USA WIRE & CABLE, INC.™

BENDING RADII AND PULLING TENSIONS

MINIMUM BENDING RADII

Power Cables 600 Volts. without Sheath. Shielding or Armor

The minimum bending radii for single and multi-conductor cables rated 600 volts and less, and without lead sheath, shielding or armor;

Thickness of Conductor Insulation in Mils	Minimum Bending Radius as a Multiple of Cable Diameter		
	Overall Diameter of Cable in Inches		
	1.000 and Less	1.001 to 2.000	2.001 and Over
169 and less	4	5	6
170 - 310	5	6	7
311 and over	-	7	8

Power Cables Over 600 Volts. without Sheath. Shielding or Armor

1. The minimum bending radius for all cables is eight times the overall cable diameter.

Shielded Cables without Armor. All Voltages

1. The minimum bending radius for single conductor cable and multi-conductor cable with an overall shield is twelve times the overall cable diameter.
2. The minimum bending radius for multi-conductor or multiplexed cables having individually shielded conductors is twelve times the diameter of one of the individual conductors or seven times the overall diameter, whichever is greater.
3. The minimum bending radius for lead sheathed cables is twelve times the overall cable diameter.

Interlocked Armored Cable. All Voltages

1. The minimum bending radius for cables with non-shielded conductors is seven times the armor O.O..
2. The minimum bending radius for cables with shielded conductors is twelve times the diameter of one phase conductor or seven times the overall diameter, whichever is greater.

Note: The minimum bending radius applies to the inner surface of the cable and not to the cable axis.

PULLING TENSIONS

A. Maximum Pulling Tension on Cable

(1) With pulling eye attached to copper conductors, the maximum pulling tension in pounds should not exceed 0.008 times cir-mil area.

(2) With pulling eye attached to aluminum conductors, the maximum pulling tension in pounds should not exceed 0.006 times cir-mil area.

$$T_M = 0.008 \times n \times CM$$

where

T_M = max. tension, lb.

n = number of conductors

CM = cir-mil area of each copper conductor

(3) With cable grip over lead sheath, the maximum pulling tension in pounds should not exceed 1500 lb./sq. inch of lead sheath cross-sectional area for commercial lead

$$T_M = 4712\ t\ (O - t)$$

where

t = sheath thickness, inches

O = overall diameter of cable, inches

(4) With cable grip over non-leaded cable, the maximum pulling tension should not exceed 1000 lb. and may not exceed the maximum tension based on 0.008 or 0.006 x total conductor area.

(5) When more than three conductors are pulled together, the maximum pulling tension should be reduced 20%.

B. Maximum Permissible PUlling Length

$$L_M = \frac{T_M}{fW}$$

where

L_M = pulling length, feet (straight section)

T_M = maximum tension, lb.

W = weight of cable per foot, lb.

f = coefficient of friction (usually 0.5)

C. Pulling Tension Requirements in Ducts or Conduits:

(1) For straight sections, the pulling tension in pounds equals the length of duct or conduit multiplied by the weight per foot of cable and the coefficient of friction (paragraph B, above). T=LWf

(2) For curved sections, the following formula applies:

$$T_c = T_1 e^{fa}$$

where

T_c = tension exiting curved section, lb.

T_1 = tension entering curved section, lb.

a = angle of bend in radians (1 radian = 57.3 deg.)

f = coefficient of friction (usually 0.5)

e = naperian logarithm base

(3) To limit the sidewall bearing pressure on cables at bends, the maximum pulling tension in pounds shall not exceed the following factor times the radius of curvature of bend expressed in feet:

Cable Type	Factor
Low Voltage 16-10 AWG	300
Low Voltage 8 AWG & LGR	500
5kV NonShielded	500
5kV-35kV	500
Interlocked Armor (all voltages)	300