

COPING WITH ELECTRICAL SAFETY STANDARDS



APPLIANCE WIRE NOW PERMITTED—WITH RESTRICTIONS

The key change to NFPA-79 for 2012 involves the ability to use Appliance Wiring Material (AWM), which had been banned since 2007. AWM can be a cost-effective wiring choice compared to higher-performing UL listed Machine Tool Wire (MTW). But there were a couple of sound reasons behind the AWM ban.

For one, some contractors had been using AWM incorrectly as part of the building infrastructure. And the National Electrical code does not recognize AWM for this type of use.

For another, not all AWM products are created equal when it comes to the quality of their insulation layer. In cases of low-quality commodity cabling, insulation thickness variations had resulted in wire that was not sufficiently flame resistant for use in industrial machines.

It's important to stress that not all AWM suffers from this quality issue. Lapp and other reputable cable manufacturers can and do produce AWM products whose insulation wall thickness is both consistent and adequate for the voltage rating of the cable. High quality AWM can pass necessary vertical flame tests (FT 1) and can safely be used in industrial machines. Keep in mind, however, that AWM lacks the extra layers of PVC-nylon insulation found in MTW. This extra insulation allows some types of MTW to pass more rigorous flame tests (FT 4) than even the best AWM.

Reversing the AWM ban reflected the realities of the global machinery marketplace, in which AWM remains a popular cabling choice. In contrast to MTW cable, however, the permission to use AWM is not a given. Instead, the NFPA standard imposes restrictions intended to overcoming the potential drawbacks of AWM.

The first of these restrictions is the the AWM must be identified as suitable for the application at hand and must be used in

If you find electrical safety standards confusing, you're not alone. Many machine builders have recently had to grapple with an ambiguous round of changes to NFPA-79, the portion of the National Electrical Code that governs the electrical wiring of industrial machines.

The standard cuts a broad swath across the industrial machinery landscape. It applies to a comprehensive range of machine types—everything from machine tools and injection molding presses to testing machines and packaging lines. It encompasses all of a machine's electrical and electronic elements operating at 600 volts or less. The vast majority of machine power, control and lighting circuits fall under the scope of NFPA-79.

Machine builders have worked under the dictates of NFPA-79 for years, but earlier this year the standard underwent revisions that make it far more difficult to specify compliant electrical cabling. Here's a look at those revisions and how to design around them:

accordance with the machine manufacturer's instructions. The restrictions also detail cable construction details including minimum conductor count, flame resistance and wall thickness. Compliant AWM cable must be labeled appropriately with a jacket print legend that spells out the AWM style number, voltage, temperature rating and flame rating.

The reversal on AWM usage also resulted in increased documentation requirements. For example, field installation information related to the AWM wire must be provided with each machine's technical documentation.

FOR EASY COMPLIANCE, GO WITH MACHINE TOOL WIRE

Given all the cable runs on and around today's complex industrial machines, the need to document AWM usage for each and every machine represents the most onerous of all the NFPA restrictions. In the case of extremely large machines, such as bottling lines, machine builders and installation contractors have in some cases spend dozens of engineering hours and thousands of dollars complying with the documentation requirements (see sidebar).

These documentation requirements, while not insurmountable, need to be factored into the cost of wiring the machine. In some cases, the documentation may even erode the minor price advantages of some AWM cables.

If the documentation requirements cause concern, one way around them is to favor listed MTW. Because it inherently complies with NFPA-79, MTW cabling can alleviate the documentation requirements and eliminate any residual confusion over whether a given AWM product is approved and properly labeled. MTW also has a host of technical advantages that derive from its superior flexibility and resistance to flame, oil, chemicals and mechanical stresses.

Some MTW products also carry a UL TC listing and may even be rated for Exposed Run usage. These broadly-certified MTW cables adapt to the widest range of application requirements, and they can slash installation costs when used in exposed runs (see sidebar).

There's are times, however, when AWM may be the best valid choice, MTW's technical edge notwithstanding. In overseas markets, for example, AWM may win out for supply chain reasons.

If you do go with AWM, make sure you buy only the high quality product designed to withstand all abuse of an industrial environment. And buy from reputable suppliers who can help you comply with the complex labeling, documentation and application hurdles imposed by NFPA-79.

KRONES PUTS IN THE TIME FOR NFPA COMPLIANCE

One company that has successfully navigated the shoals of the recent NFPA-79 is Krones Inc., a leading manufacturer and integrator of packaging lines for some of the world's best known food and beverage companies. The company's engineering team recently found that compliant AWM usage does require a bit of extra effort compared to the automatic compliance found with listed UL wire.

"Whenever you have to implement changes to an electrical code, there's definitely an engineering labor factor," says Mike Nelson, the Krones engineer charged with NFPA-79 compliance.

Some of that engineering labor has gone into researching into specific AWM products to see whether they meet the compliance restrictions. Even proper jacket labeling doesn't answer all the compliance questions regarding AWM, "so you can't tell whether a product complies just by looking at the cable," says Nelson. More engineering labor has been devoted to NFPA-79's documentation requirements.

In all, Nelson estimates that Krones has spent more than 150 engineering man hours complying with the requirements related to AWM use. And that figure represents just work done to formulate a compliance strategy. It does not include the technical documentation and drawing changes needed for each and every machine.

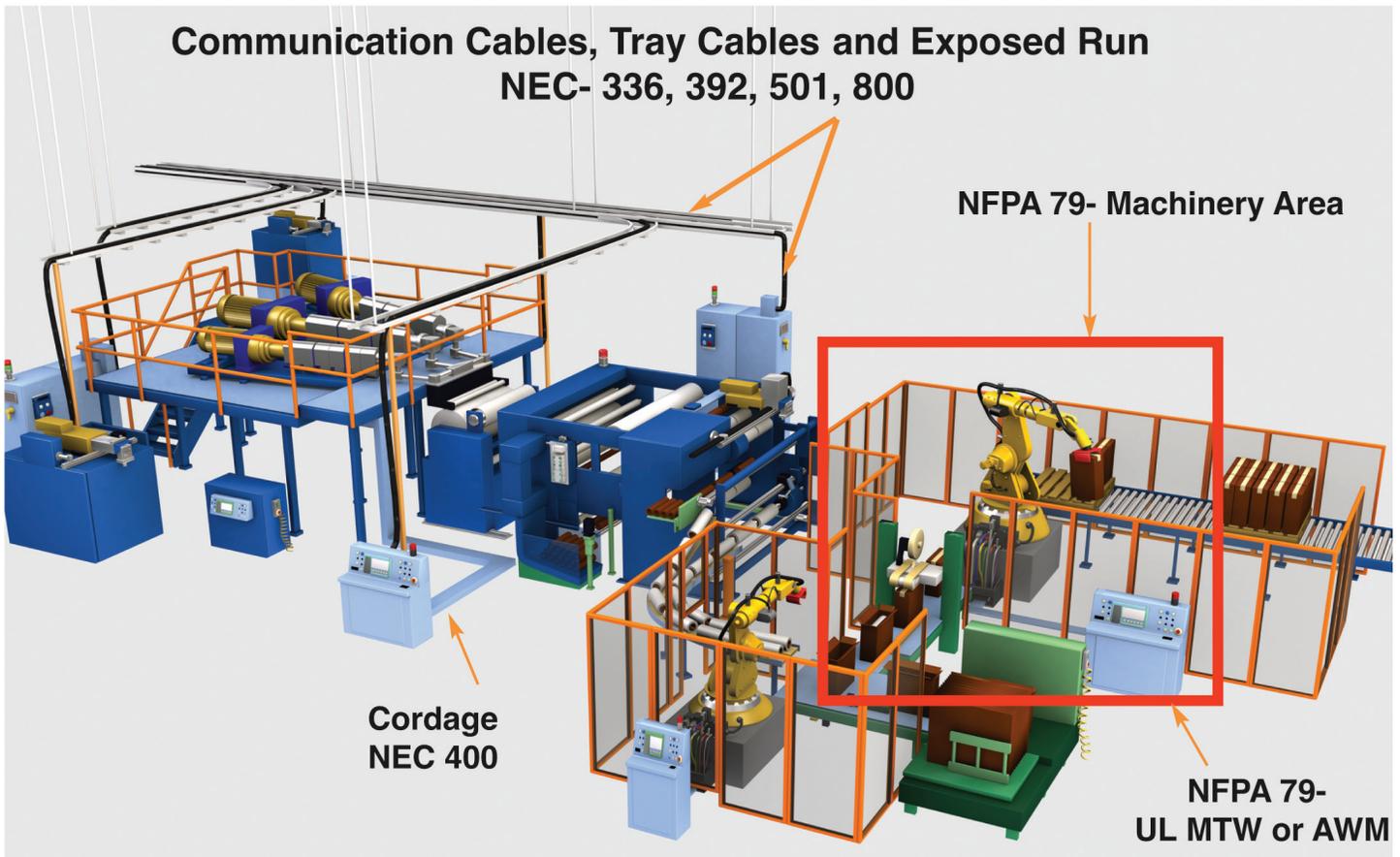


EXPOSED CABLE RUNS FOR FAST INSTALLATION

Another change in the 2012 NFPA-79 allows exposed cable runs along the structure of the equipment or in the machine chassis. As long as the exposed cables have to closely follow the surface and structural members of the machine, the installation does not require conduit, raceways or any special hardware. Thanks to reductions in installation time and labor, exposed cable runs can dramatically reduce cost dramatically compared to traditional installation methods requiring conduit or special mounting hardware.

Certain UL Listed cables meet Exposed Run (-ER) requirements, which provide an additional level of protection for these types of applications. Cables meeting -ER requirements are subjected to the same crush and impact tests as armored type or Metal Clad (MC) cables, allowing cables to leave the machine area and enter into a cable tray without conduit.

Keep in mind, though, that not all UL Listed cables meet NFPA requirements, especially the lower-priced commodity and rigid products.



COMMON ELECTRICAL COMPLIANCE QUESTIONS

With UL requirements and NFPA standards each holding sway over different aspects of electrical compliance, it's always been tough to figure out whether your cable choices will pass regulatory muster.

The job of picking compliant cables recently became even tougher. A new version of NFPA 79, the main standard governing the electrical safety of industrial machines, drastically changes the compliance picture. To read more about the changes and how they'll affect your cable selection practices, download our new technical paper on NFPA 79 compliance.

And check out the following answers to your most commonly asked compliance questions:

- **Is NFPA 79 a law?** No. NFPA-79 is the key electrical safety standard accepted by machine builders, installers and buyers in the United States.
- **Does a machine have to comply with NFPA 79?** In most cases, yes. The need for NFPA compliance ultimately depends on the application details and whether the machine is being installed in a building. When in doubt, it's a good idea to comply with NFPA 79 to maximize safety and avoid the potential for litigation.
- **Will machine builders and buyers standardize on the new edition of NFPA 79?** Yes. Concerns about safety and liability issues will force compliance with the new 2012 edition of the NFPA standard. Buyers of industrial equipment are unlikely to purchase non-compliant machines that could increase the potential for litigation.
- **Who decides which cables can be installed in the field?** Engineers may assume that UL dictates cable choice, but the real authority falls with electrical inspectors who determine compliance with the National Electrical Code. UL, however, does control the electrical, physical and environmental testing requirements and approvals that, in practice, determine cable usage in the field.
- **Are UL listed cables always allowable for use on a machine?** Not necessarily. There are machines that use UL listed cordage incorrectly. For example, some listed cables are only intended for temporary applications. Other listed cables may not meet the minimum stranding requirements needed for NFPA 79 compliance.
- **What's special about MTW approval?** Machine Tool Wire (MTW) approval requires that the cable be flexible and offer a high degree of mechanical durability. These characteristics allow it to perform under the challenging conditions surrounding industrial machines.
- **Are all MTW cables oil resistant?** Yes, all compliant MTW cables minimally meet the requirements of the UL Oil Res I test. For applications requiring a more severe exposure, the more rigorous Oil Res II test is also a permitted option.
- **Can I run MTW cable into building infrastructure?** No, not unless it is dual marked with the appropriate UL Listing. Cables marked "TC" offer the high flammability rating needed for installation in building infrastructure. The MTW requirements alone mandate that a cable only meet a minimal flame test known as VW-1.
- **Can cables be left exposed when going from the machine to the cable tray?** In most cases, no. Cables designed for exposed runs must have a "TC-ER" approval.