



## NEMA Enclosure Types & IP Codes

The purpose of this document is to provide general information on the definitions of NEMA Enclosure Types to architects, engineers, installers, inspectors and other interested parties. Important Note: NEMA Ratings are maintained through testing and certification. Correlation to the IP ratings does not confirm the IP code assigned on a product or enclosure has been tested or is under a certification program.

### Definitions

[from NEMA 250-1997]

In Non-Hazardous Locations, the specific enclosure Types, their applications, and the environmental conditions they are designed to protect against, **when completely and properly installed**, are as follows:

**Type 1** - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection against falling dirt.

**Type 2** - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment, to provide a degree of protection against falling dirt, and to provide a degree of protection against dripping and light splashing of liquids.

**Type 3** - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, and windblown dust; and that will be undamaged by the external formation of ice on the enclosure.

**Type 3R** - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, and snow; and that will be undamaged by the external formation of ice on the enclosure.

**Type 3S** - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, and windblown dust; and in which the external mechanism(s) remain operable when ice laden.

**Type 4** - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; and that will be undamaged by the external formation of ice on the enclosure.

**Type 4X** - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water, and corrosion; and that will be undamaged by the external formation of ice on the enclosure.

**Type 5** - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against settling airborne dust, lint, fibers, and flyings; and to provide a degree of protection against dripping and light splashing of liquids.

**Type 6** - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during occasional temporary submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.

**Type 6P** - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during prolonged submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.

**Type 12** - Enclosures constructed (without knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against dripping and light splashing of liquids.

**Type 12K** - Enclosures constructed (with knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against dripping and light splashing of liquids.

**Type 13** - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against the spraying, splashing, and seepage of water, oil, and noncorrosive coolants.



**Table 2-1**  
 [From NEMA 250-1997]  
 Comparison of Specific Applications of Enclosures  
 for Indoor Nonhazardous 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
Circulating 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 or coolant spraying and splashing	...	...	...	...	...	...	...	...	...	X
Corrosive agents	...	...	...	X	...	...	X	...	...	...
Occasional temporary submersion	...	...	...	...	...	X	X	...	...	...
Occasional prolonged submersion	...	...	...	...	...	...	X	...	...	...

\* These enclosures may be ventilated.

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

**Table 2-2**  
 [From NEMA 250-1997]  
 Comparison of Specific Applications of Enclosures  
 for Outdoor Nonhazardous 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, and sleet **	X	X	X	X	X	X	X
Sleet ***	...	...	X	...	...	...	...
Windblown dust, lint, fibers, and flyings	X	...	X	X	X	X	X
Hosedown	...	...	...	X	X	X	X
Corrosive agents	...	...	...	...	X	...	X
Occasional temporary submersion	...	...	...	...	...	X	X
Occasional prolonged submersion	...	...	...	...	...	...	X

\* These enclosures may be ventilated.

\*\* External operating mechanisms are not required to be operable when the enclosure is ice covered.

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



NEMA/IEC Correlation

In Hazardous Locations, when completely and properly installed and maintained, Type 7 and 10 enclosures are designed to contain an internal explosion without causing an external hazard. Type 8 enclosures are designed to prevent combustion through the use of oil-immersed equipment. Type 9 enclosures are designed to prevent the ignition of combustible dust.

**Type 7** - Enclosures constructed for indoor use in hazardous locations classified as Class I, Division 1, Groups A, B, C, or D as defined in NFPA 70.

**Type 8** - Enclosures constructed for either indoor or outdoor use in hazardous locations classified as Class I, Division 1, Groups A, B, C, and D as defined in NFPA 70.

**Type 9** - Enclosures constructed for indoor use in hazardous locations classified as Class II, Division 1, Groups E, F, or G as defined in NFPA 70.

**Type 10** - Enclosures constructed to meet the requirements of the Mine Safety and Health Administration, 30 CFR, Part 18.

**Table SA-1**

[From NEMA 250-1997]

Comparison of Specific Applications of Enclosures  
for Indoor Hazardous Locations

(If the installation is outdoors and/or additional protection is required by  
Table 2-1 and Table 2-2, a combination-type enclosure is required)

Provides a Degree of Protection Against Atmospheres Typically Containing (See NFPA 497M for Complete Listing)	Enclosure Types 7 and 8, Class I Groups **				Enclosure Type 9 Class II Groups				
	Class	A	B	C	D	E	F	G	10
Acetylene	I	X	...	...	...	...	...	...	...
Hydrogen, manufactured gas	I	...	X	...	...	...	...	...	...
Diethyl ether, ethylene, cyclopropane	I	...	...	X	...	...	...	...	...
Gasoline, hexane, butane, naphtha, propane, acetone, toluene, isoprene	I	...	...	...	X	...	...	...	...
Metal dust	II	...	...	...	...	X	...	...	...
Carbon black, coal dust, coke dust	II	...	...	...	...	...	X	...	...
Flour, starch, grain dust	II	...	...	...	...	...	...	X	...
Fibers, flyings *	III	...	...	...	...	...	...	X	...
Methane with or without coal dust	MSHA	...	...	...	...	...	...	...	X

\* For Class III type ignitable fibers or combustible flyings see the National Electrical Code, Article 500.

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



**Correlation Between NEMA Enclosure Type Numbers and IEC Enclosure Classification Designations**

IEC Publication 60529 Classification of Degrees of Protection Provided by Enclosures provides a system for specifying the enclosures of electrical equipment on the basis of the degree of protection provided by the enclosure. IEC 60529 does not specify degrees of protection against mechanical damage of equipment, risk of explosions, or conditions such as moisture (produced for example by condensation), corrosive vapors, fungus, or vermin. The NEMA Standard for Enclosures for Electrical Equipment does test for environmental conditions such as corrosion, rust, icing, oil, and coolants. For this reason, and because the test and evaluations for other characteristics are not identical, the IEC Enclosure Classification Designations cannot be exactly equated with the enclosure Type numbers in this Standard.

The IEC designation consists of the letters IP followed by two numerals. The first characteristic numeral indicates the degree of protection provided by the enclosure with respect to persons and solid foreign objects entering the enclosure. The second characteristic numeral indicates the degree of protection provided by the enclosure with respect to the harmful ingress of water.

Table A-1 provides a correlation of the enclosure Type numbers in this Standard to the IEC Enclosure Classification Designations (IP Codes). The enclosure type numbers meet or exceed the test requirements for the associated IEC Classification; for this reason Table A-1 cannot be used to convert from IEC Classifications to enclosure Type numbers.

**Table A-1**  
*[From NEMA 250-1997]*  
Conversion of Enclosure Type numbers to IEC Classification Designations  
**Cannot be used to convert IEC Classification Designations to NEMA Type numbers**

Enclosure Type Number	IEC Enclosure Classification Designation
1	IP10
2	IP11
3	IP54
3R	IP54
3S	IP54
4 and 4X	IP55 & IP56
5	IP52
6 AND 6P	IP67
12 AND 12K	IP52
13	IP54

*This comparison is based on tests specified in IEC Publication 60529.*



## **IP Ratings and Protection Levels**

### **And Test Equipment Identification**

As defined by IEC-60529

- Degrees of Ingress Protection against solid foreign objects IP1X to IP6X
- Degrees of Ingress Protection against water IPX1 to IPX8
- Degrees of Ingress Protection against hazardous parts Suffix A-D
- Supplemental Ingress Protection factors Suffix H, M, S, & W
  
- Degrees of Ingress Protection against solid foreign objects = IP1X to IP6X
  - : 50 mm sphere Impact IP1X
  - : Jointed Finger Probe IP2X
  - : Test Rod, 2.5 mm diameter IP3X
  - : Test Rod, 1.0 mm diameter IP4X
  - : Dust Test w/ or w/o negative pressure IP5X
  - : Dust Test w/ negative pressure IP6X
  
- Degrees of Ingress Protection against water = IPX1 to IPX8
  - : Drip Box & Turntable IPX1
  - : Drip Box with tilt support IPX2
  - : Oscillating Spray Tester Handheld Spray Nozzle IPX3
  - : Oscillating Spray Tester Handheld Spray Nozzle IPX4
  - : Jet Nozzle w/ 6.3 mm tip IPX5
  - : Jet Nozzle w/ 12.5 mm tip & Pump or Water Tank System IPX6
  - : Enclosure is immersed in water standardized conditions of pressure and time. IPX7
  - : Enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7. IPX8
  
- Degrees of Ingress Protection against hazardous parts = Suffix A-D
  - : 50 mm sphere + Creepage & Clearance Keys Suffix A
  - : Jointed Finger Probe & Clearance Keys Suffix B
  - : Test Rod, 2.5 mm diameter & Clearance Keys Suffix C
  - : Test Rod, 1.0 mm diameter & Clearance Keys Suffix D
  
- Supplemental Ingress Protection factors = Suffix H, M, S, & W
  - : High Voltage Apparatus Suffix H
  - : Ingress protection from water with moving parts in motion Suffix M
  - : Ingress protection from water with moving parts stationary Suffix S
  - : Special weather equipment – based on special product features Suffix W

