

APPLICATION ENVIRONMENTS:

Flammability and Fire Effects



Among the physical properties of nonmetallic materials used in modern wiring systems and wiring components, flammability characteristics are extremely important. The flammability of nonmetallic materials, including those used to mold cable ties and their associated fixing devices or coat metallic cable ties, have been tested, measured, and compared to determine safe levels of use. There is a growing consideration in some applications for a better understanding of other fire related effects involving nonmetallic materials.

Flammability

Flammability can be defined as the relative ease with which a material will ignite, continue to combust, and spread or propagate a flame over a distance. The relative difficulty required to cause the ignition of a material is typically determined through laboratory fire testing. Perhaps the most recognized rating system for the flammability of nonmetallic materials is determined by the tests found in UL 94, *Test for Flammability of Plastic Materials for Parts in Devices and Appliances*, and IEC 60695-11-10, *Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame-test methods*. A summary of these flammability classifications can be found at <https://plastics.ulprospector.com/properties/UL94> .

The present standards for Type 11, 21, and 21S nonmetallic cable ties and their associated nonmetallic fixing devices specify minimum flammability characteristics. HB is the minimum rating in accordance with UL 94 and IEC 60695-11-10. Products that offer a higher flammability rating are commonly available. Composite cable ties and fixing devices that use a non-metallic material for a portion of the product are evaluated in the same manner.

Type 1 and 2 non-metallic and composite cable ties and Type 2 Metallic cable ties with a non-metallic or organic coating are evaluated for adequate resistance to flame propagation in accordance with the needle flame test specified in IEC 60695-11-5, *Fire hazard testing - Part 11-5: Test flames - Needle-flame test method - Apparatus, confirmatory test arrangement and guidance*.

Other Fire Effects

The relative flammability characteristics of a nonmetallic material used in a cable tie or any nonmetallic component can be enhanced with specialized polymers such as those having higher continuous operating temperatures or that have flame-retardant additives. Due to the typically small size and volume of non-metallic material to construct a cable tie, the likelihood to endure the



effects of prolonged exposure to fire is low. Increasing consideration is being given to the contribution of all combustible materials to the perils resulting from a fire. Some "fire effects," or by-products of combustion, that may be considered include: generated heat, volume of smoke, toxicity of smoke, and corrosiveness of smoke.

Type 2, 21, 2S, 21S cable ties and fixing devices that meet the requirements of UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces*, have demonstrated characteristics for low smoke volume and heat generation under fire conditions. This qualification meets requirements in the National Electrical Code®, NFPA 70, and NFPA 90A. See [NEMA Cable Ties Application Guide No. 1](#) for more details.

All fires result in toxic smoke, regardless of the building materials involved. Carbon dioxide (CO₂) and carbon monoxide (CO) are produced in all fires. CO, an odorless and colorless gas, is universally recognized to present a toxic threat in any fire situation. The hazard of gases produced when most plastics burn is similar to the hazard produced by any other burning building materials. Smoke and gases from nonmetallic cable ties are no more hazardous than those from other materials commonly used in construction or the contents of a building.

Concern for the corrosiveness of smoke, usually associated with materials that include halogens when exposed to fire, is a special consideration particularly in installations with sensitive electronics. Plastic materials such as standard 6/6 nylons commonly used in cable ties and fixing devices are usually halogen free, but when enhanced for higher continuous operating temperatures or for improved flammability ratings, halogens may be introduced to the product.

Similar to relative flammability characteristics, cable ties and fixing devices are available in a variety of polymeric materials with enhanced characteristics intended to address many of these "fire effects" considerations. It may be impractical however to expect any one material to optimize each of these characteristics. While there is a trend toward considering the potential aggregate impact of all combustible materials in an application environment, cable ties and fixing devices typically represent a very minor contribution to the overall "fire effects" volume of such materials in most any event.

The manufacturer should always be consulted if there is a question about the proper application of a cable tie or associated fixing device.

NEMA members provide high value, consistent quality, safe and efficient use for cable ties and their associated fixing devices that meet the expectations of a wide variety of users. Visit us at <https://www.nema.org/directory/products/view/cable-ties> for current information on our industry and for the names of NEMA cable tie manufacturers.



NOTICE AND DISCLAIMER

The information in this publication was considered technically sound by the consensus of persons engaged in the development and approval of the document at the time it was developed. Consensus does not necessarily mean that there is unanimous agreement among every person participating in the development of this document.

The National Electrical Manufacturers Association (NEMA) standards and guideline publications, of which the document contained herein is one, are developed through a voluntary consensus standards development process. This process brings together volunteers and/or seeks out the views of persons who have an interest in the topic covered by this publication. While NEMA administers the process and establishes rules to promote fairness in the development of consensus, it does not write the document and it does not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in its standards and guideline publications.

NEMA disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. NEMA disclaims and makes no guaranty or warranty, expressed or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfill any of your particular purposes or needs. NEMA does not undertake to guarantee the performance of any individual manufacturer or seller's products or services by virtue of this standard or guide.

In publishing and making this document available, NEMA is not undertaking to render professional or other services for or on behalf of any person or entity, nor is NEMA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

NEMA has no power, nor does it undertake to police or enforce compliance with the contents of this document. NEMA does not certify, test, or inspect products, designs, or installations for safety or health purposes. Any certification or other statement of compliance with any health or safety-related information in this document shall not be attributable to NEMA and is solely the responsibility of the certifier or maker of the statement.