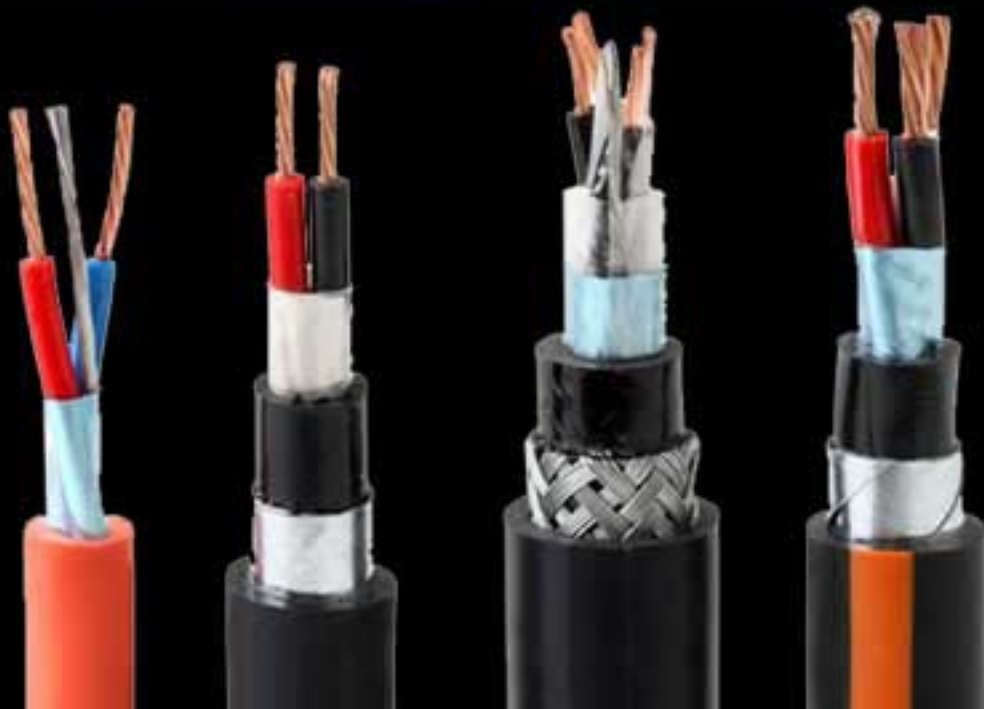


UNDERSTANDING NFPA 79



UNDERSTANDING NFPA 79

By Ned Lloyd and Mike Levesque

NFPA-79 is the electrical standard that has been developed by the National Fire Protection Association (NFPA) and is “intended to minimize the potential hazard of electrical shock and electrical fire hazards of industrial metalworking machine tools, woodworking machinery, plastics machinery and mass produced equipment, not portable by hand.”

The National Fire Protection Association is also responsible for the National Electric Code (NEC)/ (NFPA-70).

The scope of NFPA-79 is summarized as follows: “The standard shall apply to the electrical / electronic equipment, apparatus, or systems of industrial machines operating from a nominal voltage of 600 volts or less, and commencing at the point of connection of the supply to the electrical equipment to the machine.”

One of the focuses of the latest edition is to improve product safety by ensuring that appropriate types of wire and cable are used in the application with regard to current carrying capacity, temperature rating, or flammability. As such, the guidelines for NFPA-79 compliant products are more stringent than those cables allowed by past editions.

The NFPA-79 provisions make specific reference to only two types of cable:

1. Type MI cable: Mineral-insulated, metal sheathed cable.
2. RG -/U Transmission cable. Per the standard, this cable shall be permitted where necessary for proper functioning of the equipment.

The standard also references nine specific NEC conductor types having what is described as “the flame retardant properties and temperature limits” to satisfy the intended use. These conductor types include:

1. MTW
2. THHN
3. THW
4. THWN
5. RHH
6. RHW
7. RHW-2
8. XHHW
9. XHHW-2

In addition to types of cables and conductors, NFPA-79 also offers some specific guidelines around cable constructions. Those guidelines include:

1. The conductors shall be copper.
2. The conductors shall be insulated.
3. Conductors that are 22 AWG and larger shall be stranded.
4. Conductors 24 AWG to 30 AWG, within control enclosure, where not subject to flexing, may be solid.
5. Other listed conductors and listed cables shall be permitted.
6. Wiring material may be marked “AWM” – Appliance Wiring Material - provided it is also marked as a listed type (any of the 9 NEC conductor types listed above, as well as TC, PLTC, MTW, CM, CL2, CL3, etc.)

As can be expected when requirements for use change, some products that formerly were acceptable for use in the specified applications are no longer classified as such. Under NFPA-79, the use of conductors, cables, and flexible cords has been redefined in a more specific manner. Similarly, single conductor or multi-conductor Type AWM alone shall not be permitted.

Relative to the use of AWM products, an exception exists when part of a listed assembly is suitable for the intended application. That is to say, if one were to incorporate an appropriate UL listed subcomponent in the overall equipment, that subcomponent may contain AWM. For example, a UL listed digital temperature controller used on a molding machine may contain Type AWM wiring within its housing.

When examining what has changed with the introduction of the 2007 edition of NFPA-79, one need only look to the constraints of past standards. In previous versions of the standard, Appliance Wiring Material (AWM) was not expressly permitted under NFPA 79. However, its use was tolerated under the General Requirements statement that stated, “Conductors, cables, and flexible cords shall be selected for the operating conditions and external influences that can exist. Conductors, cables, and flexible cords shall be identified for their intended use.” The 2007 edition of the standard is far clearer about the parameters of suitable constructions, making the acceptable and non-acceptable uses of AWM wire and cable much more difficult to ignore.

Of course, to understand fully the effect of the latest revision of NFPA-79, it is important to understand the differences between Appliance Wiring Material (AWM) and listed products.

Appliance Wiring Material represents the lowest level in the hierarchy of recognized wire and cable material. A wire and cable manufacturer will apply to, and based on the positive test results of product samples, receive from a NRTL (Nationally Recognized Test Laboratory) the authorization to manufacture and mark a variety of inner, or primary conductor, styles as well as a variety of overall cable construction styles. The number of authorized inner and overall styles that a manufacturer is approved for is discretionary, and may vary greatly from manufacturer to

manufacturer. When designing an AWM cable, a manufacturer may select from a variety of inner conductor styles, combine them together, and group them as part of one overall style, providing all the temperature and voltage ratings are compatible. This flexibility of design could almost be thought of as a “buffet method” of cable building.

As an example of the design flexibility AWM constructions offer, a manufacturer could take two, 18 AWG Style 1730 PVC primaries and combine them with several 24 AWG Style 10343 Hytrel primaries and a Style 1354 Polyethylene/PVC coax under a PVC jacket, and mark the finished product as an AWM Style 20082 cable. Once the individual style approvals are obtained a completed cable may be configured and manufactured with no additional testing. By virtue of this flexibility, Type AWM wire and cable has the ability to be highly customized to meet the exact customer requirements.

Listed cables represent those constructions whose completed designs have been individually submitted to a NRTL in order to undergo a battery of physical tests and measurements specific to the use and construction. Typically, these evaluations are more stringent than those for AWM. Upon successful completion of this testing the manufacturer will receive an approval or “listing” for that specific cable design. (An actual listing will typically allow for some variation of design although not to the degree offered by AWM recognitions.)

In contrast to the earlier AWM “buffet”, one could think of the manufacturing of listed products as a “Chinese Menu method” of building wire and cable. For example, if you choose listing “#1”, you will receive the ability to manufacture a ten conductor cable using a limited range of gauge sizes, with a specific insulation compound, with or without tapes and shields, with a very specific jacketing compound required to finish the product. As the parameters of a listing cover the complete design start to finish, and are compound specific, there is limited flexibility in the design options. (Compound specific means that the actual listing indicates exactly what insulation and jacket material may be used and often references the manufacturer’s part number as part of the documentation.)

With the changes to the 2007 edition of the NFPA-79 standard, the selection and sourcing of wiring material has become even more complicated and involved. In addition to properly fulfilling the customer’s application requirements, a cable design must also be able to fit into the predefined definition of a listing in order to be NFPA 79 compliant. Given the broad range of application requirements that industrial equipment wire and cable may need to satisfy, which include the electrical requirements as well as possible environmental (temperature, exposure to oils, acids, bases) and physical requirements (flexible, high flex, abrasion resistance, etc.), designing wire and cable can become a significant challenge.

When necessary, a new cable design may require submission to an NRTL for testing bringing into play the need for regulatory expertise on the part of the cable manufacturer.

As designers, we can no longer make material and compound selections based solely on the appropriateness for the application; we must also address the requirements for a listed product. This has the potential of resulting in wire and cable being used in industrial machinery that is less than ideal from a performance perspective.

One aspect of industrial machinery design and installation that has not changed with this update of NFPA 79, but should be mentioned, is the requirement that all wiring material that leaves a machine must comply with NEC guidelines. NFPA 79 only states that “other listed conductors and listed cables shall be accepted”, which in no way implies that there will be NEC compliance if the material is brought off the machine. These cables and wires must meet NEC guidelines as a stand-alone product

Clearly, when navigating through the requirements of NFPA-79, any cable user would be wise to engage a qualified cable manufacturer as early in the process as is possible to ensure the proper product for the application is selected and is manufactured with appropriate agency certifications.

7/10



Obsessed with cable solutions.