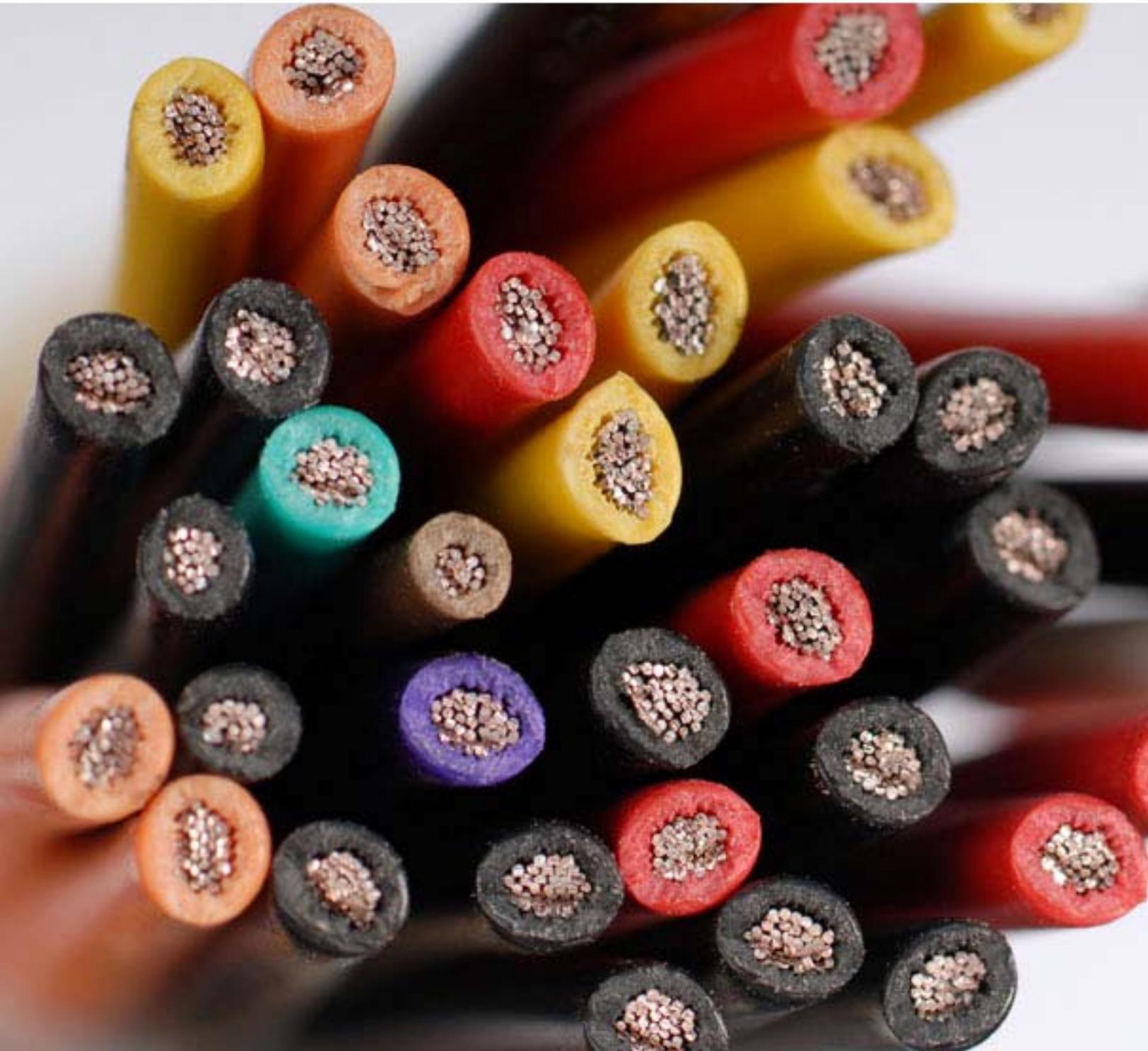


Explaining the Agency Approval Process for Wire and Cable Products

By Mike Levesque & Randy Elliott, C&M Corporation



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Some engineers think it is science. Others contend it is some type of black magic.

Many have no idea of exactly how the process works.

Regardless of what is known –or unknown – about the submission and evaluation process, there are few that will disagree with the premise that agency certifications, such as those offered by organizations like Underwriters Laboratories (UL), Canadian Standards Association (CSA), or Intertek, formerly known as Edison Testing Laboratories (ETL), to name only a few, are an important part of any product offering in the wire and cable industry. With today's focus on product safety, there has been an increased need for wire and cable products to carry either a listed or recognized mark signifying they have been independently evaluated and have met the appropriate safety guidelines that have been established based on their intended use.

In an attempt to help bring some clarity to the agency certification process for bulk cable, I have posed a series of related questions to Randy Elliott, C&M Corporation's Regulatory Compliance Engineer. Randy has been a practicing engineer in the wire and cable industry for over 20 years. His background in R&D and design engineering has brought him into contact with regulatory agencies and their requirements on a regular basis throughout his career. For the past three years, his focus has been completely on regulatory issues for C&M.

Who is responsible for testing and what do their results mean?

Interesting first question! For test results to be accepted as valid, they must be performed by a Nationally Recognized Test Lab, also known as an NRTL. These organizations are part of OSHA's NRTL Program, which is a part of their Directorate of Technical Support and Emergency Management. These labs test a given product to an appropriate standard and render a decision on whether or not that product met the requirements of that standard. In the case of wire and cable, the National Electric Code (NFPA-70) would be an example of installation guidelines against which standards and test parameters would be developed by the appropriate governing regulatory bodies. These parameters would then be used by the NRTL to determine whether a submitted product is compliant. Contrary to what many believe, these NRTL organizations do not grant "approvals". They only certify compliance of a product sample to a set of performance criteria.

Why is an agency mark necessary and what does it mean?

An agency mark serves as verification for a cable consumer that the item they are purchasing has been tested, certified, authorized, recognized and/or listed by a certified testing facility. Further, it ensures the product can be sold and used for the function it was intended without harm to human beings, animals, or the environment. In a word, it assures the buyer that the cable has been independently tested and based

on the results the product will meet or exceeded all safety requirements for the application in which it will be used. In many instances related to wire and cable, the markings required by the product's certification provide evidence to the AHJ – Authority Having Jurisdiction – that the product has been properly tested and is appropriate for the use intended.

How is the correct agency mark determined for a given product?

This is based in large part on the application and use of the product. Considerations such as where the cable will be used and how it is to be installed are part of the evaluation. In addition, safety codes as designated by the government of a particular country and any state or local building and installation codes must also be part of the process when the appropriate mark for a cable is determined. Again, the NEC would be very representative of such a governing code.

What is the difference between a listed, recognized, or certified product?

This is a common question that we hear often in the regulatory group and I am glad you asked. Each designation is a different way of saying the cable has been tested and found to comply with the standard it was tested against. Often, depending on the type of marking required, the testing parameters will be different. Generally, a 'listed' product will carry more stringent testing than a 'recognized' product. Further, 'listed' products can stand on their own while 'recognized' products usually serve as components in larger systems. The differences can be traced back directly to the standard each product type will be tested against. Those standards are driven by the end use.

How does a NRTL determine which tests they will need to run?

When a request for a new approval is made to a test facility, an engineer from the lab is assigned to work with the manufacturer. The work plan is captured under what is often called a 'project'. As part of the project, the engineer assigned reviews the construction and requested approvals and determines what tests and safety standards will have to be met based on the applicable standards in order for the lab to be able to approve the construction as either a listed, recognized, or certified product.

How are the sample constructions a lab will evaluate determined?

As part of the scope of the project, the responsible NRTL engineer assigned will determine, based on the certifications sought, what constructions will be required for evaluation. Often it is not a single construction, but a range of constructions that are driven by the manufacturer's desired approvals. For example, most manufacturers will not seek approval for a "six conductor, 28 AWG, PVC insulated, unshielded" cable construction. They will seek something more along the lines of "2 to 50 conductors, 28 AWG-18 AWG, PVC insulated with optional shielding". Generally, a wider range of approvals will require a larger range of samples. The detail provided by the NRTL engineer to the manufacturer will include parameters such as conductor counts, gauge sizes, and wall thicknesses for both the primary insulation and jacket that will be required in the various samples submitted.

What are some of the typical tests that are performed when evaluating cables?

The number and types of tests are driven by the approval sought by the manufacturer. At a high level, and at a minimum, all physical parameters are tested. This would include parameters such as tensile and

elongation, as well as material thicknesses. In addition heat aging, cold bend, cold impact, and flame testing, among others, may also be added to the overall test plan.

Why are some submittals completed quickly while others require significant time?

It all comes down to the approval sought. Some approvals require very basic testing and are completed quickly. Some listings, however, may require, for example, a long term aging test that could take several months to complete. Some other types of testing, such as sunlight resistance test, may take 720 hours, or just over a month of around the clock testing, while a Weatherometer test may take 1000 hours, or just short of six weeks of non-stop testing. Often times, at the end of the day, the approval time is a function of simple physics – you cannot do a 1000-hour test in 20 hours.

What happens if you fail the testing?

In addition to being disappointed from an approval perspective, the manufacturer is also somewhat disappointed financially as well. If your samples fail the evaluation, you are provided with options that are consistent with your testing organization’s guidelines. As an example, should you fail your testing, you might be allowed to close the project and be billed for 50% of the quoted testing price, or, if you feel you can quickly address any of the failure modes indicated, you may be allowed to opt for leaving the project open and re-submitting new samples, at which time an additional charge of up to 50% of the cost of the originally quoted price would be added to your invoice. Cable users can take solace in the fact that no product is granted an approval unless it has met the required testing. ‘Very close’ is never good enough relative to NRTL testing.

Do the samples submitted for testing match the actual product?

The form of the samples submitted are determined by a number of factors. In some instances, an exact product match may be requested, while other times constructions that differ from the exact product parameters may be requested. Regardless of the construction submitted, the decision on what samples will be provided is driven by the testing requirements.

How do the NRTLs determine from their test results the range of the approval they will grant?

Generally, specific tests require samples that may include particular cable constructions, wall thicknesses, materials, etc. Based on the original intent of the project combined with the lab’s years of experience in testing and evaluating test data – and they have a lot of experience! - the responsible engineer will correlate the testing results and from that determine what range of cable constructions best meet the actual application requirements of each listing requested. What this can mean to a manufacturer is while a certification has been granted, it may not carry the range of construction options that was originally requested. Based on the need or intent that drove the manufacturer's original request that may or may not turn out to be a problem.

How are compliant cables identified and why is the identification important?

Each of the organizations that evaluate cable products has a methodology for identifying cables that have passed their testing regimens. For example, UL uses an “E” number while CSA identifies cable via a “LL” identification number. ETL uses yet a different identification system. Regardless of the method, the process of identifying compliant products allows an inspector who is out in the field evaluating a cable

construction the ability to quickly determine the manufacturer of the cable or product. If a cable user needs to know the manufacturer, perhaps to secure replacement parts or ask technical questions, in the case of a UL certification, for example, they can reference the E-number on UL's website where they will be provided with the name of the manufacturer.

How does the NRTL ensure the parameters they have approved are met once actual manufacturing begins?

That is a good question. Using UL as an example, they provide a FUS (Follow Up Service) whereby the UL Inspector is at the manufacturing facility periodically. During the visits, the inspector is free to move about the manufacturing floor or warehouse and pick random samples of products that carry any type of UL marking. The samples and frequency of collection are determined by the applicable sample plan. Those samples are then tagged and submitted to the UL test lab for follow up testing to ensure products are being manufactured according to listing requirements. Other labs may use similar type of follow up service.

How does the manufacturer ensure compliance around parameters that cannot be easily tested lot to lot, such as those associated with long term aging?

Manufacturers have internal quality control programs that randomly test products for compliance. That is a 'given' for any company that has a viable quality system. Generally, when specific materials are certified or listed by a test lab, the manufacturer's engineering team will design new cables using the materials that are known to have passed testing for the key parameters they are considering in their design work. Based on the cost and time involved around approvals, it serves no purpose to supply products for testing that are unknown relative to their ability to meet certain performance criteria if reliable and proven materials or manufacturing techniques are available.

What latitude does the manufacturer have around changing materials – as an example, for cost savings – without the risk of losing their approval?

All changes to materials listed by a NRTL as part of their approval documentation have to be resubmitted for approval. Even if the new material is superior in every way based on test results from the vendor or the manufacturer, if it was not part of the original submittal it cannot be substituted. It is that simple and straightforward. The only way new materials can be added to the existing listing before use is through a submittal, retesting, and a subsequent certification by the test lab after their evaluation. This provides another assurance to users that they are purchasing the same product each time they buy.

What is harmonization?

Despite being competitors, NRTL's often test to the same standards. As a result, and in the interest of fairness, they often cooperate around product certifications and toward that end have developed standards that mirror each other. As an example, let's consider a cable that is made by a US manufacturer who is seeking a particular certification for both the US and Canadian marketplaces. In the example, let's assume the test lab used is located in New York. If the testing done in that lab would be identical to the testing done in a Canadian based lab, the certification received from the New York lab would carry what is called a "harmonized" mark. This mark would indicate the product is certified for use in both the US and Canada. The same could be true if the test location was Toronto, for example.

Certifications for products used in Europe, or tested in Europe for use in the US or Canada can also be part of this cooperative, or harmonized, certification program.

In today's world of compressed product introduction cycles and a 'faster to market' focus for many companies, the importance of the agency approval process to the introduction strategy cannot be underestimated. In many instances the time required to secure the approvals can outpace the time required to design, prototype, evaluate, and submit the samples to a regulatory agency for their evaluation. When choosing a wire and cable vendor it is important that the manufacturer possesses not only an in depth understanding of product design but the certification process for those products as well. This technical expertise on the part of your vendor is critical to avoiding compliance issues that could potentially de-rail a new product introduction or delay the implementation of a product improvement.

With this being said, one of the soundest strategies for cable users who may require specific agency approvals that are based on unique constructions required to support their product, or will be counting on their cable vendor to secure specified approvals as part of their service offering, is to engage the manufacturer as early in the design cycle as possible, understand the approval process that will apply to the product under development, and include the required evaluation time as part of their overall development plan.

For more information or design assistance, please call C&M Corporation at 860-774-4812 or email us at sales@cmcorporation.com