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CONTROL PANEL RATINGS

NEMA, UL, and CSA Ratings

EMA, UL, and CSA are standard writing organizations commonly recognized in North America. Their ratings are based on similar application descriptions and expected performance. UL and CSA both require enclosure testing by qualified evaluators. They also send site inspectors to make sure a manufacturer adheres to prescribed manufacturing methods and material specifications. NEMA, on the other hand, does not require independent testing and leaves compliance completely up to the manufacturer.

Enclosure Types Non-Hazardous Location

Enclosure Rating	NEMA National Electrical Manufacturers Association (NEMA Standard 250) and Electrical and Electronic Mfg. Association of Canada (EEMAC)	Underwriters Laboratories Inc. (UL 50 and UL 508)	Canadian Standards Association (Standard C22.2 No. 94)
Type 1	Enclosures are intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment or locations where unusual service conditions do not exist.	Indoor use primarily to provide protection against contact with the enclosed equipment and against a limited amount of falling dirt.	General purpose enclosure. Protects against accidental contact with live parts.
Type 3	Enclosures are intended for outdoor use primarily to provide a degree of protection against windblown dust, rain, and sleet; undamaged by the formation of ice on the enclosure.	Outdoor use to provide a degree of protection against windblown dust and windblown rain; undamaged by the formation of ice on the enclosure.	Indoor or outdoor use; provides a degree of protection against rain, snow, and windblown dust; undamaged by the external formation of ice on the enclosure.
Type 3R [a]	Enclosures are intended for outdoor use primarily to provide a degree of protection against falling rain and sleet; undamaged by the formation of ice on the enclosure.	Outdoor use to provide a degree of protection against falling rain; undamaged by the formation of ice on the enclosure.	Indoor or outdoor use; provides a degree of protection against rain and snow; undamaged by the external formation of ice on the enclosure.
Type 4	Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose directed water; undamaged by the formation of ice on the enclosure.	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.	Indoor or outdoor use; provides a degree of protection against rain, snow, windblown dust, splashing and hose-directed water; undamaged by the external formation of ice on the enclosure.
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, and hose-directed water; undamaged by the formation of ice on the enclosure.	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure; resists corrosion.	Indoor or outdoor use; provides a degree of protection against rain, snow, windblown dust, splashing and hose-directed water; undamaged by the external formation of ice on the enclosure; resists corrosion.
Type 6	Enclosures are intended for use indoors or outdoors where occasional submersion is encountered, limited depth; undamaged by the formation of ice on the enclosure.	Indoor or outdoor use to provide a degree of protection against entry of water during temporary submersion at a at a limited depth; undamaged by the external formation of ice on the enclosure.	Indoor or outdoor use; provides a degree of protection against the entry of water during temporary submersion at a limited depth. Undamaged by the external formation of ice on the enclosure; resists corrosion.
Type 12	Enclosures are intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping noncorrosive liquids.	Indoor use to provide a degree of protection against dust, dirt, fiber flyings, dripping water, and external condensation of noncorrosive liquids.	Indoor use; provides a degree of protection against circulating dust, lint, fibers, and flyings; dripping and light splashing of non-corrosive liquids; not provided with knockouts.
Type 12K	Enclosures with knockouts are intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping noncorrosive liquids.	Indoor use to provide a degree of protection against dust, dirt, fiber flyings, dripping water, and external condensation of noncorrosive liquids. Knockouts located in the top or bottom walls, or both.	Indoor use: provides a degree of protection aganst circulating dust, lint, fibers and flyings; dripping and light splashing of non-corrosive liquids; provided with knockouts.
Type 13	Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and noncorrosive coolant.	Indoor use to provide a degree of protection against lint, dust seepage, external condensation and spraying of water, oil, and noncorrosive liquids.	Indoor use; provides a degree of protection against circulating dust, lint, fibers, and flyings; seepage and spraying of non-corrosive liquids, including oils and coolants.

[a] NFPA 70 (National Electric Code) defines new Type 3RX as providing the same degree of protection as Type 3R, with the addition of protection against corrosive agents.

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Standards
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Comparison of Specific Non-Hazardous Applications Outdoor Locations

Provides a Degree of Protection Against the Following Environmental Conditions	Type of Enclosure					
	3	3R [a]	3RX [a]	4	4X	6
Incidental contact with the enclosed equipment	✦	✦	✦	✦	✦	✦
Rain, snow, and sleet [b]	✦	✦	✦	✦	✦	✦
Sleet [c]						
Windblown dust	✦			✦	✦	✦
Hose-down				✦	✦	✦
Corrosive agents			✦		✦	
Occasional temporary submersion						✦

[a] These enclosures may be ventilated.
[b] External operating mechanisms are not required to be operable when the enclosure is ice covered.
[c] External operating mechanisms are operable when the enclosure is ice covered.

Comparison of Specific Non-Hazardous Applications Indoor Locations

Provides a Degree of Protection Against the Following Environmental Conditions	Type of Enclosure							
	1 [a]	4	4X	6	11	12	12K	13
Incidental contact with the enclosed equipment	✦	✦	✦	✦	✦	✦	✦	✦
Falling dirt	✦	✦	✦	✦	✦	✦	✦	✦
Falling liquids and light splashing		✦	✦	✦	✦	✦	✦	✦
Dust, lint, fibers, and flyings [b]		✦	✦	✦		✦	✦	✦
Hose-down and splashing water		✦	✦	✦				
Oil and coolant seepage						✦	✦	✦
Oil or coolant spraying and splashing								✦
Corrosive agents			✦		✦			
Occasional temporary submersion				✦				

[a] 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. Consult Hoffman for more information.
[b] These fibers and flyings are non-hazardous materials and are not considered Class II type ignitable fibers or combustible flyings. For Class III type ignitable fibers or combustible flyings see the National Electrical Code Section 505.

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NEMA, UL, and CSA Ratings

Cross-Reference (Approximate) NEMA, UL, CSA vs. IEC Enclosure Type

Cross-Reference (Approximate) NEMA, UL, CSA, vs. IEC Enclosure Type

Enclosure Rating	IP20	IP22	IP55	IP64	IP65	IP66	IP67
Type 1	✦						
Type 3				✦			
Type 3R 3RX		✦					
Type 4						✦	
Type 4X						✦	
Type 6							✦
Type 12, 12K			✦				
Type 13					✦		

IEC 60529 has no equivalents to NEMA enclosure Types 7, 8, 9, 10, or 11.
✦ Indicates compliance.

Enclosure Type Rating vs. IP Rating

Electrical enclosures are rated by type (NEMA 250 / UL 50), and/or IP rated (IEC 60529) based on the degree of protection provided. Type ratings and IP ratings have only the following in common:

1. A degree of protection for persons from hazardous components inside the enclosure
2. A degree of protection for equipment inside the enclosure from ingress of solid foreign objects, including dust
3. A degree of protection for equipment inside the enclosure from ingress of water

NEMA 250 and UL 50 type rating documentation defines additional requirements that a type-rated enclosure must meet. These include:

- Mechanical impact on enclosure walls
- Gasket aging and oil resistance
- Corrosion resistance
- Door and cover latching requirements
- Sheet metal gauge construction requirements (UL 50 only)

Electrical enclosures that carry only an IP rating have not been designed to the additional type-rating requirements. Therefore, a type rating cannot be assigned to an enclosure that has been only IP-rated.

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Glossary Terms Specifying Non-Hazardous Environmental Conditions

Corrosion-Resistant

Constructed to provide a degree of protection against exposure to corrosive agents such as salt spray. Type 4X enclosures meet this requirement.

Dust-tight

Constructed so that circulating or airborne dust will not enter the enclosure under specified test conditions. Type 3, 4, 4X, 12, 12K, and 13 enclosures meet this requirement.

Drip-tight

Constructed so that falling moisture or dirt does not enter the enclosure under specified test conditions. Type 3, 4, 4X, 12, 12K, and 13 enclosures meet this requirement.

Indoor

Not to be exposed to weather. Type 1, 3, 3R, 4, 4X, 6, 12, 12K, and 13 enclosures meet this requirement.

Oil-Resistant

Constructed so that oil will not interfere with successful operation of equipment. Type 12 and 13 enclosures meet this requirement.

Oil-tight

Constructed so that oil will not enter the enclosure under specified test conditions. Type 13 enclosures meet this requirement.

Outdoor

Constructed or protected so that exposure to the weather will not interfere with successful operation of equipment. Type 3, 3R, 4, 4X, and 6 enclosures meet this requirement.

Rainproof

Constructed, protected, or treated to prevent beating rain from interfering with the successful operation of the apparatus or result in wetting of live parts and wiring within the enclosure under specified test conditions. Type 3R enclosures meet this requirement.

Rain-tight

Constructed or protected so that exposure to beating rain will not result in water entering the enclosure under specified test conditions. Type 3, 4, 4X, and 6 enclosures meet this.

Water-tight

Constructed so that moisture will not enter the enclosure when it is subjected to a stream of water under specified test conditions. Type 4, 4X, and 6 enclosures meet this requirement.

Weatherproof

Constructed or protected so that exposure to the weather will not interfere with successful operation of the equipment. Rainproof, rain-tight, or water-tight equipment can fulfill the requirements for weatherproof where varying weather conditions other than wetness, such as snow, ice, dust, or temperature extremes, are not a factor.

Wet Locations

See Rainproof.

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Table 1

[From NEMA 250-2003]

Comparison of Specific Applications of Enclosures for Indoor Nonhazardous Locations

Provides a Degree of Protection Against the Following Conditions	Type of Enclosure									
	1 *	2 *	4	4X	5	6	6P	12	12K	13
Access to hazardous parts	X	X	X	X	X	X	X	X	X	X
Ingress of solid foreign objects (falling dirt)	X	X	X	X	X	X	X	X	X	X
Ingress of water (Dripping and light splashing)	...	X	X	X	X	X	X	X	X	X
Ingress of solid foreign objects (Circulating dust, lint, fibers, and flyings **)	...	...	X	X	...	X	X	X	X	X
Ingress of solid foreign objects (Settling airborne dust, lint, fibers, and flyings **)	...	...	X	X	X	X	X	X	X	X
Ingress of water (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	...	...	...
Ingress of water (Occasional temporary submersion)	...	...	...	...	...	X	X	...	...	...
Ingress of water (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

[From NEMA 250-2003]

Comparison of Specific Applications of Enclosures for Outdoor Nonhazardous Locations

Provides a Degree of Protection Against the Following Conditions	Type of Enclosure									
	3	3X	3R*	3RX*	3S	3SX	4	4X	6	6P
Access to hazardous parts	X	X	X	X	X	X	X	X	X	X
Ingress of water (Rain, snow, and sleet **)	X	X	X	X	X	X	X	X	X	X
Sleet ***	...	...	...	...	X	X	...	...	...	...
Ingress of solid foreign objects (Windblown dust, lint, fibers, and flyings)	X	X	...	...	X	X	X	X	X	X
Ingress of water (Hosedown)	...	...	...	...	...	...	X	X	X	X
Corrosive agents	...	X	...	X	...	X	...	X	...	X
Ingress of water (Occasional temporary submersion)	...	...	...	...	...	...	...	...	X	X
Ingress of water (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.

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Table B-1

[From NEMA 250-2003]

Comparison of Specific Applications of Enclosures
for Indoor Hazardous Locations
(If the installation is outdoors and/or additional protection is required by Table 1 and Table 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.