Environmental Protection

NEMA and CSA Type Enclosure

NEMA or CSA Type 1 Enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling dirt. This type is not specifically identified in the CSA Standard.

NEMA or CSA Type 2 Enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling water and dirt.

NEMA or CSA Type 3 Enclosures are intended for outdoor use primarily to provide a degree of protection against rain, sleet, windblown dust; and damage from external ice formation.

NEMA or CSA Type 3R Enclosures are intended for outdoor use primarily to provide a degree of protection against rain, sleet; and damage from external ice formation, and must have a drain hole.

NEMA or CSA Type 3S Enclosures are intended for outdoor use primarily to provide a degree of protection against rain, sleet, windblown dust; and to provide for operation of external mechanisms when ice laden.

NEMA or CSA Type 4 Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, hose directed water; and damage from external ice formation.

NEMA or CSA Type 4X Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose directed water; and damage from external ice formation.

NEMA or CSA Type 5 Enclosures are intended for indoor use primary to provide a degree of protection against settling airborne dust, falling dirt, and dripping non-corrosive liquids.

NEMA or CSA Type 6 Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against hose-directed water, the entry of water during occasional temporary submersion at a limited depth; and damage from external ice formation.

NEMA or CSA Type 6P Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against hose-directed water, the entry of water during prolonged submersion at a limited depth; and damage from external ice formation.

NEMA or CSA Type 12 Enclosures are intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping non-corrosive liquids.

NEMA or CSA Type 12K Enclosures with knockouts are intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping non-corrosive liquids.

NEMA or CSA Type 13 Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and non-corrosive coolant.

Definitions Referring To NEMA Requirements for Hazardous Location

The following NEMA type enclosures occasionally appear on specifications and product literature

NEMA 7 Enclosures are intended for indoor use in locations classified as Class I, Groups A, B, C, or D, as defined in the NEC.

NEMA 8 Enclosures are for indoor or outdoor use in locations classified as Class I, Groups A, B, C, or D, as defined in the NEC.

NEMA 9 Enclosures are intended for indoor use in locations classified as Class II, Groups E, F, and G, as defined in the NEC.

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NEMA 10 Enclosures are constructed to meet the applicable requirements of the Mine Safety and Health Administration. (MSHA)

The designations are considered to be historical terminology approaching obsolescence and are incomplete designations at best. Types 7 and 9 are not mentioned anywhere in the National Electrical Code, the controlling document for installations. All hazardous location products must be marked with the Class, Division, Group, and Temperature Class to provide to an installer all of the information needed to complete an installation in accordance with Article 500 of the National Electrical Code.

Comparison of Specific Applications of Enclosures for Indoor Unclassified Locations

Provides A Degree Of Protection Against The Following Environmental Conditions	Type of Enclosure									
	1*	2*	4	4x	5	6	6P	12	12K	13
Incidental contact with the enclosed equipment	x	x	x	x	x	x	x	x	x	x
Falling dirt	x	x	x	x	x	x	x	x	x	x
Falling liquids and light splashing	-	x	x	x	x	x	x	x	x	x
Circulation dust, lint, fibers, and flyings**	-	-	x	x	-	x	x	x	x	x
Settling airborne dust, lint, fibers, and flyings**	-	-	x	x	x	x	x	x	x	x
Hosedown and splashing water	-	-	x	x	-	x	x	-	-	-
Oil and coolant seepage	-	-	-	-	-	-	-	x	x	x
Oil and coolant spraying and splashing	-	-	-	-	-	-	-	-	-	x
Corrosive agents	-	-	-	x	-	-	-	-	-	-
Occasional temporary submersion	-	-	-	-	-	x	x	-	-	-
Occasional prolonged submersion	-	-	-	-	-	-	-	-	-	-

*These enclosures may be ventilated. However, Type 1 may not provide protection against small particles of falling dirt when ventilation is provided in the enclosure top.

**These fibers and flyings are not explosive materials and are not considered as Class III type ignitable fibers or combustible flyings. For Class III type ignitable fibers or combustible flyings see the National Electrical Code®, Article 500.

Comparison of Specific Applications of Enclosures for Outdoor Unclassified Locations

Provides A Degree Of Protection Against The Following Environmental Conditions	Type of Enclosure						
	3*	3R***	3S	4	4X	6	6P
Incidental contact with the enclosed equipment	x	x	x	x	x	x	x
Rain, snow, sleet*	x	x	x	x	x	x	x
Sleet**	-	-	x	-	-	-	
Windblown dust	x	-	x	x	x	x	
Hosedown	-	-	-	x	x	x	
Corrosive agents	-	-	-	-	x	-	
Occasional temporary submersion	-	-	-	-	-	x	
Occasional prolonged submersion	-	-	-	-	-	-	x

*External operating mechanisms are not required to operate when the enclosure is ice covered.

** External operating mechanisms are operable when the enclosure is ice covered.

***These enclosures may be ventilated.

Comparison of Specific Applications of Enclosures for Indoor Hazardous (Classified) Locations

Provides a Degree of Protection Against Atmospheres Typically Containing Hazardous Gases, Vapors, and Dusts***	Type of Enclosure: NEMA 7 & 8, Class I Groups**					NEMA 9 & 10, Class II Groups**			
	Class	A	B	C	D	E	F	G	10
Acetylene	I	x	-	-	-	-	-	-	-
Hydrogen, manufactured gases	I	-	x	-	-	-	-	-	-
Diethyl ether, ethylene, cyclopropane	I	-	-	x	-	-	-	-	-
Gasoline, hexane, butane, naphtha, propane, acetone	I	-	-	-	x	-	-	-	-
Toluene, isoprene	I	-	-	-	x	-	-	-	-
Metal dusts	II	-	-	-	-	x	-	-	-
Carbon black, coal dust, coke dust	II	-	-	-	-	-	x	-	-
Flour, starch, grain dust	II	-	-	-	-	-	-	x	-
Fibers, flyings	III	-	-	-	-	-	-	-	-
Methane with or without coal dust	MSHA	-	-	-	-	-	-	-	x

*Due to the characteristics of the gas, vapor, or dust, a product suitable for one Class or Group may not be suitable for any other Class or Group unless so marked on the product.

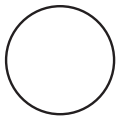
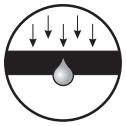
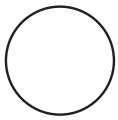
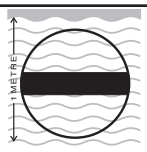
**For Class III type ignitable fibers or combustible flyings refer to the National Electrical Code® Article 500.

***For a complete listing of flammable liquids, gases, or vapors refer to NFPA 497 - 1997 (Recommended Practice for the Classification of Flammable Liquids. Gases, or Vapors and of Hazardous (Classified) Locations for Electrical installations in Chemical Process Areas and NFPA 325 - 1994 (Fire Hazard Properties of Flammable Liquids. Gases, and Volatile Solids). Reference also NFPA 499 -1997 Classifications of Combustible Dusts and of Hazardous (Classified) Locations for Electrical installations in Chemical Process Areas.

Ingress Protection (IP)

The IEC uses the term “Ingress Protection” to identify the environmental protection of a device.

This is defined in IEC Standard 60 529 and the following chart illustrates the two-digit code used.

IP The IP classification system designates, by means of a number, the degree of protection provided by a device against ingress of dust and water.		**SECOND NUMBER** Degree of protection against water	
		0 	Non-protected.
FIRST NUMBER Degree of protection against solid objects		1 	Protected against water dripping vertically, such as condensation.
0 	Non-protected.	2 	Protected against dripping water when tilted up to 15°.
1 	Protected against a solid object greater than 50mm such as a hand.	3 	Protected against water spraying at an angle of up to 60°.
2 	Protected against a solid object greater than 12mm, such as a finger.	4 	Protected against water splashing from any direction.
3 	Protected against a solid object greater than 2.5mm, such as wire or a tool.	5 	Protected against jets of water from any direction.
4 	Protected against a solid object greater than 1.0 mm, such as wire or thin strips.	6 	Protection against heavy seas or powerful jets of water.
5 	Dust-protected. Prevents ingress of dust sufficient to cause harm.	7 	Protected against harmful ingress of water when immersed between a depth of 150mm to 1 meter.
6 	Dust tight. No dust ingress.	8 	Protected against submersion. Suitable for continuous immersion in water.