Overview of Hazardous Areas

What is a Hazardous Area?

A hazardous area is a location where the potential for fire or explosion exists caused by the presence of ignitable gases or dusts in the atmosphere. Examples of these locations include oil & gas facilities, chemical processing plants and pharmaceutical manufacturers.

Download our handy Hazardous Location Chart from the Resources section.

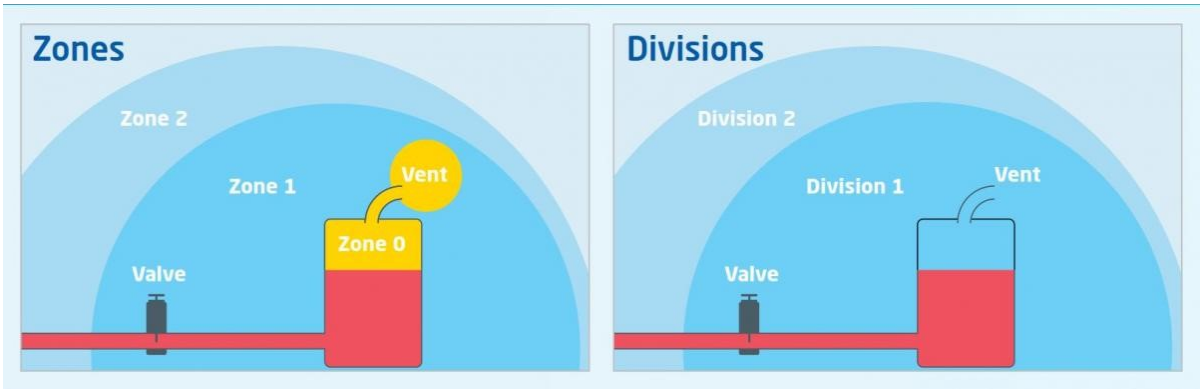
Hazardous Area Classification

Hazardous areas are defined as:

"**Zones**" under worldwide IEC standards (and their local versions, such as ATEX in Europe)
"**Divisions**" under North American NEC standards.

Under the "Zone" system, hazards are defined for gas as Zone 0, 1 or 2, with 0 as the highest hazard, and for dust as Zone 20, 21 or 22, with 20 as the highest hazard.

Under the "Division" system, hazards are defined for gas as Class I Division 1 or 2, with 1 as the highest hazard, and for dust as Class II Division 1 or 2, with 1 as the highest hazard.



The classification of Zones and Divisions is related to the frequency and duration that ignitable gases or dusts may be present in the atmosphere.

Zone 0/20: > 1000 hours /year

Zone 1/21: 10 to 1000 hours/year

Zone 2/22: < 10 hours/year

Class I & II Div 1: > 10 hours /year

Class I & II Div 2: < 10 hours/year

For full hazardous area information, download our Hazardous Location Chart from the Resources section

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Codes and Standards

Depending on where you are in the world, different codes and standards may apply. Typically, whatever the scheme, they all cover hazardous classification and the protection methods that may be used to prevent explosions in these areas.

Worldwide: IEC defines the most-widely adopted hazardous area standards.

In Europe, the ATEX scheme closely follows IEC standards

In North America: the NFPA (National Fire Protection Association) is the primary agency for the protection of installations from fire and explosion.

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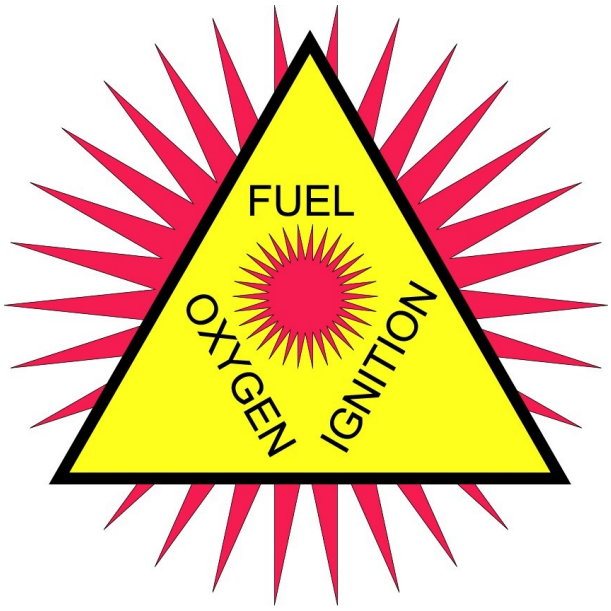
Recognised Methods for Explosion Protection

For an explosion to occur, 3 conditions must exist:

Explosive material is present in a suitable concentration

The presence of air or oxygen

A source of ignition



Thus, most forms of explosion prevention and protection rely on the elimination of one or more of these factors. eg preventing leaks or spillages of flammable material, or removing sources of ignition.
Under the various codes and standards, there are a number of recognised methods for explosion protection.

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This table shows methods under the IEC/ATEX schemes.

Protection Method	Ex Code	Standard IEC / EN / BS / ANSI/ISA	Gas			Dust		
			ATEX Category	IEC / EN (ATEX) / BS (UK) / USA (NEC 505) Zone	EPL	Zone	EPL	ATEX Category
Intrinsic Safety	ia	60079-11	1G	Zone 0	Ga	Zone 20	Da	1D
	ib		2G	Zone 1	Gb	Zone 21	Db	2D
	ic		3G	Zone 2	Gc	Zone 22	Dc	3D
Flameproof	da	60079-1	1G	Zone 0 Not for USA	Ga			
	db		2G	Zone 1	Gb			
	dc		3G	Zone 2	Gc			
Protection by Enclosure	ta	60079-31				Zone 20	Da	1D
	tb					Zone 21	Db	2D
	tc					Zone 22	Dc	3D
Pressurisation	pxb	60079-2	2G	Zone 1	Gb	Zone 21	Db	2D
	pyb		2G	Zone 1	Gb	Zone 21	Db	2D
	pzc		3G	Zone 2	Gc	Zone 22	Dc	3D
Increased Safety	eb	60079-7	2G	Zone 1	Gb			
	ec		3G	Zone 2	Gc			
Encapsulation	ma	60079-18	1G	Zone 0	Ga	Zone 20	Da	1D
	mb		2G	Zone 1	Gb	Zone 21	Db	2D
	mc		3G	Zone 2	Gc	Zone 22	Dc	3D
Liquid Immersion	ob	60079-6	2G	Zone1	Gb			
	oc		3G	Zone 2	Gc			
Powder Filling	q	60079-5	2G	Zone 1	Gb			2D
Hermetically Sealed / Non-Incendive Restricted Breathing	nC	60079-15	3G	Zone 2	Gc			
	nR		3G	Zone 2	Gc			
Pressurised Room	px	60079-13	2G	Zone 1	Gb	Zone 21	Db	2D
	py		2G	Zone 1	Gb			
	pz		3G	Zone 2	Gc	Zone 22	Dc	3D
	pv			Non-hazardous	Gb/GC			
Optical Radiation	op sh	60079-28	1G	Zone 0	Ga	Zone 20	Da	1D
	op is		1G	Zone 0	Ga	Zone 20	Da	1D
	op pr		2G	Zone 1	Gb	Zone 21	Db	2D
Special Protection	sa	60079-33	1G	Zone 0	Ga	Zone 20	Da	1D
	sb		2G	Zone 1	Gb	Zone 21	Db	2D
	sc		3G	Zone 2	Gc	Zone 22	Dc	3D
Non-electrical Equipment - Basic Method and Requirements	h	ISO 80079-36	1G	Zone 0	Ga	Zone 20	Da	1D
			2G	Zone 1	Gb	Zone 21	Db	2D
			3G	Zone 2	Gc	Zone 22	Dc	3D

Reference Standards	
Explosive Atmospheres, General Requirements	IEC / EN / BS / ANSI/ISA 60079-0
Classification of Hazardous Areas	IEC / EN / BS / ANSI/ISA 60079-10-1/2
Electrical Installations	IEC / EN / BS 60079-14, NEC 505 to 509, ANSI/UL 2225
Inspection & Maintenance	IEC / EN / BS 60079-17, NEC 505 to 509, ANSI/UL 2225

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This table shows methods under North American schemes.

Protection Method	Code	USA (NEC 500) FM & UL	Canada (CEC) CSA	Gas	Dust
Intrinsic Safety	IS	FM3610/ UL913 UL698A	C22.2 No. 157	Class I, Div 1 Class I, Div 2	Class II, Div 1 Class II, Div 2 Class III, Div 1 Class III, Div 2
Explosion-proof Dust Ignition-proof	XP	ANSI/UL1203 FM3615 FM3616	C22.2 No. 30	Class I, Div 1 Class I, Div 2	Class II, Div 1 Class II, Div 2
Dust-tight			C22.2 No. 25		Class II, Div 2 Class III, Div 1 Class III, Div 2
Purged and Pressurised	Type X Type Y Type Z	NFPA 496 FM3620	C22.2 No. 60079-2	Class I, Div 1 Class I, Div 1 Class I, Div 2	Class II, Div 1 Class II, Div 1 Class II, Div 2
Oil Immersion				Class I, Div 2	
Non-incendive Hermetically Sealed	NI		C22.2 No. 213	Class I, Div 2	Class II, Div 2 Class III, Div 1 Class III, Div 2
Pressurised Room		FM3611 NFPA 496			Class I, Div 1 Class I, Div 2 Class II, Div 1 Class II, Div 2
Optical System	op sh			Class I, Div1 Class I, Div 2	Class II, Div1 Class II, Div 2
Optical Radiation	op is			Class I, Div1 Class I, Div 2	Class II, Div1 Class II, Div 2
Optical Radiation	op pr			Class I, Div 2	Class II, Div 2
Reference Standards					
		NEC500	C22.2 No. 0		
		NEC500			
		NEC 501 to 504, ANSI/UL 2225	C22.2 No. 174		
		NEC 501 to 504			

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Classification of flammable materials

Depending on their properties, gases and dusts are classified by group. These properties include factors such as ignition energy, auto-ignition temperature, upper and lower explosive limits, flash point, etc.
Group definitions may vary between certification schemes.

For full hazardous area information, download our Hazardous Location Chart from the Resources section

Gas, Dust or Fibre	IEC / ATEX / USA (NEC 505) / Canada (CEC)	Canada (CEC) USA (NEC 500)
Acetylene	Group IIC	Class I, Group A
Hydrogen		Class I, Group B
Ethylene	Group IIB	Class I, Group C
Propane	Group IIA	Class I, Group D
Methane	Group I, IIA	Class I, Group D
Metal Dust	Group IIIC	Class II, Group E (Div 1 only)
Coal Dust	Group IIIB	Class II, Group F
Grain	Group IIIB	Class II, Group G
Fibres	Group IIIA	Class II, Group H

Temperature Classification

Temperature classification (also known as temperature class, or T class) defines the maximum surface temperature that a product destined for use in a potentially hazardous atmosphere is allowed to operate at, relative to an ambient temperature of -20°C to +40°C.

All flammable gases have an auto-ignition temperature. If a flammable mixture of the gas is exposed to a component above the auto-ignition temperature, then the mixture will ignite. Therefore, when selecting equipment, the Temperature class must be below the auto-ignition temperature of the potentially explosive atmosphere where it will be installed.

For full hazardous area information, download our Hazardous Location Chart from the Resources section

Maximum Surface Temperature	IEC, EU (Europe) USA (NEC 505)	USA (NEC 500) Canada
450°C (842°F)	T1	T1
300°C (572°F)	T2	T2
280°C (536°F)		T2A
260°C (500°F)		T2B
230°C (446°F)		T2C
215°C (419°F)		T2D
200°C (392°F)	T3	T3
180°C (356°F)		T3A
165°C (329°F)		T3B
160°C (320°F)		T3C
135°C (275°F)	T4	T4
120°C (248°F)		T4A
100°C (212°F)	T5	T5
85°C (185°F)	T6	T6

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