

## Engineer's Notebook

## NEMA Guide for Electrical Enclosures

### Enclosures for Hazardous Locations

#### **Type 1 – General Purpose-Indoor**

A Type 1 enclosure is intended primarily to prevent accidental contact with the enclosed apparatus. It is suitable for general purpose applications indoors where it is not exposed to unusual service conditions.

#### **Type 2 – Drip Proof-Indoor**

A Type 2 enclosure is intended primarily to prevent accidental contact with the enclosed apparatus and, in addition, is so constructed as to exclude falling non-corrosive liquids or dirt.

#### **Type 3 – Dust Tight and Rain Tight-Outdoor**

A Type 3 enclosure is intended to provide protection for enclosed apparatus against windblown dust and water.

#### **Type 3R – Rain Proof and Sleet (Ice) Resistant-Outdoor**

A Type 3S enclosure is intended primarily to provide suitable protection for enclosed apparatus against windblown dust and water and to provide for its operations when the enclosure is covered by external ice or sleet.

#### **Type 4 – Water Tight and Dust Tight-Indoor**

A Type 4 enclosure is designed to exclude water applied in the form of a hose stream. It is suitable for application where the apparatus may be subjected to a stream of water during cleaning operations and the like.

#### **Type 4X – Water Tight, Dust Tight and Corrosion Resistant-Indoor**

A Type 4X enclosure has the same provisions as a Type 4 and, in addition, is corrosion resistant.

#### **Type 5**

Suspended by Type 12 for Industrial use.

#### **Type 6 – Submersible-Indoor**

A Type 6 enclosure is intended for use indoors or outdoors where occasional submersion is encountered.

#### **Type 12 – Industrial Use-Dust Tight and Drip Tight-Indoor**

A Type 12 enclosure is designed for use in those industries where it is desired to exclude such materials such as dust, lint fibers, filing, oil seepage or coolant seepage, and external condensations of non-corrosive liquids.

#### **Type 13 – Oil Tight and Dust Tight-Indoor**

A Type 13 enclosure is intended primarily to prevent accidental contact with the enclosed apparatus and is so constructed that dust which may enter will not interfere with the operation of the apparatus. The construction of the enclosure can be defined only in relation to the apparatus and to the amount and kind of dust present.

### Enclosures for Hazardous Locations

#### **Type 7 – Class I, Group A, B, C or D – Indoor Hazardous Locations, Air Break Equipment**

These enclosures are designed to meet the application requirements of the National Electrical Code for Class I Hazardous Locations which may be in effect from time to time. In the type of equipment, the circuit interruption occurs in air.

#### **Type 8 – Class I, Group A, B, C or D – Indoor Hazardous Locations, Oil-Immersed Equipment**

These enclosures are designed to meet the application requirements of the National Electrical Code for Class I Hazardous Locations which may be in effect from time to time. The apparatus is immersed in oil.

#### **Type 9 – Class II, Group E, F, or G – Indoor Hazardous Locations, Air Brake Equipment**

These enclosures are designed to meet the application requirements of the National Electrical Code for Class I Hazardous Locations which may be in effect from time to time.

#### **Type 10 – Bureau of Mines – Explosion Proof**

This enclosure is designed to meet the explosion proof requirements of the U.S. Bureau of Mines which may be in effect from time to time. It is suitable for use in gassy coal mines with or without coal dust present.

# International Protection Class For Electrical Equipment Enclosures

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Designated with IP ( example: IP54 – A unit with this designation is protected against the penetration against the penetration of dust in harmful quantities and against splashing water.)

### 1st Digit

Degree of protection against penetration by solid bodies

0 = No special protection provided

1 = Solid bodies of  $\phi > 50$  mm; no protection against intentional access

2 = Solid bodies of  $\phi > 12$  mm; fingers, etc. cannot be inserted

3 = Solid bodies of  $\phi > 2.5$  mm; tools, wires, etc. (Thickness  $> 2.5$  mm cannot be inserted)

4 = Solid bodies of  $\phi > 1$  mm; tools, wires, etc. (Thickness  $> 1$  mm cannot be inserted)

5 = Dust harmful quantities, complete protection against contact

6 = Dust (dustproof); complete protection against contact

### 2nd Digit

Degree of penetration by water

0 = No special protection provided

1 = Water dripping vertically

2 = Water dripping up to 15 deg from vertical

3 = Water dripping up to 60 deg from vertical (spray)

4 = Water from all directions (splashing)

5 = Water jet projected from a nozzle, from all directions (jet spray)

6 = Heavy seas or powerful water jet (flooding)

7 = Immersion in water under a defined pressure and period of time (immersion)

8 = Submersion in water indefinitely. Conditions to be described by the manufacturer (submersion)

**Note:** Water shall not penetrate unit in critical amounts under conditions 1-8

### Cross Reference (Approximated) NEMA vs IEC Enclosure Types

Enclosure Rating	IP23	IP30	IP32	IP55	IP64	IP65	IP66	IP67
Type 1	*							
Type 2		*						
Type 3					*			
Type 3S			*					
Type 4				*	*			
Type 4X							*	
Type 6							*	
Type 12								*
Type 13						*		

**Note:** IEC 529 has no equivalent to NEMA Types 7, 8, 9, 10 or 11

# Electrical Equipment Enclosures