



Your Enclosure Source[®]

Type Rated Enclosure

The purpose of this document is to provide general information on the definitions of Enclosure Types to architects, engineers, installers, inspectors and other interested parties.

Definitions

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 access to hazardous parts and to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt).

Type 3 Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow); 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 access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, 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 access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow); and for 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 access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, 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 access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); that provides an additional level of protection against corrosion; 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 access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (hose directed water and the entry of water during prolonged submersion at a limited depth); that provides an additional level of protection against corrosion 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 access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt and circulating dust, lint, fibers, and flyings); and to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (dripping and light splashing).

Type 13 Enclosures constructed for indoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt and circulating dust, lint, fibers, and flyings); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (dripping and light splashing); and to provide a degree of protection against the spraying, splashing, and seepage of oil and non-corrosive coolants.

Attention!

Saginaw Control & Engineering recommends when enclosures are installed in full outdoor exposure and extreme weather environments the use of drip shield, ventilation and drainage. Saginaw Control & Engineering does not recommend the use of polycarbonate viewing windows for use as type 4, 4X, IP55, IP56, IP66 or any outdoor application when installed in full exposure and extreme weather environments. Carefully considered and evaluate your end use environment for the all reasons described above.

Table 1
Comparison of Specific Applications of Enclosures
for Indoor Nonhazardous Locations

Provides a Degree of Protection Against the Following Conditions	Type of Enclosure					
	1*	4	4X	6P	12	13
Access to hazardous parts	X	X	X	X	X	X
Ingress of solid foreign objects (falling dirt)	X	X	X	X	X	X
Ingress of water (Dripping and light splashing)	—	X	X	X	X	X
Ingress of solid foreign objects (Circulating dust, lint, fibers, and flyings**)	—	X	X	X	X	X
Ingress of solid foreign objects (Settling airborne dust, lint, fibers, and flyings**)	—	X	X	X	X	X
Ingress of water (Hosedown and splashing water)	—	X	X	X	—	—
Oil and coolant seepage	—	—	—	—	X	X
Oil or coolant spraying and splashing	—	—	—	—	—	X
Corrosive agents	—	—	X	X	—	—
Ingress of water (Occasional temporary submersion)	—	—	—	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
Comparison of Specific Applications of Enclosures
for Outdoor Nonhazardous Locations

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

Comparison Between Type Rated Enclosure 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 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 an equivalent conversion from the enclosure Type numbers in this Standard to the IEC Enclosure Classification Designations. 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
 Conversion of Enclosure Type Ratings
 To IEC 60529 Enclosure Classification Designations (IP)
 (**Cannot** be Used to Convert IEC Classification Designations to Type Ratings)

IP FIRST CHARACTER	Enclosure Type Rating																				IP SECOND CHARACTER
	1	2	3	3R	3S	4	4X	6P	12	13	1	2	3	3R	3S	4	4X	6P	12	13	
IP0_	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	IP_0
IP1_	A		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	IP_1
IP2_	A		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	IP_2
IP3_					A	B			A	B	A	B	A	B	A	B	A	B	A	B	IP_3
IP4_					A	B			A	B	A	B	A	B	A	B	A	B	A	B	IP_4
IP5_					A	B			A	B	A	B	A	B	A	B	A	B	A	B	IP_5
IP6_											A	B	A	B	A	B					IP_6
																	A	B			IP_7
																					IP_8
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	

A = A shaded block in the “A” column indicates that the Enclosure Type Rating exceeds the requirements for the respective IEC 60529 IP First Character Designation. The IP First Character Designation is the protection against access to hazardous parts and solid foreign objects.

B = A shaded block in the “B” column indicates that the Enclosure Type Rating exceeds the requirements for the respective IEC 60529 IP Second Character Designation. The IP Second Character Designation is the protection against the ingress of water.

EXAMPLE OF TABLE USE

An IEC IP 45 Enclosure Rating is specified. What Enclosure Type Ratings meet and exceed the IP 45 rating?

Referencing the first character, 4, in the IP rating and the row designated “IP4_” in the leftmost column in the table; the blocks in Column “A” for Enclosure Types 3, 3S, 4, 4X, 6P, 12 and 13 are shaded. These ratings meet and exceed the IEC protection requirements against access to hazardous parts and solid foreign objects.

Referencing the second character, 5, in the IP rating and the row designated “IP_5” in the rightmost column in the table; the blocks in Column “B” for Enclosure Types 3, 3S, 4, 4X and 6P are shaded. These Enclosure ratings meet and exceed the IEC requirements for protection against the ingress of water. The absence of shading in Column “B” beneath the “Enclosure Type 5” indicates that Type 5 does not meet the IP 45 protection requirements against the ingress of water. Likewise the absence of shading in Column “B” for Type 12 and 13 enclosures indicates that these enclosures do not meet the IP 45 requirements for protection against the ingress of water. Only Types 3, 3S, 4, 4X and 6P have both Column “A” in the “IP4_” row and Column “B” in the “IP_5” row shaded and could be used in an IP45 application.

The Enclosure Type 3 not only meets the IP 45 Enclosure Rating, but also exceeds the IEC requirements because the Enclosure Type **requires** an outdoor corrosion test; a gasket aging test; a dust test; an external icing test; and **no** water penetration in the rain test. Slight differences exist between the test methods, but the IEC rating **permits** the penetration of water if “it does not deposit on insulation parts, or reach live parts.” The IEC rating does **not** require a corrosion test; gasket aging test; dust test or external icing test. Because the enclosure ratings include additional test requirements, this table **cannot** be used to select IP Designations for rated enclosure specifications.

IEC 60529 specifies that an enclosure shall only be designated with a stated degree of protection indicated by the first characteristic numeral if it also complies with all lower degrees of protection. Furthermore IEC 60529 states that an enclosure shall only be designated with a degree of protection indicated by the second characteristic numeral if it also complies with all lower degrees of protection up to and including the second characteristic numeral 6. An enclosure designated with a second characteristic numeral 7 or 8 only is considered unsuitable for exposure to water jets (designated by second characteristic numeral 5 or 6) and need not comply with requirements for numeral 5 or 6 unless it is dual coded. Since the IEC protection requirements become more stringent with increasing IP character value up through 6, once an Enclosure Type rating meets the requirements for an IP designation up through 6, it will also meet the requirements for all lower IP designations. This is apparent from the shaded areas shown in the table.