

NFPA 79

Electrical Standard for Industrial Machinery

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NFPA-79 is the section of the National Electric Code (NEC®) that focuses on the electrical wiring standards used with industrial machinery. NFPA-79 applies to the electrical equipment used within a wide variety of machines, as well as groups of machines working together in a coordinated manner. Examples of industrial machinery include, among others: machine tools, injection molding machines, woodworking equipment, assembling machinery, material handling machinery and inspection and testing machines. The scope of NFPA-79 includes all electrical and electronic elements of

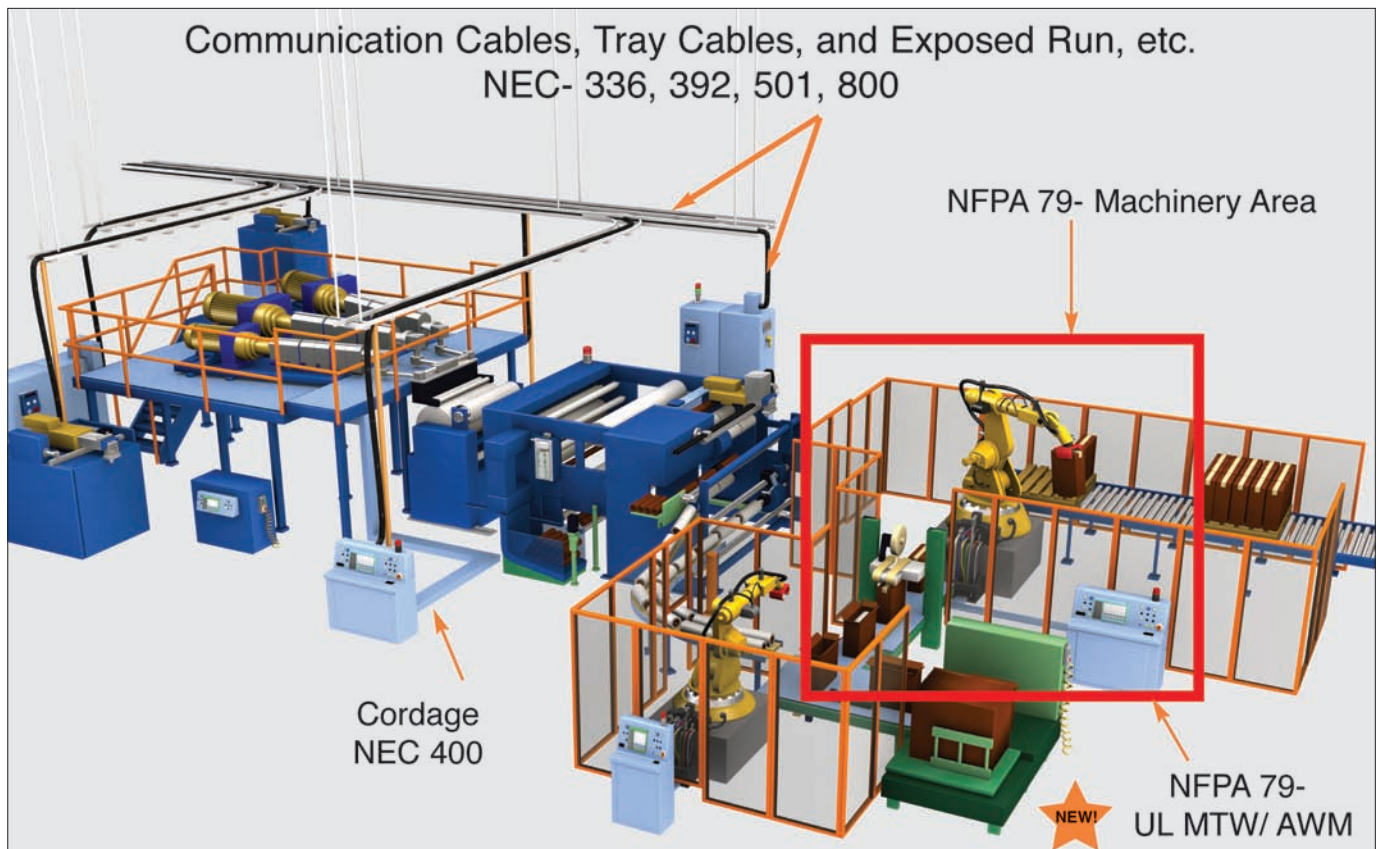
the machinery operating at 600V or less.

In 2007, the NFPA-79 code underwent significant revisions. The main goal of the revision was to harmonize NFPA-79 with its European counterpart, IEC-60204. This involved reorganizing the NFPA-79 chapter structure to follow IEC-60204 while adopting less restrictive, more progressive requirements without sacrificing the equipment safety. As of January 2007, one of the major changes in the NFPA-79 is the cable selections required under section 12.2.7.3. This section states that single conductor or multi-conductor AWM shall not be permitted, unless the completed assem-

bly has been listed prior for such use. Machine Tool Wire (MTW) is one of the wire and cable permissible options.

While 10 to 15 years ago little attention was paid to cable selection, today with the ever increasing occurrences of lawsuits and insurance liability issues, proper cable selection is now more important than ever. Perhaps one of the most overlooked items concerning installation of equipment and machines in an industrial or commercial building is the selection of the proper cable. This is primarily due to the high expenses surrounding the actual purchasing price of the machines, equipment, hardware

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(conduits, trays, raceways etc.) and costs for personnel that are necessary to complete the installation. Intentional or not, selection of cable seems to be given a secondary degree of attention in the installation process. Unfortunately, this can prove to be very costly to the building contractor, machine builder, manufacturing occupant, and all others involved in the process.

With the expansion of technology, many overseas companies are now supplying machinery for use in manufacturing facilities in the United States. As there are different codes and regulatory requirements that affect machine electrical installations both in the USA and overseas, insuring proper cable selection becomes increasingly more involved. Additionally, overseas manufacturers will sometimes include European or Asian cables along with their machines which further complicate the selection of the correct cable. These types of wiring methods do not apply in the USA and can cause many

problems for the installer and end user.

There are many manufacturers that use low cost materials with thin insulation to provide a lucrative cable price for the end user. In the long run these cable types end up being replaced at the end users facility. One of the largest companies in the USA, listed on the Fortune 10, recently had 2.5 million units recalled due to faulty cables. The cables contained materials that were very fragile which subsequently caused fires resulting in several million dollars in liability and damage. Machine manufacturers are generally given two options when their products fail in the end user facility; take the machine back and replace it with a new one (recall) or replace the faulty cables and be billed for the material and labor rate. Applications involving wire and cable for industrial machines and electrical/electronic equipment can be used in an assortment of applications including, but not limited to, power circuits, lighting and control circuits, programmable input/output con-

trollers, and motor circuits. With the omission of AWM in the new NFPA-79 standard, AWM will no longer be incorrectly used during the installation of machines in the USA. In several instances where the incorrect use of AWM has occurred, on-site inspectors have shut down operations until the cable was replaced.

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Compounding this problem was the overseas equipment manufacturers who were supplying AWM with their machines as part of a “complete package” for installation in US factories. The omission of AWM will now prevent any misinterpretation and will also put an end to the re-occurrence of these scenarios. Please read below for the various reasons why the decision was made to omit AWM from the NFPA 79 Standard:

1. AWM was being incorrectly used during installation of industrial machinery as part of the building infrastructure. For example, incorrectly running AWM from the main source of power (circuit breaker or fuse box) to the control panel of the machine

2. The National Electrical Code does not recognize AWM as an acceptable method for wiring installation; therefore, it does no test monitoring or regulation of electrical (voltage, current), physical (flammability, environmental), and mechanical requirements (wall thickness, materials) of AWM.

3. The flame rating of AWM can vary greatly. In certain instances, AWM can meet the bare minimum flammability (UL Horizontal) or

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maximum flammability (FT6 plenum test). Under specific conditions, certain types of AWM will catch and spread fire; as an example, what can happen to certain AWM types when the maximum current is exceeded in a bundle located in a high temperature type of environment

4. The mechanical characteristics of AWM can also vary greatly; wall thickness can be run as thin as .002" in certain instances providing virtually no mechanical protection where the slightest abrasion will expose conductors, creating hazardous and possibly life threatening conditions.

5. Even if installed in conduit, the NEC® does not recognize the use of AWM for installation within a building. The NEC® does not permit AWM installations in conduit for the reasons stated above. As the NEC® does not regulate AWM, they cannot verify the electrical, physical, and mechanical properties and therefore cannot substantiate usage of these wire and cables.

6. Unless listed previously with the equipment, AWM cannot be run within control panels. There have been instances where AWM has been used in these types of applications where fires have occurred, causing irreparable damage of equipment and/or destruction of the expensive electronic components within the panel box.

Cables that are used in machinery must be printed on the jacket surface with a (UL) Listed marking symbol instead of the Recognized Cable Component (RU) logo more commonly known as AWM (Appliance Wiring Material). It is also important to remember that the local inspector is the authority having jurisdiction in the area and their interpretation of NEC® code regulations is the final decision. They will not knowingly permit a non-listed product for use in an installation. When an inspector shuts down a facility, no further installation work is permitted and all progress is left at a virtual standstill. The interpretation of the NEC® code amongst inspectors can vary greatly; for

example, what is considered acceptable in New York State may not be acceptable in New York City and vice-versa.

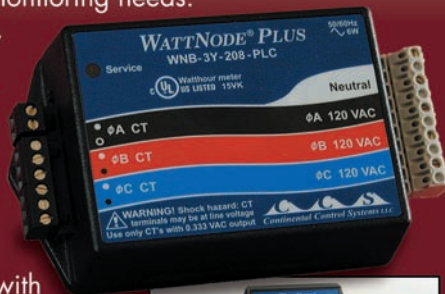
Another key section in the 2007 NFPA is section 13.1.5.1 which indicates that exposed cables installed along the structure of the equipment or system, or in the chassis of the machinery shall be permitted. Exposed cables shall be installed to closely follow the surface and structural members of the machinery. This section permits the cable to be installed without the use of conduit or raceways, thereby aiding for a fast installation that requires no tools. During installation, the cable is also permitted to be dressed along the existing machine structures without the use of any additional special hardware. The amount of time saved with machine installation combined with reduced labor quickly turns into a huge cost savings over the traditional type of installation that requires conduit and/or special mounting hardware. Certain UL Listed cables meet Exposed Run

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(-ER) requirements which provide an additional level of protection for these types of applications. Cables meeting -ER requirements have been subjected to the same crush and impact tests as armored type or Metal Clad (MC) cables and allow the cables to leave the machine area and into a cable tray without conduit.

The UL Listed MTW cable that is also permitted under the NFPA 79 is well known in the industry for its high standard regarding superior flexibility, oil resistance, flame retardency and overall ruggedness. When the cable product is UL dual rated with both cable approvals, the customer will be allowed to use one cable to meet all application requirements.

For applications where the cables needed on a machine are not addressed in the NFPA 79, Section 1.4 allows the machine builder to follow NEC® 70 and Article 670. For example: For communication applications, the UL Type CMG is allowed through the Article 800 but it has to meet the stranding criteria referenced in the

In summary, it is of the utmost importance to pay as much attention to the cables that will be used in equipment and machines as all the other costs required for an installation.


NFPA standard. Not all UL listed cables meet the NFPA requirements, especially the typical lower priced commodity and rigid products.

In summary, it is of the utmost importance to pay as much attention to the cables that will be used in equipment and machines as all the other costs required for an installation. To ignore cable specific requirements or simply consider them as sec-

ondary can be a very costly mistake or in worst case scenarios a very hazardous or life threatening risk. In the areas of industrial machine manufacturing and installation, the NFPA has taken a major step in addressing these critical issues by the publishing of its latest document, the 2007 edition of the NFPA 79. By omitting the use of AWM machine manufacturers, installers, contractors, end users, etc. are now insured that only listed cables will be used and supplied with the machine. The only allowable exception for AWM is if the machine has been previously listed with it as a complete system. It is also crucial to remember inspectors or the authority having jurisdiction in the area are the only qualified individuals that can make the final decision regarding correct cable requirements for an installation. We at Lapp USA can provide our interpretation of NEC® regulations, but we do not have any jurisdiction authority to provide a definitive answer. We can however offer product solutions that meet the new requirements. □

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