

HAZARDOUS (CLASSIFIED) LOCATIONS

Hazardous locations are those locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings. Although flammable gases and vapors, and combustible dusts, exist almost everywhere, they are usually present only in minute quantities, much less than necessary for a fire or explosion hazard to exist. Thus, the presence of a flammable gas or vapor, or combustible dust, does not in itself define a hazardous location. These materials must be present in sufficient quantities (concentrations) to present a potential explosion hazard. Locations where there is an explosion hazard because of the presence of high explosives, such as blasting agents and munitions, are not classified as hazardous locations. There are standards covering the handling and use of such materials, and some of these require electrical equipment suitable for use in hazardous locations. This is because such equipment provides a greater degree of safety than ordinary location or general-purpose equipment, not because such equipment has been tested for use in the presence of high explosives. In a like manner, locations made hazardous because of the presence of pyrophoric materials, such as some phosphorous compounds and finely divided metal powders are not classified as hazardous locations. Pyrophoric is defined in the dictionary as "igniting spontaneously" or "emitting sparks when scratched or struck, especially with steel". Where pyrophoric material or high explosives are present, precautions beyond those in the electrical codes are necessary.

HAZARDOUS (CLASSIFIED) LOCATIONS

CLASS I LOCATIONS

Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. The term "gases or vapors" is used because of common usage in the English language. The term "gases" is commonly used to refer to materials that are in a gaseous state under normal atmospheric conditions, such as hydrogen and methane. The term "vapors" refers to the gases over a material that is a liquid under normal atmospheric conditions (such as gasoline) but which emits gases within the flammable range under these same atmospheric conditions.

CLASS I, DIVISIONS 1 AND 2 GROUPS A, B, C, AND D LOCATIONS

General

The subdivision of Class I into two divisions identify the likelihood or risk that an ignitable concentration of gases or vapors will be in the location. Division 1 identifies locations where the risk is high or medium. Division 2 identifies locations where there is a small but still finite risk. If the risk is extremely low, the location is not considered a hazardous location. A single family home typifies such a location with natural gas or propane as the energy source for heating. The gas could, and on extremely rare occasions does leak into the home, and an explosion occurs. However the risk is so low (because of the safety systems built into the gas supply and heating equipment) that such locations are not classified as a hazardous location.

Division 1

Class I, Division 1 locations are those where the explosion hazard exists under normal operating conditions. The area may be hazardous all or most of the time, or it may only be hazardous some of the time. Division 1 also includes locations where breakdown or faulty operation of electrical equipment or processes might release ignitable concentrations of flammable gases or vapors, and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition. An example of such a location might be an area where a flammable liquid is stored under cryogenic conditions, and a leak of the extremely low temperature liquid directly onto electrical equipment could cause failure of the electrical equipment at the same time the vapors of the evaporating liquid are within the flammable range.

Division 2

Class I, Division 2 locations are those where ignitable concentrations of flammable gases or vapors are not normally present, but could be present in the event of a fault, such as a leak at a valve in a pipeline carrying flammable liquids. Division 2 locations also often exist around Division 1 locations where there is no barrier or partition to separate the Division 1 space from a non-hazardous location, or where ventilation failure (an abnormal condition) might extend the area where flammables exist under normal conditions.

Electrical equipment approved for Class I, Division 1 locations is also suitable for use in Division 2 locations.

CLASS II LOCATIONS

Class II locations are those that are hazardous because of the presence of combustible dust. Note that the dust must be present in sufficient quantities for a fire or explosion hazard to exist. The fact that there is some combustible dust present does not mean a Class II hazardous location exists. To be considered a "dust" the combustible material must exist as a finely divided solid of 420 microns (0.420 mm) or less. Such a dust will pass through a No. 40 U.S. sieve.

CLASS II, DIVISIONS 1 AND 2 GROUPS E, F, AND G LOCATIONS

General

Just as in Class I, Divisions 1 and 2, the subdivision of Class II into Divisions 1 and 2 identifies the likelihood that there will be an explosion hazard.

Division 1

A Class II, Division 1 location is one where combustible dust is normally in suspension in the air in sufficient quantities to produce ignitable mixtures, or where mechanical failure or abnormal operation of equipment or machinery might cause an explosive or ignitable dust-air mixture to be produced, and might also provide a source of ignition through simultaneous failure of electrical equipment. A Class II, Division 1 location also exists where combustible dusts of an electrically conductive nature may be present in hazardous quantities (Group E locations). The term "hazardous quantity" is intended to mean those locations where the dust may not be in suspension in the air in sufficient quantity to cause an explosion, but might have settled on electrical equipment so that the electrically conductive particles can penetrate the openings in the electrical equipment enclosure and cause an electrical failure, or where the dust can get into motor bearings and cause excessive temperatures because of bearing failure.

Division 2

A Class II, Division 2 location is one where combustible dust is not normally in the air in quantities sufficient to produce explosive or ignitable mixtures, and dust accumulations are not normally sufficient to interfere with the normal operation of electrical equipment, such as clogging ventilating openings or causing bearing failure. It includes locations where combustible dust may be in suspension in the air only as a result of infrequent malfunctioning of handling or processing equipment, and those locations where dust accumulation may be on or in the vicinity of the electrical equipment and may be sufficient to interfere with the safe dissipation of heat from the equipment, or may be ignitable by abnormal operation or failure of the electrical equipment.

Class II, Groups E, F, and G

The division into three groups in Class II locations is for the same reasons Class I locations are divided into Groups A, B, C, and D: equipment design and area classification. However, the three Class II groups are based on different characteristics than the four Class I groups because the design of dust-ignition proof equipment for Class II locations is based on different principles than the design of explosion proof equipment for Class I locations. In Class II locations the ignition temperature of the dust, the electrical conductivity of the dust, and the thermal blanketing effect the dust can have on heat-producing equipment, such as lighting fixtures and motors are the deciding factors in determining the Class II group.

Group E

Group E dusts include the metal dusts, such as aluminum and magnesium. In addition to being highly abrasive, and thus likely to cause overheating of motor bearings if the dust gets into the bearing, Group E dusts are electrically conductive. If they are allowed to enter an enclosure, they can cause electrical failure of the equipment.

Group F

The Group F dusts are carbonaceous, the primary dust in this group being coal dust. These dusts have somewhat lower ignition temperatures than the Group E dusts and a layer of a

Group F dust has a higher thermal insulating value than a layer of a Group E dust, thus requiring more careful control of the temperature on the surface of the equipment. Such dusts are semi-conductive but this is not usually a factor for equipment rated 600 volts and less.

Group G

The Group G dusts include plastic dusts, most chemical dusts, and food and grain dusts. They are not electrically conductive. These dusts, in general, have the highest thermal insulating characteristics and the lowest ignition temperatures. Thus, dust ignition proof equipment for use in Group G atmospheres must have the lowest surface temperatures to prevent ignition of a dust layer by the heat generated within the equipment. Because of the different design characteristics, equipment suitable for Class I locations is not necessarily suitable for Class II locations, and equipment suitable for Class II locations is not necessarily suitable for Class I locations. The equipment must be approved for each class and group of location involved. Much equipment suitable for Class I locations is also suitable for Class II locations, and is so marked, although when used in Class II locations there may be restrictions, such as lower maximum lamp wattage to maintain the lower surface temperature needed for equipment in dust atmospheres.

In Class II areas all products must operate at temperatures as shown below based on whether they are heat producing or subject to overloading or not, and based on the Group which they fall under. Class III products in all cases must operate below 165° C.

CLASS III LOCATIONS

Class III locations are those that are hazardous because of the presence of easily ignitable fibers or flyings, but in which the fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures. Easily ignitable fibers and flyings present a fire but not an explosion hazard. A typical example of this type of material is the cotton lint that accumulates in the lint trap of clothes dryers. Listed clothes dryers are designed so that even if the lint ignites, the fire will be contained within the dryer enclosure.

CLASS III, DIVISIONS 1 AND 2

Division 1

This is a location where the equipment producing the ignitable fibers or flyings is located (near textile mill machinery, for example) or where the material is handled (for example, where the material is stuffed into bags).

Division 2

This is a location where the easily ignitable fibers are stored or handled, except in manufacturing processes (which is Division 1).

Class III Groups

There are no groups in Class III locations.

