Annex J18
Hazardous locations classified using the Division system

Scope and introduction

J18-000 Scope (see Annex JB)

1) This Section constitutes an Annex to this Code and applies to Class I, II, and III hazardous locations in which electrical equipment and wiring are subject to the conditions outlined in this Section.
2) This Annex supplements or amends the general requirements of this Code.

J18-002 Special terminology (see Annex JB)

In this Section, the following definitions shall apply:

Cable gland — a device or combination of devices intended to provide a means of entry for a cable or flexible cord into an enclosure situated in a hazardous location and that also provides strain relief and shall be permitted to provide sealing characteristics where required, either by an integral means or when combined with a separate sealing fitting.

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

Class II location — a location that is hazardous because of the presence of combustible or electrically conductive combustible dusts.

Class III location — 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.

Degree of protection — the measures applied to the enclosures of electrical apparatus to ensure

a) the protection of persons against contact with live or moving parts inside the enclosure and protection of apparatus against the ingress of solid foreign bodies; and
b) the protection of apparatus against ingress of liquids.

Descriptive system document (see Appendix F) — a document in which the items of electrical apparatus, their electrical parameters, and those of the interconnecting wiring are specified.

Dust — generic term including both combustible dust and combustible flyings.

Combustible dust — dust particles that are 500 µm or smaller (material passing a No. 35 standard sieve as defined in ASTM E11) and present a fire or explosion hazard when dispersed and ignited in air.

Conductive dust — combustible metal dust.

Non-conductive dust — combustible dust other than combustible metal dust.

Combustible flyings — solid particles, including fibres, greater than 500 µm in nominal size that may be suspended in air and can settle out of the atmosphere under their own weight.

Explosive gas atmosphere — a mixture with air, under atmospheric conditions, of flammable substances in the form of gas or vapour that, after ignition, permits self-sustaining flame propagation.

Flammable limits — the lower and upper percentage by volume of concentration of flammable gas or vapour in air that will form an ignitable mixture.

LFL — lower flammable limit.

UFL — upper flammable limit.

Fluid — a substance in the form of gas, vapour, or liquid.

Intrinsically safe circuit — a circuit in which any spark or thermal effect produced under prescribed conditions, which include normal operation and specified fault conditions, is not capable of causing ignition of a given explosive atmosphere.

Intrinsically safe electrical system — an assembly of interconnected items of electrical equipment, described in a descriptive system document, in which the circuits or parts of circuits intended to be used in a hazardous location are intrinsically safe.

Non-incendive field wiring circuit — a circuit, described in a descriptive system document, in which any spark or thermal effect that may occur under normal operating conditions or due to opening, shorting, or grounding of field wiring is not capable of causing an ignition of the prescribed flammable gas or vapour.

Normal operation — the situation in which the plant or equipment is operating within its design parameters.

Protective gas — the gas used to maintain pressurization or to dilute a flammable gas or vapour.

Δ **Seals** —

Δ **Explosion seal** — a seal that
a) when installed at a cable or conduit entry to an explosion-proof, flameproof “d”, or flameproof “db”enclosure, prevents the ignition of an explosive gas atmosphere outside the enclosure;
b) when installed in a conduit, prevents the passage of an explosion from one portion of the conduit system to another; and
c) minimizes the passage of flammable fluids at atmospheric pressure.

Δ **Flammable fluid migration seal** — a cable or conduit seal intended to minimize the transmission of flammable fluids at or near atmospheric pressure.

Δ **Process seal** — a method of sealing electrical equipment in contact with flammable process fluids, consisting of one or more seals intended to prevent migration of those fluids.

Δ **Primary process seal** — a seal that is directly in contact with process fluids under conditions of normal use.

Δ **Secondary process seal** — a seal that comes into contact with process fluids only in the case of a primary process seal failure.

Δ **Single process seal equipment** — equipment that incorporates, along any single potential leakage path, a single sealing structure such that a failure of the seal would result in the migration of the process fluid from the designed containment into the wiring system.

Δ **Dual process seal equipment** — equipment that incorporates, along any single potential leakage path, a primary process seal and one or more secondary process seals such that it would require the failure of two or more independent process seals to allow migration of process fluids from their designed containment into the wiring system.

Type of protection — a defined method to reduce the risk of ignition of explosive gas atmospheres.

J18-004 Division of Class I locations (see Annex JB and Appendix L)

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; or
   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.

J18-006 Division of Class II locations (see Annex JB and Appendix L)

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; and
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.

J18-008 Division of Class III locations (see Annex JB and Appendix L)

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.

J18-010 Maintenance (see Annex JB)

Special precautions shall be observed as follows:

a) unauthorized repairs or alterations shall not be made to live equipment; and
b) electrical equipment shall be maintained in its original safe condition.

General

J18-050 Electrical equipment (see Annex JB)

1) Where electrical equipment is required by this Section to be marked for the class of location, it shall also be marked for use with the specific material that will be present.

2) For Class I, Division 1 or 2 equipment, the specific gas shall be permitted to be marked in accordance with one or more of the following atmospheric group designations:
   a) Group A, consisting of atmospheres containing acetylene;
   b) Group B, consisting of atmospheres containing butadiene, ethylene oxide, hydrogen (or gases or vapours equivalent in hazard to hydrogen, such as manufactured gas), or propylene oxide;
   c) Group C, consisting of atmospheres containing acetaldehyde, cyclopropane, diethyl ether, ethylene, hydrogen sulphide, or unsymmetrical dimethyl hydrazine (UDMH), or other gases or vapours of equivalent hazard; or
   d) Group D, consisting of atmospheres containing acetone, acrylonitrile, alcohol, ammonia, benzine, benzol, butane, ethylene dichloride, gasoline, hexane, isoprene, lacquer solvent vapours, naphtha, natural gas, propane, propylene, styrene, vinyl acetate, vinyl chloride, xylenes, or other gases or vapours of equivalent hazard.
3) Notwithstanding Subrule 2) b), where the atmosphere contains
   a) butadiene, Group D equipment shall be permitted to be used if such equipment is isolated in accordance with Rule J18-108 1) by sealing all conduit 16 trade size or larger; or
   b) ethylene oxide or propylene oxide, Group C equipment shall be permitted to be used if such equipment is isolated in accordance with Rule J18-108 1) by sealing all conduit 16 trade size or larger.
4) For equipment marked for Class II locations, markings for the specific dust shall be permitted to be indicated by one or more of the following atmospheric group designations:
   a) Group E, consisting of atmospheres containing combustible metal dust, including aluminum, magnesium, and their commercial alloys, and other metals of similarly hazardous characteristics;
   b) Group F, consisting of atmospheres containing carbon black, coal, or coke dust; or
   c) Group G, consisting of atmospheres containing flour, starch, or grain dust, and other dusts of similarly hazardous characteristics.
Δ 5) Where equipment is marked for use in Zone locations but will be used in locations classified according to the Class/Division system as permitted by Table 18, the applicable Group of the Zone system shall correspond to the equivalent Group within the Class/Division system as specified in Table 18A.

J18-052 Marking (see Annex JB)

Electrical equipment installed in Class I, II, or III hazardous locations shall have markings that are suitable for the Class and Division in which the equipment is installed.

J18-054 Temperature (see Annex JB)

1) In Class I locations, the maximum surface temperature rating marked on equipment shall not exceed the minimum ignition temperature determined for the hazardous location in which the equipment is installed.
2) In Class II locations, the maximum surface temperature rating marked on equipment shall not exceed the lower of the dust cloud or dust layer ignition temperature determined for the hazardous location in which the equipment is installed.
3) In Class II locations, for organic dusts that may dehydrate or carbonize, the maximum surface temperature rating marked on equipment shall not exceed the lower of 165 °C or the dust layer or dust cloud ignition temperature determined for the hazardous location in which the equipment is installed.
4) In Class III locations, the maximum surface temperature rating marked on equipment shall not exceed 165 °C for equipment that is not subject to overloading and 120 °C for equipment (such as motors or power transformers) that may be overloaded.