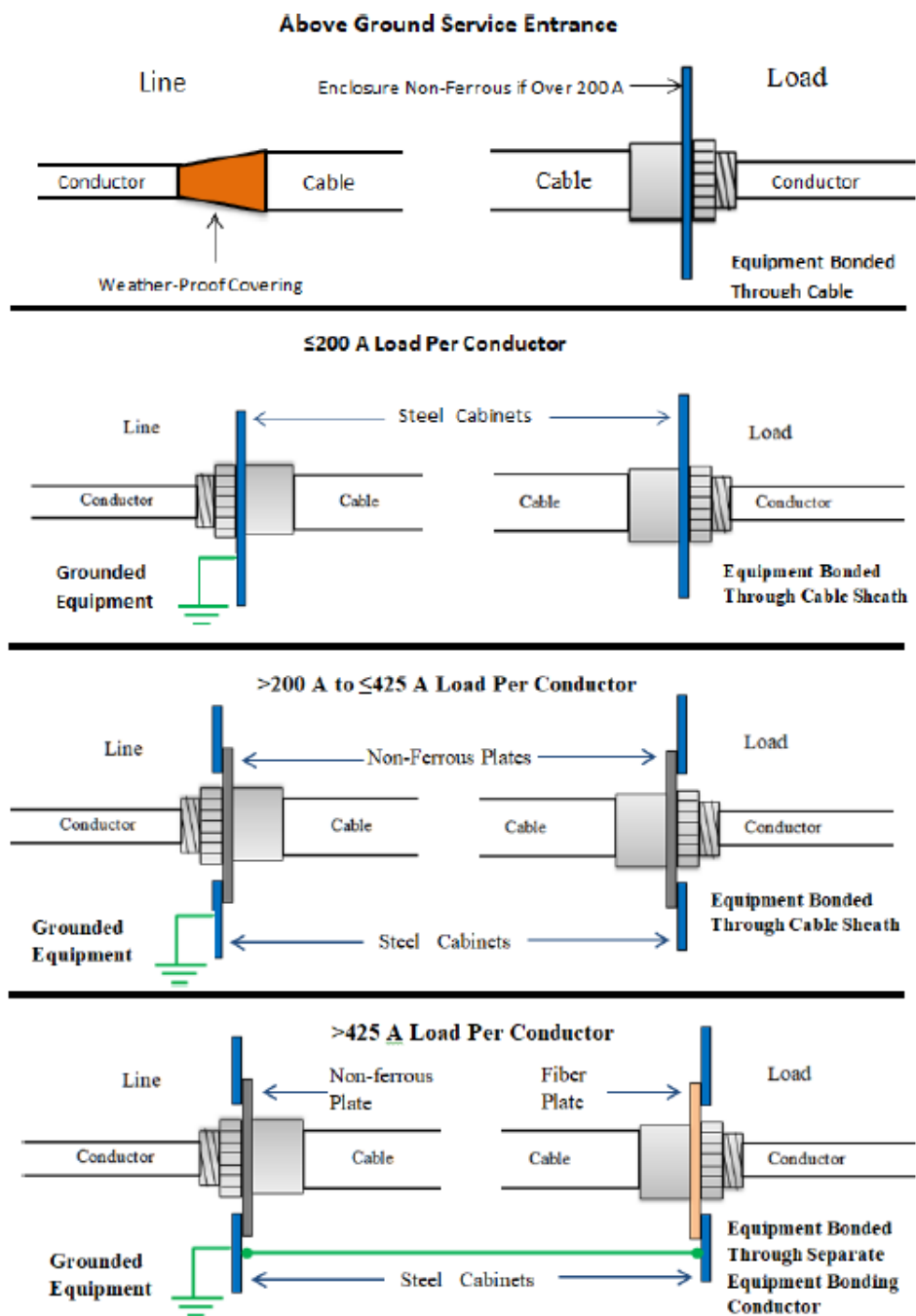
Where sheath currents are likely to cause insulation of the conductors to be subjected to temperatures in excess of the insulation ratings, the cables shall be:

- derated to 70% of the cable ampacity,
- derated in accordance with manufacturers recommendations and 2-030,
- Installed in a manner that prevents the flow of sheath currents.

Includes the use of non-ferrous metals when encircling the conductors to deal with the magnetic and hysteresis effects, i.e. clamps, straps, connectors, KO's...

1c TECK90 w/ concentric bond conductor, 1c ACWU90 w/concentric bond conductor, 1c CORFLEX RA90 w/ continuous corrugated welded aluminum sheath armour. These bonding paths shall all be treated the same as far as bonding or isolating requirements.

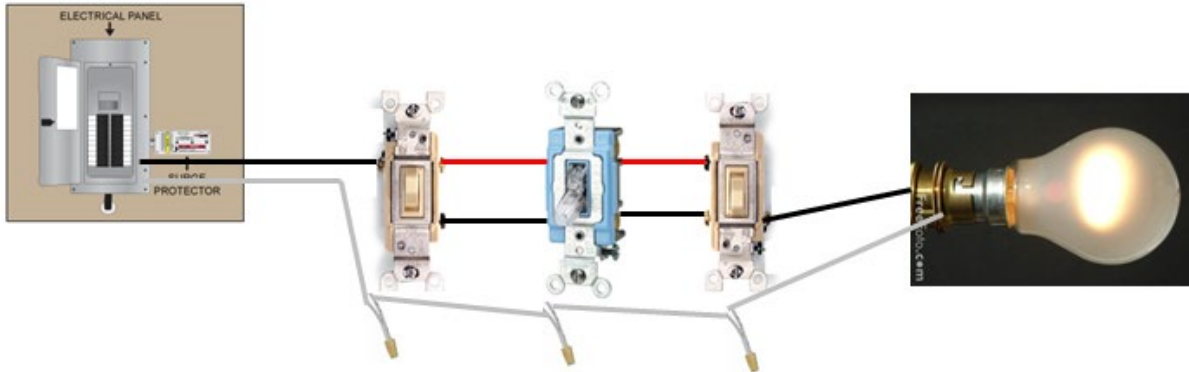
Above 425 A or whenever a single bonding conductor is installed, it should be installed as per manufacturers recommendations.



4-022 - Installation of identified conductors (see Appendix B)

4-022(1) Where a service, feeder or branch circuit requires an identified conductor, it shall be installed.

4-022(2) The neutral conductor shall be installed at each switch controlling permanently installed luminaires at a branch circuit outlet.



4-032(3) - Identification of insulated conductors

Unless specified elsewhere in the code, colour coding of branch circuit conductors and service conductors are not a mandatory requirement. This rule states that where colour coding is required, the colours shall be red, black and blue. The utility electric service requirements may specify where conductors must be colour coded (splitter box or CT metering). If CT metering is used after the main disconnect, then colour coding must be used to that point.

SECTION 6 - SERVICES AND SERVICE EQUIPMENT**6-104 - Number of consumer's services permitted in or on a building**

The maximum number of consumer services from a single supply service is four. **The contractor must confirm the installation with the local utility and meet utility requirements prior to construction.**

Note: If two supply services are permitted, then they will require a label at each service, stating that there are two services and the location of each.

6-112 - Support for the attachment of overhead supply or consumer's service conductors or cables (see Appendix B)

6-112(3) - For the purpose of this rule 'ground normally accessible to pedestrians' includes patios and decks.

6-112(5) Appendix B - note states an acceptable manner for mast support is one where three (3) support clamps are used, of these, the upper most is required to be a complete through bolt assembly consisting of a minimum 12 mm bolt, nut and washer.

As an alternative to the "through bolt" requirement, **with the permission of the District Electrical Inspector**, a unistrut support **may** be allowed to be lag bolted to the exterior of the building (into structural members) for mast support. A rigid 2-hole strap and spring nuts shall be used on the mast to secure it to the unistrut. **This may be allowed on a case by case basis, after review and acceptance by the local inspector.** It should only be considered when it is impractical or impossible to install the normal through bolt support.

6-200(1) - Service equipment - single breaker service equipment

Each consumer's service shall be provided with a single service box, except where a panelboard can employ no more than two single-pole breakers, one two-pole breaker, or one three-pole breaker and is **service entrance rated**.

6-200(2) - Service equipment – dual-lug meter sockets (see [6-104](#))

200 A dual-lug meter sockets, 400 A or 600 A customer service termination equipment (CSTE) cabinets may be installed where a customer wants multiple consumer services **and is acceptable to the utility.** The subdivision of the consumer services can be accomplished within the dual-lug meter socket or CSTE cabinet provided that the total current rating of the consumer service disconnects does not exceed the ampere rating of the meter socket or CSTE cabinet.

In rural areas where a 400 A or 600 A CSTE cabinet is used, a service entrance rated disconnect(s) is required immediately after the CSTE cabinet. (E.g. 1 - 400 A, 2 - 200 A or 4 - 100 A.)

6-206 – Consumer’s service equipment location

6-206(1)(a) - Electric Service Requirements

- SaskPower Electric Service Requirements can be found online at www.saskpower.com or call SaskPower at 1-888-757-6937.
- City of Saskatoon - www.saskatoon.ca - Saskatoon Light & Power - Service Guide.
- City of Swift Current - Use SaskPower Electric Service Requirements.

6-206(1)(c) - Panels

Thermally insulated walls are considered an undesirable location for recessing of panelboards.

Panelboards shall be installed in the building being served and the length of unfused service conductors shall not exceed six (6) conduit meters (20'). Where the service box or other consumer's service equipment is located beyond six (6) conduit meters (20') from the point where unfused service conductors enter the building, the conductors shall be run in threaded rigid metal conduit for the entire length inside the building.

Note: Metallic service conduits or service cables with metallic armor require a bonding bushing in the main service to assure continuity of the raceway or sheath. See [10-604](#) - assuring bonding continuity at service equipment.

6-206(3) - Service disconnect

The service **disconnecting means** shall be service entrance rated and permitted to be placed on the outside of the building or on a pole, provided it is rated for the location and protected from damage in accordance with the CEC requirements.

Except for extra low voltage sites (i.e. 12-volt DC), each oil well site or string of wells, shall be provided with a service entrance rated single point of disconnect and the feeder conductors shall also include a bond conductor sized to Table 16 to safely conduct any fault current back to the source and to ensure the safe operation of the overcurrent devices

Notes:

- An oil field well controller shall not be considered a service disconnect unless service entrance rated.
- The SaskPower supplied farm service center ('F' cabinet) breaker shall not be considered as overcurrent protection for the service or cables.
- 480-Volt utility service meter cabinets **shall only** be operated by Utility Personnel. (I.E. Oil Field, Irrigation Pivots etc.)

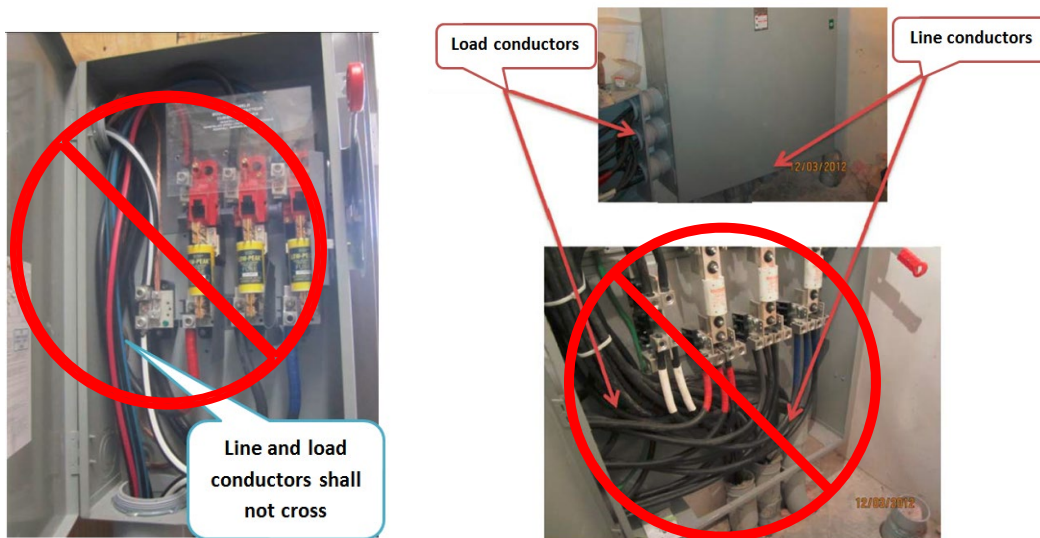
6-208 - Consumer's service conductors location - under house trailer/mobile homes

Service conductors installed underneath a house trailer/mobile home must be approved for the location and supported to the underside of the mobile home or buried. Unarmoured service conductors must be installed in a raceway from the point where they issue from the earth and include a bond as per Section 10.

For the purposes of 6-206(1)(c), the 6 m (20') rule does not apply to underneath the mobile home.

6-212 - Wiring space in enclosures

Where a service disconnecting means is not equipped with a barrier between the line and load side, the conductors shall enter the service box as close as possible to the line terminals and not come into contact with or cross conductors connected to the load terminals.

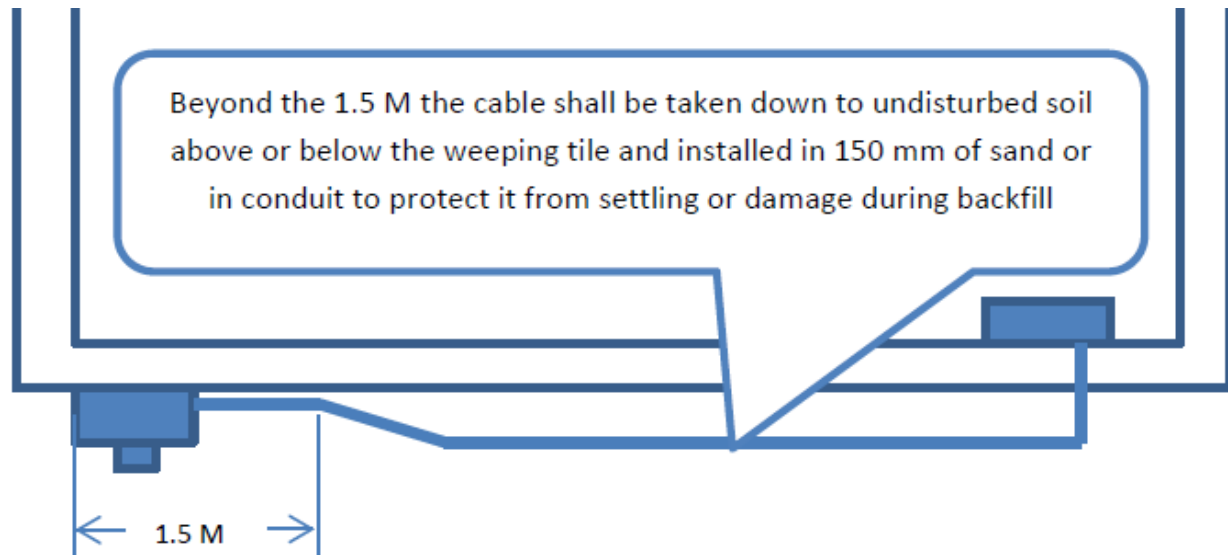


1) The bonding conductor for water line, gas line etc. shall not be taken out of the main disconnect area of a combination breaker panel.

6-300 - Installation of underground consumer's service conductors

Caution must be taken by the electrical contractor when installing a customer owned underground service from the meter socket to the panelboard location.

The consumer's underground cable must be installed tight to the basement wall anywhere within 1.5 m (5') of the meter socket location. This will help to prevent the cable from being damaged when the utility trenches in their underground service cable from the pole or pedestal to the socket. Once the cable is past the 1.5 m (5') distance, it may then be installed out away from the basement wall and shall be taken down to undisturbed soil just above or below the weeping tile. Cables without mechanical protection shall be in 150 mm (6") of sand or in a conduit to protect it from damage and settling during back fill.



As per [12-012](#)(11) & (12), the installation will also require frost sleeves at both ends and marking tape must be installed in the cable trench.

Underground service entrance cable as described in Table 19 shall be allowed to be supplied from a branch circuit overcurrent device when used as an underground feeder. The bare conductor (USEB) cannot be used as a neutral unless effectively isolated. USEI and USEB require mechanical protection installed where exposed above ground.

6-312 - Condensation in consumer's service raceway

It is recommended that the sealing be performed on the warm side to prevent condensation build-up in the conduit. Conduit may be sealed on both the warm and the cold side.

6-404 - Enclosures for instrument transformers

Where required for metering only, the neutral must be brought into the CT cabinet, sized and terminated to meet metering requirements as per local utility service requirements. Consult utility.

6-408(1)(f) - Location of meters (see also [2-326](#))

As per utility service requirements:

Furnace, water heater, air exchanger, dryer and similar exhaust vents shall not be installed directly above or directly below or within 1 m (39") horizontally of a meter socket.

SECTION 8 - CIRCUIT LOADING AND DEMAND FACTORS

8-002 - Special terminology

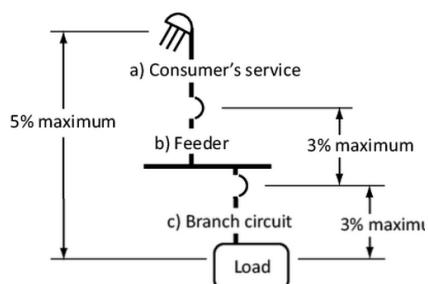
Electric vehicle energy management system - (EVEMS) The CEC created a new definition to describe the equipment used to control electric vehicle charging and supply equipment for the purpose of power sharing to loads and consisting of any of the following: a monitor(s), communications equipment, a controller(s), a timer(s) and other applicable device(s).

8-102 - Voltage drop

Precautions must be taken to prevent any services or branch circuits from exceeding 5% voltage drop from the utility to the end use, with no feeder or branch circuit exceeding 3%. The calculation of voltage drop on services and branch circuits is based on the connected load, or 80% of the overcurrent device for unknown loads. See Rule 8-102, Table D-3 in the CEC and as shown below.

Max 3% voltage drop table

3 - Phase	#14	#12	#10	#8	#6	#4	#3
208 V	1047	1664	2646	4211	6681	10648	13391
480 V	2416	3840	6107	9717	15418	24573	30901
600 V	3020	4800	7634	12146	19272	30717	38627
3 - Phase	#2	#1	1/0	2/0	3/0	4/0	
208 V	16865	21370	26897	33950	42740	53908	
480 V	38919	49315	62069	78346	98630	124404	
600 V	48649	61644	77586	97933	123288	155505	
1 - Phase	#14	#12	#10	#8	#6	#4	#3
120 V	604	960	1527	2429	3854	6143	7725
240 V	1208	1920	3053	4858	7709	12287	15451
347 V	1790	2840	4520	7180	11352	18078	22638
1 - Phase	#2	#1	1/0	2/0	3/0	4/0	
120 V	9730	12329	15517	19587	24658	31101	
240 V	19459	24658	31034	39173	49315	62202	
347 V	28740	36419	45868	57975	73035	91343	



- Values in Ampere-feet - copper conductors.
- Distances shown are in ampere-feet.
- Divide the number in the table, by the number of amps to obtain the distance in feet.
- For aluminum conductors, find the correct size copper and add 2 AWG sizes.

8-104 - Maximum circuit loading (see Appendix B)

Where single conductor cables are used they are permitted to be smaller in size due to the installation methods. Where they rise to terminate on a breaker, the heating in the enclosure can exceed the rating of the conductor. This is the reason that the single conductor cables need to be derated further.

Where a fused switch or circuit breaker is marked for continuous operation at 80% or 100% the rating of the respective cables will also change as per the CEC requirements. The continuous load as determined from the calculated load shall not exceed the continuous operation marking on the fused switch or circuit breaker. The continuous load may however be less due to the allowable ampacities of the conductors and the deration required by this rule.

Where the **maximum continuous load** allowed on a fused switch or circuit breaker as determined from Rule 8-104 (5) & (6) is less than the continuous operating marking of the fused switch or circuit breaker, a permanent, legible caution label shall be installed adjacent to the fused switch or circuit breaker to indicate the maximum continuous load permitted. A label will also be required at the main service or feeder overcurrent device, where the conductors are selected in accordance with Table 39.

Labels shall be in accordance with [2-100](#).

8-104(3)(a) - Water heaters

Water heaters are considered continuous loads and, therefore, the circuit conductor and the overcurrent device shall be loaded to a maximum of 80%. Example - if the water heater is rated at 3000 watts on 240 V (12.5 A), 62-114(7) will allow a #14 AWG conductor and a 20 A breaker.

8-106 - Demand factors**Notes:**

Please refer to [14-104](#) to assist in selection of overcurrent protection in relation to the conductor ampacity rating based on the calculated load. Unless allowed by other rules of this code the conductors must be rated for the ampacity of the O/C protection.

- Labelling requirements as per [2-100](#).

8-106 - Use of demand factors

8-106(10) is to be used where electric vehicle supply equipment loads are controlled by an electric vehicle energy management system (EVEMS). Where the system monitors the service and feeders and controls the electric vehicle supply equipment loads in accordance with 8-500, use 8-106(11) and the demand load for the electric vehicle equipment is not required to be considered in determining the calculated load.

NOTE - See Table 38 for equipment demand factors.

8-400 - Branch circuits and feeders supplying heater receptacles for vehicles powered by flammable or combustible fuels

This rule has been re-written to allow for the use of 20A breakers and receptacles. The Tables in Subrule (3) and (4) have been modified to assist with the loading calculation for parking lots.

Unrestricted or uncontrolled stalls

Number of Vehicle Spaces or Stalls	Demand Load per Space or Stall, W	
	15 A circuit	20 A circuit
First 30	1200	1800
Next 30	1000	1500
All over 60	800	1200

Restricted or controlled stalls

Number of Vehicle Spaces or Stalls	Demand Load per Space or Stall, W	
	15 A circuit	20 A circuit
First 30	650	975
Next 30	550	825
All over 60	450	675

SECTION 10 - GROUNDING & BONDING**10-000 - Scope**

Grounding and bonding installations shall conform to the drawings provided by the Electrical Inspections department Interpretations Figures 1 to 9. The Appendix B drawings may be followed under special permission.

10-004 - Special terminology

Equipotentiality - This is a new definition introduced into the code to describe the state in which conductive parts are at a **substantially** equal electric potential

Grounding - a permanent conductive path to earth. Sometimes referred to as ‘earthing’ this accomplishes system stabilization and establishes an equipotential plane in the surrounding soil.

Bonding - a low impedance path obtained by joining all non-current carrying metal parts to ensure electrical continuity and having the capacity to conduct safely any current likely to be imposed on it and to facilitate the operation of the protective (overcurrent...) device in the circuit. Also creates equipotentiality between all metallic parts.

Grounded conductor - is now defined in the code as the conductor that is intentionally grounded in a system.

System bonding jumper – is the connection between the electrical systems’ grounded point (neutral) and the non-current-carrying conductive parts (metal enclosure, raceways etc.) of the electrical system to establish a solidly grounded system.

Single point system grounding - is the connection of the system neutral or grounded system conductor to a ground electrode **at one point only**. This connection shall be made as close to the source as possible.

10-100 & 10-500 - Current over grounding and bonding conductors

For the purposes of Rules 10-100 & 10-500, the term ‘objectionable flow of current’ shall be defined as “any current that flows over conductors for which they were not intended and/or designed to accommodate, such as neutral current over bonding and/or grounding conductors, neutral current over metallic piping”. Caution shall be exercised to prevent this situation from occurring.

10-102 - Grounding electrodes

Underground metallic water lines **shall not** be used as a grounding electrode. Any existing ground connection to the water line shall be removed when upgrading the services. A tag stating **‘WARNING POSSIBLE SHOCK HAZARD’** shall be installed at the water meter. Please contact your local inspector for tags as required. See **Figure 1**



Figure 1

10-108 - Lightning protection system down conductors and grounding electrodes (see Appendices B & G)

Recommended practices for the installation of a lightning protection system, including lightning rods, interconnecting conductors and ground electrodes, are given in CAN/CSA-B72. Other national and international industry-recognized standards on lightning protection may also be available. As per Rule 12-016 where lightning down conductors are installed, electrical wiring shall, where practicable, be kept at least 2 m (6') from such conductors and installed at or below ground level in accordance with Rule 10-104.

Note:

- Lightning protection system installations are to be installed by a licensed contractor and require an electrical permit.

10-112 - Material for grounding conductors (see Appendix B)

Bare aluminum shall not be installed in corrosive locations such as direct earth burial or masonry.

10-116(1) - Installation of grounding conductors (see Appendix B)

The grounding connection shall be **electrically continuous** throughout its length. This can be accomplished through approved split bolts, lugs, etc.

10-210 - Grounding connections for solidly grounded ac systems supplied by the supply authority (see Appendix B)

1) There shall be an electrode and grounding conductor connected to the non-current carrying parts of electrical equipment at all facilities supplied with electrical power. See [Figure 2](#).

2) Customer owned service conductors supplied and installed by the electrical contractor shall include a separate neutral, where required, and bonding conductors. Service conductors supplied and installed by the supply authority (utility) may include separate neutral and bonding conductors. See [Figure 2](#).

Where separate neutral and bonding conductors are installed, there shall be no need for a system bonding jumper at the facility. The neutral conductor, where required, shall be insulated and remain isolated beyond the connection to the source. See [Figure 2 & 7](#).

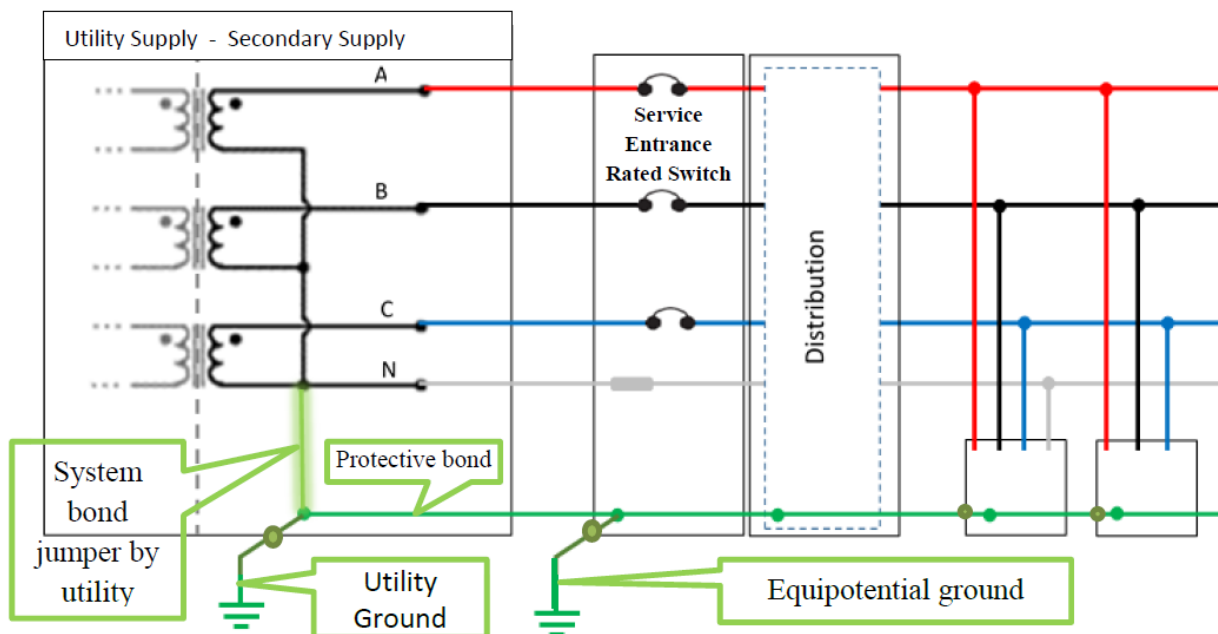
3) Where separate neutral and bonding conductors are not installed, the neutral/grounded system conductor shall be connected to ground either directly to the facility electrode or through the system bonding jumper. This connection shall be made at the first point of attachment or connection of the supply service conductors.

This connection shall be made at only one point and the neutral conductor shall be insulated and isolated from the grounding and bonding systems, metallic equipment and metallic surfaces beyond this connection. See [Figure 4, 4a, 5, 5a, 6 & 6a](#).

4) For overhead services, an insulated and weatherproof connection of the neutral conductor and bonding conductor shall be made at the overhead point of attachment where a service bonding conductor is not installed. See [Figure 4, 4a, 5 & 5a](#).

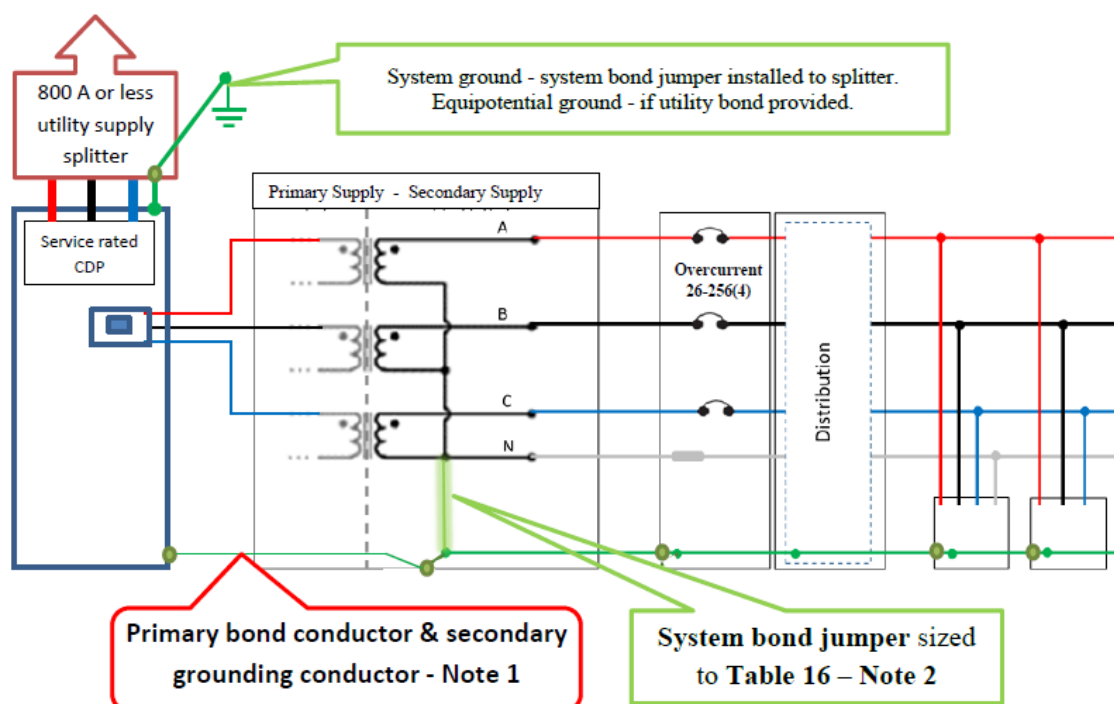
5) Where a neutral conductor is not required (there are no neutral loads being served), a bonding conductor shall be installed to facilitate the fault return. The supply authority may require a neutral conductor to satisfy the metering requirements. See [Figure 9](#).

Warning – contact your local utility to determine whether they are delivering a bond and a neutral or just a neutral conductor to assist in drawing selection



Note - Utility owned transformer is grounded and the system bond jumper is installed in accordance with utility standard, the protective bond is sized as per Table 16 based on the ungrounded conductor ampacity per [10-614\(2\)](#) and is carried with the main conductors to the service entrance switch. All other equipment grounding is for the purpose of establishing an equipotential plane.

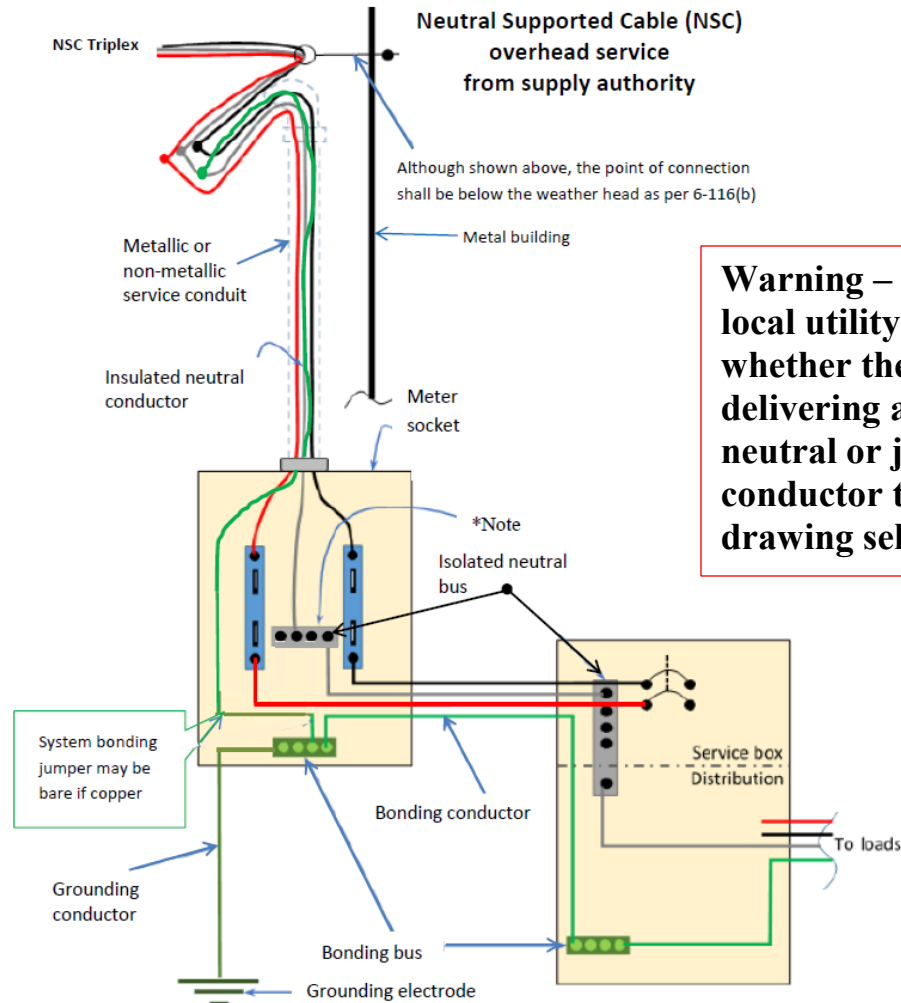
Figure 2



Note 1 - The bond conductor run with the primary feeder for a separately derived system is sized sufficiently to also function as the secondary ground per [10-212\(2\)](#).

Note 2- The system bond jumper per [10-614](#) must be sized to the secondary of the transformer based on the current from primary overcurrent device rating multiplied by the primary to secondary voltage ratio.

Figure 3



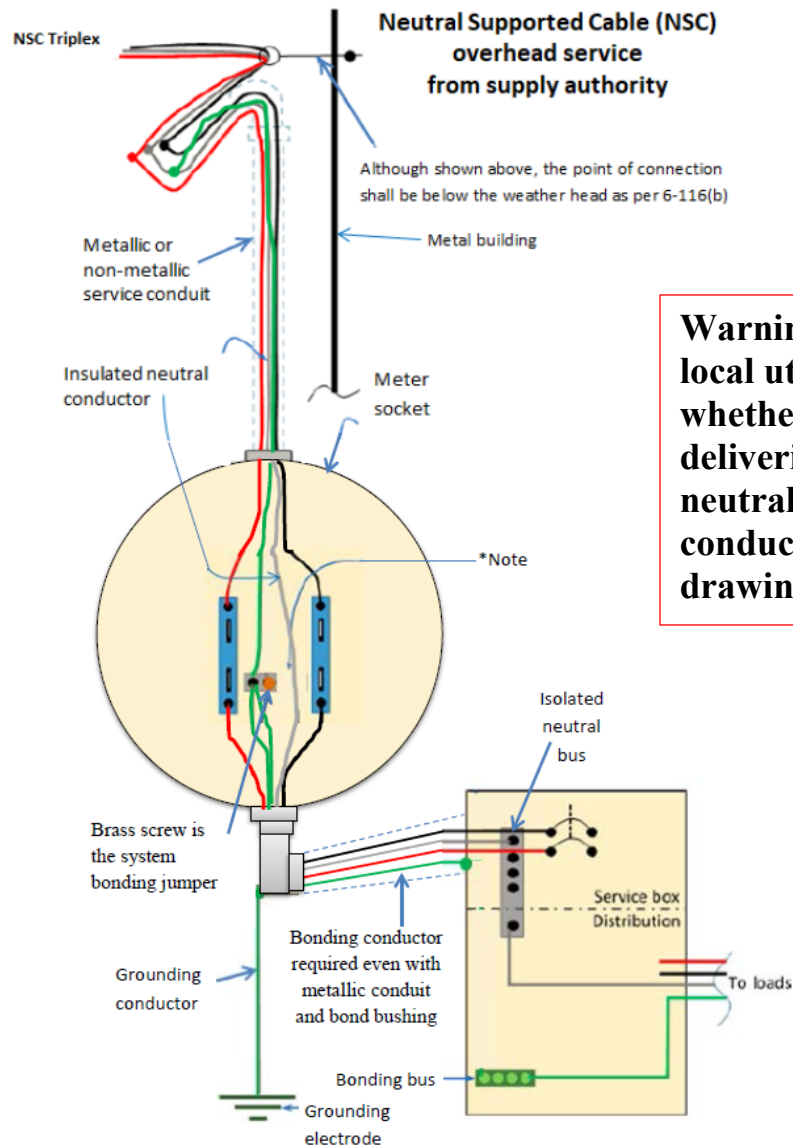
Note – This wiring method shall be used when an isolated neutral is available for the meter socket. See [Figure 4a](#) for an alternative **Figure 4**



NOTE: This installation has an isolated neutral bus installed in the meter socket. This may be an older square 100A socket or a newer style meter socket. The ground electrode connection is in the socket and has the system bonding jumper installed to and connected at the mast. See [10-102](#).

Neutral is on an isolated bus.

Figure 4a



Warning – contact your local utility to determine whether they are delivering a bond and a neutral or just a neutral conductor to assist in drawing selection

Note – When an older style meter socket is used or reused without the isolated neutral, this method may be used for overhead. See [10-102](#).

Figure 5

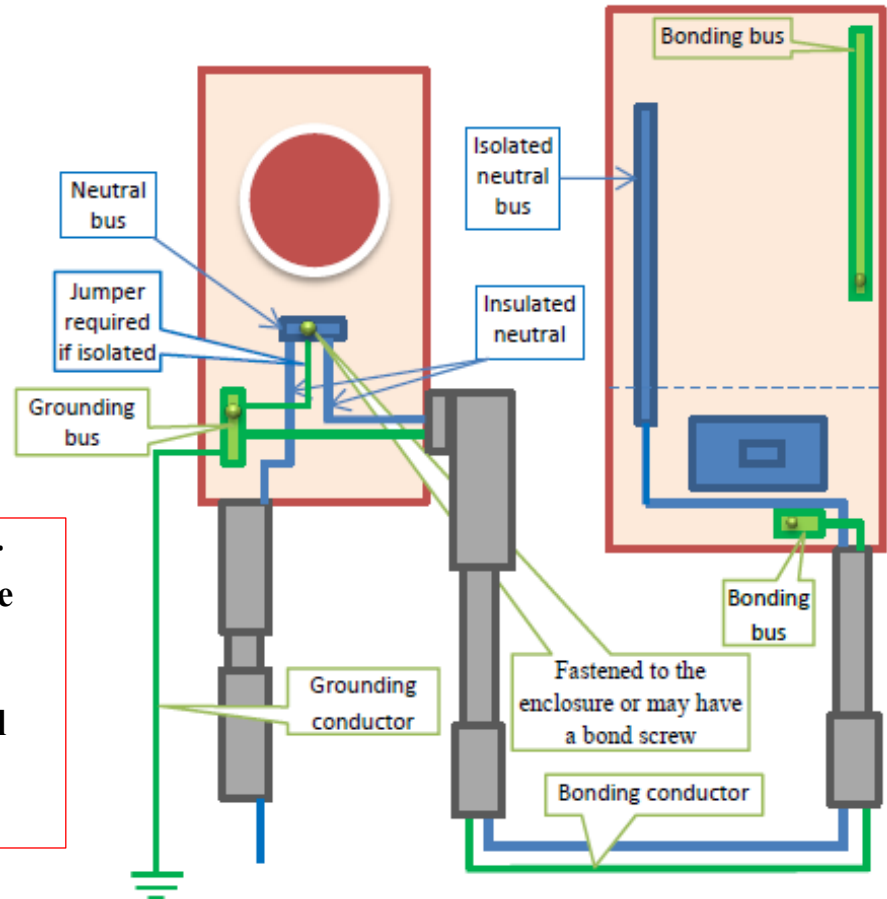


NOTE: This installation has no isolated neutral bus in the meter socket like the small round 100A sockets. The ground electrode connection may be in the socket or the panelboard and has the system bonding jumper installed to and connected at the mast. See [10-102](#).

Neutral runs through meter socket unbroken.

Figure 5a

Warning – contact your local utility to determine whether they are delivering a bond and a neutral or just a neutral conductor to assist in drawing selection



Note – This is the current method when the utility does not supply an underground bond conductor. The neutral is re-grounded at the customer meter and isolated beyond that point.

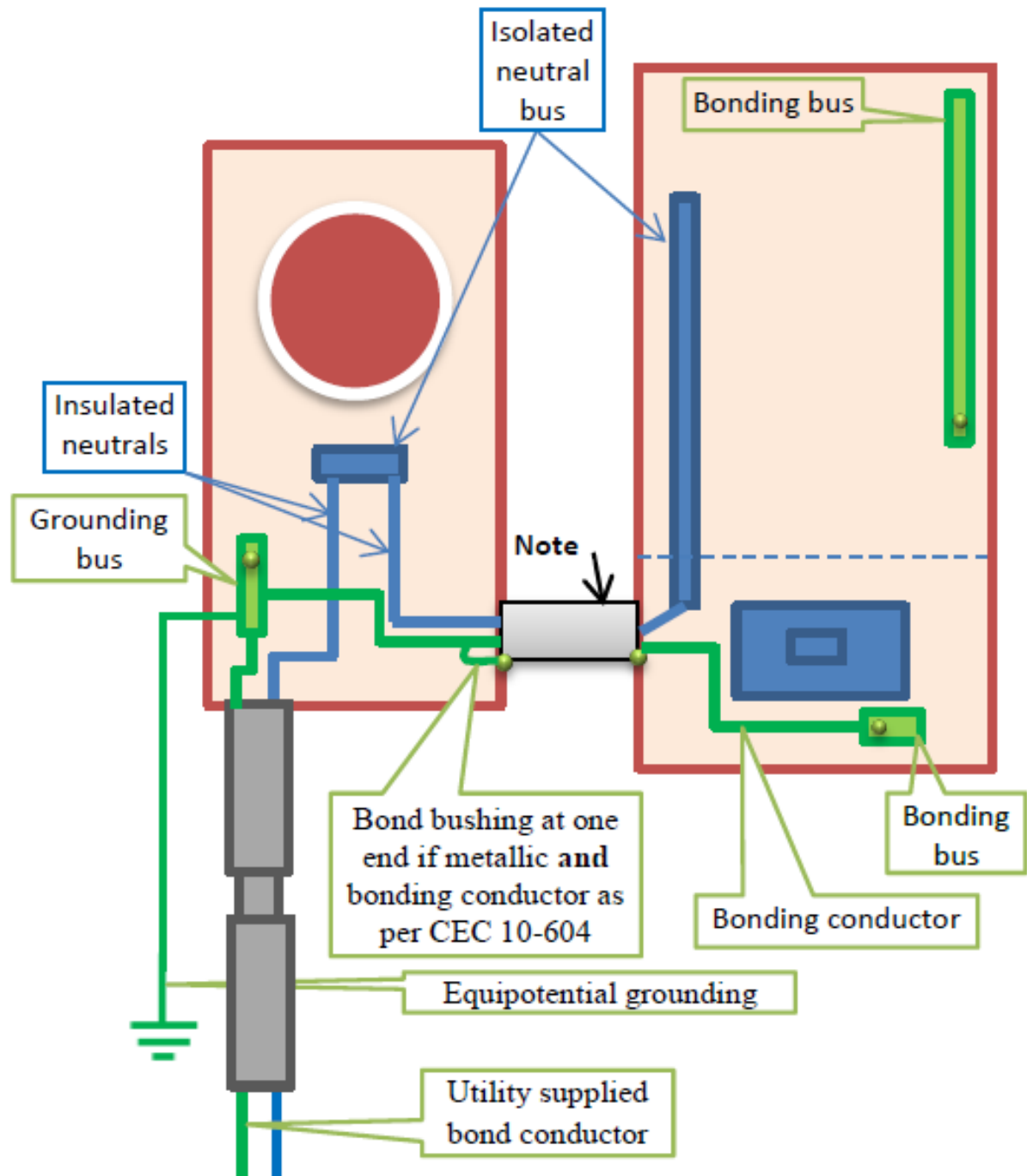
Figure 6



NOTE: This installation has an isolated neutral bus in the meter socket and has the system bonding jumper installed. When the utility cable includes a bonding conductor, this jumper can then be removed by the utility installer or contractor.

Install the system bonding jumper if you do not know what the utility will be supplying, a neutral and a bond or just a neutral.

Figure 6a



This is the new method to use when the utility supplies an underground bond conductor. The neutral conductor and busing is isolated from all metallic surfaces beyond the utility. See [Figure 6a](#) with the system bonding jumper removed.

Note – Any metallic service raceways shall have a bond bushing which may be installed at either end and be supplemented with a bonding conductor sized to Table 16.

Figure 7

Warning – contact your local utility to determine whether they are delivering a bond and a neutral or just a neutral conductor to assist in drawing selection

10-212(2) - Grounding connections for solidly grounded separately derived systems

The bonding conductor in the primary feed to a transformer enclosure will meet the requirements of the grounding conductor for the X_0 on the secondary side of the transformer.

The system bonding jumper (see 10-004 & 10-614) shall be sized as per Table 16 based on the secondary current of the transformer which is determined by the primary overcurrent protection device rating multiplied by the primary to secondary voltage ratio and connected to the enclosure to satisfy the requirement for the secondary fault return current and the grounding requirement. See [Figure 3](#) and the [3 Phase Dry Core Transformer Tables](#).

10-302(2)&(3) - Use (see Appendix B) – Impedance grounded system

Impedance grounded systems require the grounding circuit to be electrically continuous and monitored. This includes the connections from the X_0 through the impedance device and the impedance system bonding jumper to the grounding conductor connection.

The integrity of the impedance grounding system shall be monitored with an audible or visual alarm, shall be visible to persons monitoring the status of the system and labeled: ‘CONTACT _____ IF THE SYSTEM IS IN ALARM’.

10-308 - Conductors used with impedance grounding devices (see Appendix B)

Where the system is not serving neutral loads, the conductor connecting the impedance grounding device to the neutral point of the system source shall meet the requirements of this Rule and shall not be installed to the main switchgear, unless otherwise required for metering purposes or installation to the impedance grounding device. This neutral shall not be distributed and shall be labelled at each termination point to indicate “NOT FOR NEUTRAL LOADS”.

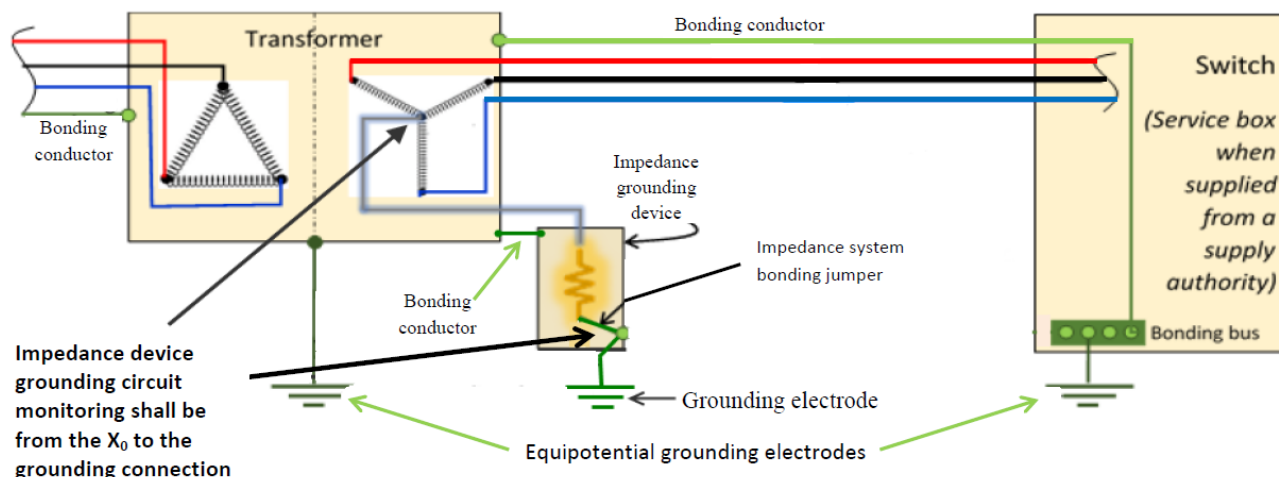
Impedance grounded systems are not solidly grounded systems. The conductor from the transformer/source to the impedance device must take the most direct route and is not required to enter the main service disconnect. This Rule provides a number of conditions that must be met with regard to this conductor. Minimum conductor size is now #12 AWG copper or #10 AWG aluminum conductors.

The path from the neutral point through the impedance grounding device to the system grounding electrode shall be electrically continuous and monitored as per 10-302. See [Figure 8](#).

10-400 - Ungrounded systems

Ground fault indication activated by a ground fault shall be visible to persons monitoring the status of the system and labeled ‘CONTACT _____ IF LIGHT IS OUT OR SYSTEM IS IN ALARM’.

Regardless of other monitoring systems being implemented, each installation shall have fault indication lights and/or audible alarm. Installation conditions may dictate that both systems may be required (i.e. site conditions, noise levels, etc.).



The impedance grounded circuit shall be monitored from the X_0 to the connection to the grounding electrode.

Figure 8

10-604 - Bonding continuity for service equipment

The requirements for bonding are more restrictive at services than downstream from the main disconnect. Service equipment and enclosures may be called upon to carry heavy fault currents in the event of a line-to-ground fault. The service conductors in these enclosures have only short circuit protection provided by the overcurrent protective device on the line side of the utility transformer.

While there are various options available to assure the continuity of service equipment and enclosures, the use of a **bonding bushing** is the **only** acceptable method to ensure the bonding of metal conduits or the metal armour of cables that use locknuts as a method of attachment to an enclosure. When using a metallic service conduit on the line side of the main service, a bonding conductor and a bonding bushing is required.

10-606 - Bonding continuity at other than service equipment

The following Subrules have been put forward to the Part 1 for approval for the 2021 CEC and are being adopted now by the Electrical Inspections department.

- a) The bonding conductor shall be permitted to be spliced or tapped ensuring sound electrical continuity.
- b) Where more than one bonding conductor enters a box, all such conductors shall be in good electrical contact with each other by;
 - a. securing all bonding conductors under bonding screws; or
 - b. connecting them together with a solderless connector and connecting one conductor only to the box by a bonding screw or a bonding device.
- c) Where a bonding conductor is run in the same raceway with other conductors of the circuit to which it is connected, it shall be insulated, except that an uninsulated bonding conductor shall be permitted to be used where the length of the raceway does not exceed 15 m and does not contain more than the equivalent of two quarter bends.

- d) Where circuit conductors are installed in a raceway, a separate bonding conductor, when required, shall be installed in the same raceway as the circuit conductors.
- e) Where a separate bonding conductor is run with single-conductor cables, it shall follow the same route as the cables.

10-614 - Size of system bonding jumper or bonding conductor (see Appendix B)

- 1) The size of a field-installed system bonding jumper shall not be less than that determined by the application of Table 16 based on the ampere rating or setting of the overcurrent device protecting the ungrounded conductors.
- 2) The size of the bonding conductor installed in accordance with Rule 10-604 **at service equipment** shall not be less than that determined by the application of Table 16 based on the allowable ampacity of the largest ungrounded conductor. See [Figure 2 & 9](#).
- 3) The size of a field-installed bonding conductor installed **at other than service equipment** shall not be less than that determined by the application of Table 16 based on:
 - a) the overcurrent device protecting the ungrounded conductors; or
 - b) the allowable ampacity of the largest ungrounded conductor for installations where the size of the circuit conductors is increased to compensate for voltage drop. See [Figure 9](#).
- 4) The size of a field-installed bonding conductor installed with each group of parallel conductors run in separate raceways or cables, shall be in accordance with Subrule (3) divided by the number of groups of parallel conductors. See [Figure 9](#).
- 5) Notwithstanding Subrules (2), (3) and (4), the bonding conductor shall not be required to be larger than the current-carrying conductors.
- 6) A metal raceway that is permitted to be used as a bonding conductor shall be considered to meet the requirements of this rule.
- 7) A bonding means that is integral to a cable assembly shall be considered to meet the requirements of this rule.

10-700 - Equipotential bonding of non-electrical equipment (see Appendix B)

The metal parts of structures that livestock access shall be bonded as per [10-614\(3\)](#) and shall include a connection to a grounding electrode at each location to provide an equipotential plane. This shall include buildings housing livestock, metal watering bowls and structures supplied with electricity within the areas accessible to livestock.

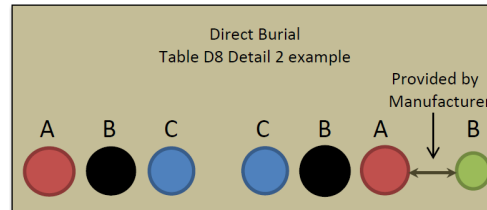
10-700(c) - Replacement of furnaces

When a furnace or similar piece of equipment is being replaced, the electrical contractor is responsible for bonding the gas line as required by the CEC. The branch circuit cable, providing it has an internal bond conductor as per Rule 10-610 and the low voltage thermostat cable, does not require replacement. See [26-806\(1\)\(5\)\(6\)\(7\)](#).

Caution: Some new furnaces require 20 amp circuits.



Bonding conductor required in each raceway for parallel conductor installations.



Direct burial parallel conductor installations may require multiple bonds, or a single bond sized to Table 16 and installed **as per manufacturer's instructions**

Figure 9

SECTION 12 - WIRING METHODS

12-012 - Underground installations (see Appendix B)

12-012(11) (12) - Frost sleeves and marking tape

All underground raceways or cables subject to movement require provisions to be made to prevent damage to the conductors or the electrical equipment. The intent of this Rule is to avoid damage to the raceway or cable (during settlement/frost).

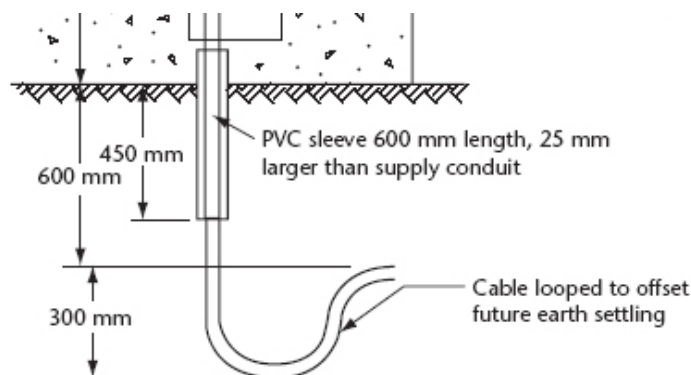
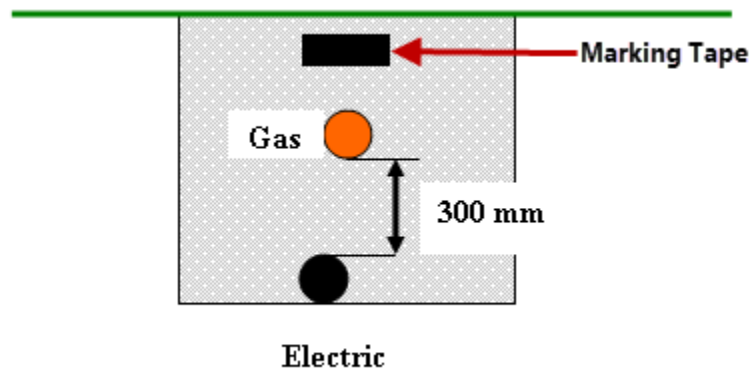
Underground installations must have a suitable marking tape buried halfway between the cable and grade level and the tape must extend the entire length of the trench. See [6-300](#).

12-012(13) - Burial of conductors in proximity to gas lines

Electrical wiring shall not be installed within 600 mm (24") of a utility natural gas line.

Electrical wiring may be installed in the same trench as customer-owned propane or natural gas lines provided the conductors are placed at a greater depth and a separation of at least 300 mm (12") of earth or 150 mm (6") if a treated plank is installed between the piping and conductor.

Customer owned propane or natural gas lines refers to customer lines supplying customer premises. Customer owned propane or natural gas lines shall be buried at a minimum of 381 mm (15") and, if subject to vehicular traffic, a minimum of 600 mm (24").



12-118 - Termination and splicing of aluminum conductors

An anti-oxidant joint compound shall be used on all aluminum or aluminum to copper terminations.

12-120 - Supporting of cables (see Appendix B)

12-120(1) - Horizontal - Permanently installed cables and conduits supplying motors, pumps, pressure switches or any other electrical equipment shall be supported as required by Section 12. Cables and conduits where exposed and subject to damage must be supported off of the ground by an approved method such as cable tray, strut, etc. Cables must be supported within 300 mm (12") of any junction box (this includes oil wells). When installing cables, ensure that there is no stress on the connectors from the weight of the cable.

12-120(2)(4) - Vertical - Vertical runs of conduit with internal conductors or runs of armoured or sheathed cable such as TECK 90, RA90, RC90, AC90 and ACWU90 shall have the internal conductors or cable assembly supported at intervals not exceeding those specified in Table 21 of the CEC.

This may also be accomplished with the installation incorporating a bend or bends equivalent to a total of not less than 90 degrees at intervals not exceeding the distances specified in Table 21 of the CEC or installation of a horizontal run of the cable not less than the length of the vertical run. This is not required when using a cable that is specifically designed for vertical runs.

The design and construction of cable types such as TECK 90, RA90, RC90, AC90 and ACWU90 do not provide internal support between the sheath or armour and internal cable assembly. Horizontal runs of TECK 90, RA90, RC90, AC90 and ACWU90 that equal or exceed the vertical length or that incorporate a bend or bends equivalent to a total of not less than 90 degrees reduces the strain on conductor terminations.

12-200 - Open wiring rules

In a renovation where walls are being opened, open wiring shall be replaced. Connections to other systems to refeed existing installations shall be through connections in a junction box meeting the requirement of Rule 12-222, and the bonding requirements of Section 10. GFI protection may be required as per Rule 26-702(2).

12-608 – Continuity of armoured cables

Where the armour is not mechanically or electrically connected to the equipment at one end, it should be insulated and isolated to prevent possible shock hazards. For 5KV and above please refer to manufacturer's instructions.

12-610 - Terminating armoured cable (see Appendix B)

ACWU or other metallic armoured cables without an inner protective jacket shall incorporate an anti-short or other approved protective device.

12-910(4) - Conductors and cables in conduit and tubing (see Appendix B)

Table 6 was revised to Tables 6A to 6K to cover the maximum number of stranded conductors of one size in conduit and tubing. New tables were added to correspond with the different stranded conductor insulation types and sizes given in Tables 10A and 10B.

Tables 9A to 9J covering the diameter and cross-sectional area of conduit and tubing were added and revised to correspond with the dimensions required from each standard for the specific type of conduit and tubing.

Table 10C was added to give the dimensions of solid conductors.

Calculating fill utilizing values from Tables 9A to 9J and Table 10C will give the maximum results for fill using solid conductors. See charts below as examples.

Note:

- These are for 600 V unjacketed wires as listed in column 1.

12-910 - Tables

RW90XLPE 600 volt

Raceway size	Raceway type											
	Table 6A (stranded conductor)			Rigid metallic conduit (T-9A)			Flexible metal conduit (T-9B)			Rigid PVC conduit (T-9C)		
	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm
#14 AWG	5	11	21	10*	18*	29*	10	17	26	8	15	26
#12 AWG	3	9	16	8	14	22	7	13	20	6	12	20
#10 AWG	2	6	12	6	10	17	5	10	15	5	9	15
#8 AWG	1	3	6	2	5	8	2	4	7	2	4	7
#6 AWG	1	2	5	2	3	6	2	3	5	1	3	5

Raceway size	Raceway type											
	Metallic liquid-tight flexible conduit (T-9G)			Non-metallic Liquid-tight flexible conduit (T-9H)			Electrical metallic tubing (T-9I)			Electrical non-metallic tubing (T-9J)		
	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm
#14 AWG	10	17	28	9	16	27	9	16	27	8	15	25
#12 AWG	7	13	21	7	13	21	7	13	21	6	12	20
#10 AWG	5	10	16	5	9	15	5	9	16	5	9	15
#8 AWG	2	4	7	2	4	7	2	4	7	2	4	7
#6 AWG	2	3	5	1	3	5	1	3	5	1	3	5

See 12-910 *Solid conductors

T90 NYLON

Raceway size	Raceway type											
	Table			Rigid			Flexible			Rigid		
	6K (stranded conductor)			metallic conduit (T-9A)			metal conduit (T-9B)			PVC conduit (T-9C)		
	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm
#14 AWG	7	16	30	15*	26*	43*	15*	25*	38*	12*	23*	38*
#12 AWG	5	12	22	11*	19*	32*	11*	18*	28*	9*	17*	28*
#10 AWG	3	7	14	7*	12*	20*	6*	11*	17*	5*	10*	17*
#8 AWG	1	4	8	3	6	9	3	5	8	2	5	8
#6 AWG	1	3	5	2	4	7	2	4	6	2	3	6

Raceway size	Raceway type											
	Metallic liquid-tight flexible conduit (T-9G)			Non-metallic Liquid-tight flexible conduit (T-9H)			Electrical metallic tubing (T-9I)			Electrical non-metallic tubing (T-9J)		
	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm	16 mm	21 mm	27 mm
#14 AWG	14*	25*	41*	14*	24*	40*	14*	25*	41*	12*	23*	38*
#12 AWG	10*	19*	30*	10*	18*	29*	10*	18*	30*	9*	16*	28*
#10 AWG	6*	11*	19*	6*	11*	18*	6*	11*	18*	5*	10*	17*
#8 AWG	3	5	9	3	5	8	3	5	9	2	5	8
#6 AWG	2	4	6	2	4	6	2	4	6	2	3	6

See 12-910 *Solid conductors

12-1118 - Expansion joints (see Appendix B)

PVC conduit shall be installed as per manufacturer's specifications and the CEC. For example, assuming a temperature change of 70 °C, this would mean a minimum of one expansion joint or more may be required depending on the maximum range of the expansion joint. See Rule 12-1012.

Rules 12-1012, 12-1118, 12-1214 and Appendix B notes

Conduits shall be installed as per manufacture's specifications and the CEC. The formula to determine if excessive expansion requires mitigation is as follows:

$$E_T = L_R \cdot T_C \cdot C_E$$

Where: E_T is the total expansion in mm.

L_R is the length of the run measured in meters

T_C is the temperature change in °C, and

C_E is the coefficient of linear expansion as per the Table in Appendix B note to Rule 10-1012

Note:

- The total expansion of the length of the run shall be determined if there are expansion concerns.

Example:

For a 20 m run of rigid PVC conduit when the minimum expected temperature is -40 °C and the maximum expected temperature is 30 °C the total expansion is:

$E_T = 20 \text{ m} \times (40 + 30) \times 0.520 = 73 \text{ mm}$. So, as per the Rules, this exceeds the maximum allowed of 45 mm. Therefore, depending on the travel of the expansion joint, one or more would be required.

12-1122 - Provision for bonding continuity - PVC

As per Rule 10-610(1)(c) a bonding conductor will be required in all PVC conduits including service masts for overhead services. See [10-210\(4\)](#).

12-1268 - Provision for bonding continuity - HDPE

HDPE conduit is permitted for installation underground or where encased in masonry but not permitted for use above ground. Bonding continuity shall be ensured. See [10-606](#).

12-1404 - Restrictions on use - EMT

EMT shall not be used in carwash bay areas, due to salt and chemical contaminants. See [22-200\(1\)](#).

12-1414 - Provision for bonding continuity - EMT

Bonding conductors are required for EMT installations in the following uses:

- (a) concrete or masonry slabs in contact with the earth;
- (b) a wet location;
- (c) outdoor locations; or
- (d) service masts for overhead services. See [10-210](#).

12-2200 - Method of installation (see Appendix B) - cable tray

Cable trays require 600 mm (24") horizontal clearance **on one** or **on each** side of the tray depending on installation methods and obstructions. They are permitted to have reduced clearances through chases, under grating, under process pipes, and other such obstructions.

Where the expansion of the cable tray, due to the maximum probable temperature change can damage the cable tray, at least one expansion joint shall be installed.

12-2208(3) - Provisions for bonding

Metal cable tray must be bonded to ground when containing PVC or similar jacketed armoured cables i.e. TECK or ACWU cable. A good electrical connection to a metal structure or metal frame of a building, bonded to the system ground would satisfy the bonding requirement.

12-2250 - Cablebus - scope (see Appendix B)

Cablebus is a self-contained engineered system incorporating a special tray, cables, cable supports and cover. Rules 12-2252 to 12-2258 apply only to the installation of cablebus as a *complete system approved for the purpose*.

A complete set of engineering and installation drawings must be submitted to the Electrical Inspections department. See [2-014](#).

12-3000 - Outlet Boxes (see Appendix B)

Continuity of non-conductive boxes - Entry of metallic conduit or cables into non-conductive junction boxes, i.e. fiberglass or PVC, requires bonding bushings and all bushings must be bonded together. Metallic fittings used in a non-conductive box must be bonded through the use of bonding bushings or other equivalent means.

Floor boxes - shall be installed in accordance with the manufacturer's installation instructions and use covers designed for the type of flooring to be installed.

12-3002 - Outlet box covers

Flush mounted floor boxes - floor box covers shall be specifically approved for the type of floor intended.

SECTION 14 - PROTECTION AND CONTROL**14-100(g) - Loading cables (see Appendix B)**

Caution must be taken to prevent overloading of cables which do not have customer protection on the supply side. Example - on a farm service center (F cabinet), where the feeder cable terminates in an exterior splitter for the purpose of supplying more than one service, the total amperage of all main breakers may not exceed the ampacity of the feeder cable.

14-104(1) - Adjustable overcurrent devices (see Appendix B)

- a) Where the cable ampacity is less than the maximum rating of the **adjustable overcurrent (OC) protection devices**, the trip settings for the OC protection device shall be documented and on-site for the inspection when available;
- b) The adjustable OC protection devices including fused disconnecting switches, shall be labelled with a lamacoid plate indicating maximum fuse size or amp trip (AT) following the cable ampacity as per Rule 4-004, lamacoid shall read “**Max_____ A; Do Not Adjust**”; and
- c) This shall apply to service, feeder and/or branch circuit conductors.

14-114 - Supplementary protection (see Appendix B)

Electrical Inspectors have encountered supplemental protectors being used as overcurrent devices in industrial control panels and other electrical applications. As a reminder to industry and per Rule 14-114, supplementary overcurrent protection shall not be used as a substitute for branch circuit overcurrent devices or in place of branch circuit protective devices to protect a circuit.

SECTION 16 - CLASS 1 AND CLASS 2 CIRCUITS**16-008 - Hazardous locations**

Extra low-voltage power circuits installed in hazardous locations on oil field sites (i.e. solar and 12-volt equipment) must be installed in accordance with the applicable rules of Section 18.

SECTION 18 - HAZARDOUS LOCATIONS**18-004 - Classification of hazardous locations (see Appendices B, J, and L)**

Hazardous area classification or reclassification as per CEC Appendix L shall be carried out and documented by qualified persons and shall be authenticated by the person assuming responsibility (Professional Engineer).

Installations as described within the scope of Sections 18, 19, 20 & 22 shall be the minimum permissible classification unless reclassified by a Professional Engineer.

Area classifications or reclassifications complete with an assessment report and stamped drawings shall be provided to Electrical Inspections department.

For selection of equipment refer to Table 18.

Micro-breweries and alcohol distilleries

Micro-breweries and alcohol distilleries contain a number of hazardous locations. Plans and hazardous location classifications shall be provided to Electrical Inspections department prior to construction.

18-006 - Ammonia compressor rooms (see Appendices B and L)

When ammonia is used in a refrigerant system, the room shall be considered a Zone 2 hazardous location unless the room is constructed to a **Class T machinery room** as specified in the **CSA standard B52-95 Mechanical Refrigeration Code**.

18-008 - Locations containing an explosive dust atmosphere (see Appendices B and L)

All grain handling systems are classified Zone 20 locations.

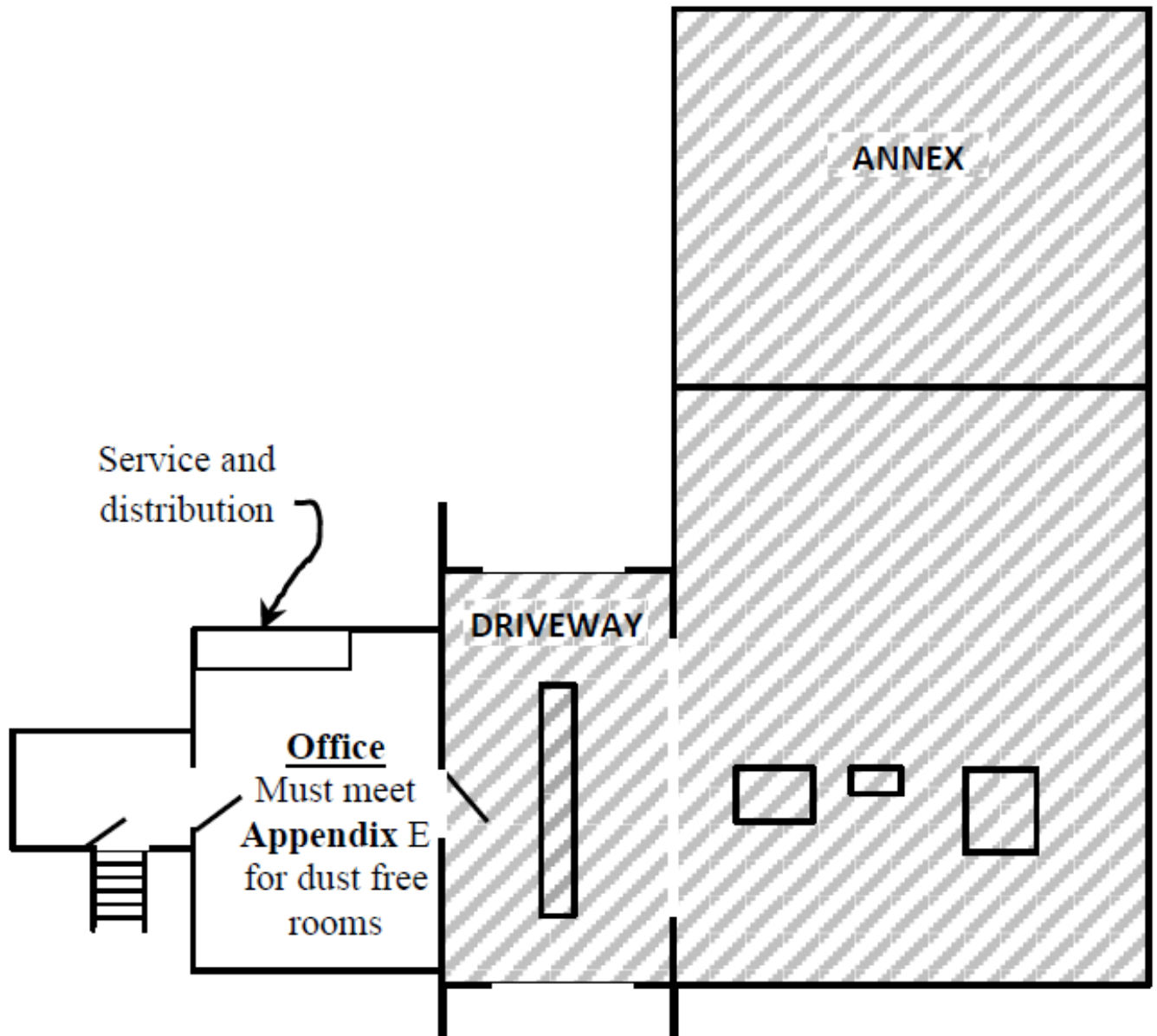
Bio diesel and canola crushing plants

As per Rule 18-008 of the CEC, canola crushing is a Zone 20 and all wiring must meet the minimum CEC requirements for the installation. Canola storage and product transferring would fall under the same area classification.

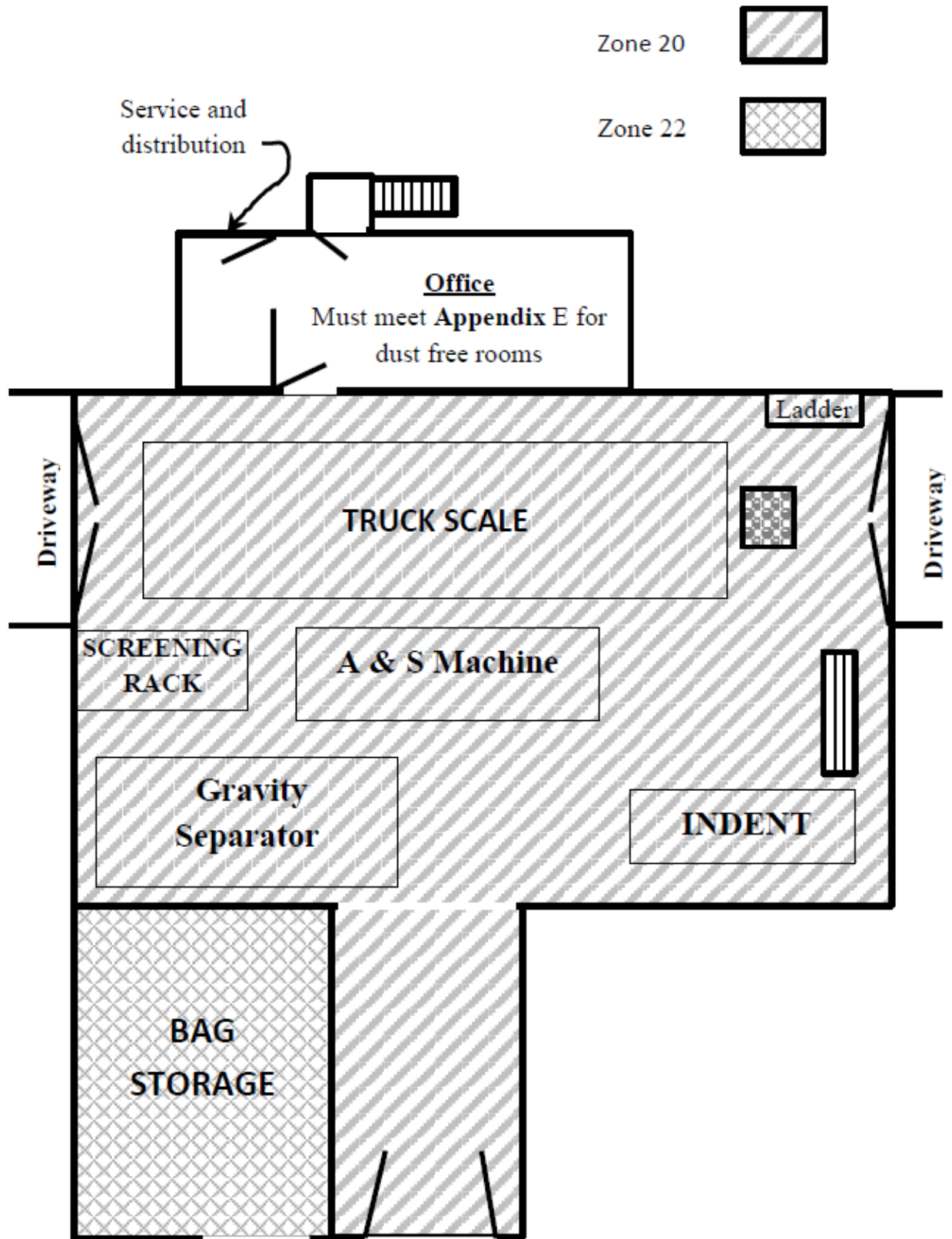
In the process of creating bio diesel, an additive must be added. If that product is methanol or another volatile additive, a hazard arises. The process must be classified as per Rule [18-004](#). Storage of methanol is under the same area classification. Bio diesel storage is the same as regular diesel and must also meet all other provincial codes and rules.

18-008 - Hazardous area classification - grain elevator

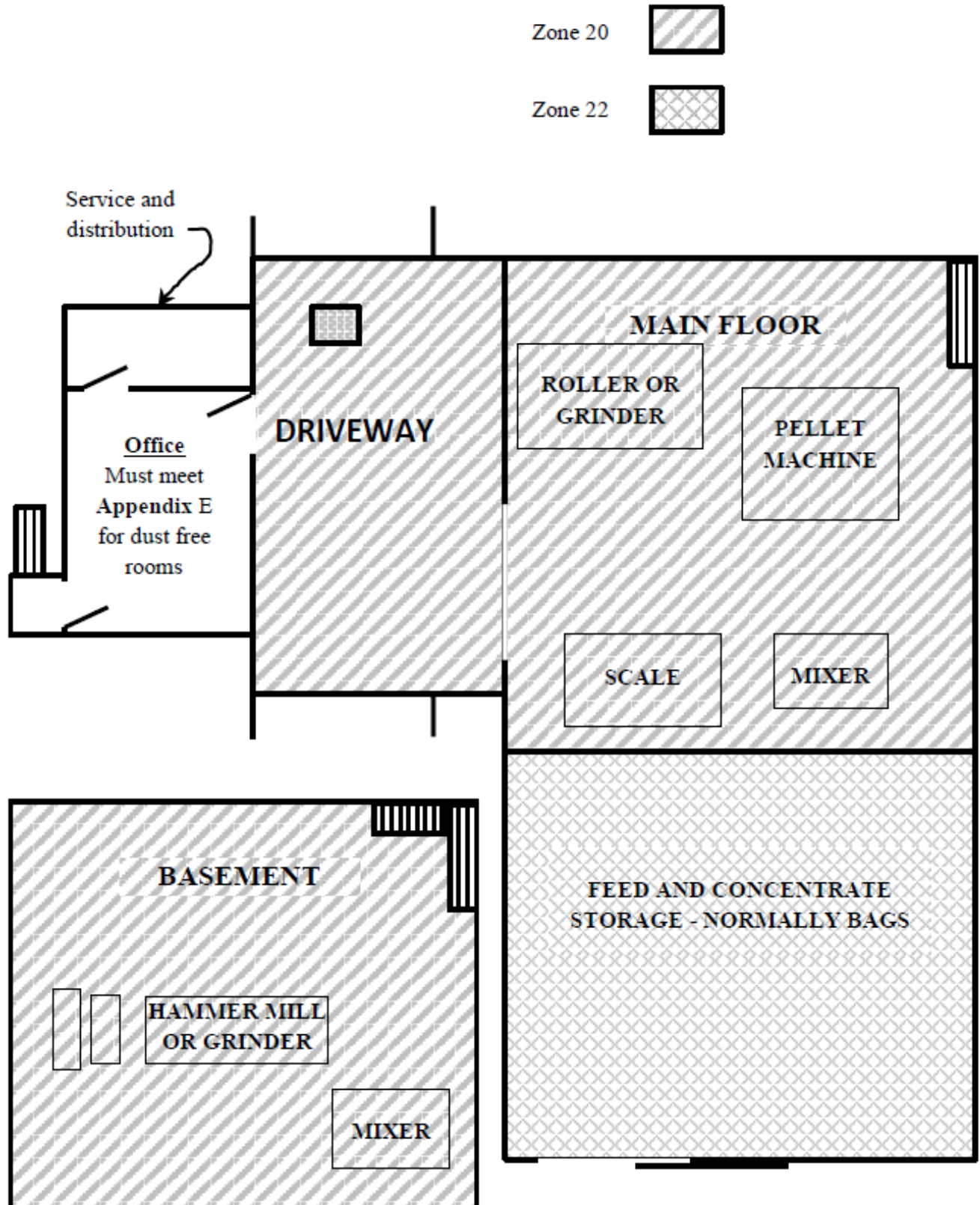
Zone 20



18-008 - Hazardous area classification - seed cleaning plant



18-008 - Hazardous area classification - feed mill floor plan



Woodworking plants and sawmills

The CEC classifies these areas as Zone 22 locations without adequate dust collection. Areas may be reclassified by a Professional Engineer. For the purposes of this rule, non-commercial residential garages and shops may not be considered wood working plants.

The following will be permitted where good housekeeping habits and adequate dust collection equipment is installed:

- a. Panelboards, controllers, etc. shall be dust tight or in dust tight enclosures.
- b. Wall surface wiring shall be threaded rigid, EMT (with rain-tight connectors) or TECK cable with dust-tight TECK connectors.
- c. Ceiling surface wiring may be ordinary location wiring methods.
- d. Boxes shall comply with Rule 18-252(2).
- e. Concealed wiring may be type AC or NM cable.
- f. Concealed boxes and fittings may be ordinary type.
- g. Switch and receptacle covers shall be of the weatherproof type.
- h. Where duplex receptacles are used, a separate self-closing cover will be required for each section of the receptacle.
- i. General purpose fluorescent lighting fixtures may be installed:
 - i) if mounted directly on the ceiling; or
 - ii) if suspended and provided with adequate dust shields to prevent the accumulation of dust.

18-050 – Electrical Equipment (see Appendices B, and J)

Selection of equipment for hazardous locations shall be in accordance with Table 18

18-052 - Marking of equipment

CSA has adopted the IEC standard for equipment protection levels (EPL's) as a requirement for marking on equipment in hazardous locations. This marking system will now appear on new hazardous location equipment. See **CEC Table 18** for more information.

18-064 - Intrinsically safe and non-incendive electrical equipment and wiring (see Appendix B)

Where an intrinsically safe electrical system or non-incendive field wiring circuit is installed in a hazardous location, a descriptive systems document shall be provided to the Electrical Inspections department and the systems shall be installed in accordance with this document.

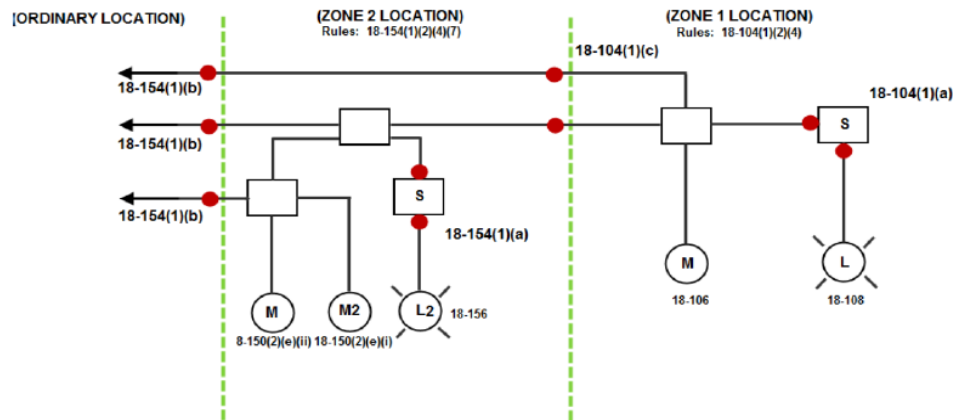
18-068 - Combustible gas detection (see Appendices B and H)

The intent of this Rule is **not** to declassify an area; it is only to be used where suitable equipment approved for the area is **not available** with proper classification for a hazardous area.

- i.e.
- General equipment to be installed in a Zone 2 location
 - Zone 2 equipment to be installed in a Zone 1 location

18-104, 18-154 - Sealing Zone 1 & 2

Zone 1 & 2 - CONDUIT Sealing Diagram (●)



Rule 18-104(4)(a) - All motors approved under the applicable Part II standards for Class 1 locations are required to have a seal provided by the manufacturer between the main motor enclosure and the connection box enclosure; therefore a seal may not be required at the connection box enclosure.

Rule 18-108 - Luminaires and portable lighting installed in a Zone 1 location shall be approved as complete assemblies in accordance with Rule 18-100. These light fixtures are also sealed by the manufacturer.

Legend:

(M) = Approved explosion-proof motor (CSA C22.2 No. 145)

(M2) = Open or non-explosion-proof motor, non arcing and sparking

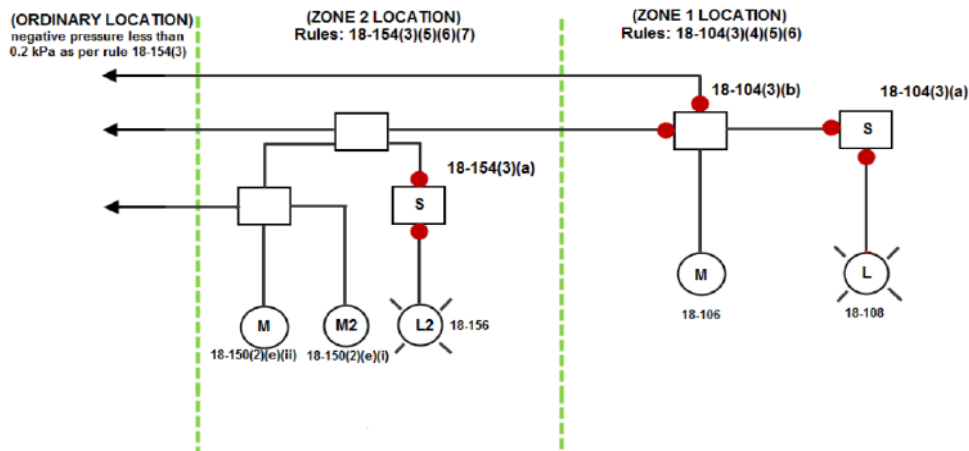
(L) = Approved explosion-proof luminaire (CSA C22.2 No. 137)

(L2) = Luminaire protected by guards or location

(S) = Non-factory sealed switch

[] = Junction box

Zones 1 & 2 - CABLE Sealing Diagram (●)



Rule 18-104(4)(a) - All motors approved under the applicable Part II standards for Class 1 locations are required to have a seal provided by the manufacturer between the main motor enclosure and the connection box enclosure; therefore a seal may not be required at the connection box enclosure.

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(L2) = Luminaire protected by guards or location

(S) = Non-factory sealed switch

[] = Junction box

Cable Seals

18-104(3)(b) - A cable entering or leaving a Zone 1 location must be sealed where it first terminates in the hazardous location regardless of the type of box it enters.

18-154(3)(b) - A cable entering or leaving a Zone 2 location from a box that is not required to be explosion proof, a seal is not required except if the cable is terminating in a non-hazardous location with a negative atmospheric pressure greater than 0.2 kPa.

18-152 & 18-252 - Wiring methods, Zone 2 & Zone 22

Liquid tight metal flexible conduit shall be marked for Heavy Duty.

18-250 - Equipment, Zone 22 locations

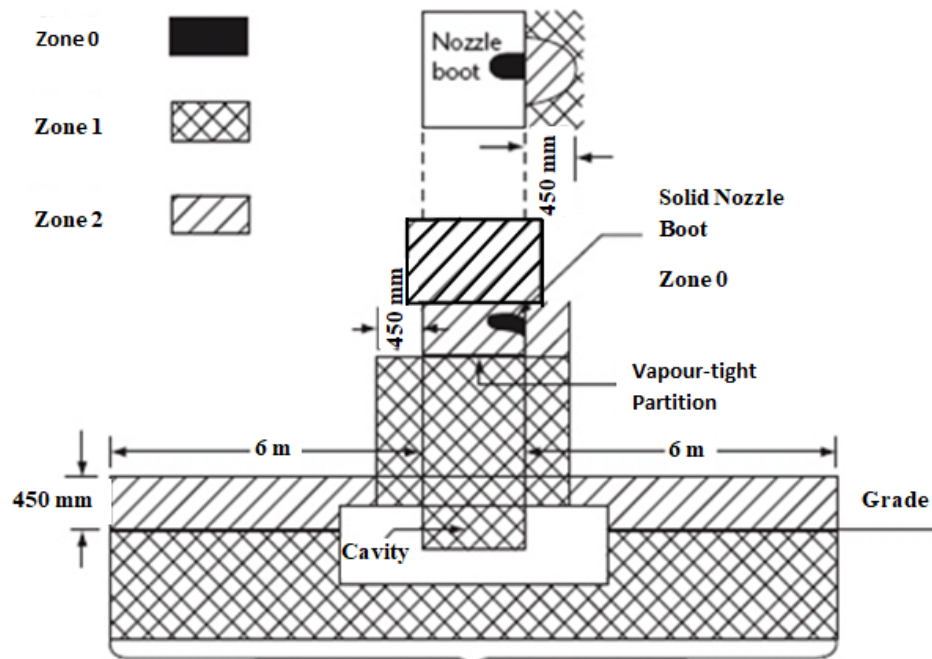
TEFC motors that meet the requirements of Table 18 and do not in normal service have ignition-capable hot surfaces or produce incendive arcs or sparks will be permitted in grain handling facilities classified as Zone 22.

Note:

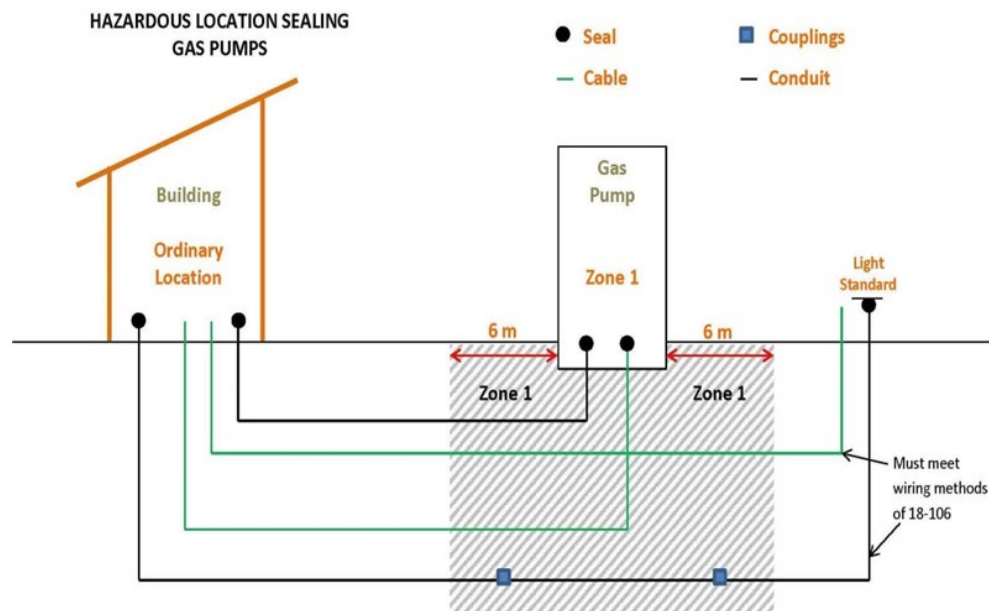
- Internal thermistor leads should be connected.

SECTION 20 - FLAMMABLE LIQUID AND GAS DISPENSING AND SERVICE STATIONS, GARAGES, BULK STORAGE PLANTS, FINISHING PROCESSES AND AIRCRAFT HANGARS

20-004 - Island gas pump



Any conduits leaving the hazardous area where the electrical wiring emerge from the ground shall meet the sealing requirements of Section 18 and 20



Cables and conduits that run through the Zone 1 area need to meet the wiring methods and sealing requirements of Section 18 whether they are associated with the pump or not.

20-034 - Propane container refill centers

Propane container refill centers and filling plants shall be classified as per Table 63.

20-062 - Compressed natural gas refueling stations, compressors and storage facilities

See CEC Table 64 for the classification of compressed natural gas refueling stations, compressors and storage facilities.

20-100 - Commercial repair garages

Section 20 now only applies to commercial garages where vehicles powered by gasoline, propane, or other flammable fuels are serviced or repaired.

20-102(1) - Hazardous area commercial repair garages

All adjacent rooms not suitably cut off with a 50 mm (2") barrier are classified as hazardous up to 50 mm (2") above the parking floor.

20-102(2) &(3) - Clarification of pits or depressions below floor level

For the purpose of Rule 20-102(2), a floor below grade is defined as - any area where daily work and storage of product takes place (i.e. vehicle service area, storage areas, etc.).

For the purpose of Rule 20-102(3), a pit is defined as - any area below grade where every day work does not take place (i.e. sump pit, etc.).

20-200 - Anhydrous ammonia

Anhydrous ammonia is considered to be a volatile flammable liquid and, as such, shall be wired in accordance with Rules 20-202 to 20-212, regardless of the aggregate capacity of the tank.

20-202 - Hazardous areas

Bulk storage plants shall be classified as shown in Table 69.

20-300 - Finishing processes

We are starting to see the use of “water-base” or “waterborne” paints in automotive and other finishing processes. While the base coat may be “water-base” or “waterborne” other components of the paint are flammable and therefore Section 20 still applies, unless it can be proven with the MSDS sheets that there are no flammable components involved.

Applies to areas where:

- paints, lacquers or other flammable finishes and fiberglass processes are regularly or frequently applied by spraying, dipping, brushing or by other means;
- volatile flammable solvents or thinners are used; or
- readily ignitable deposits or residues from such paints, lacquers or finishes may occur.

20-302 - Paint mixing rooms

All paint mixing rooms are classified Zone 1 locations unless it can be proven that all the products involved are non-flammable.

SECTION 22 - LOCATIONS IN WHICH CORROSIVE LIQUIDS, VAPOURS OR EXCESSIVE MOISTURE ARE LIKELY TO BE PRESENT**22-002 - Categories**

Greenhouses, grow-ops and freezers - are considered a Category 1 location. EMT with wet location fittings will be permitted. The area classification may be reduced to a standard location if ventilation and humidity controls are present.

All walk-in **coolers** are standard locations.

See Rule [12-1414](#) provisions for bonding using EMT for Category 1 locations.

22-200(1) - Wiring methods in Category 1 locations

Car wash - Car washes are classified as Category 1 locations. All wiring methods and equipment must be approved for wet locations.

EMT shall not be used in car wash bay areas due to salt and chemical contaminants. See [12-1404](#).

22-202 - Wiring methods in Category 2 locations

Granular fertilizer storage - All electrical equipment installed for bulk granular fertilizer storage buildings, bins, load and unload equipment, distribution chutes and augers and surrounding exterior areas, subject to corrosion under normal operation of the equipment from a combination of the fertilizer dust and humidity/moisture, must be approved for the location in accordance with Rule 2-116. Non-essential equipment shall not be installed in handling or processing areas.

Raceways may be PVC, or other non-corrosive material, with fittings and enclosure entries of such design as to not constitute dissimilar metals in contact with each other, and to exclude dust.

TECK 90 cable with non-corrosive fittings shall be permitted to be installed at bulk fertilizer storage structures.

Equipotential grounding and bonding conductors shall be of copper or equivalent and insulated where exposed to corrosion. Any terminations shall be protected from corrosion by an approved sealant or epoxy paint.

22-204 - Buildings housing livestock or poultry

Wiring in buildings housing livestock or poultry shall be the type listed in Table 19 for Category 1 and Category 2 locations.

With adequate ventilation, wiring approved for a **damp location** as per Table 19 may be used.

Note: Aluminum conductors and AC90 (BX, ACWU) cables are not approved for use in buildings housing livestock. Non-metallic sheathed cable is not approved for installation in a continuous raceway system.

Wiring methods (see [10-700](#))

The wiring methods that are acceptable in buildings housing livestock or poultry are:

- PVC conduit along with PVC boxes, straps and approved expansion joints as required. Wire within the conduit must be approved for a wet location or damp location if the barn is equipped with adequate humidity control;
- TECK 90 cable along with approved connectors, non-corrosive boxes and straps. Note - the electrical continuity of the metal armour must be maintained throughout the cable runs; or
- Non-metallic sheath cable except in any location where it may be susceptible to damage by rodents; and
- All screws and equipment must be of the corrosion resistant type.
- Wiring for watering bowls may be of aluminum. Terminations shall be protected with an anti-oxidant and effectively sealed.

Non-metallic sheath cable cannot be run inside the walls, ceiling/attics or any other concealed space in a barn, office, tack room or similar area attached to or within the barn unless provided with mechanical protection.

When non-metallic sheath cable passes through a location where it may be exposed to rodents, it must be provided with mechanical protection in the form of rigid steel, rigid non-metallic conduit or other suitable material when:

- Installed in exposed locations within 300 mm (12") above any horizontal surface; or
- Installed in exposed locations on the sides of floor joists or other structural members less than 100 mm (4") below the upper surface.

Notes:

- When an office, tack room, riding arena, sales arena or similar room is attached or within the barn, the wiring methods shall be the same as the rest of the building.
- If the room is separated from the barn by vapour tight walls, ceiling, floor and a sealed door, normal equipment (i.e. panelboards, lighting, etc.) may be installed in the interior of this room (surface mounted not recessed within the ceiling or walls).

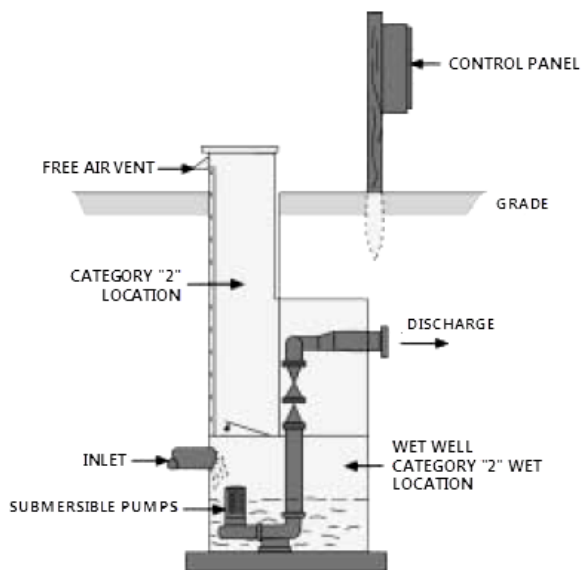
SEWAGE LIFT AND TREATMENT PLANTS

22-704 - Classification of areas

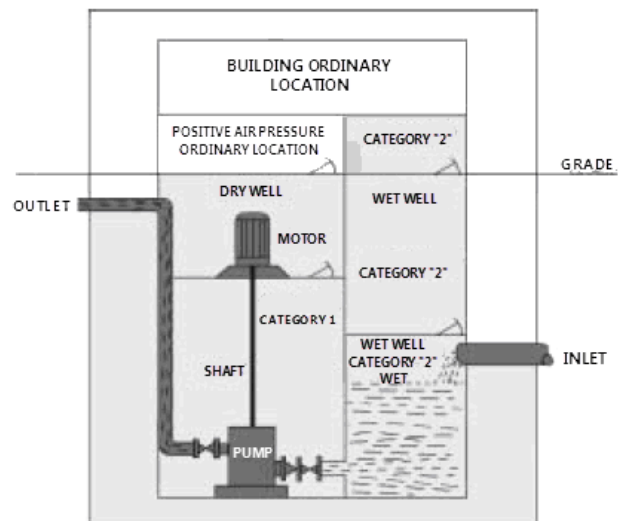
Sewage Lift & Handling

The following chart shows the classification of various locations in sewage lift and treatment plants		
Location	Condition	Classification
Wet Wells	With adequate continuous positive pressure ventilation	Zone 2, Category 2
All below-ground dry-well location	Suitably cut off from sewage gas location	Category 1
All locations	Sewage gas is present in explosive concentrations	Zone 1, Category 2
All locations	Suitably cut off from a Category 2 location and not classified as a Category 1 location.	Ordinary location
All locations	Not suitably cut off from a Category 2 location but with adequate continuous positive pressure ventilation.	Ordinary location
Below-ground dry well locations	With adequate heating and adequate continuous positive pressure ventilation	Ordinary location

Typical Sewage Lift Station (self-contained)



Building - Ordinary Location



SECTION 24 - PATIENT CARE AREAS**Definitions - Health care facilities****Health care facility - Class A**

A hospital so designated by Canada or one of its Provinces or Territories, where patients are accommodated on the basis of medical need and are provided with continuing medical care and supporting diagnostic and therapeutic services.

Note: Class A Facilities include acute and complex care.

Health care facility - Class B

A facility where residents, as a result of physical or mental disabilities, are unable to function independently and are accommodated due to a need for daily care by health care professionals.

Note: Class B Facilities provide, e.g. extended, multi-level, hospice, psychiatric or intermediate care. The definition includes rehabilitation facilities.

Health care facility - Class C

A facility where ambulatory patients are accommodated on the basis of medical need and are provided with supportive, diagnostic and treatment services.

Note: Class C Facilities include, e.g. outpatient and surgical clinics, dental offices, doctors' clinics, private residences and group homes.

24-000 - Classification of areas

Contractors need to be aware of the determination of patient care areas and provide this information to the Electrical Inspector prior to commencing work. Plans shall be submitted with indication of different patient care levels (basic, intermediate or critical), patient care environments and branch circuit wiring details.

A rough-in inspection shall be booked prior to closing in of walls. See [2-012](#).

Patient care areas are defined by the CAN/CSA-Z32 standard and include, but are not limited to, walk-in medical clinics, dental clinics, chiropractic clinics, massage/physio therapy, optometrists and others. This means that the specific rooms of a clinic in which treatment is given may be required to be wired in accordance with Section 24 methods.

The health region, clinic or hospital administrators are the personnel who will determine the area use for their facilities.

24-106(7) - Receptacles in basic care areas

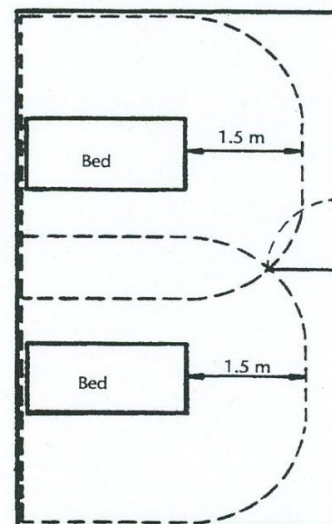
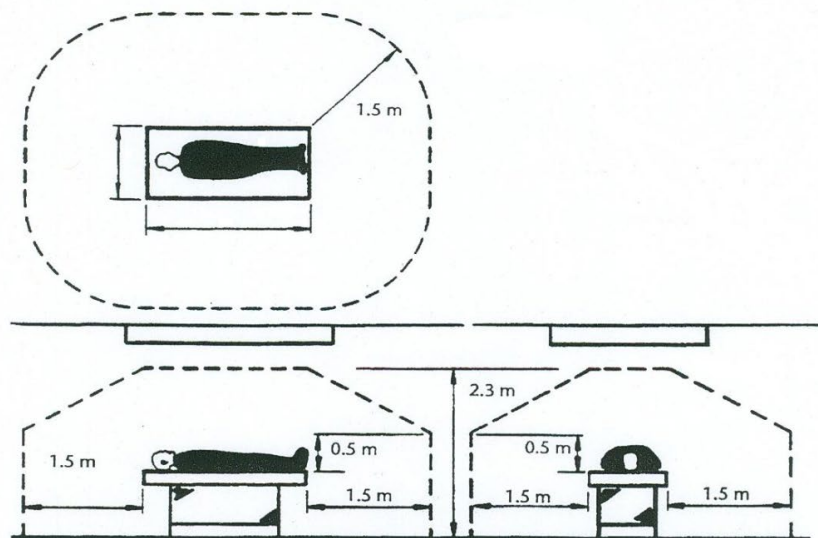
Isolated ground receptacles shall not be used in any patient care area.

24-110 - Circuits in intermediate and critical care areas

The requirement of 2-wire circuits (i.e. dedicated grounded circuit conductors/neutral) applies to the patient care environments within intermediate and critical care areas.

CAN/CSA-Z32-Patient Care Environment

A zone in a patient care area that has been preselected for the accommodation of a patient bed, table or other supporting mechanism, and for the accommodation of equipment involved in patient treatment and which includes space within the room 1.5 meters beyond the perimeter of the bed in its normal location and to within 2.3 meters of the floor. The patient environment is a zone fixed to the supporting mechanism and does not move with the patient as the patient moves through the health care facilities.



Patient Care Environment

SECTION 26 - INSTALLATION OF ELECTRICAL EQUIPMENT
Single phase transformer full load current in amperes

kVA	120v	240v	480v	600v	2400v	4160v	14400v
2	16.7	8.3	4.2	3.3	0.83	0.48	0.14
3	25	12.5	6.3	5.0	1.25	0.73	0.21
5	41.7	20.8	10.4	8.3	2.08	1.2	0.35
7.5	62.5	31.3	15.6	12.5	3.13	1.8	0.52
10	83.3	41.7	20.8	16.7	4.17	2.4	0.69
15	125	62.5	31.3	25.0	6.25	3.6	1.04
20	167	83.3	41.7	33.3	8.33	4.8	1.39
25	208	104	52.1	41.7	10.4	6.0	1.74
30	250	125	62.5	50.0	12.5	7.2	2.08
37.5	313	156	78.0	62.5	15.6	9.0	2.61
50	417	208	104	83.3	20.8	12	3.47
75	625	313	156	125	31.3	18	5.21
100	833	417	208	167	41.7	24	6.94
167	1391	695	347	278	69.6	40.1	11.6
200	1667	833	417	333	83.3	48.1	13.9
250	2083	1041	520	416	104	60.1	17.4
333	2115	1387	693	555	138	80	23.1
500	4167	2083	1042	833	208	120	34.7
750	6250	3125	1563	1250	313	180	52.1
1000	8333	4167	2083	1667	417	240	69.4

$$\text{KVA} = \text{Voltage (Current)} / 1000$$

Three phase transformer full load current in amperes

kVA	208v	240v	480v	600v	2400v	4160v	13800v	14400v
3	8.3	7.2	3.6	2.9	0.72	0.42	0.126	0.120
6	16.6	14.4	7.2	5.8	1.46	0.82	0.251	0.241
9	25	21.7	10.8	8.7	2.17	1.25	0.377	0.361
15	41.7	36.1	18.2	14.5	3.61	2.09	0.628	0.601
30	83.4	72.3	36.1	28.9	7.23	4.17	1.26	1.202
45	125	108	54.2	43.4	10.8	6.26	1.88	1.805
50	139	120	60.2	48.2	12	6.96	2.09	2
75	208	181	90.3	72.3	18.1	10.4	3.14	3.005
112.5	313	271	135	108	27.1	15.7	4.71	4.51
150	417	361	181	145	36.1	20.9	6.28	60.1
200	556	482	241	193	48.2	27.8	8.37	8.02
225	625	542	271	217	54.2	31.3	9.41	9.025
300	834	723	361	289	72.3	41.7	12.55	12.02
450	1249	1083	541	433	108	62.5	18.83	18.04
500	1390	1204	602	482	120	69.6	20.92	20.07
750	2082	1804	902	722	180	104	31.38	30.07
1000	2776	2406	1203	962	241	139	41.84	40.09
1500	4164	3608	1804	1443	361	208	62.76	60.14
2000	5552	4811	2406	1925	481	278	83.67	80.19

$$\text{KVA} = 1.73 (\text{Voltage}) (\text{Current}) / 1000$$

26-254 & 26-256 - 3 phase dry-core transformer tables

**Based on 125% of the primary rated current (FLA)
Without Secondary Protection**

Step-down transformers with primary overcurrent only

3 Phase Dry-type Transformers rated 750 V or less-Rule 26-254 & 26-256											
KVA	600 Volt primary							480 Volt secondary			
	FLA	125% of FLA	75 ° * Cond.	#1 Max. O/C		Equip. Rating		FLA	125% of FLA	75 ° * Cond.	#2 System Bond Jumper
				Breaker Size	Fuse Size	Breaker	Fuse				
4.5	4.33526	5.41908	14	15	5	30	30	5.41908	6.77384	14	14
9	8.67052	10.8382	14	15	10	30	30	10.8382	13.5477	14	14
15	14.4509	18.0636	14	15	15	30	30	18.0636	22.5795	12	14
22.5	21.6763	27.0954	10	25	25	30	30	27.0954	33.8692	10	10
30	28.9017	36.1272	8	35	35	60	60	36.1272	45.159	8	10
45	43.3526	54.1908	6	50	50	60	60	54.1908	67.7384	4	8
75	72.2543	90.3179	3	90	90	100	100	90.3179	112.897	2	6
100	96.3391	120.424	1	100	110	100	200	120.424	150.53	2/0	6
112.5	108.382	135.477	1/0	125	125	200	200	135.477	169.346	2/0	6
150	144.509	180.636	3/0	150	150	200	200	180.636	225.795	4/0	6
200	192.678	240.848	250	225	225	400	400	240.848	301.06	350	4
225	216.763	270.954	300	250	250	400	400	270.954	338.692	500	3
300	289.017	361.272	500	350	350	400	400	361.272	451.59	2 x 4/0	2

3 Phase Dry-type Transformers rated 750 V or less-Rule 26-254 & 26-256											
KVA	600 Volt primary							208 Volt secondary			
	FLA	125% of FLA	75 ° * Cond.	#1 Max. O/C		Equip. Rating		FLA	125% of FLA	75 ° * Cond.	#2 System Bond Jumper
				Breaker Size	Fuse Size	Breaker	Fuse				
4.5	4.33526	5.41908	14	15	5	30	30	12.5056	15.6319	14	14
9	8.67052	10.8382	14	15	10	30	30	25.0111	31.2639	10	10
15	14.4509	18.0636	14	15	15	30	30	41.6852	52.1065	6	10
22.5	21.6763	27.0954	10	25	25	30	30	62.5278	78.1597	4	8
30	28.9017	36.1272	8	35	35	60	60	83.3704	104.213	2	6
45	43.3526	54.1908	6	50	50	60	60	125.056	156.319	2/0	6
75	72.2543	90.3179	3	90	90	100	100	208.426	260.532	300	4
100	96.3391	120.424	1	100	100	100	200	277.901	347.377	500	4
112.5	108.382	135.477	1/0	125	125	200	200	312.639	390.799	600	3
150	144.509	180.636	3/0	150	150	200	200	416.852	521.065	2 x 300	2
200	192.678	240.848	250	225	225	400	400	555.803	694.753	2 x 500	1/0
225	216.763	270.954	300	250	250	400	400	625.278	781.597	2 x 600	1/0
300	289.017	361.272	500	350	350	400	400	833.704	1042.13	4 x 300	3/0

**Voltage
Ratio**

600 / 480 = 1.25

480 / 208 = 2.30

Amperes = (KVA x 1000) / (Volts x $\sqrt{3}$)

Volts x $\sqrt{3}$

600 x 1.732051 = 1039.23

480 x 1.732051 = 831.38

**Based on 125% of the primary rated current (FLA)
Without Secondary Protection**

Step-down transformers with primary overcurrent only

3 Phase Dry-type Transformers rated 750 V or less-Rule 26-254 & 26-256											
480 Volt primary								208 Volt secondary			
KVA	FLA	125% of FLA	75 ° * Cond.	#1 Max. O/C		Equip. Rating		FLA	125% of FLA	75 ° * Cond.	#2 System Bond Jumper
				Breaker Size	Fuse Size	Breaker	Fuse				
4.5	5.41908	6.77384	14	15	6	30	30	12.5056	15.6319	14	14
9	10.8382	13.5477	14	15	13	30	30	25.0111	31.2639	10	10
15	18.0636	22.5795	12	20	20	30	30	41.6852	52.1065	6	10
22.5	27.0954	33.8692	10	30	30	30	30	62.5278	78.1597	4	8
30	36.1272	45.159	8	40	40	60	60	83.3704	104.09	2	8
45	54.1908	67.7384	4	60	60	60	60	125.056	156.319	2/0	6
75	90.3179	112.897	2	100	100	100	200	208.426	260.532	300	4
100	120.424	150.53	2/0	150	150	200	200	277.901	347.377	500	3
112.5	135.477	169.346	2/0	150	150	200	200	312.639	390.799	600	3
150	180.636	225.795	4/0	225	225	400	400	416.852	521.065	2 x 300	1
200	240.848	301.06	350	300	300	400	400	555.803	694.753	2 x 500	1/0
225	270.954	338.692	500	300	300	400	400	625.278	781.597	2 x 600	1/0
300	361.272	451.59	2 x 4/0	400	400	400	600	833.704	1042.13	4 x 300	2/0

note #1: OC protection sized not to exceed 125% of the transformer primary FLA.

#2: The system bonding jumper shall be sized as per Rule 10-614(3)(a)&(5), Column 1 of Table 16 based on the primary overcurrent multiplied by the voltage ratio. See Appendix B.

***:** All conductors are copper.

Example:

30 Kva, 600 volt to 120/208 delta/wye transformer.

Primary:

$(30 \text{ Kva} \times 1000) / (600 \times \sqrt{3})$
30000 / 1039.23
28.87 amps

28.87 amps x 125%
36.09 amps

This can be installed with a minimum #10 AWG conductor on a 35 amp breaker (60 amp equipment) or 35 amp fuse (60 amp equipment) without secondary overcurrent protection because when multiplied by the voltage ratio the amperage is not in excess of the secondary value.

Example:

35 amps (for breaker) x 2.88 = 100.8 amps or 35 amps (for fuse) x 2.88 = 100.8 amps.

This value does not exceed the calculated ampacity of 104.09 amps for the secondary.

The value of the secondary overcurrent does not exceed 104.09 amps so therefore secondary overcurrent protection is not required.

If the primary overcurrent (FLA x 125%=36.127 amps) is adjusted to the next common size as allowed by 26-256(3) then a 40 amp breaker (60 amp equipment) or a 40 amp fuse (60 amp equipment) could be used but secondary overcurrent protection would be required because when multiplied by the voltage ratio the amperage is in excess of the secondary value.

Example:

40 amps (for breaker) x 2.88 = 115.2 amps or 40 amp (for fuse) x 2.88 = 115.2 amps.

This value exceeds the calculated ampacity of 104.09 amps for the secondary.

The value of the secondary overcurrent does exceed 104.09 amps so therefore secondary overcurrent protection rated at 104.09 amps or less is required.

Secondary:

$(30 \text{ Kva} \times 1000) / (208 \times \sqrt{3})$
30000 / 360.27
83.27 amps

83.27 amps x 125%
104.09 amps

26-256 - Limiting current output (choking) of a dry-type transformer

If the secondary conductors or equipment connected to the secondary of the transformer are less than 1.25 x the transformer's rated secondary current, but equal to or greater than the primary overcurrent (OC) multiplied by the transformers turns ratio, secondary OC protection is not required.

The primary OC device shall be labelled to indicate the maximum rating of the OC protection.

26-600 - Location of panelboards (see Appendix G)

In a retrofit where an existing service is upgraded at the same location, the new panelboard need not be lowered. If the location is otherwise undesirable, reference [6-206\(1\)\(c\)](#), the new panelboard shall be made to comply with the current CEC.

Panelboards shall not be enclosed in thermally **insulated** walls.

In all new installations in dwelling units, with the exception of the main breaker or disconnect switch, no branch circuit overcurrent device shall be located at a height greater than 1.7 m above the finished floor.

26-654 - Branch circuits for single dwellings

At least one dedicated separate circuit is required for all outdoor receptacles. More than one dedicated circuit may be installed for outdoor receptacles, but there shall be no interconnection of indoor and outdoor receptacles. This does not include the receptacles on a balcony of apartment buildings.

Receptacles located in parking lots of apartments, or similar multi-family dwellings, installed solely for the use of automobile heater receptacles in accordance with Rule [8-400](#), are not required to be protected by a GFCI. See [2-200](#) & [38-061](#))

26-656 - Arc fault protection of branch circuits for dwelling units (see Appendix B)

Combination arc fault protection as defined in Rule 26-656 is required for all branch circuits in new construction or renovations/additions of dwelling units except for:

- bathroom receptacles within 1 M (39") of the wash basin;
- refrigerator receptacles (includes a separate circuit labeled as fridge, bar fridge, wine fridge or freezer in another location i.e. basement, garage, etc.);
- kitchen counter receptacles;
- island receptacles;
- peninsula receptacles;
- a single receptacle for a sump pump, septic pump, central heating and/or related equipment that does not supply any other receptacles; or
- a dedicated receptacle on a separate circuit wired as per Section 24 for home dialysis equipment, as an example, will require the receptacle to be clearly labelled as to its purpose.

Notes:

- A dwelling unit with permanently installed cooking facilities (i.e. gas or electric range, cooktop) is deemed to have a cooking facility and thus requires arc fault protection.
- An “outlet branch circuit type combination arc fault circuit interrupter” may be used (instead of an AFCI breaker).
- Where a branch circuit, feeds receptacles (rated 125 volt, 20 amps or less) that are associated with but outside the dwelling unit such as in a yard, accessory building or detached garage, **AFCI protection is not required.**
- Combination arc fault protection refers to the ability of the breaker to monitor both series and parallel arcs.
- Non-combination arc fault breakers do not have parallel and series protection and may only be used for replacement and not for new installations.
- Dual AFCI / GFCI breakers provide ground fault protection and combination arc fault protection.

26-706 - Tamper resistant receptacles (see Appendix B)

All receptacles of CSA configuration 5-15R and 5-20R shall be tamper-resistant and shall be so marked, when installed in child care facilities, guest rooms and guest suites of hotels and motels and dwelling units.

For pre-schools and elementary education facilities they shall be required when installed in:

- The shared areas in joint facilities which may be accessed by children up to elementary school age shall also require tamper-resistant receptacles.
- Portable classrooms shall be built with TR receptacles if attached to or intended for an elementary school.
- Relocated portable classrooms shall be dealt with on a case-by-case basis however if the wiring requires maintenance due to wear and tear, the receptacles shall be made to comply.

Notes:

- This shall include all receptacles installed on or in buildings or structures associated with the residential occupancy (i.e. garages, sheds, carports, etc.).
- Please check with the Electrical Inspection department if further clarification is required.

26-708 - Receptacles exposed to the weather (see Appendix B)

Receptacles exposed to weather shall be provided with wet location cover plates as follows:

- a. receptacles of configurations 5-15R, 5-20R, 5-20RA, 6-15R, 6-20R and 6-20RA shall have a wet location cover plate that is approved for wet locations whether or not a plug is inserted into the receptacle and marked “Extra Duty”;
- b. notwithstanding the requirements in Subrule (1) when these receptacles are installed facing downward, at an angle of 45 ° or less from the horizontal, cover plates marked “Wet Location Only When Cover Closed” shall be permitted; and
- c. where receptacles exposed to the weather are installed on surface-mounted outlet boxes, the cover plates shall be held in place by four screws or by some other equivalent means.

26-710 - Receptacles for maintenance of equipment on rooftops (see Appendix B)

A receptacle is now required, for maintenance purposes, on all commercial or industrial buildings that have rooftop electrical equipment such as RTU's, ventilation, etc. This receptacle shall be:

- protected by a ground fault circuit interrupter of the class "A" type;
- supplied by a separate branch circuit that does not supply any other outlets or equipment;
- CSA configuration 5-20R;
- located within 7.5 m (24') of rooftop equipment;
- at least 750 mm (30") off finished roof; and
- protected from mechanical damage.

A receptacle that is an integral part of the rooftop unit, supplied by a separate circuit as per Rule 26-710, meets the intent of this rule.

Replacement of a rooftop unit **will not** require an upgrade to meet the intent of this rule.

26-720 - General (see Appendices B & G) - receptacles installed in cupboards

Receptacles installed in drawers for appliances such as USB chargers, hair dryers, curling irons, food processors, etc. **shall be approved as part of the assembly and power shall be disconnected from the receptacle as soon as the drawer begins to close.** The circuit shall be AFCI protected and if located within 1.5 m (5') of a sink, bath tub or shower stall it shall be GFCI protected. Receptacles shall be tamper resistant.

26-722 - Protection of residential occupancy receptacles installed outdoors by a ground fault circuit interrupter of the Class A type (see Appendix B)

The intent of this Rule is that all receptacles installed outdoors of residential occupancies and within 2.5 meters (8') of finished grade, shall be protected by a GFCI. This includes receptacles installed on buildings or structures associated with the residential occupancy such as garages, carports, sheds, posts and fences.

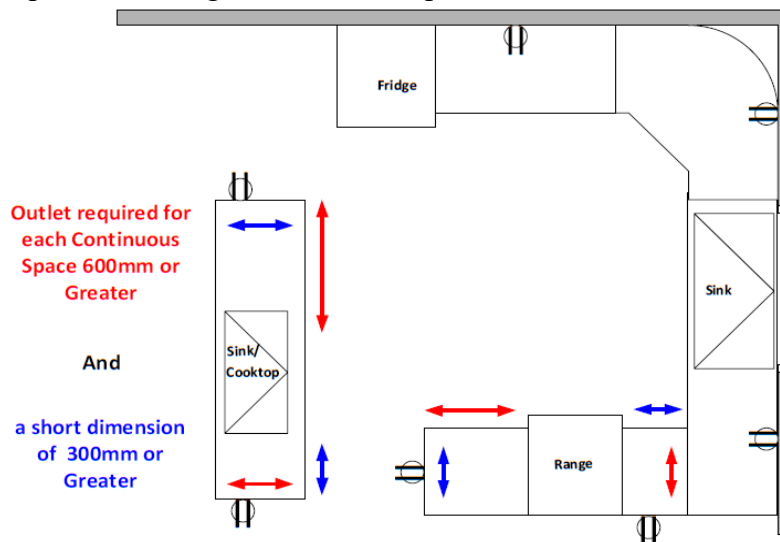
A single receptacle for a septic pump out is exempt.

26-724 - Receptacles for dwelling units (see also [2-022](#)) - kitchen receptacles

At least one receptacle installed at each permanently fixed island counter space with a **continuous** long dimension of 600 mm (24") or greater and a short dimension of 300 mm (12") or greater.

At least one receptacle installed at each peninsular counter space with a **continuous** long dimension of 600 mm (24") or greater and a short dimension of 300 mm (12") or greater.

Continuous counter space excluding sinks or cooktops



26-726 - Receptacles for single dwellings (see Appendix B) - garage door openers

At least one receptacle shall be provided in a garage for cord connected garage door openers and located adjacent to and within 1 m (39") of each overhead garage door opener.

26-806 - Heating equipment rated 117kW or less (see Appendix B)

(1)(5)(6)(7) - Gas furnaces

The furnace shall be provided with a dedicated circuit. The disconnect shall be located as required by the CEC. Garage unit heaters must also meet all these requirements and provide a point of disconnect without passing in front of the furnace. See also Rule [10-700](#).

(1)(2)(3)(4)(5) – Central Heating Unit (used as primary heating source)

The central heating unit and associated circulation pumps when cord connected shall be fed from a separate circuit exempted from 26-656 (AFCI) and shall use single receptacles labelled for boiler use only.

26-956(2) - Submersible pumps installed in bodies of water

Electrical Inspections shall be notified regarding pump installations in or on bodies of water where the voltage exceeds 150 volts-to-ground. Deviation required as per [2-030](#).

The area around the submersible pump, pump motor, or pump platform shall be protected from public access by isolation and so marked with a series double buoy system to accommodate different water levels.

Signage marked "DANGER _____ VOLT PUMP" shall be attached to both buoys and the controller structure facing the water and at access points to the platforms.

SECTION 28 - MOTORS & GENERATORS**28-104(1) - Motor supply conductor insulation temperature rating and ampacity (see Appendix B)**

Supply conductors to a motor connection box shall have an insulation temperature rating equal to or greater than that required by Table 37 (i.e. heating circulating pumps, automotive car lifts, etc.).

When there is a discrepancy between the manufacturer and the values in Table 37, the higher value shall be used **unless the motor is otherwise marked.**

28-110(1) - Feeder conductors

Aeration Fan Services - for the supply of motors shall be sized in accordance with Section 28 of the CEC.

The service calculation is based on the total number of fans permanently wired into the electrical panel. The motor disconnect shall be installed within sight of and within 9 meters (30') of the motor or be lockable at the source. If receptacles are installed to plug in the motors, then the service may be calculated by the number of fans to be utilized at one time.

28-300 - Overload protection required

Caution shall be used when connecting bin fans.

Thermistors do not provide overload protection. The leads labelled as thermostat are the thermistor.

All motors exceeding 1 hp shall indicate that they have overload protection installed or have suitable overload protection field installed at the time of installation.

28-604(1) - Location of disconnecting means

Lock off devices shall be an approved device designed for the disconnecting means.

SECTION 30 - INSTALLATION OF LIGHTING EQUIPMENT**30-308 - Circuit connections**

The connection of branch circuit conductors over 150V to ground, to a ballast or driver (replaceable) in a luminaire utilizing double ended lamps will require installation of a connector or other device to safely disconnect the circuit conductors simultaneously when separated. See [2-106](#).

Rules 30-500 to 30-510 - Luminaires in buildings of residential occupancy

For the purpose of these rules, a wall switch may include any form of wall mounted lighting controls, including wireless, provided that the wall switches are mounted in a location as per the prescriptive requirements of the Canadian Electrical Code, Part 1.

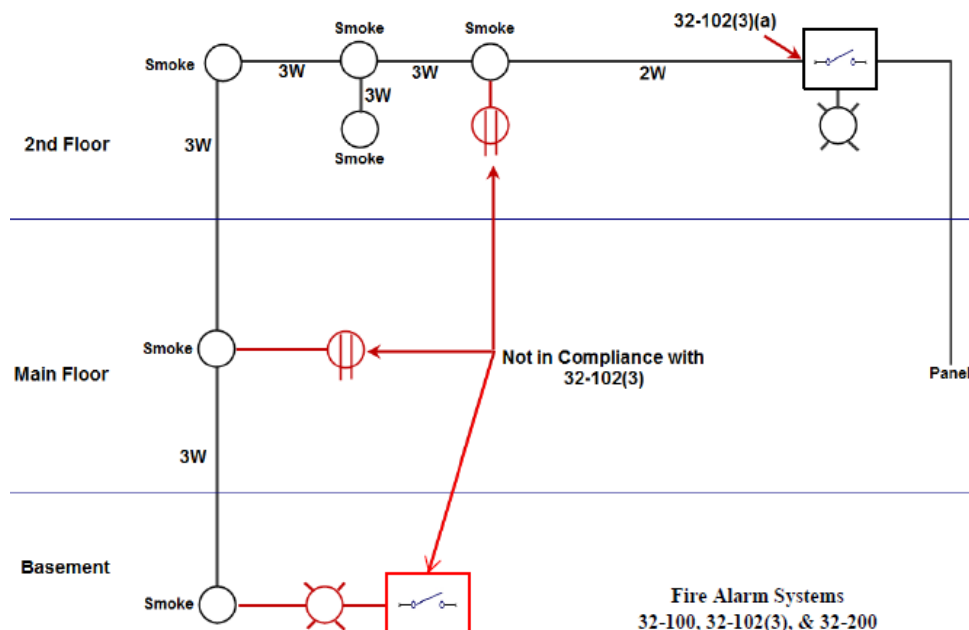
SECTION 32 - FIRE ALARMS AND FIRE PUMPS

32-102 - Wiring methods

New rule allows conductors in PVC as a wiring method for fire alarm systems and does not have to be encased in concrete.

Notes:

- Not allowed for fire pumps, conductors for fire pumps in PVC must still be encased in 50 mm (2") of concrete.
- Conductors shall be installed to be independent of all other wiring, except for connection to:
 - point of supply;
 - a signal;
 - an ancillary device; and
 - a communication circuit.



32-200 - Installation of smoke alarms and carbon monoxide (CO) alarms in dwelling units

New construction of residential units shall be provided with interconnected smoke alarms & CO alarms wired as per Section 32 and located as required by the Saskatchewan Amendments of the National Building Code (NBC) 2015 which can be found in the Appendix of The Uniform Building and Accessibility Standards Regulations (U-1.2 REG 5) available at www.qp.gov.sk.ca.

Residential Fire Warning Systems in Dwelling Units

New to the NBC 2015 is Residential Fire Warning Systems (Article 9.10.19.8.), these systems are permitted to be installed in lieu of smoke alarms. Please check with your local building Authority Having Jurisdiction for its application.

SECTION 34 - SIGNS AND OUTLINE LIGHTING**34-000 - Scope - signs and outline lighting****Signs**

Each sign shall have at least one label with the electrical ratings and certification mark readily accessible without the use of tools as per C22.2 No. 207-M89 and visible from the ground. This would include one label on one letter for multi letter/symbol signs.

For Retrofits to LED see Rule [2-106](#)

Permits

Signs are considered to be utilization equipment under the code and therefore, the permit fee shall include the wiring to the sign **and the cost of the sign as per the fee schedule**. For LED retrofits the permit fees shall reflect the labour and material required for the installation.

34-308 - Neon supply installations

LED drivers shall be installed in an accessible location as per Rule 2-312 and if installed in attics, bulkheads or similar locations, an access of not less than 900 mm (36") high x 600 mm (24") wide shall be provided.

SECTION 36 - HIGH VOLTAGE INSTALLATIONS

36-004 – Guarding

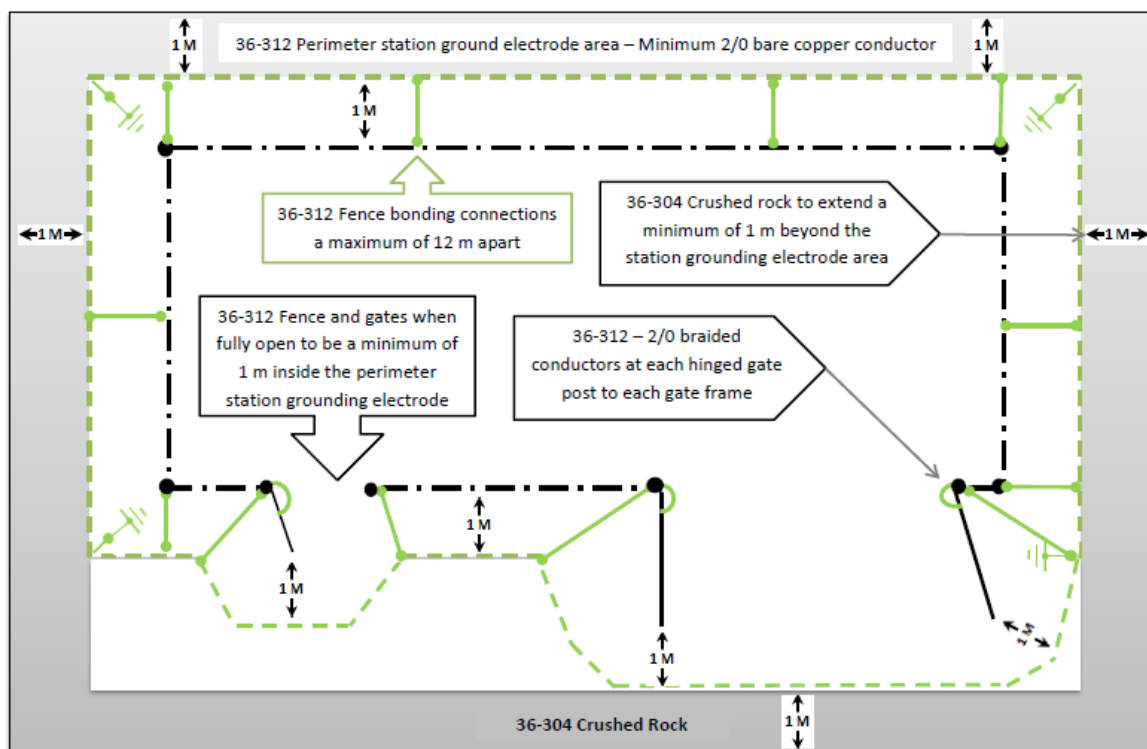
Minimum approach distances from exposed energized electrical conductors for qualified electrical workers

Nominal ph to ph Voltages*	Qualified Electrical Worker MAD		Qualified Electrical Worker MHAD	
	ph to gnd	ph to ph	ph to gnd	ph to ph
300 V	Avoid Contact		-	
750 V	0.35 m	0.35 m	-	
4.16 kV	0.65 m	0.65 m	-	
15 kV	0.70 m	0.75 m	-	
25 kV	0.75 m	0.85 m	-	
34.5 kV	0.80 m	1.00 m	-	
72 kV	0.95 m	1.25 m	1.05 m	1.35 m
138 kV	1.20 m	1.75 m	1.35 m	1.90 m
230 kV	1.80 m	2.80 m	2.00 m	3.10 m

36-118 - Conductors over buildings

No high voltage conductors shall be installed over buildings. See also CEC Section 36 and utility regulations and clearances.

36-312 - Grounding of metallic fence enclosures



36-302 – Minimum 4 driven ground rods
Grounding grid engineered as per 36-304 Appendix B and Standard CEA 249 D 541
Table 51 and 52 may require more ground rods

SECTION 38 - LIFT FOR PERSONS WITH PHYSICAL DISABILITIES**38-061 - Overcurrent protection - Outdoor wheelchair lifts**

In accordance with the manufacturer's instructions, when a receptacle is required for an outdoor wheelchair lift, it shall be a single receptacle connected to a separate circuit and shall not be arc fault or ground fault protected.

SECTION 62 - FIXED ELECTRICAL SPACE AND SURFACE HEATING SYSTEMS

62-114 - Overcurrent protection and grouping (see Appendix B)

Electric Furnace and Other Heating Equipment Single Phase 240V 62-114(6) and (7)			
Nameplate Furnace or Rating (KW)	Conductor Size at 75°C Equipment Marking 75°C		Fuse/Breaker Rating
	Copper	Aluminum	
5 KW	No. 12 AWG R90	No. 10 AWG R90	30 Ampere
10 KW	No. 8 AWG R90	No. 6 AWG R90	60 Ampere
15 KW	No. 4 AWG R90	No. 2 AWG R90	100 Ampere
18 KW	No. 4 AWG R90	No. 2 AWG R90	100 Ampere
20 KW	No. 3 AWG R90	No. 1 AWG R90	125 Ampere
23 KW	No. 3 AWG R90	No. 1 AWG R90	125 Ampere
25 KW	No. 1 AWG R90	No. 0 AWG R90	150 Ampere
30 KW	No. 0 AWG R90	No. 000 AWG R90	175 Ampere

A sample selection for a 20 KW furnace follows: The ampacity of the conductors supplying the furnace and the size of the overcurrent devices are determined by applying Rule 62-114.

The overcurrent device for the service must be sized so that the total connected load of the heating equipment does not exceed 80% of the rating of the overcurrent device in accordance with subrule (6). In this case, the load is 83.3 amps; the minimum size of overcurrent device is $83.3/0.8 = 104$ Amperes. Rule 62-114(8) the next available fuse is 125 A.

Since this fuse is supplying a heating load, Rule 14-610 requires that the fuses be a time delay type or HRC Form I.

The conductor size is determined by applying Rule 62-114(7). The conductor must have the ampacity sufficient to carry the load and must have an ampacity rating at least 80% of the rating or setting of the branch circuit overcurrent device. A conductor rated at 100 amperes, i.e. #3 AWG R90 (column 2 of Table 2) would satisfy these requirements.

Based on the conduit fill requirements of Rule 12-910 and Table 6A, it can be determined that the 2 #3 AWG R90 conductors require a 27mm (1") diameter conduit.

62-130 - Heater controls installed in proximity to sinks, tubs, or shower stalls

1. A manually operable control for an electric heater in a bathroom is to be located at least 1 m (39") from the bathtub or shower stall.
2. If 1 m (39") is not practicable, it is permitted to be located not less than 500 mm (20") from a bathtub or shower stall, provided it is:
 - a) protected by a ground fault circuit interrupter of the Class A type; or
 - b) supplied by a Class 2 circuit operating at not more than 42.4 V peak or DC.

62-132 - Heating devices installed in proximity to sinks, tubs, or shower stalls

Heating devices (i.e. baseboard heaters etc.) installed less than 1m (39") from a tub, shower or sink shall be protected by a Class A type GFI.

62-200 - Electric space heating (see Appendix B)

Table 67 has been added to the code to provide installation clearance requirements for space heating systems (i.e. in-floor systems, baseboard heaters, etc.). Receptacles shall not be mounted within 200 mm (8") of electric space heating. See also drawing B62-3.

SECTION 64 - RENEWABLE ENERGY SYSTEMS

NOTE: Rules for marking, warning notices and Diagrams - see [Appendix M](#)

64-002 - Special terminology

In this section, please refer to the attached diagram for terminology and components of a DC interconnected system with recombiners.

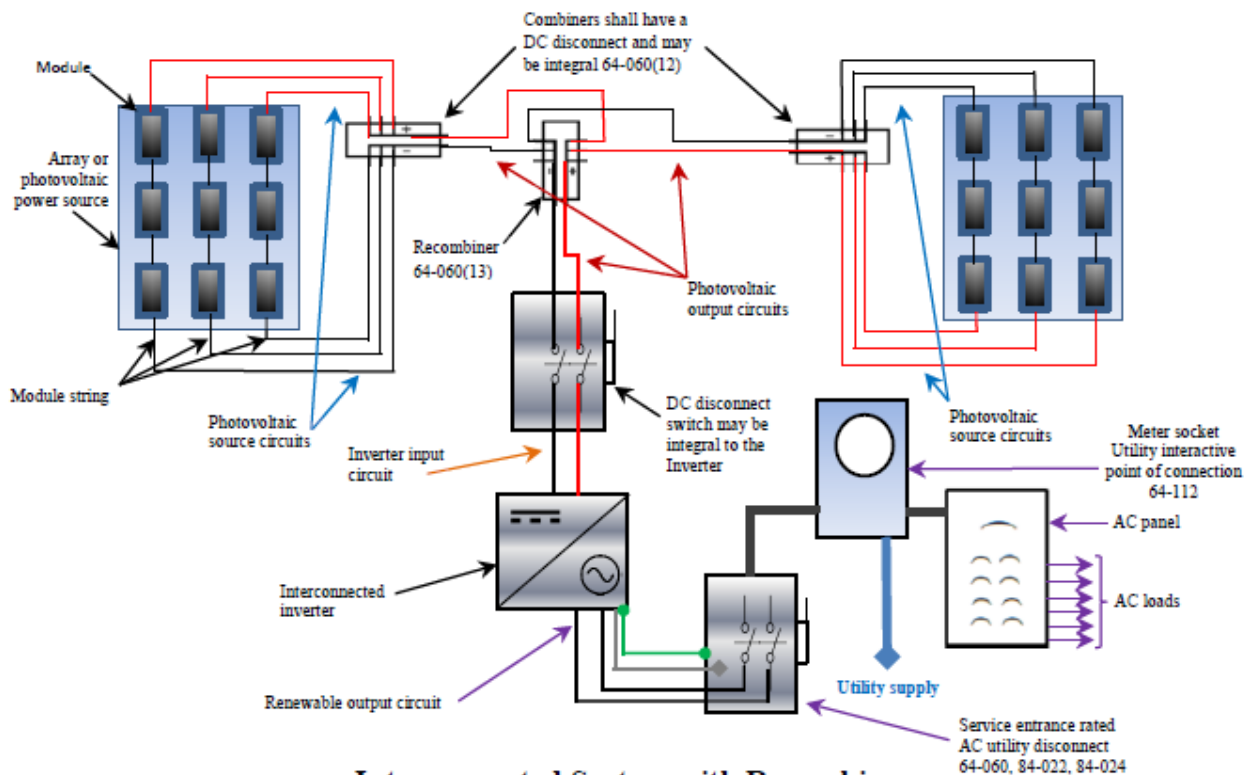


Figure 1

64-058 - Overcurrent protection (all renewable energy systems)

Where circuit conductors are connected to more than one source, all overcurrent devices shall be located in such a way that they provide overcurrent protection from all sources.

Overcurrent devices marked or **approved only for AC use** shall not be used in DC circuits.

Circuit breakers that are marked “Line” and “Load” have been evaluated for connection only in the direction marked.

Note:

To facilitate the inspection of the installation contractor photos can be attached to the permit in the Permit System or made available on site to show the wiring installation, bonding of the racking and installation of the equipment.

64-060 - Disconnecting means (see also [84-022](#), [84-024](#) & [Appendix M](#))

- (2) The disconnecting means shall be capable of being energized from both sides, indicate open or closed, lockable in the open position, conform to Section 14, capable of opening at the rated load, capable of being closed under fault conditions and located within sight and 9 m (30') of or integral to the equipment.
- (6) Solid state devices shall not be used as isolating switches or as a disconnecting means.
- (7) Output circuits rated 48V and greater shall have a means to disable and isolate them.
- (8) Disconnecting means shall be provided to disconnect a fuse from all sources of supply if the fuse is energized from both directions as required by Rule 14-402.
- (9) Disconnecting means on DC circuits shall be marked for the purpose.
- (12) For combiners, a single disconnect within 2 m (6') or integral to and interlocked with the combiner door, is required for the photovoltaic output circuit rated in accordance with Rule 64-206.
- (13) For recombiners a single disconnect within 2 m (6') or integral to and interlocked with the recombiner door, is required for the inverter input circuit rated in accordance with Rule 64-206.

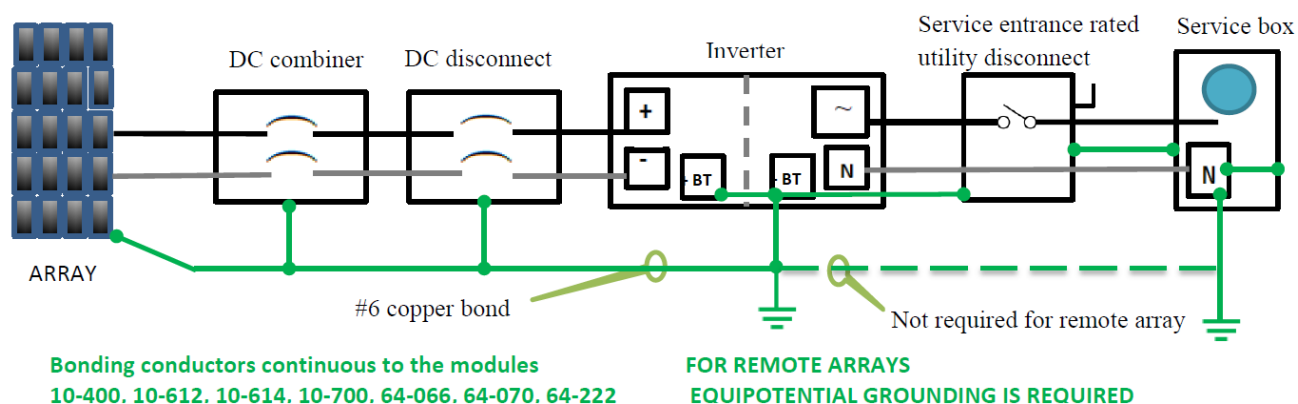
64-062 - Wiring methods

- (1) Insulated conductors for DC renewable energy sources or supply circuits of an interactive inverter, installed inside a building or structure, must be contained in metallic raceways, metallic enclosures or cables which are metal-sheathed or metal armoured;

64-066 - Ungrounded renewable energy power systems

Renewable energy systems are permitted to operate with ungrounded source and supply circuits if the system complies with the following:

- All source and supply conductors must have overcurrent protection (positive and negative conductors) except as per [64-214\(1\)](#);
- Inverters or charge controllers must be suitable for the purpose;
- The system must be provided with ground fault protection; and
- A suitable warning must be installed at each junction box, disconnect or any other device where these circuits can be exposed during service. See [Appendix M](#).

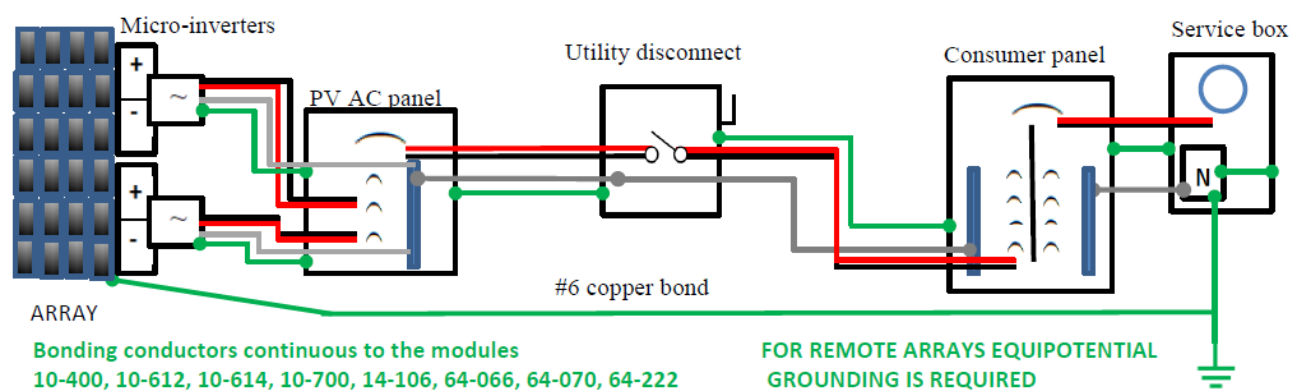


Ungrounded solar photovoltaic power source

Figure 2

Legend

BT – equipment bonding terminals



Solar Photovoltaic Power Source with Micro-Inverters

Figure 3

64-070 - Equipment bonding

The installation of a #6 copper bond conductor, continuous from the module bonding system, to the system ground in conjunction with and external to the feeder cable, shall be installed to meet the intent of this rule for the removal of combiner boxes, inverters or other equipment.

See also Rule [64-222](#), 10-708, & 22-200.

Racking systems

Racking systems shall be approved as a bonding system for the specific modules, and the modules must appear in the 'verified compatible modules list' of the racking system. Racking systems used to bond the modules shall be installed as per the racking system installation manual. If the racking is not approved as a bonding system, the solar modules shall be bonded in compliance with the module installation manual. Modules cannot be drilled. (See manufactures' instructions)

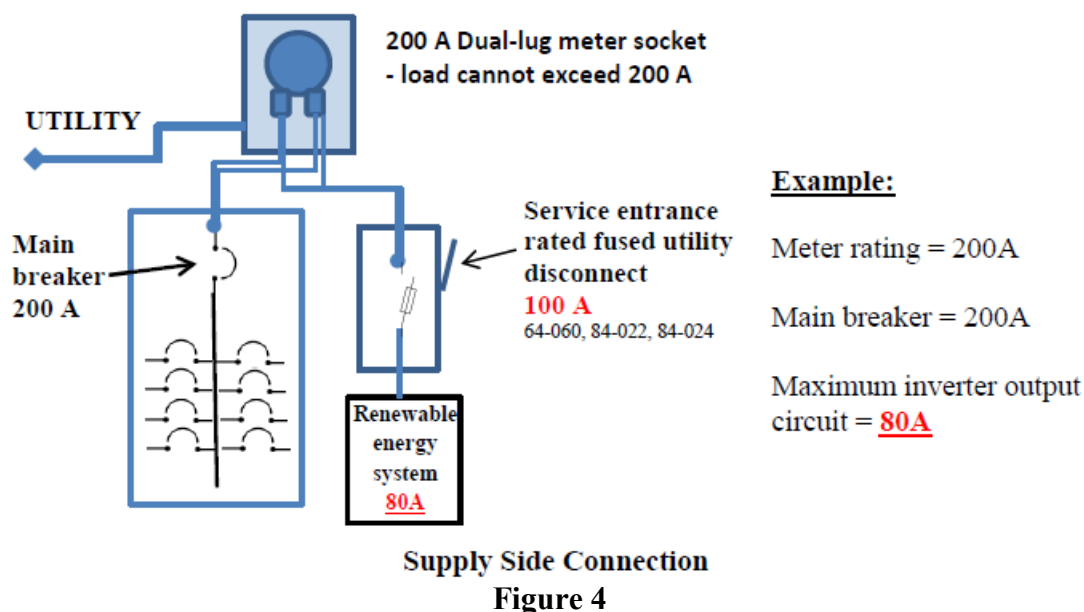
64-110 - Unbalanced interconnections (inverters)

Single phase inverters shall not be connected to a three-phase utility system unless:

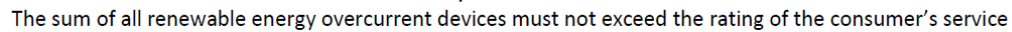
- The inverters used are certified as utility interconnected and approved for use in three-phase systems;
- The single-phase inverters are designed such that under normal operating conditions the resulting three-phase system voltages are balanced within the limits of the supply authority;
- The installation complies with Rules 84-008 and 84-018;
- Confirmation that the installation is acceptable to the supply authority; and
- The installation meets the inverter manufacturer's requirements.

64-112 - Utility-interactive point of connection (inverters)

- (1) The output of an interactive inverter shall be connected to the supply authority system in accordance with Section 84.
- (2) The output of an interactive inverter is allowed to be connected to the line side of the service disconnecting means at a dual lug meter socket or other source(s).

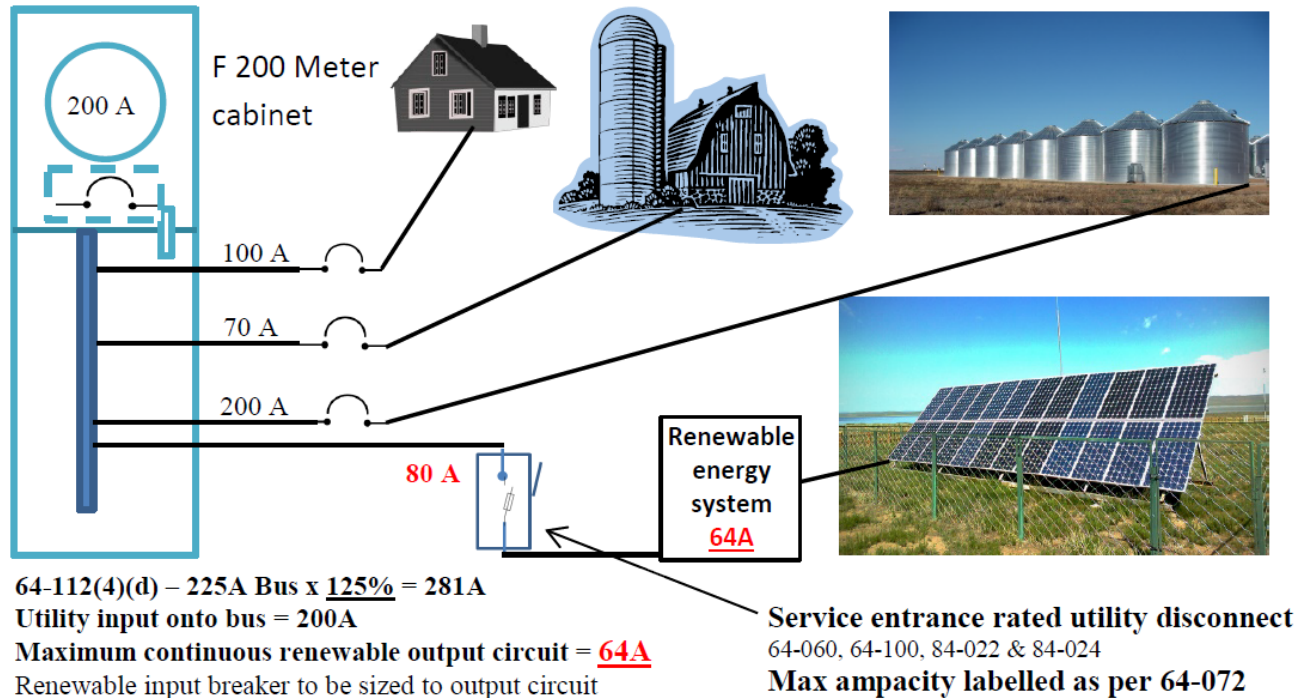


- (3) The output of an interactive inverter is allowed to be connected to the load side of the service disconnecting means provided that each source interconnection is made at a dedicated circuit breaker or fused disconnecting means. This point of connection shall be positioned at the opposite (load) end of the panelboard, busbar or conductor from the input feeder location or main circuit breaker location.



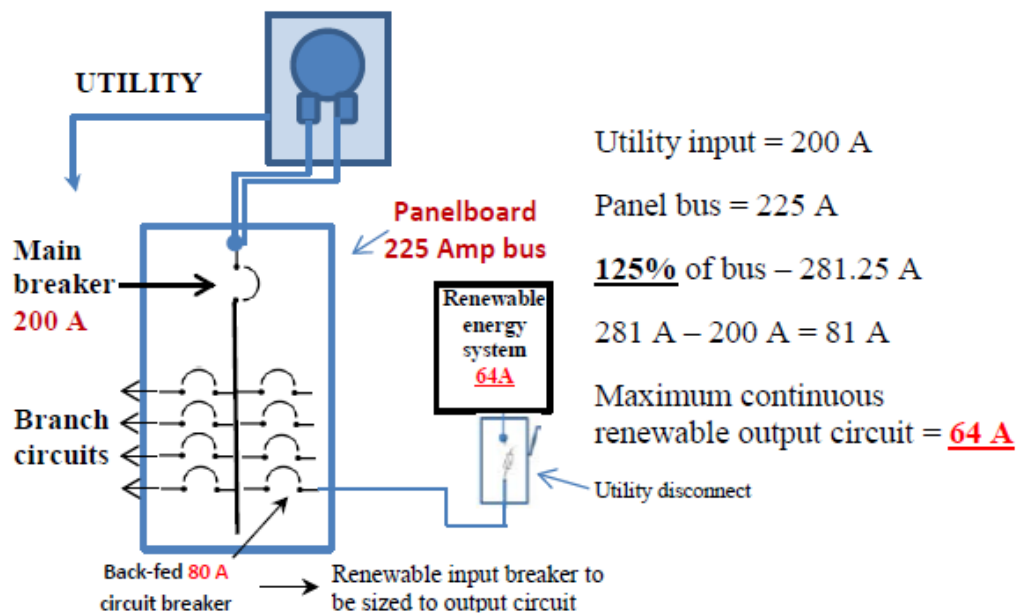
Dwelling units

(4)(d) The sum of the overcurrent devices supplying power to a busbar or conductor is allowed to exceed the rating of the busbar or conductor to a maximum of 125%.



F200 Farm/Acreage installation

Figure 7



Load side connection – dwelling unit

Figure 8

64-202 - Voltage of solar photovoltaic systems

(1) The maximum photovoltaic source and output circuit voltage shall be the rated open circuit voltage (V_{oc}) of the photovoltaic power source X 125%; or

(2) The source and circuit output voltage (V_{MPC}) may be calculated using the open circuit voltage (V_{oc}) of the photovoltaic power source, the difference between 25 °C and the lowest expected daily minimum temperature (T_m) (available from Environment Canada “Canadian Climate Norms”) and the voltage temperature coefficient (T_k) as specified by the manufacturer.

$$V_{MPC} \text{ _____} = V_{oc} \times [1 + (T_m - 25) \times T_k]$$

Calculation of V_{MPC}					
	V_{MPC}	=	V_{oc}	x	$(1 + ((T_m - 25) \times T_k (\% / ^\circ C)))$
Step 1	V_{MPC}	=	45.8	x	$(1 + ((-23.2 - 25) \times -0.31 (\% / ^\circ C)))$
Step 2	V_{MPC}	=	45.8	x	$(1 + ((-23.2 - 25) \times -0.0031))$
Step 3	V_{MPC}	=	45.8	x	$(1 + (-48.2 \times -0.0031))$
Step 4	V_{MPC}	=	45.8	x	$(1 + 0.1494)$
Step 5	V_{MPC}	=	45.8	x	1.1494
Step 6	V_{MPC}	=	52.6434	Volts	
	TOTAL	=	947.582	Volts	
	V_{oc}	=	45.8	Volts	Note: Input information into blue cells only.
	T_m	=	-23.2	°C	
	T_k	=	-0.31	%	
	# of panels	=	18		

(4) The photovoltaic source and output circuits for installations in or on a dwelling unit shall be permitted to have a voltage not exceeding 600V DC.

(5) The voltages of solar photovoltaic systems may exceed 750V DC but not more than 1500 V DC and shall not be required to meet the requirements of 36-204, 36-208 & 36-214 provided they are maintained by qualified persons, are inaccessible to the public, and labelled “DANGER _____ V DC”. See [Appendix M](#).

64-210 - Wiring methods (see 12-200)

(2) & (3) Where the source and output circuits operate at a maximum system voltage greater than 30V, the wiring is deemed inaccessible to the public and not readily accessible if it is:

- contained in a raceway;
- contained behind metal screening or guarding with holes not exceeding 13mm (1/2”) x 13mm (1/2”);
- elevated 2.5 m or more above grade level; or
- located within a fenced enclosure in accordance with Rule 26-304, 26-312, and 26-314

(4) Conductors and cables shall be supported 300 mm (12”) from every box and at intervals not more than 1 m (39”) throughout the run;

(5) **Rodent protection is required** on all insulated conductors or cables, with the exception of armoured cables or MI cables, installed on or above a building by enclosing them in material such as approved raceways, expanded metal, solid metal, metal screening (maximum 13 mm (1/2") x 13 mm (1/2") holes) or other acceptable protection.

(7) RPV conductors shall be permitted for the module interconnections if they are contained in a raceway;

(9) Types RPV and RPVU conductors installed inside a building or structure shall be contained in a metallic raceway. See [64-062](#)

Notes:

- For rodent protection, module level arc fault protection must be part of the module and listed in the module manufacturers' installation instructions.
- **Modules cannot be drilled into for mounting of rodent protection.**

64-212 - Insulated conductor marking or colour coding

RPVU or RPV conductors shall be coloured red for positive, black for negative or permanent surface printing of the polarity on the insulated conductors. TECK 90 cables may be field marked in a permanent manner (heat shrink).

64-214 - Overcurrent protection for apparatus and conductors

1) Maximum photovoltaic source circuit short-circuit-current (I_{sc}) is equal to the sum of the short circuit current for all the source circuits connected in parallel minus the short circuit current for one of the photovoltaic source circuits.

2) If the photovoltaic source circuit short-circuit-current (I_{sc}) (sum of all parallel strings minus one string) exceeds the maximum series fuse rating (reverse current rating) (typically 15A or 20A) or the ampacity of the source circuit conductor, then OC protection will be required on each ungrounded conductor.

Eg. String $I_{sc} = 9.5A \times 3(\text{strings}) = 28.5 - 9.5 = 19A \times 125\% = 23.75A$; DC fusing is required for 15A or 20A series fuse rating.

3) Where the value specified in Subrule 2) does not correspond to the standard rating of an overcurrent device, the next higher standard rating shall be permitted.

4) DC overcurrent devices shall be accessible and grouped where practicable.

Note - AC overcurrent protective devices must be readily accessible. See Rule 14-106.

64-216 - Photovoltaic DC arc-fault protection (solar photovoltaic systems)

Photovoltaic systems with DC source or output circuits, or both, and operating at a system voltage of 80V or greater, shall be DC arc-fault protected when installed on or above buildings other than those constructed for the sole purpose of housing solar equipment, or for other than those on or above buildings when not installed in totally enclosed metal raceways, direct buried, or when complying with ongoing ground cover and vegetation control to mitigate the possibility of fire spread with a deviation requested in accordance with 2-030.

64-218 - Rapid shutdown

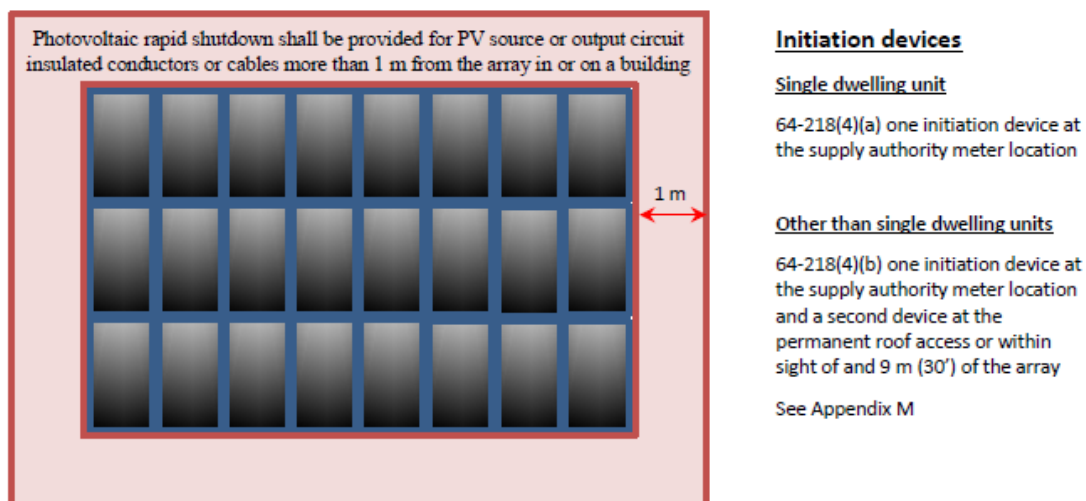
A photovoltaic system rapid shutdown device shall be provided for a photovoltaic system installed on buildings or structures where the photovoltaic source or output **insulated conductors or cables** installed on or in buildings are more than 1m (39") from the photovoltaic array. See Figure 9.

The rapid shut down initiating device, for single dwelling units, shall be located at the utility meter location.

For other than single dwelling units, one initiating device shall be at the utility meter location **and** a second initiating device at the permanent access to the building roof **or** within sight of and 9 m (30') of the array.

(6) Placards shall be located at the supply authority meter location and the consumer's service equipment location. The location of these placards (or additional placards) on buildings without exterior metering may require discussion with the local fire department (i.e. near the gas meters, water standpipe, service splitter, fire annunciation panel, etc.).

If the utility disconnect serves a dual function as a rapid shutdown, it shall be labeled as such (e.g. systems using micro-inverters or optimizers.).



Photovoltaic rapid shutdown

Figure 9

64-220 - Attachment plugs and similar wiring devices (see Appendix B)

PV connectors are only tested and approved as mated pairs in accordance with CSA 22.2 no 182.5 (UL 6703). Equipment with different types of mated connectors will not be accepted for interconnection.

64-222 - Photovoltaic module bonding (solar photovoltaic systems)

All exposed metal parts of photovoltaic modules shall be bonded to ground in accordance with the module installation instructions. If the racking system is used to bond the PV modules, the racking system shall be approved for the specific modules and installed as per the module and racking installation instructions.

Use of unapproved racking systems will require interconnection of modules with a bonding conductor and approved module bonding lugs. The bonding connections shall be arranged so that removal of a photovoltaic module from the array does not interrupt a bonding conductor to other equipment. See [64-070](#).

**SECTION 66 - AMUSEMENT PARKS, MIDWAYS, CARNIVALS, FILM AND TV SETS,
TV REMOTE BROADCASTING LOCATIONS, AND TRAVELLING SHOWS****66-404 - Receptacles**

All Receptacles having CSA configuration 5-15R or 5-20R installed in or around travelling midways, carnivals, fairs and festivals in outdoor or damp locations shall be protected by ground fault circuit interrupters of the Class A type and have weatherproof in-use covers marked for “Extra Duty”.

SECTION 68 - POOLS, TUBS AND SPAS**68-000 – Scope**

A pool shall be deemed to include:

- permanently installed and storable swimming pools;
- hydromassage bathtubs;
- spas and hot tubs;
- wading pools;
- baptismal pools;
- decorative pools; and
- splash pads.

68-054 - Utility conductors over pools

Electric utilities may not permit open service conductors to be located directly over a pool, hot tub or spa.

Note:

- A structure that will adequately provide a permanent barrier between overhead conductors and the hot tub shall be acceptable as protection from overhead lines crossing above a hot tub and if the structure is metal and within 1.5 m of the hot tub, it shall be bonded to ground.

68-056 - Utility conductors under pools

Electric utilities may not permit service conductors to be located directly under a pool, hot tub or spa.

Note:

– if locating or relocating a pool, hot tub or spa, ensure it is not located directly over a Utility gas line. Contact Gas Utility for further information.

68-308 - Other electrical equipment

No other (unrelated) equipment is to be fed from a circuit feeding a hydro massage bathtub.

Access must be provided to all electrical equipment including the pump motor.

See Rule 2-122 - Minimum 400 mm (18”) x 400 mm (18”) access panel.

Section 68 - Pool Diagrams

Canadian Electrical Code, Part I Section 68 – Pools, tubs & spas

68-068 Ground fault circuit interrupters

- (6) Ground fault circuit interrupters shall be installed (a) in a location that will facilitate the testing required in Subrule(5); (b) not closer than 3 m to the pool water except as permitted by item (c); and (c) not closer than 3 m to the pool water in a spa or hot tub and not closer than 1.5 m to a hydromassage bathtub, unless the ground fault circuit interrupter is an integral part of an approved factory-built spa, hot tub, or hydromassage bathtub or is located behind a barrier that will prevent the occupant of the pool from contacting the device.

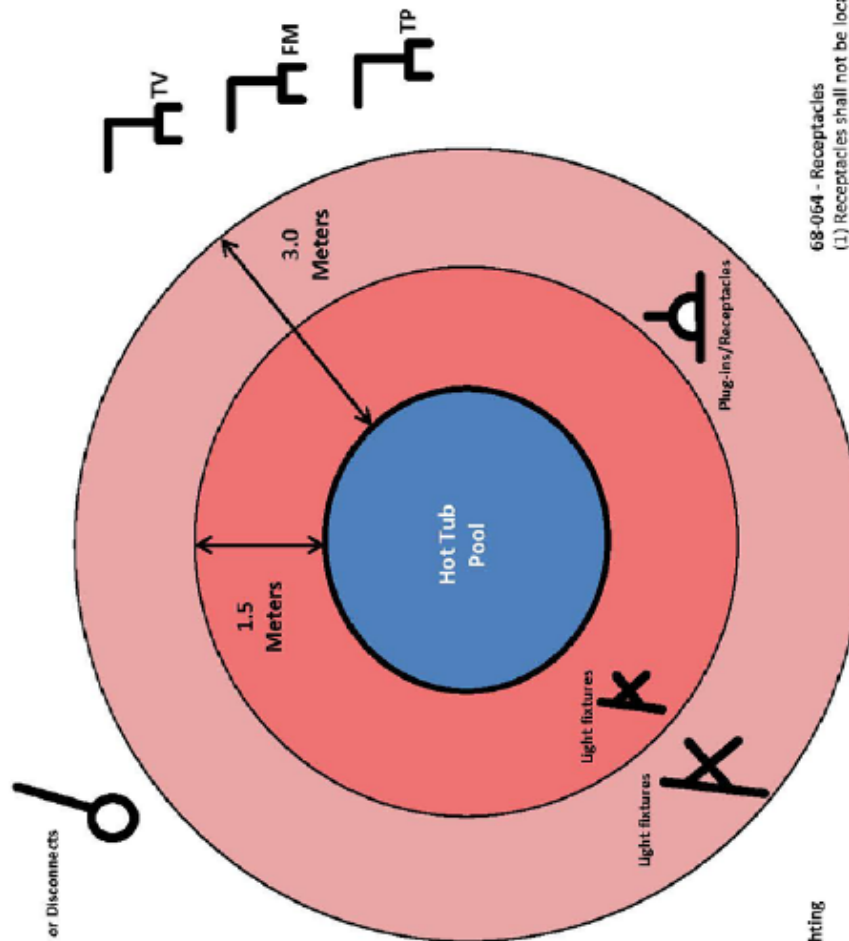
- (7) Except as permitted by Rule 68-070, the following equipment shall be protected by a ground fault circuit interrupter:

- (d) electrical equipment located within the confines of the pool walls or within 3 m of the inside walls of the pool and not suitably separated from the pool area by a fence, wall or other permanent barrier.

Electrical Service Equipment and any associated piping



Switches or Disconnects



68-066 Luminaires and lighting equipment

- (6) Luminaires installed within 3 m of the pool surface or walls and not suitably separated from the pool area by a fence, wall or other permanent barrier, shall be electrically protected by a ground fault circuit interrupter

68-064 - Receptacles

- (1) Receptacles shall not be located within 1.5 m of the inside walls of the pools.
(2) Receptacles located between 1.5 m and 3 m of the inside walls of a pool shall be protected by a ground fault circuit interrupter of the Class A type.

- 68-070 Other electrical equipment**
(1) Loudspeakers installed beneath the pool surface shall be (a) mounted in a recess in the wall or floor of the pool and enclosed by a separate, rigid, corrosion resistant metal screen; and (b) connected to their audio isolating transformers by ungrounded wiring.

- (2) Communication equipment installed within 3 m of the inside walls of the pool shall be (a) permanently fixed on the wall and located so that no part is within 1.5 m of the inside walls of the pool or can be used from the pool, unless actuated by means of a cord with an insulating link; or (b) separated from the pool area by a fence, wall, or other permanent barrier.

- (3) Notwithstanding Subrule (2), communication jacks shall not be installed within 3 m from the inside walls of the pool.

TV – Television jack
FM – Stereo jack / speaker
TP – telephone jack

Section 68 - Pool Diagrams

Things you should know before installing a swimming pool

A pool is deemed to include:

- * permanently installed and storable swimming pools;
- * spas, hot tubs;
- * wading Pools, baptismal pools;
- * decorative pools;
- * splash pads.

Permanently installed swimming pool - means a pool constructed in such a manner that it cannot be disassembled for storage.

Storable swimming pool - means a pool constructed in such a manner that it may be readily disassembled for storage and reassembled to its original integrity.

Spa, or hot tub - means a pool or tub designed for the immersion of persons in heated water circulated in a closed system incorporating a filter, heater, pump and with or without a motor-driven blower but not intended to be filled and drained with each use.

Decorative pool or baptismal pool - means a pool that could be used as a wading pool or the immersion of persons, that is larger than 1.5 m in any dimension, and that is readily accessible to the public.

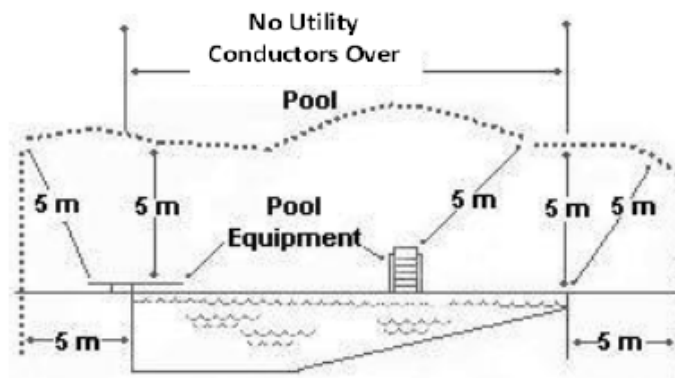
Overhead wiring (includes overhead telephone, cable TV and power conductors)

Customer owned overhead wiring including insulated communication conductors, communication antenna distribution conductors, and neutral supported cables not exceeding 750 V shall be permitted to be located over a pool, diving structure, slide, observation stand, tower, or platform, providing there is a vertically clearance of 5 m (17') above the pool and/or pool equipment. This also includes the area extending 5 m (17') horizontally from the pool edge, and 5 m (17') measured radially.

Utilities do not permit any service conductors to be located directly over a swimming

Utility service conductors not exceeding 750V may be located adjacent to a pool or hot tub provided there is at least 5 m (17') measured radially from the edge of the pool, hot tub, and diving or play structure. 7.5 m (25') for conductors 750V and above.

(See figure to the right)



Underground wiring (includes underground telephone, cable TV and power utility service cables)
 The horizontal separation between the inside walls of an in ground pool or splash pad and underground conductors, except for bonding conductors or conductors supplying electrical equipment associated with the pool and protected by a ground fault circuit interrupter, shall not be less than:

<i>Type of Installation</i>	<i>Conductors Buried Directly in earth</i>		<i>Conductors in non-conducting Ducts</i>	
Communications conductors	<i>1.5 m(5')</i>		<i>1 m(39")</i>	
Power Conductors:	<i>CEC t-61</i>	<i>SaskPower t 2-3</i>	<i>CEC 68-054</i>	<i>SaskPower t 2-3</i>
0 - 750 V	<i>1.5 m(5')</i>	<i>2.0m(6')</i>	<i>1.0 m(39")</i>	<i>1.0m(39")</i>
751 - 15,000 V	<i>3.0 m(10')</i>	<i>2.0m(6')</i>	<i>1.5 m(5')</i>	<i>2.0m(6')</i>
15,001 - 28,000 V	<i>6.0 m(20')</i>	<i>6.0m(20')</i>	<i>2.0 m(6')</i>	<i>2.0m(6')</i>

Receptacles (wall plugs)

Receptacles shall not be located within 1.5 m (5') of the inside walls of a pool.

Receptacles located between 1.5 m (5') and 3 m (10') of the inside walls of a pool shall be protected by a ground fault circuit interrupter outside of the 3m (10') distance.

Ground fault circuit interrupters shall not be installed closer than 3m (10') to the pool water unless the ground fault circuit interrupter is an integral part of an approved factory built spa or hot tub and is located behind a barrier that will prevent the occupant of the tub from contacting the device.

Other electrical equipment (air conditioning equipment, pumps, etc.)

Electrical equipment located within 3 m (10') of the inside walls of the pool and not suitably separated from the pool area by a fence, wall or other permanent barrier, shall be protected by a ground fault circuit interrupter.

Electrical utility meter

A swimming pool or hot tub shall not be located within 3 m (10') of the electrical utility meter unless it is suitably separated from the pool area by a fence, wall or other permanent barrier that provides no less than 1 m (39") clearance about the electric meter. *(Metal poles used for pool servicing can present a shock hazard to persons in the pool area coming in contact with the electric service equipment)*

Lighting

Lighting installed below, or within 3 m (10') of the pool surface or walls, and not suitably separated from the pool area by a fence, wall, or other permanent barrier shall be electrically protected by a ground fault circuit interrupter.

Standards or supports for lighting shall not be installed within 3 m (10') of the inside walls of a swimming pool unless a ground fault circuit interrupter protects such lighting.

Bonding to ground

Pool reinforcing steel and the pool shell shall be bonded at four equally spaced points around the pool. All metallic components associated with the pool and metallic fences within 1.5 m (5') of the pool shall be bonded to ground by a copper conductor.

SECTION 70 – Tiny Home Requirements

Definition – A Tiny Home is a Dwelling unit built on a flatbed trailer designed for use of a single family and built to be relocated.

Permits will be required for the service connection of Tiny Homes.

Unless approved by a certification agency, these dwelling units shall be wired to the CEC requirements. Permits are required by a licensed electrical contractor for the wiring of a tiny home.

SECTION 72 - MOBILE HOME AND RECREATIONAL VEHICLE PARKS

72-102(2) - Demand factors for service and feeders

When doing a service or feeder calculation for an RV park, the calculated load is considered a continuous load as per Rule 8-104.

72-102(2),(3),(4)

Campground service calculation Example A

A campground has 30 sites. 10 of the sites have a pedestal with a 50 A, 240 V receptacle and a 30 A, 120 V receptacle. 20 of the sites have a pedestal with a 30 A, 120 V receptacle and a 15 A, 120 V receptacle. Panel A is protected by a 100 A breaker (rated at 80%) and serves the shower building. Panelboard B is protected by a 100 A breaker (rated at 100%) and serves site lighting, etc.

What size 120/240 V service is required?

Panelboard 'A' =	$[(100 \text{ A} \times 240 \text{ V}) \times .80]$	=	19,200 watts
Panelboard 'B' =	$[(100 \text{ A} \times 240 \text{ V}) \times 1]$	=	24,000 watts
First 5 sites at 100% =	$(5 \times 50 \text{ A} \times 240 \text{ V})$	=	60,000 watts
Next 10 sites at 75% =	$[(5 \times 50 \text{ A} \times 240 \text{ V}) + (5 \times 30 \text{ A} \times 120 \text{ V}) \times .75]$	=	58,500 watts
Next 10 sites at 50% =	$[(10 \times 30 \text{ A} \times 120 \text{ V}) \times .5]$	=	18,000 watts
Remainder at 25% =	$[(5 \times 30 \text{ A} \times 120 \text{ V}) \times .25]$	=	4,500 watts
	Total watts	=	184,200 watts
	$184,200 \div 240 \text{ V}$	=	767.5 Amps

This campground would require an 800 Amp service with a 100% rated main breaker or a 1000 Amp 80% rated main breaker.

72-102(2),(3),(4)

Campground service calculation Example B

A campground has 40 sites. 14 of the sites have a pedestal with a 50A, 208V single phase receptacle and a 30A, 120V receptacle. 17 of the sites have a pedestal with a 30A, 120V receptacle and a 15A, 120V receptacle. 9 of the sites have a 20A, 120V receptacle. Panel A is a 120/208V single phase panelboard with a 60A breaker (rated at 80%) and serves the shower building. Panel B is a 120/208V 3 phase panelboard protected by a 150A breaker (rated at 100%) and serves the site lighting etc.

What size 120/208V service is required?

Panelboard 'A' =	$[(60 \text{ A} \times 208 \text{ V}) \times .80]$	=	9984 watts
Panelboard 'B' =	$[(150 \text{ A} \times 208 \text{ V} \times 1.73) \times 1]$	=	53,976 watts
First 5 sites at 100% =	$[(5 \times 50 \text{ A} \times 208 \text{ V}) \times 1]$	=	52,000 watts
Next 10 sites at 75% =	$[(9 \times 50 \text{ A} \times 208 \text{ V}) + (1 \times 30 \text{ A} \times 120 \text{ V}) \times .75]$	=	72,900 watts
Next 10 sites at 50% =	$[910 \times 30 \text{ A} \times 120 \text{ V}) \times .5]$	=	18,000 watts
Remainder of sites at 25% =	$[(6 \times 30 \text{ A} \times 120 \text{ V}) + (9 \times 20 \text{ A} \times 120 \text{ V}) \times .25]$	=	10,800 watts
	Total Watts	=	217,660 watts
	$217,660 \div (208 \text{ V} \times 1.73)$	=	604.88Amps

This campground will require an 800 Amp 120/208 V 3 phase service.

72-104 - Feeders

Bonding and grounding shall be made to comply with Section 10.

SECTION 76 - TEMPORARY WIRING**76-006 - Service entrance equipment**

When located in an outdoor location, these services must be of weather-proof construction.

76-016 - Receptacles

All temporary service receptacles of 5-15R and 5-20R are to be ground fault protected. In use 'extra duty' covers will not be required on temporary construction services.

Receptacles installed in a building under construction that are part of the permanent wiring system will not require ground fault protection.

SECTION 78 - MARINE WHARVES, DOCKING FACILITIES, FIXED AND FLOATING PIERS, AND BOATHOUSES**78-050 - Receptacles**

Receptacles for use on fixed or floating piers, docking facilities, marine wharves or boat houses shall be GFI protected and mounted above the permanent or maximum normal water level to avoid immersion.

78-052 - Branch circuits and feeders

GFI protection shall be provided to de-energize all normally ungrounded conductors for distribution equipment in or on fixed or floating piers, docking facilities, marine wharves or boat houses with a setting sufficient to allow normal operation of the equipment but in no case greater than 30 mA.

SECTION 84 - INTERCONNECTION OF ELECTRIC POWER PRODUCTION SOURCES**84-000 - Portable generators**

As with all electrical equipment, portable generators and associated equipment must be approved and carry the mark of a recognized certification agency. Although recommended in the manuals of many power take-off generators, welding cable is not an approved wiring method and will not be accepted.

Recessed male receptacles shall be used as an interface to the generator. Anderson Plugs shall be permitted when installed in a junction box. Wiring methods to the interface receptacle, shall meet the requirements of section 12 for permanently installed equipment.

Generators and associated equipment (i.e. transfer switches, load bank, etc.) must be installed by a licensed electrical contractor and the appropriate permit must be submitted. See [2-014](#).

See Appendix M for diagrams to show typical residential and farm generator installation configurations. For other installation configurations contact a licensed electrical contractor or Electrical Inspections.

Caution – owners shall ensure that generators being interconnected with renewable systems are compatible.

84-030 Warning Notice and Diagram

Utility disconnect, and interconnected system information shall be displayed at the meter location. For examples of warning notices and diagrams refer to Appendix M.

84-002 - General requirement

A closed transition transfer switch requires a Utility Interconnection Agreement before this equipment can be put into service. Please contact the utility to complete this agreement.

Caution – owners shall ensure that generators being interconnected with renewable systems are compatible.

84-020 - Disconnecting means - electric power production

For interconnection of renewable energy sources, more than one disconnect may be permitted in a multiple metered unit provided they are located at one location.

84-022 - Disconnecting means - supply authority system

The utility disconnect shall provide a single point of disconnect for the supply authority **for all electric power production sources** on a property.

Confirmation of acceptance is required during the interconnection agreement process. Please contact the engineering department of the respective utility prior to installation.

84-024 - Disconnecting means - general (see [Appendix M](#))

- 1 c) Have contact operation verifiable by direct visual means if required by the supply authority.
- 1 d) Have provision for being locked in the open position.

84-030 - Warning notice and diagram (see [Appendix M](#))

A single line, permanent, legible diagram of the interconnected system shall be installed in a conspicuous place at the supply authority disconnecting means and supply authority meter location.

This diagram should show the physical location of the interconnected sources, the interlocks between the switching equipment and isolation points (utility disconnect) so that personnel are able to isolate the Section being serviced. Acceptance of the disconnect location shall be acceptable to the supply authority and a letter of acceptance should be provided upon submission of plans for review.

See Figure B64-4 in Appendix B and Rule 64-002 [Figure 1](#) for an illustration of an interconnected photovoltaic system.

2-035 - OIL & GAS FIELD INSTALLATIONS

Installations for oil and gas fields shall comply with Section 19, *Code for Electrical Installations at Oil and Gas Facilities, Fourth Edition, 2015*, as published and distributed by SaskPower. It is available on our website at www.saskpower.com.

MINING INSTALLATIONS**Standards applications***Canadian Electrical Code, Part 1 C22.1 - Safety Standards for Electrical Installations*

The electrical works, facilities and plant that are on surface and are used for housing, maintenance, and processing of extracted minerals.

M421 - Use of Electricity in Mines

Supplemental to the requirements of C22.1, including the electrical works, facilities and plant that are both underground and on surface that are used in the extraction of minerals.

*The Electrical Licensing Act, 1993 -c.E-7.2 s.8(1), 23(1)(2)(3)***Approved electrical equipment**

- C22.1-15 2-024 - Use of Approved Equipment,
- M421 4.1.2 - Application,
- The Electrical Inspection Act, 1993 - c.E-6.3 s.18(1)(2) - Equipment Approval

All surface and sub-surface electrical equipment requires an overall approval from a Saskatchewan recognized Certification Body prior to being electrically connected or reconnected and must bear evidence of the approval or certification. [See 2-024.](#)

2-012 - Notification of inspection

Applies to owner's new installations of cables and/or equipment, installed by employees or contractors. See [2-012.](#)

2-014 - Plans and specifications

Applies to owner's new installations of cables and/or equipment, installed by employees or contractors. See [2-014.](#)

12-402 - Use of flexible cord

(3) Flexible cord shall not be used (a) as a substitute for fixed wiring (i) permanently secured to any structural member. See also M421-11. 6.3.1.1

36-006 - Warning notice

(1) Permanent warning notice shall be placed (b) on all high voltage cables at points of access (d) on all exposed portions of all high voltage cables at a spacing not to exceed 10 m (33').

M421-11 4.2.1.2 Mine plans

Plans and diagrams shall be reviewed and updated every 4 months, and shall be posted at each power skid, electrical room, substation, load break / switch, and distribution location.

M421-11 4.3.3.4 Identification of cables

Each cable assembly operating at a voltage above 300 V shall be labeled:

- at the distribution / source end of the cable;
- where the cable terminates or which equipment the cable is connected to in the field; and
- at the equipment end of the cable – the overcurrent device location for the cable and its source location.

M421-11 6.2.1 Conductors

Cable supports shall have a safety factor of 5.

Appendix M - Renewables Marking, Warning Notices and Diagrams

A warning sign for a photovoltaic system shall be in capital letters with a minimum height of 9.5 mm, in white on a red background.

Appendix M

64-060(10) - Disconnecting means

- all AC disconnects with 2 sources of power.

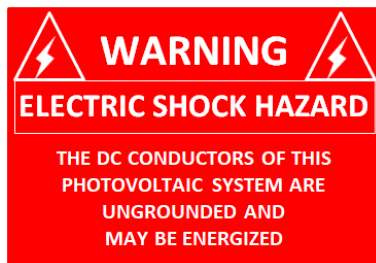


**MAIN PV SYSTEM
AC DISCONNECT**



64-066(1)(b) - Ungrounded renewable energy power systems

- ungrounded DC circuits.



64-072(1) - Marking

- for each interconnecting AC power source.



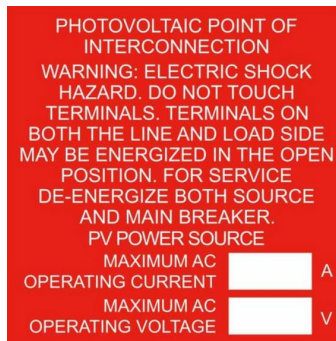
64-074(4) - Warning notice and diagram

- for energy storage systems.



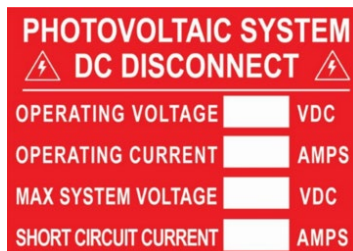
64-112(4)(b)(iii) - Interactive point of connection

- PV input breaker in electrical panelboard.



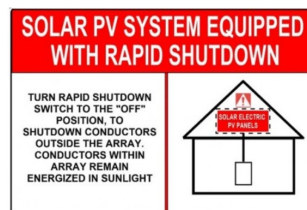
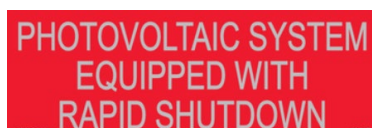
64-200(1) - Marking

- String inverters - DC Disconnect.



64-200(2) - Marking

- When rapid shutdown is installed labelling at the DC disconnect is required.



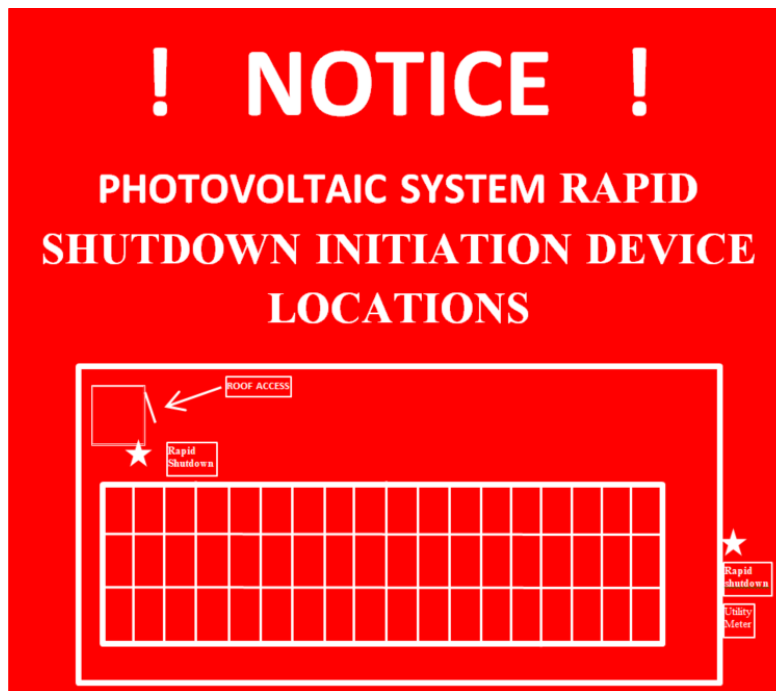
64-202(5)(c) - Voltage of solar photovoltaic systems

- For all DC circuits over 750 VDC.



64-218(5) - Photovoltaic rapid shutdown

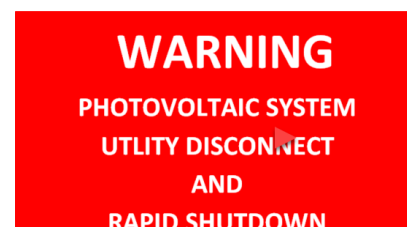
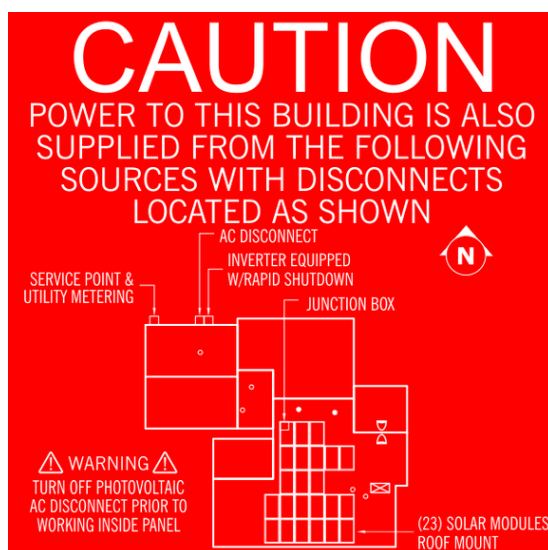
- Rapid shutdown initiation device shall be shown on the diagram of 84-030(2).



64-218(6) - Photovoltaic rapid shutdown

- Placards **shall be** located at the supply authority meter location and the consumer's service equipment location.

The location of these placards (or additional placards) on buildings without exterior metering may require discussion with the local fire department (i.e. near the gas meters, water standpipe, service splitter, fire annunciation panel...).



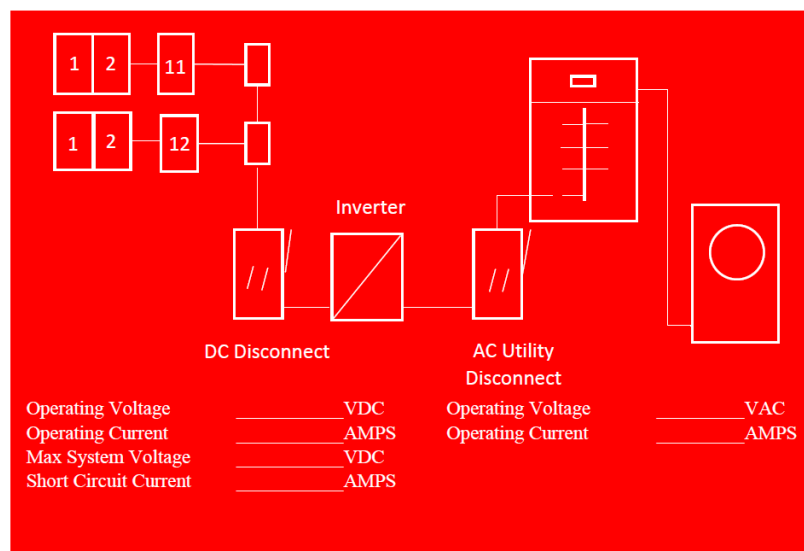
84-030(1) - Warning notice and diagram

- utility disconnect and interconnected system information at the utility disconnect and meter location.

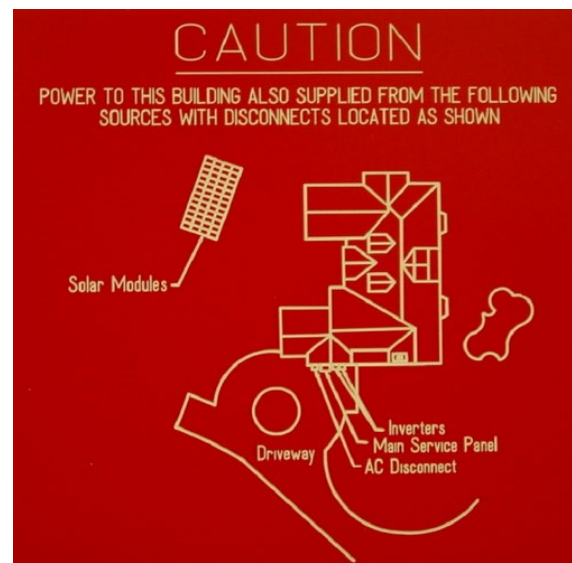
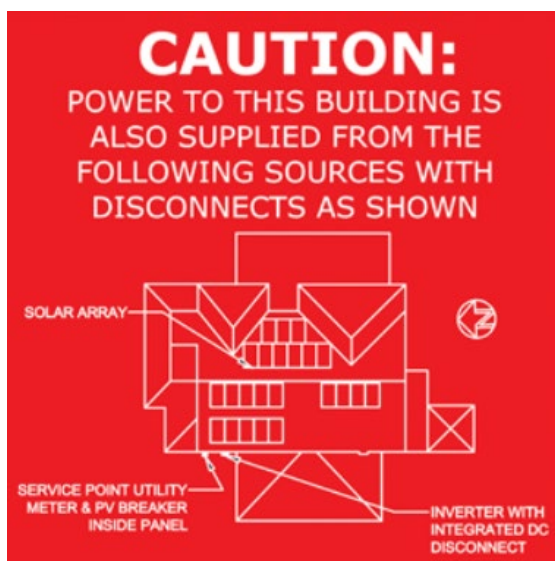


84-030(2) - Warning notice and diagram

- Single-line, permanent, legible drawing of the interconnected system, and equipment locations ...



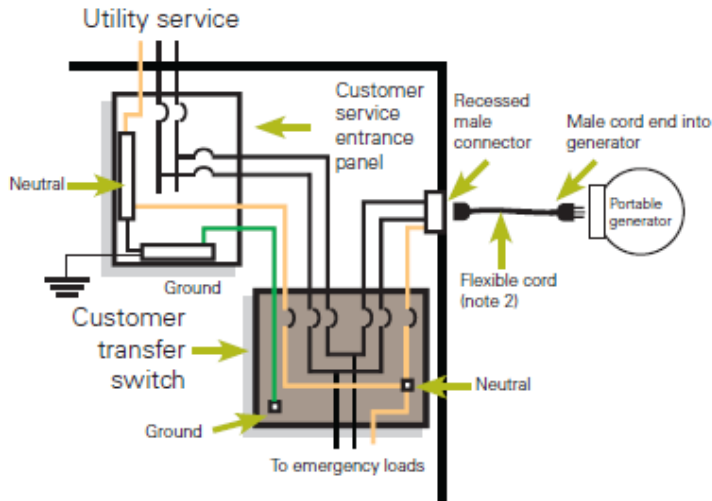
- shall be installed at the utility disconnect and meter location.



Residential Service

Customer transfer switch required.

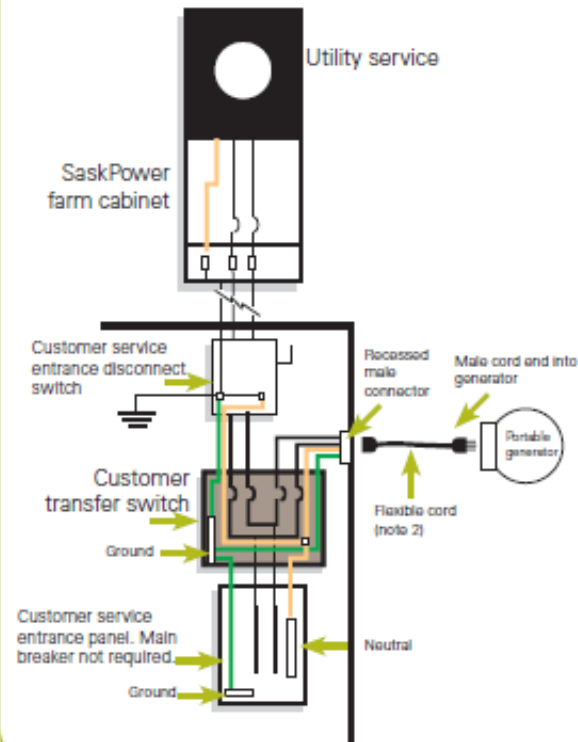
Example with neutral bonded to frame
(note 3 & 4)

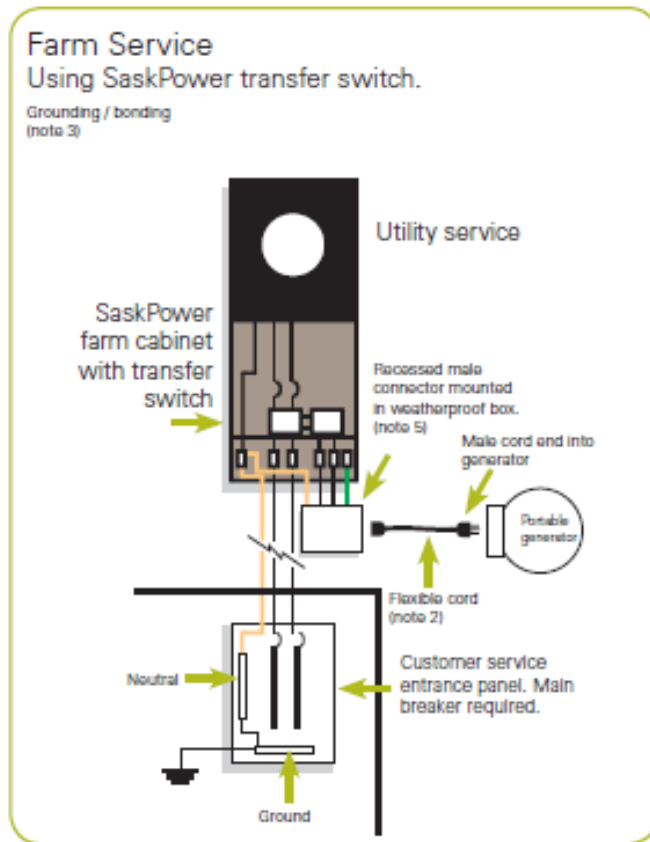


Farm Service

Using customer transfer switch.

Example with neutral floating
(note 3)





Notes:

1. Rewiring or tampering with a generator unit voids CSA certification.
2. Conductors must be sized to match the maximum output of the generator.
3. Follow generator manufacturer's installation, grounding and operation instructions.
4. A transfer switch must be capable of switching the neutral when the generator neutral is bonded to the frame.
5. Permission is required from your local **SaskPower District Office** to install this recessed male connector on a transformer pole.
6. A portable electric power plant that is operated at voltages exceeding 240 volts to ground or is rated in excess of 12.0 kW shall be grounded as per Section 10 of the current CEC.

Portable electric power plants (as per OH&S Regulations 1996)

460(1) An employer, contractor or supplier shall ensure that:

- (a) a portable electric power plant that is operated at voltages exceeding 240 volts to ground or is rated in excess of 12.0 kilovolt-amperes is connected to ground in a manner approved pursuant to *The Electrical Inspection Act, 1993*; and
- (b) all electrical equipment connected to an ungrounded portable electric power plant:
 - (i) is of the double insulated type; and
 - (ii) is clearly marked as being of the double insulated type or is supplied from a Class A type ground fault interrupting device.

Electrical Inspections Phone Listing

SaskPower Electrical Inspections Division

Mike Anderson - Chief Electrical Inspector & Director of Electrical Inspections
 Regina 306-566-2515; Cellular 306-535-9920

Scott McCorriston - Manager Electrical Inspections, Regina---- 306-566-2516;
 Cellular 306-536-4122

Rod Pack - Manager Electrical Inspector, Saskatoon -----306-934-7720; Cellular
 306-291-8126

Phoukham Phommavong - Electrical Plans Review, Regina ---306-566-2596;
 Cellular 306-531-6445

David Pilon - Training Coordinator, Saskatoon -----
 Cellular 306-229-7986

Mark Woitas - Compliance Inspector, Regina ----- 306-566-2531;
 Cellular 306-536-6549

Blaine Ganchar - Compliance Inspector, Saskatoon ----- 306-934-7891;
 Cellular 306-221-0916

Regina Office Address

#177-1621 Albert Street

Regina, SK, S4P 0S1

Toll Free: 1-888-757-6937

(option5)

Fax 306-566-2906

Saskatoon Office Address

1370 Fletcher Road; P.O. Box 1560

Saskatoon, SK, S7K 3R3

Toll Free: 1-888-757-6937 (option 5)

Fax 306-934-7736

Office Location & Area	Electrical Inspector	Address
Estevan	Cell 306-421-9390	234-5th Street Estevan S4A 0X8
Estevan	Cell 306-421-5996	234-5th Street Estevan S4A 0X8
Kindersley	Cell 306-463-7196	P.O. Box 1119, Hwy#7 East Kindersley S0L 1S0
Kindersley	Cell 306-460-9608	P.O. Box 1119, Hwy#7 East Kindersley S0L 1S0
Lloydminster	Cell 306-821-0330	4005-52nd Street Lloydminster S9V 2B5
Lloydminster	Cell 306-821-6649	4005-52nd Street Lloydminster S9V 2B5
Moose Jaw	Cell 306-630-5311	880 Lillooet St. West, Box 1240 Moose Jaw S6H 4P9
Moose Jaw	Cell 306-630-5788	880 Lillooet St. West, Box 1240 Moose Jaw S6H 4P9
North Battleford	Cell 306-441-0511	P.O. Box 550; 9905 Thatcher Ave North Battleford S9A 2Y7
North Battleford	Cell 306-441-3219	P.O. Box 550; 9905 Thatcher Ave North Battleford S9A 2Y7

Office Location & Area	Electrical Inspector	Address
Prince Albert	Cell 306-961-2634	Box 5900; 3050 2 nd Ave W Prince Albert S6V 7V6
Prince Albert	Cell 306-930-9268	Box 5900; 3050 2nd Ave W Prince Albert S6V 7V6
Prince Albert	Cell 306-961-7470	Box 5900; 3050 2nd Ave W Prince Albert S6V 7V6
Regina	Cell 306-536-6550	#177-1621 Albert Street. Regina S4P 0S1
Regina	Cell 306-536-4665	#177-1621 Albert Street. Regina S4P 0S1
Regina	Cell 306-536-4121	#177-1621 Albert Street. Regina S4P 0S1
Regina	Cell 306-529-6035	#177-1621 Albert Street. Regina S4P 0S1
Regina	Cell 306-533-0922	#177-1621 Albert Street. Regina S4P 0S1
Regina	Cell 306-526-8950	#177-1621 Albert Street. Regina S4P 0S1
Regina	Cell 306-550-1480	#177-1621 Albert Street. Regina S4P 0S1
Regina	Cell 306-526-9006	#177-1621 Albert Street. Regina S4P 0S1
Regina	Cell 306-527-6844	#177-1621 Albert Street. Regina S4P 0S1
Regina	Cell 306-519-3940	#177-1621 Albert Street. Regina S4P 0S1
Saskatoon	Cell 306-221-2960	1370 Fletcher Road, P.O. Box 1560 Saskatoon S7K 3R3
Saskatoon	Cell 306-222-7794	1370 Fletcher Road, P.O. Box 1560 Saskatoon S7K 3R3
Saskatoon	Cell 306-221-0918	1370 Fletcher Road, P.O. Box 1560 Saskatoon S7K 3R3
Saskatoon	Cell 306-221-0916	1370 Fletcher Road, P.O. Box 1560 Saskatoon S7K 3R3
Saskatoon	Cell 306-221-0913	1370 Fletcher Road, P.O. Box 1560 Saskatoon S7K 3R3
Saskatoon	Cell 306-222-4819	1370 Fletcher Road, P.O. Box 1560 Saskatoon S7K 3R3
Saskatoon	Cell 306-220-8233	1370 Fletcher Road, P.O. Box 1560 Saskatoon S7K 3R3
Saskatoon	Cell 306-221-6877	1370 Fletcher Road, P.O. Box 1560 Saskatoon S7K 3R3

Office Location & Area	Electrical Inspector	Address
Saskatoon	Cell 306-227-5540	1370 Fletcher Road, P.O. Box 1560 Saskatoon S7K 3R3
Saskatoon	Cell 306-227-2966	1370 Fletcher Road, P.O. Box 1560 Saskatoon S7K 3R3
Swift Current	Cell 306-741-2807	1800 Aberdeen St., Box 580 Swift Current S9H 3W4
Swift Current	Cell 306-741-0690	1800 Aberdeen St., Box 580 Swift Current S9H 3W4
Swift Current	Cell 306-750-1489	1800 Aberdeen St., Box 580 Swift Current S9H 3W4
Tisdale	Cell 306-873-7399	Box 1900; 613 Heritage Road Tisdale S0E 1T0
Tisdale	Cell 306-852-7946	Box 1900; 613 Heritage Road Tisdale S0E 1T0
Tisdale (Mines)	Cell 306-370-6875	Box 1900; 613 Heritage Road Tisdale S0E 1T0
Weyburn	Cell 306-461-9961	1665 Ebel Road Weyburn S4H 1V3
Weyburn	Cell 306-861-5866	1665 Ebel Road Weyburn S4H 1V3
Yorkton	Cell 306-621-1592	79 A Broadway St W Yorkton S3N 0M1
Yorkton	Cell 306-621-1102	79 A Broadway St. W Yorkton S3N 0M1
Yorkton	Cell 306-516-7115	79 A Broadway St. W Yorkton S3N 0M1

Other Contacts:

Annex B

TO: The Electrical Code Coordinator for the Saskatchewan Electrical Interpretations

FROM:

AFFILIATION:

DATE:

RE: Request for an amendment to Rule(s)

Request (Specifically Worded):

Reason for Request:

Supporting Information:

For office use only:

Subject No. Assigned:

Completed form to be sent to: Saskatchewan Interpretations Code Coordinator – geis@saskpower.com

Submitter:

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