Classifying Hazardous Locations, Flammable Gases and Vapours

Article and Photo by Pierre McDonald

Inspectors who review drawings and inspect installations in areas where flammable gases and vapours are or could be present require a good understanding of the extent of those areas as defined within the Canadian Electrical Code, Part 1 (CE Code). Certain installations such as gasoline dispensing stations and service stations are common and provide a certain degree of uniformity in the installation. While hazardous locations also include areas where combustible dusts, electrically conductive combustible dusts, fibres and flyings are or may be present, this article will focus only on those installations where flammable gases and vapours are or could be present.

Section 18 of the CE Code outlines the requirements for installing electrical equipment and wiring methods permitted in hazardous locations. Defining those locations will help determine which equipment and wiring methods are required. Rule 18-004 defines a Class I area as an area in which flammable gases and vapours are or may be present in the air in quantities sufficient to produce an explosive gas atmosphere. This classification is further divided (Rule 18-006) into zones based on the frequency to which this explosive atmosphere may be present:

• Zone 0 — a location where an explosive gas atmosphere is present continuously or for long periods of time

• Zone 1 — usually adjacent to a Zone 0 location or where an explosive gas atmosphere could occur during normal operation

• Zone 2 —usually adjacent to a Zone 1 area or an area where an explosive gas atmosphere would not likely occur during normal operation, and if it did, would exist only for a short time.

18-006 Division of Class I locations (see Appendices B and J)

Class I locations shall be further divided into three Zones based upon frequency of occurrence and duration of an explosive gas atmosphere as follows:

(a) Zone 0, consisting of Class I locations in which explosive gas atmospheres are present continuously or are present for long periods;

(b) Zone 1, consisting of Class I locations in which

(i) explosive gas atmospheres are likely to occur in normal operation; or

(ii) the location is adjacent to a Class I, Zone 0 location, from which explosive gas atmospheres could be communicated; and

(c) Zone 2, consisting of Class I locations in which

(i) explosive gas atmospheres are not likely to occur in normal operation and, if they do occur, they will exist for a short time only; or

(ii) the location is adjacent to a Class I, Zone 1 location, from which explosive gas atmospheres could be communicated, unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

Given these definitions, certain common installations have been classified for the code user and appear in Section 20. This section describes the extent of the hazardous area for the following installations:

• gasoline dispensing and service stations — Rules 20-002 to 20-014

• propane dispensing, container filling, and storage — Rules 20-030 to 20-042

• compressed natural gas refueling stations, compressors, and storage facilities — Rules 20-060 to 20-070

• commercial garages — repairs and storage — Rules 20-100 to 20-114

• residential storage garages — Rules 20-200 to 20-206

• bulk storage plants — Rules 20-300 to 20-312

• finishing processes — Rules 20-400 to 20-414

• aircraft hangars — Rules 20-500 to 20-522.

The descriptions of hazardous areas expressed in the rules above can be better visualized with the figures published in the CE Code Handbook. Keep in mind that the CE Code Handbook is not adopted by any jurisdiction in Canada, and is therefore used solely for information purposes.

In addition to the above installations, the Alberta Safety Codes Council publishes the Code for Electrical Installations at Oil and Gas Facilities. Adopted in Alberta and Saskatchewan and referenced in BC and Manitoba, this code applies to electrical installations used in the search, transmission, or production of oil, natural gas and related hydrocarbons. It does not apply to electrical installations used in

•petroleum refineries; petrochemical facilities

• gas distribution systems operated by a gas utility at a pressure of 700 kPa or less for the purpose of distributing gas to consumers in all or part of a municipality

• fuel supply systems for equipment

Some of the more common installations are classified and shown as diagrams within this document. They include:

• service rigs and drilling rigs

• mud tanks in several configurations with/without shale shaker

• tool launching and receiving installations

• valves, pumps and manifolds

• storage tanks

• process vents, and instrument and control vents

Like the CE Code Handbook, these diagrams are for information only and the code user should use the rules in making decisions as to the extent of an area classification.

Classification of hazardous areas not described in Section 20 of the CE Code or not described within the Code for Electrical Installations at Oil and Gas Facilities should only be undertaken by a qualified individual. Due to the nature of hazardous locations and the risk of fire and explosions associated with them, specific involvement by those with the understanding of the properties of the hazardous materials and process involved is essential to ensure that the appropriate measures are taken to mitigate the hazard. This may involve more than one discipline such as electrical, mechanical, process, safety, and operations specialists. Appendix D19 of the Code for Electrical Installations at Oil and Gas Facilities provides engineering guidelines for determining area classifications.

Inspectors charged with the review of plans and inspection of these installations need to know at which point within an installation the wiring methods have to change to meet the installation rules of the CE Code for different areas. If these boundaries are not clearly defined for the Inspector, they have the obligation to request and the right to receive area classification drawings produced by qualified individuals. Area classification is not the responsibility of an Inspector and should not be left to open interpretation. Owners of these facilities have an obligation to produce and maintain area classification drawings.

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