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Sakthi Krishnamoorthy,
Market Development Engineer,
Littelfuse, Inc.

HAZARDOUS LOCATION CIRCUIT PROTECTION

**Selection of Fuses for Class I Division II Location
Based on NEC® 2014 and CEC Section 18**

BASED ON NEC® 2014 ARTICLES 500 TO 504 & CEC SECTION 18

Introduction

Electrical and electronic equipment, during their normal operating condition, interact with the surrounding atmosphere to produce ignitable gases, vapors and dust as a result of their material composition. These ignitable materials are considered hazardous in certain locations.

Design Engineers are cautious when it comes to selecting devices that are used in such locations vulnerable to fires and explosions.

Electrical Codes and Standards do an extensive job in identifying and defining the necessary device requirements for industrial and occupational safety, and have the requirements updated constantly in their publications.

Identifying the right product that meets all necessary code requirements is critical in the selection process.

This document outlines the latest Code changes in the circuit protection devices selection procedure and provides an easy selector tool that guides in selecting the right product for various hazardous locations.

What is a Hazardous Location?

Based on the properties of flammable gases, vapors and combustible dust that are present in an installation or layout, the location can be designated as a hazardous (classified) location or an unclassified location.

Occupational Safety and Health Administration (OSHA) defines a hazardous location as “*Hazardous locations are areas where flammable liquids, gases or vapors or combustible dusts exist in sufficient quantities to produce an explosion or fire. In hazardous locations, specially designed equipment and special installation techniques must be used to protect against the explosive and flammable potential of these substances.*” [OSHA Publication 3073]

National Electrical Code (NEC) and Canadian Electrical Code (CEC) describe a hazardous location as an area where presence of flammable gases or vapors, combustible dusts or ignitable fibers may exist that can cause a potential hazard of fire or explosion etc. NEC Articles 500 to 504 and CEC Section 18 specify the requirements for electrical and electronic equipment that are used in these hazardous locations.

Eliminating or avoiding combustible materials is not always possible. A common example would be in mines where the presence of methane gas cannot be avoided. It is important to understand the requirements of the equipment used in these hazardous locations and how it interacts with its surroundings in order to properly select the right products that can be operated safely.

OSHA, NEC and CEC along with National Fire Protection Association® (NFPA®) have formulated regulations on hazardous locations and have them defined by means of a Class/Division System.



BASED ON NEC® 2014 ARTICLES 500 TO 504 & CEC SECTION 18

What is a Class/Division System?

NFPA® Publication 70, NEC Article 500.5 and CEC Articles 18-004, 006, 008 and 010 identify and designate hazardous locations by means of Class and Divisions. Class I, Class II and Class III are the three broad classifications of hazardous locations and are sub-divided into Divisions I and II. A Class I Location is further grouped into Zones 0, 1 and 2.

Class I locations exist where flammable gases and vapors are present in the atmosphere and can cause an explosion.

Class I Division I locations exist where flammable materials are present in normal operating conditions. Typical locations include fuel storage locations, gas generator rooms and cleaning and dyeing plants where flammable liquids are used.

Class I Division II locations exist where flammable materials are handled and confined within closed containers or systems. Typical locations include flammable liquid or compressed gas in sealed containers storage areas, and locations where flammable material can escape in the event of an accident.

Class II locations can be found where combustible dust material is present. Examples include flour mills, feed mills, coal preparation plants and sugar plants.

Class III locations exist where ignitable fibers are handled or manufactured. Examples include textile mills or wood cutting and processing plants.

NEC and CEC Requirements for Circuit Protection Fuses used in Hazardous Locations

NEC Article 501.115 and CEC Article 18-150 specifies the requirement that circuit protection fuses should meet when used in hazardous locations.

Class I Division I Requirements state that fuses used in this location should be placed within an enclosure that is permitted to be used in the Class I location [NEC 501.115(A), CEC 18-110]

All Littelfuse UL listed Power and Supplementary fuses and holders meet this requirement!

Class I Division II Requirements vary based on fuse type and the end application or equipment that is being protected by the fuse.

NEC Article 501.115(B)(3) and CEC Article 18-150 state that plug type fuses and cartridge fuses that are protecting motors, appliances and lamps (when applied external to the lamp) should be placed within an enclosure that is permitted to be used in a Class I Division II Location.

Other types of fuses used for protecting motors, appliances and lamps can be used if placed within a general purpose enclosure, and must satisfy any of the following criteria:

Criteria 1: Element(s) of the fuse used should be immersed in oil or other approved liquid that is permitted to be used in the location.

Criteria 2: Element(s) of the fuse used should be placed inside a hermetically sealed chamber that prevents entrance of any gases or vapors from surrounding.

Criteria 3: Fuse used should be non-indicating, filled and rated as current limiting.

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Littelfuse Circuit Protection Products for Use in Hazardous Locations

Littelfuse offers a wide range of fuses that are non-indicating, silica-sand filled and current limiting, and can be safely used in Class I Division II locations.

Littelfuse also recommends that UL Listed non-indicating fuse blocks, suitable for the fuse permitted, be used in Class I Division II locations.

Code recommends supplementary protection for fuses when used inside a luminary (lighting fixture). Littelfuse UL Class CC, G and Midget style cartridge fuses are typically used for such applications.

The table below provides a list of listed fuses and fuse blocks compliant to NEC Article 501.115 and CEC Section 18.

Table 1.
Littelfuse Recommended Products suitable to be used in Hazardous Locations

Fuse Class	Fuse Series	Ampere Range	Fuse Block
L	KLPC	200A to 6000A	Bolted directly to bus-bar
	KLLU	601A to 4000A	
	LDC	150A to 2000A	
RK1	LLNRK	1/10A to 600A	LFR25
	LLSRK	1/10A to 600A	LFR60
	KLNR	1A to 600A	LFR25
	KLSR	1A to 600A	LFR60
RK5	FLNR	1/10A to 600A	LFR25
	FLSR	1/10A to 600A	LFR60
J	JTD	1A to 600A	LFJ60
	JLS	1A to 600A	
T	JLLN	1A to 1200A	LFT30
	JLLS	1A to 1200A	LFT60
G	SLC	½A to 60A	LFG
CC	CCMR	2/10A to 30A	L60030C
	KLDR	1/10A to 30A	LEC
	KLKR	1/10A to 30A	LEY
CD	CCMR	35A to 60A	LFC60060

Class II Division I Requirements state that fuses used should be placed within an enclosure that is permitted for Class II locations. [NEC 502.115(A), CEC 18-206]

Class II Division II Requirements state that fuses used should be placed within a dust-tight enclosure that is permitted for Class II locations. [NEC 502.115(B), CEC 18-256]

Class III Requirements states that fuses used should be placed within a dust-tight enclosure. [NEC 503.115, CEC 18-304]



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Selector Tool: Littelfuse Hazardous Location Circuit Protection Product Selection Guide

HAZARDOUS (CLASSIFIED) LOCATION FUSE SELECTION GUIDE								
Hazardous Locations	Class I			Class II		Class III		
Location Details	Flammable gases and vapors are present			Combustible dust materials are present		Ignitable fibers are handled or manufactured		
Division	Div I	Div II			Div I	Div II	Div I & II	
Code Reference	NEC: 501.115(A) CEC: 18-110	NEC: 501.115(B)(3) CEC: 18-150			NEC: 502.115(A) CEC: 18-206	NEC: 502.115(B) CEC: 18-256	NEC: 503.115 CEC: 18-304	
Typical Locations	Fuse storage room, gas generator room, cleaning or dyeing plants using flammable liquids	Flammable liquid or compressed gas in sealed containers, processing area and their storage room			Grain handling plants, dust producing machinery where metals and powders are produced or processed	Machinery from which dust might escape only under abnormal conditions; rooms or areas adjacent to Class II, Division 1 locations	Textile mills, cotton-seed mills, flax processing mills, clothing manufacturing plants, woodworking plants	
Device Protected	Motor, appliance and luminaries	Motor, appliance and luminaries	Luminaries	Motor, appliance and luminaries	Motor, appliance and luminaries	Motor, appliance and luminaries	Motor, appliance and luminaries	Motor, appliance and luminaries
Enclosure Type used	Explosion proof or Flame proof enclosure	Explosion proof or Flame proof enclosure	Not Applicable	General purpose enclosure	General purpose enclosure	Dust-tight enclosure	NEMA Type 4 or 5 enclosure	NEMA Type 5 enclosure or any enclosure that prevents entrance of fibers
Permitted Fuses Category or Type per NEC and CEC	Standard Plug and Listed Cartridge type Fuses	Standard Plug and Listed Cartridge type Fuses	Listed Cartridge Fuses	Listed Cartridge Fuses that are oil immersed and in a hermetical sealed chamber*	Listed Cartridge Fuses that are non-indicating, sand-filled and current limiting	Standard Plug and Listed Cartridge type Fuses	Standard Plug and Listed Cartridge type Fuses	Standard Plug and Listed Cartridge type Fuses
Littelfuse Compliant Products	Littelfuse fuse and fuse holder series listed in Table 1 of this document.							

*** Note:** Littelfuse does not offer oil immersed or hermetically sealed fuses. NEC and CEC permits use of listed power fuses that are current limiting, non-indicating and sand filled. Littelfuse products listed in Table 1 of this document meet this requirement.

For additional questions, contact our Littelfuse Technical Support and Engineering Service Group at **1-800-TEC-FUSE** or **techline@littelfuse.com**

For additional Whitepapers, visit **www.littelfuse.com/pgwhitepapers**

For more information, visit
Littelfuse.com

Additional technical information and application data for Littelfuse protection relays, generator and engine controls, fuses and other circuit protection and safety products can be found on www.littelfuse.com. For questions, contact our Technical Support Group (800-832-3873). Specifications, descriptions and illustrative material in this literature are as accurate as known at the time of publication, but are subject to changes without notice. All data was compiled from public information available from manufacturers' manuals and datasheets.