

**TEMPERATURE CONSIDERATIONS:**

***Electrical Conductor and  
Temperature Ratings***



When specifying the maximum operating temperature of cable ties or associated fixing devices, it is not necessary to match the insulated conductor's or cable's marked temperature rating. Use the installation environment's maximum temperature when selecting the cable tie product.

Cable ties should not be considered electrical insulation, and their insulating value, if any, is not evaluated in UL 62275.

Maximum and minimum operating temperature ratings identified for cable ties and associated fixing devices refer to the extreme conditions in the application environment where the products are placed and expected to perform their intended function.

In electrical installations, cable ties are most often expected to bundle or secure insulated electrical conductors, or groups of conductors or cables. Insulated electrical conductors and cables also have marked temperature ratings. Those ratings pertain to the range of temperatures that the conductor insulation or cable jacket can withstand in order to maintain its mechanical integrity and electrical insulation properties, or dielectric strength. Of course, electrical current that flows through these conductors is a natural source of heating. The amount of heat generated is a function of a combination of factors, including the resistance in the circuit for which the conductor(s) is used and the installed environment. Also, the proximity of insulated conductors to one another can add heat through electromagnetic induction.

Electrical Codes contain sophisticated calculations to compensate for the effects of potential excessive heating of the conductors based on the system design and installed environment through adjustment factors. Very often, these adjustments result in significant reductions or derating of the circuit ampacity (current carrying capacity). The marked temperature rating on a conductor or cable is not the anticipated or recommended continuous operating temperature of the conductor or cable.



## **Exposure to High or Low Temperatures**

Performance characteristics of engineered polymers such as those used in cable ties and their associated fixing devices can be affected by temperature. Exposure to extreme temperature conditions and widely variable temperature cycles can be experienced year-round in climates around the world; outdoors, indoors in harsh environments, and even within manufactured equipment in operation. The installation of a nonmetallic cable tie in cold temperatures also requires special considerations.

## **Operating Temperatures**

The maximum and minimum operating temperature in a given environment is amongst the most important criteria to consider when deciding the use of a cable tie product.

Cable ties and their associated fixing devices are typically rated for both maximum and minimum operating temperatures. These are the temperature extremes for which the products are expected to continuously maintain their intended function in normal use. Prolonged exposure to temperatures that are higher or lower than those declared for the product eventually will result in a loss of mechanical properties and potential failure. This is most commonly seen as a loss in loop tensile strength and/or polymer embrittlement.

Cable ties and their associated fixing devices are commonly available in materials having a wide range of declared temperature ratings. Metallic cable ties, as expected, have the widest temperature range but even nonmetallic products are available with declared operating temperatures of 170°C or higher and -40°C or lower.

## **Installation Temperature**

The temperature in the application environment in which nonmetallic and composite cable ties are to be installed is an important consideration for user satisfaction and their overall performance. Usually assembly at low temperatures is of greatest concern. If the temperature is too low, most nonmetallic and composite materials will become brittle, which can lead to breakage during assembly of the product. Typically, due to the nature of their design and size, a cable tie could crack or degrade, which could lead to breaking under this condition. Unless the manufacturer declares a lower temperature, the minimum recommended installation temperature should be considered to be 0°C.

If the application requires the installation of cable ties at lower temperatures, products should be stored in a controlled temperature environment up until the time of installation.

There are no particular high installation temperature recommendations, other than what would be a reasonable environment in which a person could safely work and the maximum operating temperature declared for the product.



## **Other Considerations**

The maximum and minimum operating temperature ratings for cable ties and their associated fixing devices, particularly those made from polymeric materials, may not fully take into account the effects of other elements present in the application environment. Continuous exposure to temperatures approaching the declared limits for the products can contribute to material degradation or reduced performance if the environment also contains certain chemicals, sees high or low levels of moisture, or is subject to dynamic forces such as vibration. All of these factors need to be taken into consideration in the selection and installation of cable ties.

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 member cable tie manufacturers.



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