Hazardous Locations

Classes, Divisions & Zones

What is Area Classification?

Area classification is the study or the determination of hazardous areas in facilities where explosive atmospheres can occur. As set in the national electrical codes, the following factors need to be accounted for during area classification study.

a) the characteristics of the fluids being handled (e.g., chemical and physical properties such as flash point, molar composition, liquid density, vapour specific gravity, lower flammable limit (LFL), upper flammable limit (UFL), mole weight);

b) operating pressures, temperatures, flow rates, and volumes;

c) the design and maintenance of the compression, pumping, piping, valve, and containment systems for handling the fluids;

d) the minimum explosible concentration of dusts;

e) dust confinement systems;

f) housekeeping and humidity;

g) building design and dimensions;

h) heating and ventilation systems in buildings;

i) the site layout and proximity to other structures;

j) the type of safety systems available (e.g., gas detection);

k) outdoor terrain and topographical features (e.g., berms, low spots, slopes, vegetation);

l) local temperature and wind conditions;

m) the remoteness of an installation (i.e., the capacity to detect and/or respond to a release through on-site personnel or remote monitoring);

n) operating and maintenance practices and training;

o) the operating, maintenance, and failure history of the facility;

p) facility modifications resulting from site operations or maintenance that could impact the area classification boundaries.

What are Hazardous Location Ratings?

Hazardous Location ratings are determined by the area classification study and depend on several factors. It is important to identify the ratings of your manufacturing site and verify the equipment's adequacy for installation in the classified area ahead of time.

The Canadian Electrical Code (CEC), and similarly National Electrical Code (NEC), have the following definitions for different hazardous location areas:

Class I location

Class I location is a location where flammable gases or vapours are or may be present in the air in quantities sufficient to produce explosive gas atmospheres.

Class I locations shall be further divided into two Divisions based on frequency of occurrence and duration of an explosive gas atmosphere as follows:

A) Division 1, consisting of Class I locations in which explosive gas atmospheres are likely to be present continuously, intermittently, or periodically during normal operation; and

B) Division 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.

ii) The location is adjacent to a Class I, Division 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.

Class I locations for Zone system can be divided into:

Zone 0 — A location in which explosive gas atmospheres are present continuously or are present for long periods.

Zone 1 — A location in which:

A) Explosive gas atmospheres are likely to occur in normal operation; or

B) The location is adjacent to a Zone 0 location, from which explosive gas atmospheres could be communicated.

Zone 2 — A location in which:

A) 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

B) The location is adjacent to a 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.

Class II location

Class II location is a location that is hazardous because of the presence of combustible orelectrically conductive combustible dusts.

Class II locations shall be further divided into two Divisions as follows:

A) Division 1, consisting of Class II locations in which

i) Combustible dust is or may be in suspension in air continuously, intermittently, or periodically under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures.

ii) The abnormal operation or failure of equipment might

a) Cause explosive or ignitable mixtures to be produced; and

b) Provide a source of ignition through simultaneous failure of electrical equipment, operation of protection devices, or from other causes; or

iii) Combustible dusts having the property of conducting electricity may be present.

B) Division 2, consisting of Class II locations in which:

i) Combustible dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment, but such dust would be present in quantities insufficient to

a) Interfere with the normal operation of electrical or other equipment; and

b) Produce explosive or ignitable mixtures, except for short periods of time; or

ii) Combustible dust accumulations on, in, or in the vicinity of the electrical equipment may be sufficient to interfere with the safe dissipation of heat from electrical equipment or may be ignitable by abnormal operation or failure of electrical equipment.

Class II locations for Zone system can be divided into:

Zone 20 — A location in which an explosive dust atmosphere, in the form of a cloud of dust in air, is present continuously, or for long periods, or frequently.

Zone 21 — A location in which an explosive dust atmosphere, in the form of a cloud of dust in air, is likely to occur in normal operation occasionally.

Zone 22 — A location in which an explosive dust atmosphere, in the form of a cloud of dust in air, is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

Class III location

Class III location is a location that is hazardous because of the presence of easily ignitable fibres or flyings, but in which such fibres or flyings are not likely to be in suspension in air in quantities sufficient to produce ignitable mixtures.

Class III locations shall be further divided into two Divisions as follows:

A) Division 1, consisting of Class III locations in which readily ignitable fibres or materials producing combustible flyings are handled, manufactured, or used; and

B) Division 2, consisting of Class III locations in which readily ignitable fibres other than those in process of manufacture are stored or handled.