

FORCE-TO-BEND AND MINIMUM BEND RADIUS

The amount of force required to bend a hose and the minimum bend radius are important factors in hose design and selection. The minimum bend radius is defined as the radius to which the hose can be bent in service without damaging or appreciably shortening the life of the product. Perhaps more important in determining flexibility, the force-to-bend is defined as the amount of stress required to induce bending around a specified radius. The less force that is required, the easier the product is to maneuver in the field.

Different hose constructions may require significantly different forces to attain the same minimum bend radius. Generally, the preferred hose is the more flexible hose, provided all other properties are essentially equivalent.

General formula to determine minimum hose length given hose bend radius and degree of bend required:

$$\frac{\text{Angle of Bend}}{360^\circ} \times 2 \pi r = \text{Minimum length of hose to make bend.}$$

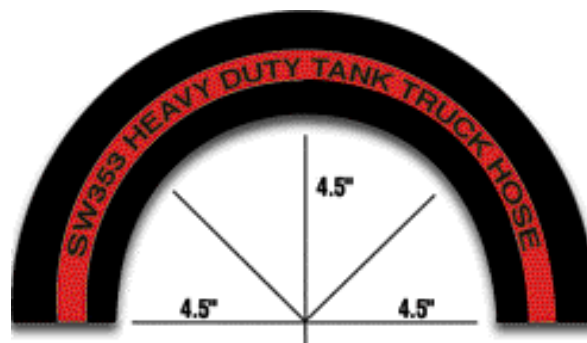
r = Given bend radius of hose.

Example: To make a 90° bend with 2" I.D. hose.
Given r = 4.5 inches.

$$\frac{90}{360^\circ} \times 2 \times 3.14 \times 4.5$$

$$.25 \times 2 \times 3.14 \times 4.5 = 7" \text{ minimum length of hose to make bend without damage to hose.}$$

The bend radius for a given application must be equal to or greater than the rated minimum bend radius. Bending the hose to a smaller bend radius than minimum may kink the hose and result in premature failure.



The minimum bend radius is measured to the inside of the curvature.

SUCTION AND VACUUM

Most hose is used for pressure service; however, some applications require the hose to resist collapse in suction and vacuum service. Such hose is subjected to crushing forces because the atmospheric pressure outside the hose is greater than the internal pressure. The hose can collapse and restrict the flow unless the hose is constructed to resist these pressure differentials.

The most common method of preventing hose collapse is to build a helical wire reinforcement into the hose body. The size and spacing of the wire reinforcement depends on the size of the hose and the pressure differential. In such applications approaching a perfect vacuum, most of the carcass plies are applied over the wire reinforcement.

The hose is constructed with high adhesion between the tube and the carcass to prevent tube separation. Suction hose must be specifically designed for the service for which it is used. Each element -- tube, textile reinforcement, size, spacing, and location of the wire reinforcement -- must be carefully considered.

While suction hose is generally used to convey liquids, vacuum hose carries air under a partial vacuum. Vacuum hose is reinforced to resist collapse and maintain its shape under rough handling and/or mechanical abuse. It does not require the heavy construction of suction hose because the dry materials generally conveyed are much lighter in weight than liquids and the vacuum is usually less than for normal suction service.