WIRE WISDOM
Wire & Cable Group

ANIXTER

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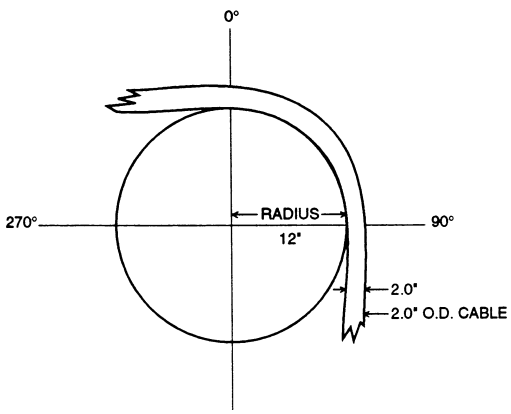
Minimum Bending Radius

It is fairly obvious that most cables are designed to be bent or flexed. However, a related and frequently asked question is -- how *tight* can you bend a cable without damaging it?

The answer depends primarily on the specific cable being considered. There are several industry standards that give minimum bending radii for many different cable types. The most frequently used sources are the National Electrical Code (NEC) and the Insulated Cable Engineers Association (ICEA).

But let's not get ahead of ourselves. What is "minimum bending radius"? Take a look at the illustration to the right. In the drawing, a cable is being bent around a radius of 12 inches. The bend could be the result of pulling a cable around a curve in an above ground conduit or undergrount duct. It could also be the result of laying a cable in the bend of a cable tray or pulling a cable around a sheave (rhymes with "give") -- a pulley set up in a manhole to help ease a cable around a curve.



According to the rules of trigonometry that you learned so well in school, the *radius* of a circle is always one-half the *diameter*. Keep that fact in mind because, in the wire and cable industry, we usually give the minimum bending *radius* as a multiple of the cable *diameter*. (I think we do it to confuse newcomers to the industry.) When there is no circle present to determine the radius of the bend (as there is in the illustration above) just imagine a circle with a diameter that just "snuggles" into the curve of the cable. The bend radius is then the distance from the center of the imaginary circle to the inside surface of the cable bend. Easy huh?

Now, back to the minimum bending radii for specific cables. Below is a table of minimum bending radii for various cable types. The table is a simplified version of actual, more detailed, industry recommendations but is accurate enough for most applications. For more precise (but more difficult to use) information, see NEC Articles 300-34, 334-11, and 336-16 as well as Appendix H of ICEA S-66-524 and ICEA S-68-516.

(continued)

Cable Type	Minimum Bending Radius as a Multiple of Overall Cable Diameter
Single or Multiple Conductor Cables without Metallic Shielding	8 times the overall cable diameter
Single Conductor Cables with Shielding	12 times the overall cable diameter
Multiple Conductor Cables with Individually Shielded Conductors	12 times the individual cable diameter or 7 times the overall cable diameter -- whichever is greater
Portable (Mining) Cables	6 times for cables rated 5000 volts or less, 8 times for cables rated over 5000 volt
Fiber Optic Cables	10 times overall diameter for multimode cables, 20 times overall diameter for singlemode cables
Interlocked Armor or Corrugated Sheath (Type MC) Cables	7 times overall cable diameter

To use the table, obtain the required cable diameter from product literature, from the cable supplier, or by measuring the actual cable. Then multiply that diameter by the appropriate factor from the table. If you have the cable diameter in inches, the minimum bending radius that you calculate will also be in inches.

Example: What is the minimum bending radius of a 1/0, 5 kV, SHD-GC cable?

Answer: SHD-GC is a shielded mining cable. Consulting the table, the minimum bending radius is found to be 6 times the cable's overall diameter. The overall diameter of the cable is given as 2.08 inches in the product catalog. Multiplying 2.08 inches by the factor of 6, we get 12.48 inches. Eureka! The minimum bending *radius* for this SHD-GC cable is approximately 12 ½ inches! Or, put another way, it can be safely bent around a *diameter* of 25 inches.

So remember -- In general, cables are durable and quite rugged -- but they do have their limits!

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