

2018 CANADIAN ELECTRICAL CODE

SUBJECT: Section 18 – Hazardous locations

Rule 18-006 Locations containing an explosive gas atmosphere

General

For area classification requirements at oil and gas facilities, permitted or constructed prior to February 1, 2019, the use of the “Code for Electrical Installations at Oil and Gas Facilities”, published by the Safety Codes Council, is permitted. For oil and gas facilities permitted on or after February 1, 2019, the prescriptive requirements of Rule 18-004 of the 2018 Canadian Electrical Code, Part I shall apply.

For classification requirements at Flammable liquid and gasoline dispensing, service stations, garages, bulk storage plants, finishing processes, and aircraft hangars please consult Section 20 of the Canadian Electrical Code and STANDATA CEC-20.

For classification requirements at sewage lift and treatment plants, see Rule 22-704.

Area Classification

The purpose of area classification, as outlined in the Canadian Electrical Code, is to determine the proper equipment, materials, and wiring methods for electrical installations in the Hazardous Locations.

Rule 18-004 of the 2018 Canadian Electrical Code requires that hazardous location classification be carried out and documented by qualified persons, and that the person assuming responsibility for the classification shall authenticate the hazardous area classification. In Alberta we interpret this to mean a registered engineering professional who is authorized to engage in the practice of engineering under the *Engineering and Geoscience Professions Act* and its Regulations. The engineering professional then authenticates (affixes their stamp to) the area classification documentation. Subrule 4) of Rule 18-004 allows installations within the scope of Section 20 to be classified in accordance with Section 20.

In determining if an area is required to be classified as a hazardous location, consideration should be given to:

- the definition of ‘hazardous location’ in Section 0,
- the divisions of explosive atmospheres into Zones based on frequency of occurrence and duration of the explosive atmosphere as prescribed in Rules 18-006 and 18-008, and
- the definitions of Zones in Rule 18-002.

Once it is determined that an explosive atmosphere could exist in an area, an area classification would be performed in compliance with 18-004.

Issue of this STANDATA is authorized by
the Provincial Electrical Administrator

[Original Signed]

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Due to the nature of hazardous locations and the risk of fire and explosions associated with them, involvement by various individuals who understand the relevance and significance of the properties of the hazardous materials involved, are knowledgeable in the appropriate classification standards / guidelines, and who are familiar with the process and equipment is essential to ensure that appropriate measures are taken to properly classify the hazardous locations. For a small or simple facility, this may only require the input of a single discipline, whereas for a large or complex facility, this may involve more than one discipline such as electrical, mechanical, process, safety, and operations specialists.

Documentation is an essential element in classifying hazardous locations, and typically includes items such as drawings, studies and calculations, reports and operating descriptions. This documentation should be maintained and updated over the life of the facility.

Appendix L of the CE Code contains more details on area classification guidelines.

Rule 18-050 Electrical Equipment

Ammonia machinery rooms

Ammonia is listed in Rule 18-050 as a Group IIA hazardous gas. CSA Standard B52-Mechanical Refrigeration Code includes installation requirements for refrigerating systems that use ammonia. Where a refrigerating system uses ammonia in a "Machinery Room", the room is normally considered a hazardous location.

However, when a refrigerating system using ammonia is installed in a "Class T Machinery Room", the room shall not be considered a hazardous location. One of the requirements for a Class T machinery room is that where the independent mechanical ventilation system is not operated continuously, a gas monitoring system shall be installed that will automatically start up the ventilation system and actuate a remote alarm at the lowest practical instrument-detection level not exceeding 25 per cent of the lower explosive limit.

To be acceptable as a non-hazardous location, it may be necessary to provide the appropriate Authority Having Jurisdiction written confirmation that the refrigerating system is installed in a "Class T Machinery Room" in conformance with CSA Standard B52.

Installation of transducers and similar devices

Transducers are devices used to convert one form of energy into another (such as pressure-to-current or vice versa). In a typical application the transducer converts an electrical output signal (usually 4-20mA) from a controller to a pneumatic signal necessary to operate a control valve actuator or pneumatic positioner (I/P). Another application may be to monitor the flow and/or pressure of process fluids with transducers that convert pressure to a 4-20mA signal (P/I).

Careful consideration must be given to the selection of an appropriate transducer if a flammable gas or liquid (explosive fluid) is intended as the medium for operation. Using transducers designed only to be operated with "normal air" pose significant safety hazards when they are actually operated by an explosive fluid. In these situations, the device has not been designed or tested for use with an explosive fluid and is not suitable for the application thus voiding its certification and is in non-compliance with the Canadian Electrical Code.

When a "normal air" transducer is operated with an explosive fluid there is a significant risk that the explosive fluid will migrate into the wiring system with potentially increased pressures within the equipment and the wiring system further compounding the hazard. Even though the wiring system and equipment enclosure may be explosion proof, they may not have been designed for

use where we have a combination of an explosive fluid at elevated pressures. Therefore, the “normal air” transducer is not suitable for the application.

CSA Standard C22.2 No. 30 – *Explosion Proof Enclosures for Use in Class I Hazardous Locations* has provisions for incorporating an explosive fluid seal where a transducer is operated by an explosive fluid. When selecting a transducer (or similar device) intended for operation with an explosive fluid, be sure to specify to the supplier/manufacturer its intended application and that it requires an explosive fluid seal. At existing transducer installations, where an explosive fluid is the medium used to operate the device, you are encouraged to review documentation and consult with the manufacturer to determine whether the device incorporates an explosive fluid seal. Where it is identified that these installations have a transducer that is not suitable for the application, you are advised to take all necessary actions to resolve a potentially hazardous situation.

Note: Although the installation of this type of equipment is prevalent in hazardous locations, there are certainly situations where a transducer operated by an explosive fluid is located in a non-hazardous location. In those cases, the above information is also equally applicable.

Relocatable structures (skid units)

See STANDATA CEC-2, Item “Rule 2-100 Marking of Equipment”.

Rule 18-062 Pressurized equipment or rooms

CE Code Rule 18-062 allows equipment pressurized with a protective gas to be located in an explosive atmosphere. The appendix B note to this Rule suggests three possible references that could be used to meet the requirements of this Rule. The NFPA standard 496 “Standard for Purged and Pressurized Enclosures for Electrical Equipment” is frequently used as a guide in designing systems to meet the requirements of Rule 18-064 in Zone 2 or Class 1, Division 2 Hazardous Locations. The purpose of this STANDATA item is to highlight a common error that is made in applying this Standard, as outlined in the following:

The pressurization system used by the standard to pressurize enclosures in Zone 2/Class 1, Division 2 Hazardous Locations is a type Z purge. Three requirements of type Z pressurizing in the standard read as follows:

4.8* Type Z Purging

4.8.1 Detection shall be provided to indicate failure to maintain positive pressure within a protected enclosure

4.8.1.1 Failure to maintain positive pressure within a protected enclosure shall be communicated by an alarm or an indicator.*

4.8.1.2 It shall not be required to de-energize the protected equipment upon detection of the failure to maintain positive pressure within the protected enclosure.

Note that when reading the standard an asterisk (*) at the beginning of a paragraph, indicates that explanatory material on the paragraph can be found in Appendix A of the standard.

In some cases designers have interpreted paragraph 4.8.1.2 to mean that while loss of pressurization requires an alarm, it will not be necessary to de-energize the protected equipment. It should be noted that the wording in paragraph 4.8.1.2 should be understood to mean that while it may not be necessary to de-energize the protected equipment immediately

“upon” loss of pressurization, if the pressurization cannot be restored within a short period, the protected equipment should be de-energized.

This interpretation is confirmed by the Appendix A note to the definition for an alarm which reads as follows:

A.3.3.1 Alarm. *An alarm is intended to alert the user that the pressurizing system should be immediately repaired or that the electrical equipment protected by the failed pressurizing system should be removed from service.*

If the protected equipment is critical to the operation of a facility, installation of backup pressurization means should be considered as a part of the design.

Rule 18-072 Bonding in hazardous locations

For sizing bonding conductors or bonding jumpers in hazardous locations, Rule 10-614 (Size of system bonding jumper or bonding conductor) should be used.

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

Sealing of control cables with bundled sub-assemblies

CSA Standards C22.2 No.174 (Cables and cable glands for use in hazardous Locations) and C22.2 No.230 (Tray Cables) have provisions to test and mark cables with bundled sub-assemblies for extending through a sealing fitting or gland without removing the shield. Cables that meet the requirements of these standards will bear the mark "HL" (for cables approved for hazardous locations) or "TC" (for Tray Cable), followed by the appropriate group designation.

Only those cables tested and marked in accordance with the appropriate CSA Standards will be acceptable when extended through a seal without removing the shield and separating the individual conductors of the pairs, triads, etc.

Sealing underground conduits and cables

Areas in earth below grade are normally considered non-hazardous, although the areas above grade have been classified as hazardous locations. In some cases however, spilled flammable liquids or heavier than air gases seeping through the earth and entering underground can enter conduits and cables. Examples of such locations may be service stations, bulk storage plants, refineries, tank farms and batteries.

To prevent the transfer of ignitable vapours into non-hazardous areas, conduits and cables located in such areas should be sealed at the point of emergence in the non-hazardous area. Cables may be sealed at the first point of termination in the non-hazardous area. The holes through which such conduits and cables enter the building should be made vapour-tight to prevent ignitable vapours from entering the building around the outside of the conduits or cables.

Rule 18-150 Equipment, Zone 2 locations

Resistance temperature devices (RTDs)

RTDs used to measure temperature do not operate above ambient temperature and are therefore considered part of the exception that exempts them from the requirements of Rule 18-150 1)

Installation of transducers and similar devices

See Information item to Rule 18-050 above.