

WHAT IS I.E.C.?

The International Electrotechnical Commission writes technical standards including the 79 series and is comprised of nations throughout the world including Canada

Class I Flammable Gases, Vapours or Liquids		Class II Combustible Dusts	Class III Ignitable Fibers and Flyings
Division System	Zone System		
	Zone 0 Ignitable concentrations of gases, vapours, or liquids are continuously present under normal operating conditions		
Division 1 Ignitable concentrations of gases, vapours, or liquids may be present under normal operating conditions	Zone 1 Ignitable concentrations of gases, vapours, or liquids may be present under normal operating conditions	Division 1 Ignitable concentrations of combustible dusts may be present under normal operating conditions	Division 1 Ignitable concentrations of fibers may be present under normal operating conditions
Division 2 Ignitable concentrations of gases, vapours, or liquids are not likely present under normal operating conditions	Zone 2 Ignitable concentrations of gases, vapours, or liquids are not likely present under normal operating conditions	Division 2 Ignitable concentrations of combustible dusts are not likely present under normal operating conditions	Division 2 Ignitable concentrations of fibers are not likely present under normal operating conditions
Class I Groups Division 1 and 2: A (acetylene) B (hydrogen) C (ethylene) D (propane)	Class I Groups Zone 0, 1 and 2 IIC (acetylene and hydrogen) IIB (ethylene) IIA (propane)	Class II Groups Division 1 and 2: E (metal dusts) F (coal) G (grain)	Class III Groups None

Note: There is no IEC system that covers CEC Class II and Class III.

T-RATINGS

Heat producing equipment is marked with a Temperature Code, to indicate the maximum surface temperature.

"T" Code (Division System)	T1	T2	T2A	T2B	T2C	T2D	T3	T3A	T3B	T3C	T4	T4A	T5	T6
"T" Code (Zone System)	T1	T2					T3				T4		T5	T6
Max. Surface Temp. (°C)	450°	300°	280°	260°	230°	215°	200°	180°	165°	160°	135°	120°	100°	85°

Note: There are no intermediate "T" ratings (e.g. T2A) in the Zone system

ZONE SYSTEM PROTECTION METHODS

Area where product can be used	Letter Designation Of Protection	Type of Protection
Zone 0	ia	Intrinsically Safe (Apparatus is incapable of releasing enough energy to cause an explosion)
Zone 1	m	Encapsulation (Arcing devices enclosed in Resin)
	d	Flameproof (Enclosures can contain an internal explosion)
	e	Increased Safety (Enclosures do not allow the ingress of hazardous gases)
	ib	Intrinsically Safe (Apparatus is incapable of releasing enough energy to cause an explosion)
	o	Oil immersion (Arcing devices enclosed in Oil)
	q	Powder Filling (Arcing devices enclosed in finely ground powder)
Zone 2	p	Purged/Pressurized (Pressure higher than surrounding area maintained within enclosure)
	nC	Nonincendive (Hermetically Sealed)
	nA	Non-Sparking Device (Non-arcing device)
	nR	Restricted Breathing (Enclosures restrict the ingress of hazardous gases)

HAZARDOUS LOCATION MARKINGS

Class I, II & III, Division 1 and 2

Required: Class(es), Division(s), Gas/Dust Group(s), Temperature Code.
 Example: Class I, Division 1, Group C & D, T4A
 Optional: Class1, Zone1, Group IIB IIA T4

Class I, Zone 0, 1 and 2

Required: Ex, Protection Method(s), II, Gas Group(s), T Temperature Code.
 Example: Ex de IIB T4
 Optional: Class1, Zone1, Group IIB T4

IEC PRODUCT MARKINGS CLARIFICATION

- Ex** Indicates suitability for use in hazardous locations.
- de** Indicates type "d" and "e" protection.
- II** Indicates "Above Ground" usage.
- C** Indicates group IIC gases.
- T6** Indicates T6 temperature rating.

COMPARING ZONE AND DIVISION SYSTEMS

(Only typical Methods of Protection Listed)

Zone 0	Division 1
Intrinsically Safe "ia"	Class I Division 1 Equipment
Zone 1	
Division 1 Approved Flameproof "d" Increased Safety "e"	Division 2 Division 1 and 2 Equipment Flameproof "d" Increased Safety "e" Non-Sparking "n"
Zone 2	
Zone 0 and 1 Equipment Division 2 Approved Non-Sparking "n"	

Note: Division/Zone 1 represents about 5% while Division/Zone2 represents about 95% of a typical Canadian hazardous petrochemical area.

IEC INGRESS PROTECTION IP RATINGS

Typically a two-digit number

Protection Against Solids

- 0** - No Protection.
- 1** - Protected against solid bodies larger than 50mm. e.g. Hand.
- 2** - Protected against solid bodies larger than 12mm. e.g. Finger.
- 3** - Protected against solid bodies larger than 2.5mm. e.g. Tool, wires. (Type 1)
- 4** - Protected against solid bodies larger than 1.0mm. e.g. Small wires.
- 5** - Protected against dust. No harmful deposits. (Type 5)
- 6** - Completely protected against dust.

Protection Against Liquids

- 0** - No Protection.
- 1** - Protected against vertically falling drops. e.g. Condensation.
- 2** - Protected against falling drops of water tilted 15 degrees from vertical. (Type 2)
- 3** - Protected against falling rain, tilted 60 degrees from vertical. (Type 3)
- 4** - Protected against splashing water from all directions. (Type 3R)
- 5** - Protected against jets of water from all directions. (Type 4)
- 6** - Protected against jets of water of similar force as heavy seas from all directions.
- 7** - Protected against effects of immersion. (Type 6)
- 8** - Protected against effects of submersion.

Note: Equivalent CSA Type (Nema), indicated in parenthesis. A third digit is occasionally used, and reflects the effects against mechanical forces.

MAIN DIFFERENCES BETWEEN ZONE AND DIVISION SYSTEMS

Non-metallic enclosures and fluorescent light fixtures (Increased Safety "e") are permitted in a Zone 1 Area. The enclosures are to have special seals (Ingress Protection IP54 see Table above) and use special nonloosening terminal blocks. The fluorescent light fixture has to incorporate an automatic electrical disconnect upon entry into fixture.

Although a significant change, it is important to note that a Zone 1 area represents only 5% of a typical Canadian petro-chemical facility.

Higher "T" ratings achieved for Zone 2 HID light fixtures (Restricted Breathing Ex nR). The "T" rating is based on the highest exterior temperature.

This allows for the use of less expensive light fixtures. A strict and possibly costly maintenance program is recommended to ensure the integrity of the seals on the light fixture.

THE COST FACTOR	
Location	The Argument
In Europe	In Europe most of a Petro-chemical facility is classified as Zone 1. When comparing the cost of a typical Zone 1 type application to a Division 1 application you will find that there is likely a cost saving for the Zone system.
In Canada and North America	In Canada where 95% of a facility is Zone 2 or Division 2, there have been several studies done, which conclude that the Division system costs less. Since there is very little difference in product used in Zone 2 or Division 2, and that Division equipment is typically less expensive, it can be argued that the Division system will actually cost less.
Conclusion	Many factors (capital, installation, maintenance) including the nature of the facility need to be considered when determining actual cost. The most significant advantage for the user is flexibility in the choice of product that can be used.