CABLE MANUFACTURING & ASSEMBLY CO. INC.

CALCULATING MINIMUM BEND RADIUS FOR MECHANICAL CABLE SYSTEMS

Pull-Pull & Push-Pull Influences on Bend Radius

Pull-Pull Cables

Pull-Pull cable assemblies are used in applications that require the transmission of forces in tension only. In general, a more flexible conduit and cable construction is used in order to allow greater freedom for routing around smaller bend radii.

Push-Pull Cables

Push-Pull cable assemblies are used in applications that require the transmission of forces in both tension and compression. In general, Push-Pull cables require the installer to consider as few bends or turns as possible along larger radii.

Other Related Mechanical Cable Types by CMA Cable:

Remote Actuator Cables

Remote Actuation Cable Systems (RAS) are a subset of both Push-Pull and Pull-Pull cables. An internal return spring built into the actuating mechanism allows the cable to be used for Pull-Pull applications.

Cycle-Flex™ Miniature Cables

Combining lubricated, stainless steel strands with a flexible, abrasion resistant Nylon coating, Cycle-Flex™ cables are designed for high life cycles and reciprocating drive applications.

Determining Minimum Bend Radius for Push-Pull & Pull-Pull Cables

With so many cable configurations available, finding the minimum bend radius will ultimately depend on the manufacturer's general recommendations or actual test data from the application itself. Regardless, it's always considered as an estimation.

Factors that affect cable life during routing, such as fatigue and rate of fatigue, have to be determined by the actual application's number of cycles and loads. In addition, the frequency and influence of surface contact and mating between cable and drum/sheave will also play a significant role.

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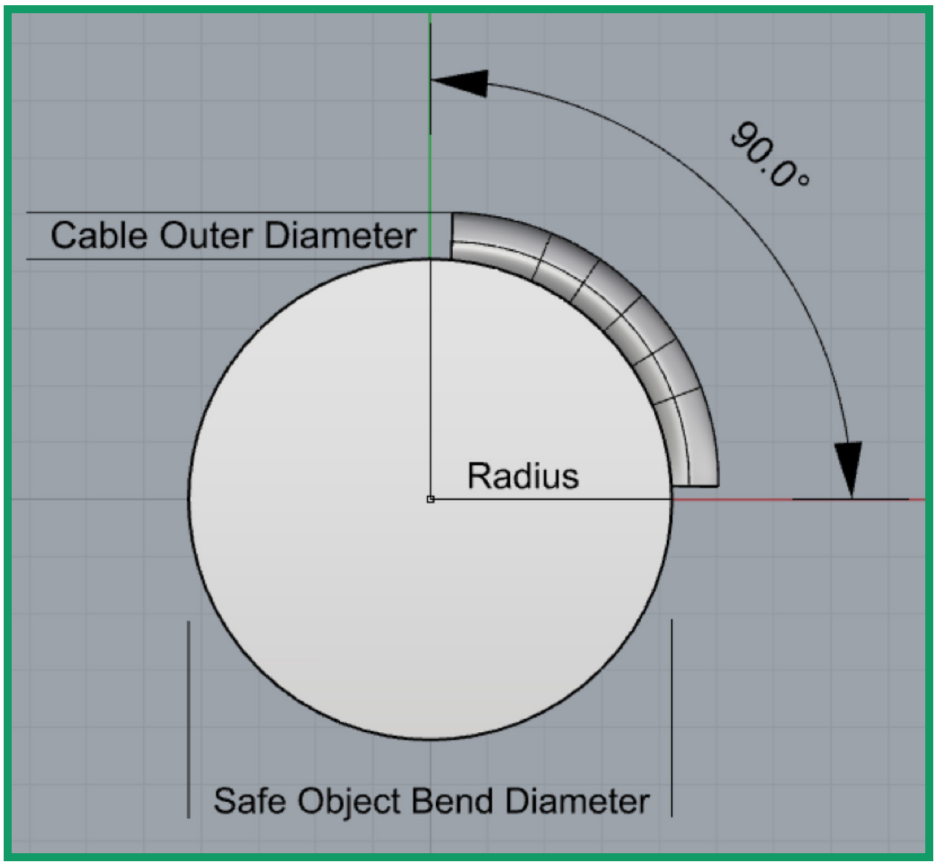
Calculation for Cable Bend Radius

Generally, cables should never flex beyond 90˚ and exceed a 2" radius. At CMA Cable, bend radii estimations are performed using the following formula:

Estimated Bend Radius = Diameter of cable x 100

This estimation is based on the assumption that the cable is subjected to cyclic bending stresses while operating over some type of sheave or drum. The magnitude of the stresses will depend on the ratio between the sheave's diameter (D) and cable's diameter (d), expressed as D/d.



The smaller the bend radius is in a cable, the greater its degree of flexibility. If the bend radius is larger, the cable is less flexible.

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Additional Considerations for Cable Type

While the calculations above provides a general determination for minimum bend radii, more precise charts are available that depend on the manufacturer's specific cable type, industry standards, and other included features.

The minimum bend radius, for example, of a push-pull cable will differ than that of a remote actuation cable. This requires us to consider all of the cable's features when determining the minimum bend radius and to verify any other supplied data that's available from the manufacturer.

Bend Radius When Using Cable Connectors

For cable connectors such as ferrules or clamps, holding the cable in place may also flex the cable beyond its recommended bend radius. In addition, pulling the cable at an improper angle in relation to the connector may cause damage.

Additional Design Criteria for Bend Radius

- Consider the pulling tension
- Relevant movement between top cable strands and bottom cable strands due to change in distance
- Changing the bending direction frequently will accelerate fatigue
- Cable lubrication
- Groove-to-cable seating

Questions?

If you have questions or are interested in speaking with us about the proper selection of a pulley for our line of cable assemblies, we are happy to help. Contact CMA today!

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