



# NEMA - 4X Enclosures

This information is from the NEMA Standards Publication No . 250 "Enclosures for Electrical Equipment (1000 Volts Maximum)"

## Type 4X Enclosures Description and Application

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. They are not intended to provide protection against conditions such as internal condensation or internal icing.

### Specific applications for Type 4X Enclosures, Indoor non hazardous locations:

- Incidental contact with the enclosed equipment
- Falling dirt
- Falling liquids and light splashing
- Circulating dust, lint, fibers, and flyings
- Hosedown and splashing water
- Corrosive agents

### Specific applications for Type 4X Enclosures, Outdoor non hazardous locations:

- Incidental contact with the enclosed equipment
- Rain, Snow, and Sleet
- Windblown dust
- Hosedown
- Corrosive agents

### Features and Test Criteria

When completely and properly installed, Type 4X enclosures:

- 1) Shall exclude water under test conditions which are intended to simulate hosedown condition.
- 2) Shall be undamaged after being encased in ice under test conditions.
- 3) Shall be permitted to have a conduit hub or equivalent provisions to exclude water at the conduit entrance.
- 4) If mounting means are provided, these means shall be external to the equipment cavity.
- 5) Shall be manufactured of American Iron and Steel Institute Type 304 Stainless Steel, polymerics, or materials with equivalent corrosion resistance, to provide a degree of protection against specific corrosive agents.

### Design Tests:

Type 4X enclosures shall be tested and evaluated by the following:

#### External Icing Test

The enclosure shall be mounted in a room which can be cooled to 20°F. A metal test bar which is 1 inch in diameter and 2 feet long shall be mounted in a horizontal position in a location where it will receive the same general water spray as the enclosure under test. Provisions shall be made for spraying the entire enclosure from above with water at an angle of approximately 45 degrees from the vertical. The water shall be between 32°F and 37°F. As a guide, spraying facilities which provide between 1 and 2 gallons per square foot of area to be sprayed have been found effective. The room temperature shall be lowered to 35°F. The spray of water shall be started and continued for at least 1 hour, maintaining the room temperature between 32°F and 37°F. At the end of this time the room temperature shall be lowered to between 20°F and 27°F without discontinuing the water spray. The water spray shall be controlled so as to cause ice to build up on the bar at a rate of approximately ¼ inch per hour and shall be continued until ¾ inch of ice has formed on the top surface of the bar. The spray shall be discontinued, but the room temperature shall be maintained between 20°F and 27°F for 3 hours to assure that all parts of the enclosure and ice coatings have been equalized to a constant temperature.

#### Evaluation

The enclosure and its external mechanisms shall be considered to have met the requirements of this test if:

While ice laden, they can be manually operated by one person without any damage to the enclosure, the enclosed equipment, or mechanism. When an auxiliary mechanism is provided to break the ice, it shall be included and utilized in the test. A separate test is required for each maintained position of each external operator. If

necessary, it shall be possible to gain access to the enclosure interior using an appropriate hand tool without causing functional damage to the enclosure. They are found to be undamaged after the ice has melted. Enclosures which have no external cavities to trap water when mounted in the normal position shall be considered to be acceptable and need not be tested.

#### Hosedown Test

The enclosure and its external mechanisms shall be subjected to a stream of water from a hose which has a 1 inch diameter nozzle and which delivers at least 65 gallons per minute. The water shall be directed at all joints from all angles from a distance or 10 to 12 feet for a period of time equal to 48 seconds times the test length (H + W + D) for a minimum of 5 minutes. A conduit shall be permitted to be installed to equalize internal and external pressures but shall not serve as a drain.

#### Evaluation

The enclosure shall be considered to have met the requirements of this test if no water has entered the enclosure. An enclosure complying with the hosedown test complies with the dust test previously described without further testing.

#### Rust Resistance Test

The rust-resistance test shall apply to all enclosures incorporating external ferrous parts. Non ferrous enclosures with no external ferrous parts need not be tested. The enclosures or representative parts of enclosures shall be subjected to salt spray (fog) as described below:

- 1) The test apparatus shall:
  - a) Consist of a fog chamber, a salt-solution reservoir, a supply of compressed air, atomizing nozzles, support for the enclosure, provision for heating the chamber, and a means of control.
  - b) Not permit drops of solution which accumulate on the ceiling or cover of the chamber to fall on the enclosure being tested.
  - c) Not permit drops of solution which fall from the enclosure to be returned to the solution reservoir for respraying.
  - d) Be constructed of materials which will not affect the corrosiveness of the fog.
- 2) The salt solution shall be prepared by dissolving 5 parts by weight of salt in 95 parts by weight of either distilled water or water containing not more than 200 parts per million of total solids. The salt shall be sodium chloride which is substantially free of nickel and copper and which contains, when dry, not more than 0.1 percent of sodium iodide and not more than 0.3 percent of total impurities.
- 3) The compressed air supply to the nozzles for atomizing the salt solution shall be free of oil and dirt and maintained between 10 and 25 pounds per square inch.
- 4) The temperature of the salt spray chamber shall be maintained at 95°F, plus 2°F or minus 3°F. The nozzle(s) shall be directed or baffled so that none of the salt spray can impinge directly on the enclosure being tested.
- 5) The test shall be run continuously for 24 hours: for example the chamber shall be closed and the spray operated continuously except for the short daily interruption necessary to inspect, rearrange, or remove the test specimens, to check and replenish the solution in the reservoir, and to make the necessary recordings.
- 6) At the end of the test, the specimens shall be removed from the chamber and washed in clean running water which is not warmer than 100°F to remove salt deposits from their surface, and then dried immediately. Corrosion products, other than rust, shall be permitted to be removed by light brushing if required, to observe the condition of the underlying stratum.

#### Evaluation

The enclosure shall be considered to have met the requirements of this test if there is no rust except at those points where protection is impractical, such as machined and mating surfaces of cast enclosures and sliding surfaces of hinges, shafts, and so forth.