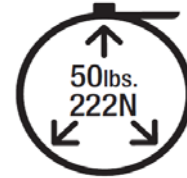


**APPLICATION CONSIDERATIONS:**

*Mechanical Properties*



This application guide is intended to describe the mechanical properties most often considered in the design and intended performance of cable ties and their fixing devices. When considering the mechanical properties of any fastening device, understanding its intended use is the best way to prioritize the most important mechanical characteristics. The versatility of cable ties and their associated fixing devices has led to their use in a very wide variety of applications. Therefore, the set of physical characteristics offered in a given product can often go beyond that which is critical for an application. It is important that users and specifiers understand that all cable ties are not the same despite their outward appearance. Materials, design, and control of manufacturing processes combine to provide the mechanical properties declared by the manufacturer and help ensure their reliability in the application environments and conditions specified for the products.

Fundamental applications for cable ties are bundling, securing and supporting. For electrical applications, all of these can be associated under the heading of cable management. Cable ties have for decades provided a convenient and economical means to bundle electrical conductors or cables in manufactured equipment, in temporary or permanent field installations and to assemble wire harnesses for a variety of applications. Managing wires and cables in electrical applications by bundling and safely routing them is necessary for “neat and workmanlike” installations required by the National Electrical Code®. Effectively positioning and securing conductors and cables helps ensure that necessary electrical and mechanical clearances are maintained. The bundling of circuit conductors is also a convenient means for identifying discrete circuits in a crowded panel. Securing of cables or bundles of wires to a support structure is also very common and when carefully selected and spaced, cable ties and appropriate fixing devices will support static loads. They can also provide resistance to movement of cables or wire bundles due to electromechanical forces resulting for example, from motor starts.

**Mechanical Strength – Cable Ties**

The traditional measure of the mechanical ability of a cable tie to remain locked around a bundle of wires or cables is its loop tensile strength. The term “loop tensile strength” was first used in the first standard for cable ties, a U.S. military specification for cable ties used in aircraft. Although not implied to be a static load rating for the product, loop tensile strength is an important reference mechanical characteristic of a cable tie with its locking mechanism engaged. Traditional loop

tensile strength ratings: 18 lbs., 30 lbs., 50 lbs., 120 lbs., and 175 lbs. are most common although other ratings may be declared.

Often, the polymers used in the construction of nonmetallic cable ties have been pre-tested for other mechanical strength characteristics (e.g. Tensile Strength- ISO 527-2, Flexural Strength- ISO 178). The cable tie manufacturer should be contacted when additional information on mechanical strength is needed.

### **Mechanical Strength – Fixing Devices**

The mechanical strength declared for a separately supplied fixing device intended for use with a cable tie, or a fixing device provided as an integral part of a cable tie, should be considered as its static load capability with no safety factor applied. Specific installation instructions provided by the manufacturer should be strictly followed to ensure reliable performance and safety, especially where static loads are to be suspended. When the installation of a cable tie and a fixing device will be subject to a static load, the declared mechanical strength of the fixing device must always be considered along with the loop tensile strength of the cable tie in determining the suitability of the installation.

### **Impact Resistance**

The National Electrical Code® typically does not permit electrical wires and cables, and even flexible conduits, to be installed where they are subject to physical abuse. Standards for cable ties and their fixing devices therefore do not traditionally address resistance to impact or dynamic forces. Often, the polymers used in the construction of nonmetallic cable ties have impact resistance characteristics predetermined by tests (e.g. Tensile Impact- ISO 8256, Izod Impact- ISO 180, Charpy Impact- ISO 179-2). The cable tie manufacturer should be contacted when impact characteristics are important for the application.

### **Supporting Conduit and Cables in Accordance with the National Electrical Code®**

Cable ties are specifically mentioned in the NEC® for support of some flexible wiring methods and are generally accepted among “other support hardware” for most wiring systems. Close adherence to the maximum spacing intervals for supports specified in the NEC® for each raceway and cable type is important. Closer support intervals are often an acceptable option to heavier support hardware where security of the support system is in question.

Nonmetallic cable ties are not recommended for primary support of rigid conduit (metallic or nonmetallic) or electrical metallic tubing. For supporting flexible conduits (e.g. electrical nonmetallic tubing, flexible metal conduit, liquidtight conduit) or flexible cables and cord, only cable ties having at least a declared minimum loop tensile strength of 50 lbs., and associated fixing devices having a declared mechanical strength of at least 50 lbs., should be considered.

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 <http://www.nema.org/prod/be/cable-ties/> for current information on our industry and for the names of NEMA cable tie manufacturers.

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