Equipment for Use in and Relating to Class I, II and III, Division 1 and 2 Hazardous Locations

GENERAL

Electrical equipment for use in and relating to Class I, II and III, Division 1 and 2 hazardous (classified) locations has been investigated with reference to risk to life and property and for conformity to the installation and use provisions of NFPA 70, "National Electrical Code" (NEC), or the United States Coast Guard (USCG) Electrical Engineering Regulations including 46CFR110, "General Provisions," 46CFR111, "Electric Systems - General Requirements," 46CFR112, "Emergency Lighting and Power Systems," and 46CFR113, "Communication and Alarm Systems and Equipment." Those products investigated for conformity to the installation and use provisions of the USCG Regulations are identified in the general Guide Information for each product category or the individual certifications for the product. Attention is called to the limitations of the individual certifications specified in the general Guide Information for each product category, such as current, voltage, horsepower limits, markings, special descriptions and installation provisions.

Unless equipment is identified in 1) the product category title as relating to hazardous (classified) locations or 2) the individual certifications as apparatus for use in unclassified locations, all product categories contain electrical equipment for use in Class I, II and III hazardous (classified) locations.

Regarding electrical equipment for use in and relating to Zone classified locations, some general technical information is provided together with the specific technical information provided regarding Division classified locations. For additional specific technical information regarding Zone classified locations, see Equipment for Use in and Relating to Zone Classified Hazardous Locations (AANZ).

Electrical equipment for use in and relating to hazardous (classified) locations must also comply with the applicable requirements for the same type of equipment for use in unclassified locations. For additional information, see Electrical Equipment for Use in Ordinary Locations (AALZ).

AREA CLASSIFICATION OVERVIEW

Hazardous (classified) locations, as defined in the NEC, are locations where fire or explosion hazards may exist due to the presence of flammable gases, flammable-liquid-produced vapors, combustible-liquid-produced vapors (Class I), combustible dusts (Class II), combustible fibers/flyings, or ignitible fibers or flyings (Class III). Locations where metal combustible fibers/flyings are present shall be classified as Class II, Division 1, Group E.

There are two independent classification systems as described in the NEC. One system, found in Article 500 of the NEC, divides all hazardous (classified) locations into Classes, Divisions and Groups as applicable

- Class I, Division 1 is a location where ignitible concentrations of flammable gases, flammable liquid–produced vapors or combustible liquid–produced vapors can exist under normal operating conditions.

- Class I, Division 2 is a location where ignitible concentrations of flammable gases, flammable liquid–produced vapors or combustible liquid–produced vapors are not likely to exist under normal operating conditions.

- Class II, Division 1 is a location where ignitible concentrations of combustible dust are present under normal operating conditions

Note: Locations where metal combustible fibers/flyings are present shall be classified as Class II, Division 1, Group E.

- Class II, Division 2 is a location where ignitible concentrations of combustible dust are not present under normal operating conditions.

- Class III, Division 1 is a location where explosible mixtures of nonmetal combustible fibers/flyings are present under normal operating conditions, or where ignitible fibers/flyings are handled, manufactured, or used.

- Class III, Division 2 is a location where explosible mixtures of nonmetal combustible fibers/flyings are not present under normal operating conditions, or where ignitible fibers/flyings are stored or handled, other than in the process of manufacture

The other classification system, found in Articles 505 and 506 of the NEC. Article 505 divides locations having flammable gases, flammable-liquid-produced vapors, and combustible-liquid-produced vapors into Zones and Gas Groups.

- Zone 0 is a location where ignitible concentrations are present continuously or for long period of time under normal operating conditions.

- Zone 1 is a location where ignitible concentrations are likely to exist under normal operating conditions.

- Zone 2 is a location where ignitible concentrations are not likely to exist under normal operating conditions.

Article 506 divides locations having combustible dusts, combustible fibers/flyings or ignitible fibers or flyings into Zones and Groups.

- Zone 20 is a location where ignitible concentrations are present continuously or for long periods of time under normal operating conditions.

- Zone 21 is a location where ignitible concentrations are likely to exist occasionally under normal operating conditions.

- Zone 22 is a location where ignitible concentrations are not likely to occur under normal operating conditions.

Protection against explosion in hazardous (classified) locations requires that all equipment that could be exposed to the explosive atmospheres be of a type suitable for installation in such locations. The Classes, Divisions and Groups or Zones and Groups for which equipment has been certified are shown in the individual certifications under the respective categories and are marked on the equipment itself. In addition, intrinsically safe circuit-wiring terminals and intrinsically safe equipment is marked "Intrinsically Safe."

GAS, VAPOR AND DUST GROUPS

The following paragraphs group ignitible mixtures of specific gases, vapors, and dusts in accordance with the NEC classifications noted in Article 500. For a complete list of group classifications for Class I and II materials where used within Divisions 1 or 2, see

- NFPA 497, "Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas," and

- NFPA 499, "Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas."

Class I Equipment

Equipment for use in Class I hazardous (classified) locations, as defined in Article 500 of the NEC, is investigated with respect to acceptability of operation in the presence of ignitible mixtures of specific gases and vapors in air. For purposes of location classification for Divisions 1 and 2, such mixtures have been grouped on the basis of their characteristics as follows:

- **Group A** — Atmospheres containing acetylene.

- **Group B** — Atmospheres containing flammable gas, flammable-liquid-produced vapor, or combustible-liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.45 mm or a minimum igniting current ratio (MIC ratio) less than or equal to 0.40. A typical Class I, Group B material is hydrogen.

- **Group C** — Atmospheres containing flammable gas, flammable-liquid-produced vapor, or combustible-liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.45 mm and less than or equal to 0.75 mm, or a minimum igniting current ratio (MIC ratio) greater than 0.40 and less than or equal to 0.80. A typical Class I, Group C material is ethylene.

- **Group D** — Atmospheres containing flammable gas, flammable-liquid-produced vapor, or combustible-liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm or a minimum igniting current ratio (MIC ratio) greater than 0.80. A typical Class I, Group D material is propane.

Equipment for use in Class I, Zone 0, 1 and 2 hazardous (classified) locations, as defined in Article 505 of the NEC, is investigated with respect to acceptability of operation in the presence of ignitible mixtures of specific gases and vapors with air. For purposes of location classification, such mixtures have been grouped on the basis of their characteristics as follows:

- **Group IIC** — Atmospheres containing acetylene, hydrogen, or flammable gas, flammable-liquid-produced vapor, or combustible-liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.50 mm or minimum igniting current ratio (MIC ratio) less than or equal to 0.45. Group IIC is equivalent to a combination of Class I, Group A and Class I, Group B.

- **Group IIB** — Atmospheres containing acetaldehyde, ethylene, or flammable gas, flammable-liquid-produced vapor, or combustible-liquid-produced vapor mixed with air that may burn or explode, having either maximum experimental safe gap (MESG) values greater than 0.50 mm and less than or equal to 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.45 and less than or equal to 0.80. Group IIB is equivalent to Class I, Group C.

- **Group IIA** — Atmospheres containing acetone, ammonia, ethyl alcohol, gasoline, methane, propane, or flammable gas, flammable-liquid-produced vapor, or combustible-liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.80. Group IIA is equivalent to Class I, Group D.

The following table compares Class I, Division 1 and 2 Gas Groups with Zone 0, 1 and 2 Gas Groups. The gases shown are representative of others in the Group.

Class I, Division 1 and 2	Zone 0, 1 and 2
A (Acetylene)	IIC (Acetylene and Hydrogen)
B (Hydrogen)	IIB + H2 (Hydrogen)
C (Ethylene)	IIB (Ethylene)

D (Propane)	IIA (Propane)

Class I Equipment in Class II and III Locations

Equipment certified for use in Class I locations is not necessarily acceptable for Class II or III locations as it may not be dust-tight or operate at a safe temperature when blanketed with dust.

Class II Equipment

Equipment for use in Class II, Division 1 and 2 hazardous (classified) locations, as defined in Article 500 of the NEC, is investigated with respect to acceptability of operation in the presence of ignitible mixures of specific in air. For purposes of location classification, the NEC groups combustible dust in air mixtures as follows:

- **Group E (Division 1 only)** — Atmospheres containing combustible metal dusts, including aluminum, magnesium, and their commercial alloys, or other combustible dusts whose particle size, abrasiveness, and conductivity present similar hazards in the use of electrical equipment.

  Note: Combustible metal fibers/flyings — Atmospheres containing combustible metal fibers/flyings such as metal flake are classified as Class II, Division 1, Group E.

- **Group F** — Atmospheres containing combustible carbonaceous dusts that have more than 8% total entrapped volatiles (see ASTM D3175, "Standard Test Method for Volatile Matter in the Analysis Sample for Coal and Coke," for coal and coke dusts), or that have been sensitized by other materials so that they present an explosion hazard. Coal, carbon black, charcoal, and coke dusts are examples of carbonaceous dusts.

- **Group G** — Atmospheres containing combustible dusts not included in Groups E or F, including flour, grain, wood, plastic, and chemicals.

Equipment for use in Zone 20, 21 and 22 hazardous (classified) locations, as defined in Article 506 of the NEC, is investigated with respect to acceptability of operation in the presence of combustible dusts, combustible fibers/flyings or ignitible fibers/flyings in air. For purposes of location classification, the NEC groups combustible dust, combustible fibers/flyings and ignitible fibers/flyings in air mixtures as follows:

- **Group IIIC** — Atmospheres containing combustible metal dust, including combustible metal fibers/flyings. Combustible dust is defined as solid particles that are 500 µm or smaller (i.e., material passing a U.S. No. 35 Standard Sieve as defined in ASTM E11-17, Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves) that can form an explosible mixture when suspended in air at standard atmospheric pressure and temperature.

- **Group IIIB** — Atmospheres containing combustible dust other than combustible metal dust.

- **Group IIIA** — Atmospheres containing combustible fibers/flyings or ignitible fibers/flyings other than metal.

Combustible fibers/flyings are defined as material where any dimension is greater than 500 µm in nominal size, which can form an explosible mixture when suspended in air at standard atmospheric pressure and temperature. These are a potential explosion hazard.

ignitible Fibers/Flyings are defined as fibers/flyings where any dimension is greater than 500 µm in nominal size, which are not likely to be in suspension in quantities to produce an explosible mixture but could produce an ignitible layer fire hazard.

Examples of easily ignitible fibers/flyings include rayon, cotton (including cotton linters and cotton waste), sisal, jute, hemp, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, and other materials of similar nature.

The following table compares Class II, Division 1 and 2 Dust Groups with Zone 20, 21 and 22 Dust Groups. The terms shown in parenthesis are representative of the materials in the Group.

Class II, Division 1 and 2	Zone 20, 21 and 22
E (Combustible metal dust — Division 1 only)	IIIC (Combustible metal dusts and fibers/flyings — Zone 20 and 21 only)
F (Combustible carbonaceous dust)	IIIB (Combustible dusts other than metal)
G (Combustible nonconductive dust)	IIIB (Combustible dusts other than metal)
(Class III)	IIIA (Combustible fibers/flyings or ignitible fibers/flyings other than metal)

Class II Equipment in Class III Locations

Equipment certified for Class II, Group G hazardous (classified) locations is also suitable for use in Class III locations, except for 1) those products marked for Division 2 only, and 2) fan-cooled-type motors where there is a very large amount of lint or combustible flyings that are likely to choke or clog the air passages of the motor.

Class III Equipment

Equipment for use in Class III hazardous (classified) locations, as defined in Article 500 of the NEC, is investigated with respect to acceptability of operation in the presence of ignitible mixtures of specific fibers/flyings. There are no Groups for nonmetal combustible fibers/flyings or for ignitible fibers/flyings for Class III.

INTRINSICALLY SAFE CIRCUITS AND APPARATUS, AND ASSOCIATED APPARATUS

Intrinsically safe circuits and apparatus may be investigated for any or all of the Classes and Groups as defined in the NEC. In an intrinsically safe circuit, the energy level available in the hazardous (classified) location under normal and abnormal conditions is sufficiently low so as not to cause ignition of the specified explosive atmospheres. It is important that intrinsically safe apparatus for locations containing metal dusts be constructed to exclude dust in order to maintain the energy limitations by minimizing the possibility of circuit faults. To maintain the low energy levels, it is necessary that the intrinsically safe and associated apparatus be installed and interconnected in accordance with Article 504 of the NEC and the instructions provided with the equipment.

Associated apparatus is apparatus in which the circuits are not necessarily intrinsically safe, but which affect the energy in the intrinsically safe circuits and are relied upon to maintain intrinsic safety. Associated apparatus is not intended for use in hazardous (classified) locations unless use in hazardous (classified) locations is specifically indicated.

When interconnecting associated apparatus with equipment for use in the hazardous (classified) location, special attention should be paid to installation instructions, control drawings, or product markings which may limit the types of connections that are acceptable.

ELECTRICAL EQUIPMENT RELATING TO HAZARDOUS (CLASSIFIED) LOCATIONS

Electrical equipment relating to hazardous (classified) locations is commonly referred to as associated apparatus and involves external circuit connections that are intrinsically safe or nonincendive. The equipment circuitry that supplies these external circuit connections is not necessarily intrinsically safe or nonincendive itself. This supply circuitry affects the energy in the intrinsically safe or nonincendive external circuit connections and is relied on to maintain these circuit connections as intrinsically safe or nonincendive respectively. Such equipment is one of the following:

- Electrical equipment in which the supply circuitry and external circuit connections are both explosion protected for use in their intended hazardous (classified) location.

- Electrical equipment in which the supply circuitry is not explosion protected, with only the external circuit connections explosion protected for use in their intended hazardous (classified) location.

An example of associated apparatus is an intrinsic safety or nonincendive barrier, which is a network designed to limit the energy (voltage and current) available to the protected circuit in the hazardous (classified) location, under specified conditions.

SUITABILITY OF CERTIFIED EQUIPMENT

Equipment intended for use in a hazardous (classified) location and marked "Class I, Division 1", or marked “Class I” without any Division indication, is also suitable for Class I, Division 2 locations of the same gas group and with a suitable temperature class as defined in the NEC. Equipment marked "Class I, Division 2" is suitable only for Class I, Division 2 locations.

Equipment intended for use in a hazardous (classified) location and marked “Class II, Division 1”, or marked “Class II” without any Division indication, is also suitable for Class II, Division 2 locations of the same dust atmosphere and with a suitable temperature class.

Intrinsically safe equipment marked “Class II, Division 1” with a temperature class of not greater than T120C for equipment subject to overloading or not greater than T165C for equipment not subject to overloading is suitable for Class III, Division 1 or 2 locations.

Dust-tight, hermetically sealed, Nonincendive and Sealed equipment marked “Class II, Division 2” with a temperature class of not greater than T120C for equipment subject to overloading or not greater than T165C for equipment not subject to overloading is suitable for Class III, Division 1 or 2 locations.

The NEC also permits the following:

- Intrinsically safe equipment for Class I, Division 1 locations to be used in a Zone 0, 1 or 2 location of the same gas and with a suitable temperature class.
- Equipment (other than intrinsically safe equipment) for Class I, Division 1 locations to be used in a Zone 1 or 2 location of the same gas and with a suitable temperature class.
- Equipment for Class I, Division 2 locations to be used in a Zone 2 location of the same gas and with a suitable temperature class.
- Equipment for Zone 0 locations to be used in a Class I, Division 1 or 2 location of the same gas and with a suitable temperature class.
- Equipment for Zone 1 or 2 locations to be used in a Class I, Division 2 location of the same gas and with a suitable temperature class.
- Equipment for Class II, Division 1 locations to be used in a Zone 20, 21 or 22 location of the same dust atmosphere and with a suitable temperature class.
- Equipment for Class II, Division 2 locations to be used in a Zone 22 location of the same dust atmosphere and with a suitable temperature class.
- Equipment for Zone 20 locations to be used in a Class II, Division 1 location of the same dust atmosphere and with a suitable temperature class.
- Equipment for Zone 20, 21 or 22 locations to be used in a Class II, Division 2 location of the same dust atmosphere and with a suitable temperature class.
- Equipment for Zone 20 locations with a temperature class of not greater than T120C for equipment subject to overloading or not greater than T165C for equipment not subject to overloading to be used in a Class III, Division 1 location.

- Equipment for Zone 20, 21 or 22 locations with a temperature class of not greater than T120C for equipment subject to overloading or not greater than T165C for equipment not subject to overloading to be used in a Class III, Division 2 location.

In addition, equipment for use in hazardous (classified) locations is also suitable for use in unclassified locations.

RELATED EQUIPMENT

For additional information on electrical equipment for use in and relating to Zone classified locations, see Equipment for Use in and Relating to Zone Classified Hazardous Locations (AANZ).

For additional information on electrical equipment for use in unclassified locations, see Electrical Equipment for Use in Ordinary Locations (AALZ).

TEMPERATURE CONSIDERATIONS

The marked temperature class (T-code) of the equipment is based on either the maximum external temperature or internal temperature of the equipment, depending on the protection technique used.

Equipment is required to be marked with the operating temperature or temperature class (T-code) if the maximum operating temperature is more than 100 °C (212 °F). The marking specifies the temperature class or operating temperature based on a +40 °C (+104 °F) ambient temperature or based on the higher ambient temperature if the equipment is rated and marked for an ambient temperature of greater than +40 °C (+104 °F). For equipment rated and marked for an upper ambient temperature of less than +40 °C (+104 °F), the operating temperature or temperature class is still based on +40 °C (+104 °F).

For Class I and II locations, this temperature marking should not exceed the ignition temperature of the specific combustible material to be encountered. For organic dusts that may dehydrate or carbonize, the temperature marking should not exceed the lower of either the ignition temperature or 165 °C.

For Class III locations, the maximum permitted temperature is 120 °C for equipment that is subject to overloading (such as motors) and 165 °C for equipment that is not subject to overloading.

AMBIENT TEMPERATURES

Unless the equipment is marked otherwise, it has been investigated only for use under normal atmospheric conditions in an ambient temperature within the range of -25 °C (-13 °F) to +40 °C (+104 °F). Electrical equipment that is designed for use in a range of ambient temperatures other than -25 °C (-13 °F) and +40 °C (+104 °F) may be investigated and marked on the equipment, including either the symbol “Ta” or “Tamb” together with the range of ambient temperatures. Equipment may be marked for a lower ambient temperature that is greater than -25 °C (-13 °F). Equipment may also be investigated and marked for an upper ambient temperature that is less than +40 °C (+104 °F). While equipment may be investigated and marked for an upper ambient temperature that is less than +40 °C (+104 °F), the operating temperature or temperature class is still based on +40 °C (+104 °F).

Use of equipment under conditions of higher than normal atmospheric pressure or oxygen partial pressure, use in artificial atmospheres, and use under conditions of excessively high ambient temperatures can increase the likelihood of ignition of flammable atmospheres. In addition, low ambient temperatures may increase explosion pressures developed within explosion-proof equipment.

ENCLOSURE MODIFICATION AND MAINTENANCE

The integrity of an enclosure for all protection techniques must be maintained, but it is of particular importance for explosion-proof, dust-ignition-proof and purged/pressurized equipment.

Regarding explosion-proof, dust-ignition-proof, and purged/pressurized equipment, making holes (other than conduit openings specified in the instructions) or alterations in the enclosure during installation may compromise the ability of the enclosure to contain an explosion or to exclude the explosive atmosphere as applicable based on the protection technique. Holding bolts and threaded parts must be screwed tight. The continued acceptability of the equipment will depend upon proper maintenance.

ENVIRONMENTAL CONSIDERATIONS

Unless the equipment is marked otherwise, it is intended to be used indoors where severe corrosive conditions are not likely to be present. Equipment investigated for severe environmental conditions is marked with an enclosure Type or IP Code designation, or other designation, indicating the suitability of the equipment in different environments. See **ENCLOSURE CONSIDERATIONS FOR ALL EQUIPMENT** below for more information.

ENCLOSURE CONSIDERATIONS FOR ALL EQUIPMENT

110.11 of the NEC directs that equipment shall not be used in damp or wet locations; locations where exposed to gases, fumes, vapors, liquids, or other agents having a deteriorating effect on the equipment; or locations where exposed to excessive temperatures unless the equipment is identified for use in such environments. 300.6 of the NEC provides guidance regarding protection against corrosion. To assist Authorities Having Jurisdiction, electrical equipment certified for use in and relating to hazardous (classified) locations may be investigated for use in certain operating environments and marked with an enclosure type number or numbers. The following table summarizes the intended uses of the various enclosure types.

Provides a Degree of Protection Against the Following Environmental Conditions:	Type of Enclosure															
	1†	2†	3	3R	3S	3X	3RX	3SX	4	4X	5	6	6P	12	12K	13
Access to hazardous parts	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Falling dirt	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dripping and light splashing of noncorrosive liquids	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rain, snow and sleet[a]	—	—	X	X	X	X	X	X	X	X	—	X	X	—	—	—
Rain, snow and sleet[b]	—	—	—	—	X	—	—	X	—	—	—	—	—	—	—	—
Circulating dust, lint, fibers and flyings[c]	—	—	X	—	X	X	—	X	X	X	—	X	X	X	X	X
Settling airborne dust, lint, fibers and flyings[c]	—	—	X	—	X	X	—	X	X	X	X	X	X	X	X	X
Windblown dust	—	—	X	—	X	X	—	X	X	X	—	X	X	—	—	—
Hosedown and splashing water	—	—	—	—	—	—	—	—	X	X	—	X	X	—	—	—
Oil and coolant seepage	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X
Oil or coolant spraying and splashing	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X
Corrosive agents	—	—	—	—	—	X	X	X	—	X	—	—	X	—	—	—
Occasional temporary submersion	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—
Occasional prolonged submersion	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	—

† Types 1 and 2 enclosures may be ventilated.

[a] External operating mechanisms are not required to be operable when the enclosure is ice covered.

[b] External operating mechanisms are operable when the enclosure is ice covered.

[c] These fibers and flyings are nonhazardous materials and are not considered Class III ignitible fibers or combustible flyings

Enclosures for indoor locations include Types 1, 2, 5, 7, 9, 12, 12K and 13; enclosures for indoor or outdoor locations include Types 3, 3X, 3R, 3RX, 3S, 3SX, 4, 4X, 6 and 6P.

Note 1: A Type 7 enclosure is an explosionproof enclosure demonstrating compliance with the requirements of UL 1203, "Explosion Proof and Dust-Ignition Proof Electrical Equipment for Use in Hazardous (Classified) Locations" for use in areas classified as Class I, Division 1, Groups A, B, C or D as defined in the NEC.

Note 2: A Type 9 enclosure is a dust-ignition-proof enclosure demonstrating compliance with the requirements of UL 1203, "Explosion Proof and Dust-Ignition Proof Electrical Equipment for Use in Hazardous (Classified) Locations" for use in areas classified as Class II, Division 1, Groups E, F or G as defined in the NEC.

A Type 3, 3X, 3S, 3SX, 4, 4X, 6, or 6P enclosure may be marked "Raintight". For equipment designated as "Raintight", such exposure will not result in entrance of water. A Type 3R or 3RX enclosure may be marked "Rainproof". For equipment designated as "Rainproof", such exposure will not interfere with the operation of the apparatus or result in wetting of live parts and wiring within the enclosure.

A Type 4, 4X, 6, or 6P enclosure may be marked "Watertight". A Type 4X or 6P enclosure may be marked "Corrosion Resistant". A Type 2, 5, 12, 12K, or 13 enclosures may be marked "Driptight". A Type 3, 3X, 3S, 3SX, 5, 12, 12K, or 13 enclosures may be marked "Dusttight".

Additionally or alternatively, IEC 60529, "Degrees of Protection Provided by Enclosures (IP Code)," describes a system for classifying the degrees of ingress protection (or IP Code) provided by the enclosures of electrical equipment as follows:

First Characteristic Numeral†	• Degrees of Protection Against Ingress of Solid Foreign Objects • Degrees of Protection Against Access to Hazardous Parts	Second Characteristic Numeral†	Degrees of Protection Against Ingress of Water Harmful Effects
IP0X	• Nonprotected • Nonprotected	IPX0	Nonprotected
IP1X	• 50 mm diameter and greater • Back of hand	IPX1	Vertically dripping water drops
IP2X	• 12.5 mm diameter and greater • Finger	IPX2	Vertically falling water drops (15 degrees tilted)
IP3X	• 2.5 mm diameter and greater • Tool	IPX3	Spraying water
IP4X	• 1.0 mm diameter and greater • Wire	IPX4	Splashing water
IP5X	• Dust-protected • Wire	IPX5	water jets
IP6X	• Dust-tight • Wire	IPX6	Powerful water jets
		IPX7	Temporary immersion in water
		IPX8	Continuous immersion in water

		IPX9	High pressure and temperature water jets
† Where a characteristic numeral is not required to be specified, it shall be replaced by the letter “X”.			

FITTINGS AT SUPPLY ENTRIES

Consideration should be given to the Type or IP rating of fittings used at supply entries. When the manufacturer supplies a fitting with the enclosure, enclosures are to be connected to the wiring system using the fitting provided. If no fitting is provided by the manufacturer, the fitting employed must meet or exceed the Type or IP rating of the enclosure, so that the assembly maintains its protection against contaminants.

CABLE AND CONDUIT SEALS

Equipment with a factory-installed conduit seal is marked "Leads factory sealed," or equivalent wording. The absence of this marking indicates that the need for a field-installed seal in accordance with 501.15 or 502.15 of the NEC should be determined.

PROCESS SEALS

Process-connected electrical equipment provided with seals to prevent the migration of process fluids into the electrical system are either the single-seal or dual-seal types. The construction, testing and marking requirements for process seals are found in UL 122701, "Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids."

SECONDARY BATTERIES WITHIN EXPLOSIONPROOF ENCLOSURES

Secondary (i.e. storage) batteries can evolve hydrogen gas during charging. An explosionproof enclosure containing such batteries, that is not tightly closed and gasketed (or similarly sealed), is sufficient for the dissipation of the hydrogen gas. Venting by means of drain and breather fittings suitable for the same Class and Group ratings of the enclosure and located higher than the battery in every configuration in which the equipment can be mounted is one means to dissipate the hydrogen gas.

If the concentration of hydrogen gas is greater than 4% under charging conditions, the enclosure will need to be explosionproof for Group B or specifically for hydrogen gas. Equipment not otherwise required to be marked as such, shall be permanently marked where readily visible during and after installation with the word "WARNING" and the following or the equivalent wording: "To reduce the risk of ignition of hazardous atmospheres, all entries must have a sealing fitting connected within 18 inches of the enclosure."

PROTECTION OF EQUIPMENT AND TRANSMISSION SYSTEMS USING OPTICAL RADIATION

Equipment and transmission systems that use optical radiation and are intended for use in hazardous (classified) locations may pose a risk of ignition. This includes equipment and systems, which themselves are located outside the hazardous (classified) locations, but their emitted optical radiation enters such locations.

For Class I or II, Division 2 or Class III laser equipment, optical fibre equipment and any other convergent light sources or beams where light is focused in one single point within the hazardous area,

- when incorporating a laser light source or other optical radiation source, the requirements that may be applied are found in UL 60079-28, "Explosive Atmospheres - Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation."

For Class I or II, Division 1 laser equipment, optical fibre equipment and any other convergent light sources or beams where light is focused in one single point within the hazardous area,

- when incorporating a laser light source, the laser light source complies with UL 60079-28; and
- when incorporating other optical radiation sources, the construction, testing and marking requirements that may be applied for such equipment and systems are found in UL 60079-28.

EQUIPMENT PROTECTION BY 2-WIRE INTRINSICALLY SAFE ETHERNET CONCEPT (2-WISE)

2-Wire Intrinsically Safe Ethernet concept (2-WISE) is a concept for an advanced physical layer (APL), designed to simplify the examination process for intrinsic safety parameters of components and cabling within APL segments. This is achieved by defining universal intrinsic safety parameter limits for APL ports, according to the specific hazardous area requirements and listing a concise set of rules for the segment setup.

UL 60079-47, Explosive atmospheres – Part 47: Equipment protection by 2-wire intrinsically safe Ethernet concept (2-WISE), specifies requirements for the construction, marking and documenting of apparatus, systems and installations for use with 2-WISE devices, such as the physical layer specification for 2-Wire Ethernet 10BASE-T1L as defined in IEEE 802.3CG. Additional requirements for construction and installation of 2-WISE devices and systems are included in UL 913, and in the NEC.

Parts of a 2-WISE device can be protected by any Type of Protection detailed in the **REQUIREMENTS** table below, as applicable for the intended hazardous location. In these circumstances, the requirements of UL 60079-47 apply only to intrinsically safe circuits of the apparatus.

SPECIAL PROTECTION TECHNIQUES

Types of protection that permit the design, assessment, and testing of equipment that cannot be fully assessed within recognized types of protection or combination of recognized types of protection because of functional or operational limitations, but that can be demonstrated to provide the necessary equipment protection for the involved location classification in accordance with the **REQUIREMENTS** table below.

FIELD WIRING METHODS

Field wiring methods permitted by the NEC for hazardous (classified) locations are, in general, more restrictive than those permitted for unclassified locations. Extra-hard-usage flexible cord is only permitted for connection of portable luminaires and other types of portable utilization equipment and the fixed portion of their supply circuit, or in other situations where flexibility is necessary for the installation as determined by the Authority Having Jurisdiction.

INSTRUCTIONS AND PRODUCT MARKINGS

These products are intended to be installed in accordance with the installation instructions provided with the product. It is critical that the cautionary statements and installation and operating instructions on the product and in accompanying literature be followed. The marking of Division 1 is optional for equipment suitable for Divisions 1 and 2 classified areas.

REQUIREMENTS

The basic hazardous (classified) locations standards used to investigate these products address the risk of explosion associated with installation in a hazardous (classified) location, as well as the risk of fire and electric shock associated with any electrical equipment. Unless indicated otherwise in the Guide Information for the product category, the basic hazardous (classified) locations standards used to investigate these products with respect to risk of explosion are referenced below for the protection techniques shown.

Note: The standard edition and any revision date, if applicable, of the basic hazardous (classified) locations standards used to investigate products in this category is recorded in the Report and not in the Guide Information or individual certifications.

Location Classification	Standard	Protection Technique
Class I, Division 1	UL 1203, "Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations"	Explosion-proof
	UL 913, "Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II and III, Division 1, Hazardous (Classified) Locations"	Intrinsic safety

	NFPA 496, "Purged and Pressurized Enclosures for Electrical Equipment"	Purged and pressurized (Type X or Y)
	UL 60079-28, "Explosive Atmospheres - Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation"	Inherently safe Optical system with interlock
	UL 60079-33, "Explosive Atmospheres - Part 33: Equipment Protection by Special Protection "s" "	Special protection
Class I, Division 2	UL 121201, "Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations"	Enclosed-break Hermetically sealed Nonincendive Nonsparking Oil immersed Sealed
	NFPA 496, "Purged and Pressurized Enclosures for Electrical Equipment"	Purged and pressurized (Type Z)
	UL 60079-28, "Explosive Atmospheres - Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation"	Inherently safe Protected Optical system with interlock
	UL 60079-33, "Explosive Atmospheres - Part 33: Equipment Protection by Special Protection "s" "	Special protection
Class II, Division 1	UL 1203, "Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations"	Dust-ignition-proof
	UL 913, "Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II and III, Division 1, Hazardous (Classified) Locations"	Intrinsic safety
	NFPA 496, "Purged and Pressurized Enclosures for Electrical Equipment"	Pressurized (Type X or Y)
	UL 60079-28, "Explosive Atmospheres - Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation"	Inherently safe Optical system with interlock
	UL 60079-33, "Explosive Atmospheres - Part 33: Equipment Protection by Special Protection "s" "	Special protection
Class II, Division 2	UL 121201, "Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations"	Dust-tight Hermetically sealed Nonincendive Sealed
	NFPA 496, "Purged and Pressurized Enclosures for Electrical Equipment"	Pressurized (Type Z)
	UL 60079-28, "Explosive Atmospheres - Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation"	Inherently safe Protected Optical system with interlock

	UL 60079-33, “Explosive Atmospheres - Part 33: Equipment Protection by Special Protection “s” “	Special protection
Class III, Division 1 Class III, Division 2	UL 913, "Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II and III, Division 1, Hazardous (Classified) Locations"	Intrinsic safety
	UL 121201, "Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations"	Dust-tight Hermetically sealed Nonincendive Sealed
	UL 60079-33, “Explosive Atmospheres - Part 33: Equipment Protection by Special Protection “s” “	Special protection
Note: ISA 12.12.01, "Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations," is also an option for UL Class I and II, Division 2 and Class III, Division 1 and 2 certifications.		

In addition to the protection techniques detailed in the **REQUIREMENTS** table above for Division classified areas, protection techniques for Zone classified areas are also permitted. The criteria for this permission is detailed under **SUITABILITY OF CERTIFIED EQUIPMENT** above. Equipment that is certified solely to protection techniques for Zone classified areas is covered under the applicable category for Zone classified areas. However, equipment that is certified to a combination of protection techniques for Division and Zone classified areas may be covered under the applicable category for Division classified areas or the applicable category for Zone classified areas, or both.

Further, unless otherwise specified in the general Guide Information for each product category, the basic unclassified locations standard used to investigate these products with respect to risk of fire, electric shock and injury to persons is from the following list, with the applicable standard for low-voltage applications, based on the determination made by the manufacturer:

For low-voltage applications:

- Part I of UL 508, "Industrial Control Equipment"
- UL 60065, "Audio, Video and Similar Electronic Apparatus - Safety Requirements"
- UL 60730-1, "Automatic Electrical Controls - Part 1: General Requirements"
- UL 60950-1, "Information Technology Equipment - Safety - Part 1: General Requirements"
- UL 61010-1, "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements"
- UL 62368-1, "Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements"

For medium-voltage applications:

- UL 347, "Medium-Voltage AC Contactors, Controllers, and Control Centers"

TECHNOLOGY THAT PROVIDES LOCATION INFORMATION

The performance or reliability of any technology that provides location information functionality of equipment covered under this category has not been investigated. Examples of such technology include global positioning systems (GPS), enhanced 911 (E911) hardware, digital pinging, cellular triangulation, and passive radar reflection. This technology has only been investigated for the explosion, fire, shock and casualty hazards required by the applicable safety standards. UL certification does not cover the performance or reliability of any technology that provides location information functionality. **UL makes no claims, representations or warranties whatsoever regarding the performance or reliability of any technology that provides location information functionality of equipment covered under this category.**

OPEN-TYPE EQUIPMENT

Unless indicated otherwise in the Guide Information for the applicable hazardous (classified) locations product category, and where permitted for comparable unclassified locations products, open-type hazardous (classified) locations equipment is permitted when it is intended for installation within a suitable enclosure. Examples of installation issues to consider when determining the suitability of the equipment enclosure include, but are not limited to, the following as applicable: 1) the involved area classification, 2) protection against any specific environmental conditions, 3) thread engagement, and 4) whether a tool is required for opening of the enclosure. Installation requirements relating to the suitability of the enclosure are specified in the instructions or markings for the open-type equipment.

MARINE EQUIPMENT

Certain equipment has been specifically investigated and certified for use aboard marine vessels. Such equipment has been investigated in accordance with the applicable requirements of UL, the United States Coast Guard (USCG), the American Boat and Yacht Council, Inc. (ABYC), and the National Fire Protection Association (NFPA). For additional information, see the general Guide Information for the specific product category. Equipment bearing UL's Marine Mark is suitable for use only with stranded copper wire.

FIELD-MODIFIED OR REBUILT EQUIPMENT

An authorized use of the UL Mark is the manufacturer's declaration that a product was manufactured in accordance with the applicable certification requirements, and was in compliance with those requirements when the UL Mark was applied. When a product bearing a UL Mark is modified or rebuilt (including being refurbished, remanufactured, reconditioned or renovated) after the UL Mark was applied, UL does not know if the product continues to meet the applicable requirements unless the modification or rebuilding has been specifically investigated by UL. The only exceptions to this are:

- when a UL-certified product has specific markings for field-installed equipment or the replacement of components;
- when a UL-certified product has been provided with remote software updates investigated by UL; or
- when the individual product is addressed through one of the specific programs and is marked as noted below.

Evidence that UL has specifically investigated the modification or rebuilding can only be demonstrated by a product that bears the UL Mark or label of one of UL's programs for modified or rebuilt equipment, which include:

- **UL Rebuilt Product Certifications —** UL's rebuilt product certifications cover a wide range of product types. The general Guide Information for each product category with a rebuilt certification program identifies the applicable requirements and the specific marking for products rebuilt under the program. Only rebuilt products that bear the UL Mark together with the product identity including the word "Rebuilt," "Refurbished," "Remanufactured," "Reconditioned" or "Renovated" have been investigated by UL to the applicable certification requirements.

- **UL Retrofit Certifications —** UL's retrofit certifications include an investigation of all required component parts, including instructions, for retrofitting specific types of certified products in the field. Products investigated under this program bear a UL Mark together with the product identity including the word "Retrofit."

- **UL Field Evaluated Products —** For products identified by the Authority Having Jurisdiction, owner, or other regulatory body as being acceptable to evaluate after installation or otherwise outside of the manufacturer's location, UL's Field Evaluation program addresses investigation to applicable product requirements based on the specific application and use location for the particular equipment. The specific equipment investigated under this program bears the UL Field Evaluation label.

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