Class I: Flammable gases, vapors or liquids

North American Protection Techniques Comparison			
		Applicable Certification Documents	
Area	**Protection Techniques**	**USA**	**Canada**
Div 1	• Intrinsic safety	UL 913	CSA 157
	• Explosionproof	UL 1203	CSA 30
	• Purged/pressurized (Type X or Y)	NFPA 496	NFPA 496
	• Class I, Zone 0 intrinsic safety, “ia”	UL 60079-11	CSA E60079-11
Div 2	• Hermetically-sealed	ISA 12.12.01 or UL 1604	CSA 213
	• Nonincendive	ISA 12.12.01 or UL 1604	CSA 213
	• Non-sparking	ISA 12.12.01 or UL 1604	CSA 213
	• Purged/pressurized (Type Z)	NFPA 496	NFPA 496
	• Any Class I, Division 1 technique	See above	See above
	• Any Class I, Zone 0, 1 or 2 technique	See USA Zone 0, 1 or 2 techniques	See Canada Zone 0, 1 or 2 techniques
Note: Class I, Division 1 intrinsically safe system requirements are contained UL 913 (USA) and CSA 157 (Canada).			

Class I, Division 1	Class I, Division 2
Intrinsically Safe Apparatus: Apparatus in which all the circuits are intrinsically safe. **Intrinsically Safe Circuit:** A circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions. **Intrinsically Safe System:** An assembly of interconnected intrinsically safe apparatus, associated apparatus, and interconnecting cables, in that those parts of the system that may be used in hazardous (classified) locations are intrinsically safe circuits. **Explosionproof Apparatus:** Apparatus enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby. **Purged and Pressurized:** The process of (1) purging, supplying an enclosure with a protective gas at a sufficient flow and positive pressure to reduce the concentration of any flammable gas or vapor initially present to an acceptable level; and (2) pressurization, supplying an enclosure with a protective gas with or without continuous flow at sufficient pressure to prevent the entrance of a flammable gas or vapor, a combustible dust, or an ignitible fiber.	**Hermetically Sealed:** Equipment sealed against the entrance of an external atmosphere where the seal is made by fusion, for example, soldering, brazing, welding, or the fusion of glass to metal. **Nonincendive Circuit:** A circuit, other than field wiring, in which any arc or thermal effect produced under intended operating conditions of the equipment is not capable, under specified test conditions, of igniting the flammable gas–air, vapor–air, or dust–air mixture. **Nonincendive Component:** A component having contacts for making or breaking an incendive circuit and the contacting mechanism is constructed so that the component is incapable of igniting the specified flammable gas–air or vapor–air mixture. The housing of a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion. **Nonincendive Equipment:** Equipment having electrical/electronic circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas–air, vapor–air, or dust–air mixture due to arcing or thermal means. **Non-sparking apparatus:** Apparatus that has no normally arcing parts or thermal effects capable of ignition. **Purged and Pressurized**: See definition of “Purged and Pressurized” under Class I, Division 1.

International Protection Techniques Comparison					
		Applicable Certification Documents			
Area	Protection Techniques	USA	Canada	IECEx Scheme	Europe
Zone 0	• Intrinsic safety, “ia”	UL 60079-11	CSA E60079-11	IEC 60079-11	EN 60079-11
	• Encapsulation, “ma”	UL 60079-18	---	IEC 60079-18	EN 60079-18
	• Class I, Div 1 intrinsic safety	UL 913	CSA 157	---	---
Zone 1	• Flameproof, “d”	UL 60079-1	CSA 60079-1	IEC 60079-1	EN 60079-1
	• Pressurization, “px” or “py”	ISA 60079-2	CSA E60079-2	IEC 60079-2	EN 60079-2
	• Powder filling, “q”	UL 60079-5	CSA E60079-5	IEC 60079-5	EN 60079-5
	• Oil immersion, “o”	UL 60079-6	CSA E60079-6	IEC 60079-6	EN 60079-6
	• Increased safety, “e”	UL 60079-7	CSA E60079-7	IEC 60079-7	EN 60079-7
	• Intrinsic safety, “ib”	UL 60079-11	CSA E60079-11	IEC 60079-11	EN 60079-11
	• Encapsulation, “mb”	UL 60079-18	CSA E60079-18	IEC 60079-18	EN 60079-18
	• Any Zone 0 method	See above	See above	See above	See above
	• Any Class I, Div 1 technique	See USA Class I, Div 1 techniques	See Canada Class I, Div 1 techniques	---	---
Zone 2	• Pressurization, “pz”	ISA 60079-2	CSA E60079-2	IEC 60079-2	EN 60079-2
	• Intrinsic safety, “ic”	---	---	IEC 60079-11	EN 60079-11
	• Encapsulated, “nC”	---	CSA E60079-15	IEC 60079-15	EN 60079-15
	• Enclosed-break, “nC”	UL 60079-15	CSA E60079-15	IEC 60079-15	EN 60079-15
	• Energy-limited, “nL” (“nC” for USA)	UL 60079-15	CSA E60079-15	IEC 60079-15	EN 60079-15
	• Hermetically-sealed, “nC”	UL 60079-15	CSA E60079-15	IEC 60079-15	EN 60079-15
	• Nonincendive, “nC”	UL 60079-15	CSA E60079-15	IEC 60079-15	EN 60079-15
	• Non-sparking, “nA”	UL 60079-15	CSA E60079-15	IEC 60079-15	EN 60079-15
	• Restricted breathing, “nR”	UL 60079-15	CSA E60079-15	IEC 60079-15	EN 60079-15
	• Sealed, “nC”	UL 60079-15	CSA E60079-15	IEC 60079-15	EN 60079-15
	• Self-protected Energy-limited, “nA nL” (“nL” for Canada)	---	CSA E60079-15	IEC 60079-15	EN 60079-15
	• Any Zone 0 or 1 technique	See above	See above	See above	See above
	• Any Class I, Div 1 or 2 technique	See USA Class I, Div 1 or 2 techniques	See Canada Class I, Div 1 or 2 techniques	---	---

Note 1: Zone 0, 1 and 2 general requirements are contained in UL 60079-0 (USA), CSA 60079-0 (Canada) and IEC/EN 60079-0 (IECEx Scheme & Europe).

Note 2: Zone 0 and 1 intrinsically safe system requirements are contained UL 60079-11 (USA & Canada) and IEC/EN 60079-25 (IECEx Scheme & Europe).

Note 3: Zone 0 and 1 special requirements for equipment installed in Zone 0 areas are contained in ISA 60079-26 (USA) and IEC/EN 60079-26 (IECEx Scheme & Europe).

Note 4: Zone 0, 1 and 2 FISCO requirements are contained in UL 60079-27 (USA) and IEC/EN 60079-27 (IECEx Scheme & Europe).

Zone 0

Intrinsic Safety "i": Type of protection where any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions.

Encapsulation "m": Type of protection where electrical parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited.

Zone 1

Flameproof "d": Type of protection where the enclosure will withstand an internal explosion of a flammable mixture that has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure, of an external explosive gas atmosphere consisting of one or more of the gases or vapors for which it is designed.

Pressurization "p": Type of protection for electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere.

Powder Filling "q": Type of protection where electrical parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere.

Oil Immersion "o": Type of protection where electrical equipment is immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

Increased Safety "e": Type of protection applied to electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks.

Intrinsic Safety "i": See definition of "Intrinsic Safety" under Zone 0 above.

Encapsulation "m": See definition of "Encapsulation" under Zone 0 above.

Zone 2

Type of Protection "n": Type of protection where electrical equipment, in normal operation, is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.

Pressurization "p": See definition of "Pressurization" under Zone 1 above.

Intrinsic Safety "i": See definition of "Intrinsic Safety" under Zone 0 above.