

# BUD

Bud Industries, Inc.

## **NEMA 4 Enclosures** Buyer's Guide



***Enclosures Right Now, Right Price.***

The first step in selecting a NEMA 4 enclosure is to make sure that you really need it. The definitions below will help you select the just-right NEMA rating for your application, like Goldilocks: neither too much nor too little.

**NEMA 1:** For indoor use. Protects users against contact with hazardous components and protects the components from the ingress of solid objects, such as fingers and falling dirt.

**NEMA 2:** For indoor use. Same as NEMA 1 but adds protection against the ingress of dripping and light splashing water.

**NEMA 3:** For indoor or outdoor use. Same as NEMA 2 but adds stronger protection against the ingress of water and dust. It protects against windblown dust, rain, sleet, and snow and will be undamaged by ice forming on the enclosure.

**NEMA 3R:** Same as NEMA 3 but without the protection against windblown dust. The standard doesn't say this, but typically the difference is that there is no gasketing on NEMA 3R enclosures.

**NEMA 3S:** Same as NEMA 3 but adds the provision that external mechanism remain operable when ice laden.

**NEMA 3X, NEMA 3RX, NEMA 3SX:** the X signifies the addition of corrosion protection.

**NEMA 4:** Same as NEMA 3 but adds protection against hose directed water.

**NEMA 4X:** Same as NEMA 4 but adds protection against corrosion.

**NEMA 6:** For indoor or outdoor use. Protects against the ingress of objects, fingers, and falling dirt, hose directed water and is undamaged by ice formation. What's more, it protects against occasional temporary submersion to a limited depth.

**NEMA 6P:** Same as NEMA 6 but adds protection of prolonged submersion to a limited depth and adds corrosion protection.

**NEMA 12:** Protects against the ingress of objects, fingers, falling dirt, settling dust and drips. It is similar to NEMA 3 but it is for indoor use, so instead of protecting against windblown dust it protects against settling airborne dust, lint, fibers, and flyings. It won't protect against rain, sleet, and snow, but it does protect against seeping oil and coolant as well as dripping and light splashing water. Despite the large number it is a basic level of protection. It may be helpful to think of it as NEMA 1.2 rather than NEMA 12.

**NEMA 13:** Same as NEMA 12 but adds protection against oil and coolant splashing and spraying.

By the way, the above definitions are for non-hazardous locations. NEMA 7, 8, 9 and 10 are the ones to look at for hazardous environments.

## Tips on Selecting a NEMA 4 Enclosure

**Do you need to protect the entire enclosure, or only a sensitive component?** For example, if only one component needs NEMA protection, then protect that component with a small die-cast type NEMA box instead of buying a large NEMA 4 enclosure.

**What level of protection is required?** The most common mistake is to specify a NEMA 12 enclosure, when in fact [NEMA 4 enclosures](#) offers more environmental protection. On the other hand, don't over specify, because each increasing level of protection can exponentially increase the cost of an enclosure. Consider where the enclosure will be located. Often a NEMA 12 enclosure will work if there is no spray down requirement. There is no point to specifying UV stabilization if the plastic enclosure is being used indoors.



**What material do you need?** Steel is often the choice for a NEMA enclosure, especially for large enclosures where its strength is helpful. However, plastic is less costly and provides adequate protection in many applications. Polycarbonate plastic, ABS plastic, fiberglass, and [die cast-aluminum enclosures](#) are lower cost materials than steel and should not be overlooked. Plus they are inherently corrosion resistant.

ABS plastic is tough stuff; NFL helmets are made of ABS. Polycarbonate plastic has the option of being transparent—ideal for viewing readouts without breaking the seal. Relatively new is a polycarbonate infused with 10 percent fiberglass. The fiberglass helps assure tight tolerances during manufacturing, as well as adding strength. For a combination of strength, heat dispersion, and shielding, die cast aluminum enclosures may be the best choice.

**Can your vendor make modifications?** If you are dealing with more than a few pieces, often your enclosure supplier has the best equipment to easily and affordably modify the enclosure with cut-outs and to add cable glands for [NEMA 4X applications](#). Plus there is no risk of scrap when a cut doesn't go right.

In fact, Bud Industries can make simple modifications to in-stock enclosures in only five days. That's three to five times faster than other suppliers. The steps are simple, and they are spelled out in Bud's [5 Day Modifications Planning Guide](#).

## The Top 6 Issues in Selecting Enclosures for Harsh Environments

Typically, choosing an enclosure is considered to be an easy task. First, review the sizes of the components that are to be enclosed, and then determine the basic dimensions required. Decide what material (plastic, steel, aluminum, etc.) you need. Sometimes aesthetics are important as well. With this information, it should be easy to select the right box.

However, when evaluating enclosures for use in a harsh environment, the decision becomes more complex and meaningful as the wrong choice can be fatal to the end product.

Here are the top questions to ask when selecting an enclosure for use in a challenging location.

- 1. How harsh is harsh?** Defining the level of protection needed has a significant impact on the selection of enclosure...and often this translates into how much you will need to pay.
- 2. Do all components need to be protected?** For example, instead of buying a NEMA 4 rack, consider putting only the most sensitive components in a sealed box inside a basic rack.
- 3. Will the enclosure be used outdoors?** Not all boxes are weather-tight, and not all plastic is UV stable.
- 4. How will the electronics stay cool?** This is a special concern for electronics mounted inside an environmentally sealed box. Metal enclosures dissipate heat better than plastic enclosures. It may be preferable to mount power components in a small die-cast aluminum box and mount signal components in a large plastic box.
- 5. What is your budget?** Engineering is the art of tradeoffs. A plastic box that is reinforced with 10 percent fiberglass may provide the strength you need, at lower cost than a fully fiberglass or metal box.
- 6. What is you plan for modifications?** All stock boxes need cut-outs, at least for power and signals. NEMA rated cable glands will preserve the protection of your enclosure, so remember to order those as needed. It may be tempting to cut your own holes, but the enclosure supplier is better equipped for this. Scrapping just one box because you have the wrong drill bit will usually exceed the small cost of having it done right.

# NEMA vs. IP Enclosure Protection Ratings

## NEMA Ratings

Electrical enclosures are rated according to their ability to withstand environmental elements. In the United States, the National Electrical Manufacturers Association developed NEMA ratings for classifying an enclosure's level of protection from those environmental elements.



A NEMA 1 rating basically means you can't stick your finger in the enclosure. NEMA 4 protects against windblown dust, rain and snow, and hose-directed water (factory washdown.)

There are also ratings for hazardous (explosion-proof) environments. It is not always true that the higher number provides the highest protection, so you need to select carefully.

NEMA ratings are stated by the manufacturer. No testing is required (although some manufacturers do test), and no standards body certifies the NEMA rating claims of manufacturers. In practice, however, the NEMA ratings may be trusted.

## IP Ratings

The International Electrotechnical Commission (IEC) <http://www.iec.ch/index.htm> uses its own rating system, the IP standard, which stands for Ingress Protection. The standard format is "IP" followed by two numbers which designate the level of protection.

The first digit describes the level of protection from solids and the second digit specifies the level of protection from water. The higher the number is, the more protection. IP 67 is more waterproof than IP65, for example.

First Number	Protection From Solid Objects	Second Number	Protection From Water
0	No protection	0	No protection
1	Protected from solid objects over 50mm	1	Protected from vertically falling drops of water
2	Protected from solid objects over 12mm	2	Protected from direct sprays of water up to 15 degrees from vertical
3	Protected from solid objects over 2.5mm	3	Protected from direct sprays of water up to 60 degrees from vertical
4	Protected from solid objects over 1mm	4	Protected against sprays from all directions—limited ingress permitted
5	Protected from dust—limited ingress	5	Protected from low pressure jets of water from all directions—limited ingress permitted
6	Totally protected from dust	6	Protected against strong jets of water—limited ingress permitted
NA		7	Protected from the effects of temporary immersion between 15cm and 1m
NA		8	Protected against long periods of immersion under pressure

### Comparing NEMA to IP

There is not a one-to-one match between NEMA ratings and IP ratings, as the two systems are based on different variables. However, the table below shows an approximate cross reference that can be used to help determine the IP number that meets or exceeds a particular NEMA rating.



NEMA	IP
1	10
2	11
3	54
3r	14
3s	54
4 and 4x	55
5	52
6 and 6p	67
12 and 12k	52
13	54