

## 3.7 PROTECTION SPECIFICATIONS

Although our industries have in-depth standards and test procedures to define load cell and weighing system performance, no standards have been developed to cover product suitability for specific environmental conditions.

In the absence of such standards, most manufacturers have adopted the international Index of Protection (IP rating) system (IP/IEC 529 or EN 60529) or National Electrical Manufacturers Association Standards (NEMA publication 250) to define the level of sealing for their products. Both standards provide good test procedures for environmental sealing when applied to the products for which they were intended - those being electrical enclosures, but they are not very well suited to weighing equipment.

### IP Ratings

The IP standard describes a system for classifying the degree of protection provided by the enclosures of electrical equipment:

- Protection of persons against access to hazardous parts inside the enclosure.
- Protection of the equipment inside the enclosure against the ingress of solid foreign objects.
- Protection of equipment inside the enclosure against harmful effects due to the ingress of water.

Unfortunately, no definition is given for the term "harmful effects". Presumably, for enclosures, the main problem with water could be one of electrical shock to persons in contact with the enclosure, rather than malfunctioning of the unit. Furthermore, the standard only relates to water ingress and ignores moisture, chemicals, corrosion, etc.

The IP rating code is based on a two digit number. The first digit is the rating for solids and dusts, the second digit is the rating for liquids.

The commonly used categories to describe load cell and weighing equipment sealing are:

- |      |   |
|------|---|
| IP65 | Protected against low pressure jets of water from all directions, limited entrance allowed  |
| IP66 | Protected against strong jets of water e.g. for use on ship decks, limited entrance allowed |
| IP67 | Protected against the effects of immersion between 15cm and 1m                              |
| IP68 | Protected against long periods of immersion under pressure                                  |

When a 7 or 8 designation is specified for a product, it is important to note that the standard clearly states that "an enclosure designated with a second characteristic numeral 7 or 8 is considered unsuitable for exposure to water jets (designated by second characteristic 5 or 6) and need not comply with requirements for numeral 5 or 6 unless it is dual coded, e.g. IP66 / IP68". In other words, under certain conditions and for certain product designs, a product that has passed a half hour immersion test may not necessarily pass one which involves the use of high pressure water jets from all angles.

### **NEMA Standards**

Classifications in the NEMA system run from NEMA 1 to NEMA 12, but load cell manufacturers concern themselves with NEMA 4 and NEMA 6. Unlike the IP system, NEMA does concern itself with environmental conditions such as corrosion, rust, freezing, oil and coolants.

NEMA 4 enclosures are intended for indoor and outdoor use, providing a degree of protection against windblown dust, rain, splashing water, and hose directed water. However, no consideration is given for the effects of internal condensation. NEMA 4X enclosures meet the same standards as NEMA 4 and are constructed of 304 stainless steel or other material offering equal corrosion resistance.

NEMA 6 enclosures are used where there is a chance of temporary immersion. This standard calls for the highest part of the enclosure to remain submerged in water, with its highest point 1.83 metres below the surface for 30 minutes. NEMA 6P enclosures are used where prolonged immersion may occur and resistance to corrosion is needed.

While it may seem that NEMA standards offer some advantages over the IP system for corrosion resistance, they only relate to external corrosion of enclosures. This is very limited when applied to the more complex load cell construction and the different effects of corrosion or water ingress.

### **References**

British and EN standards can be obtained from the British Standards Institute (BSi) website. See the bibliography for full references.

NEMA standards can be obtained from the NEMA website:

<http://www.nema.org/stds/>

Search for publication number 250.

The NEMA website also provides a comparison between the NEMA standards and the IP ratings:

<http://www.nema.org/stds/briefcomparison.cfm>

