

Studies have shown that cable failures are often due to damage caused during installation. The recommended practices detailed below are based on information compiled from field studies and experience installing electrical conductors that are recognized by applicable codes and standards. These recommendations are intended to optimize the cable life.

Cables must not be installed below the minimum installation temperature without warming the cables. When installing in cold weather, cables should be stored in a heated environment for a period of at least 24 hours prior to installation.

Jacket / Insulation Type	Minimum Installation Temperature	
PVC	-10°C	14°F
XLPE	-40°C	-40°F
NYLON	-3.9°C	25°F

## Guidelines for Installing Conductors in Cable Tray or Raceways

Before installation, be sure the raceway or conduit is sized in accordance with the requirements of the National Electrical Code (NEC). Care should be taken to ensure that no sharp edges exist to cut the cable's insulation as it is being installed. It is essential to run a clean brush through the conduit to remove or loosen any burrs. When finished, pull a swab through to clean out foreign objects.

When installing cables in wet, underground locations, the cable ends must be sealed to prevent entry of moisture into the conductor strands. These seals should be left intact or remade after pulling is disrupted, until splicing, terminating, or testing is to be done. This practice is recommended to avoid unnecessary corrosion of the conductors and to safeguard against entry of moisture into the conductor strands, which would generate steam under overload, emergency loadings, or short circuit conditions after the cable is energized.

Another important consideration is to not exceed the maximum allowable tensile strength or the maximum bending radius of the cable. The force required for pulling a given length can be reduced by the application of a pulling compound on cables in conduit and the use of rollers in cable trays.

## A. Maximum Pulling Tension on a Cable

The maximum tension should not exceed .008 times of the circular mil area when pulled with a pulling eye attached to the copper conductor.

$$\text{Formula: } T_m = .008 \times N \times CM$$

Where:  $T_m$  = max pulling tension (lbs.)  
 $N$  = number of conductors being pulled  
 $CM$  = circular mil area of each conductor

## B. Maximum Permissible Pulling Length

The maximum length of cable that can safely be pulled through conduit is calculated as shown below:

$$\text{Formula: } LM = T_m / (W \times C)$$

Where:  $L_m$  = maximum pulling length (feet)  
 $T_m$  = maximum tension (lbs.)  
 $W$  = weight of cable per foot (lbs.)  
 $C$  = coefficient of friction (usually .5)

## C. Maximum Bending Radius

The minimum bending radii for both single and multiple conductor cable, with or without lead sheath and metallic shielding, are as follows:

Thickness of Conductor Insulation (inches)	Outside Diameter of Cable		
	(inches)	(inches)	(inches)
	1.000 & less	1.001-2.000	2.001 & over
	Minimum Bending Radius as a Multiple of Cable Diameter		
.169 & less .170 & larger	4	5	6
	5	6	7

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