Correct Hose Configuration
& Length Calculations - for Bend Radius
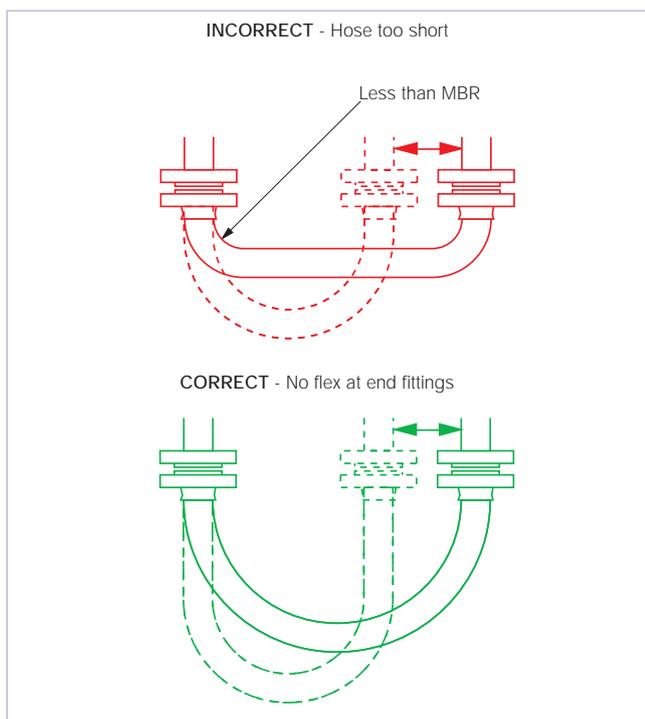
Hose Configuration Requirements

Hose Assemblies are usually connected at both ends in service. They may then either remain in a fixed, or static configuration or in a flexing, or dynamic configuration.

Whether static or dynamic, the First Rule concerning the configuration of the hose is that the bend radius of the hose must never be less than the Minimum Bend Radius (MBR) for the hose as listed in the relevant hose brochure.
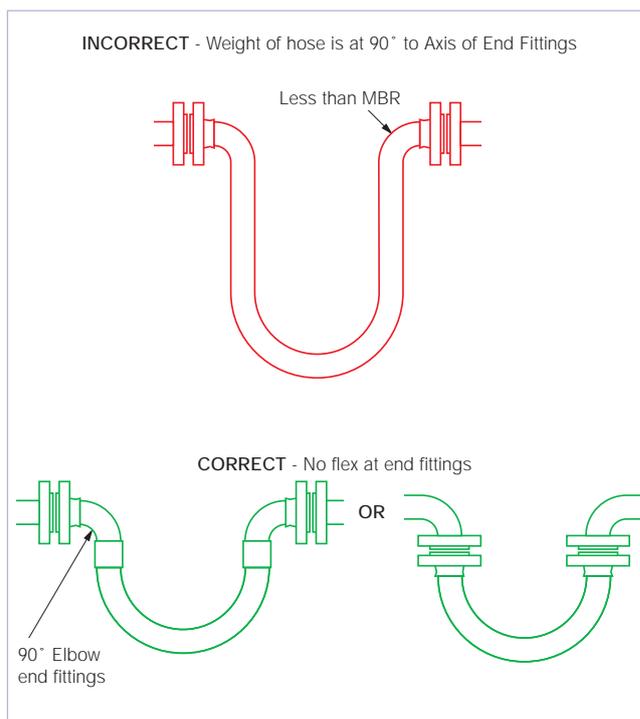
The most common situation when this is likely to occur is when the hose is flexed at the end fitting, with stress being applied to the hose at an angle to the axis of the end fitting. Typically, this happens either because the length of the hose is too short, or because the weight of the hose plus contents creates a stress at an angle to the end fitting.

The Second Rule, therefore, if possible, is to design the configuration to ensure that any flexing in the hose takes place away from the end fittings.

(Dynamic) Configuration

INCORRECT - Hose too short

Less than MBR

CORRECT - No flex at end fittings

(Static) Configuration

INCORRECT - Weight of hose is at 90˚ to Axis of End Fittings

Less than MBR

CORRECT - No flex at end fittings

OR

90˚ Elbow end fittings

Correct Hose Configuration
& Length Calculations - for Abrasion & Torque

The Third Rule is that the hose configuration should always be designed, and supported where necessary, to avoid any possibility of external abrasion.

In some cases, the length, configuration and angle of the hose can be designed to avoid abrasion. In others, static or moving support frames or support wheels are required.
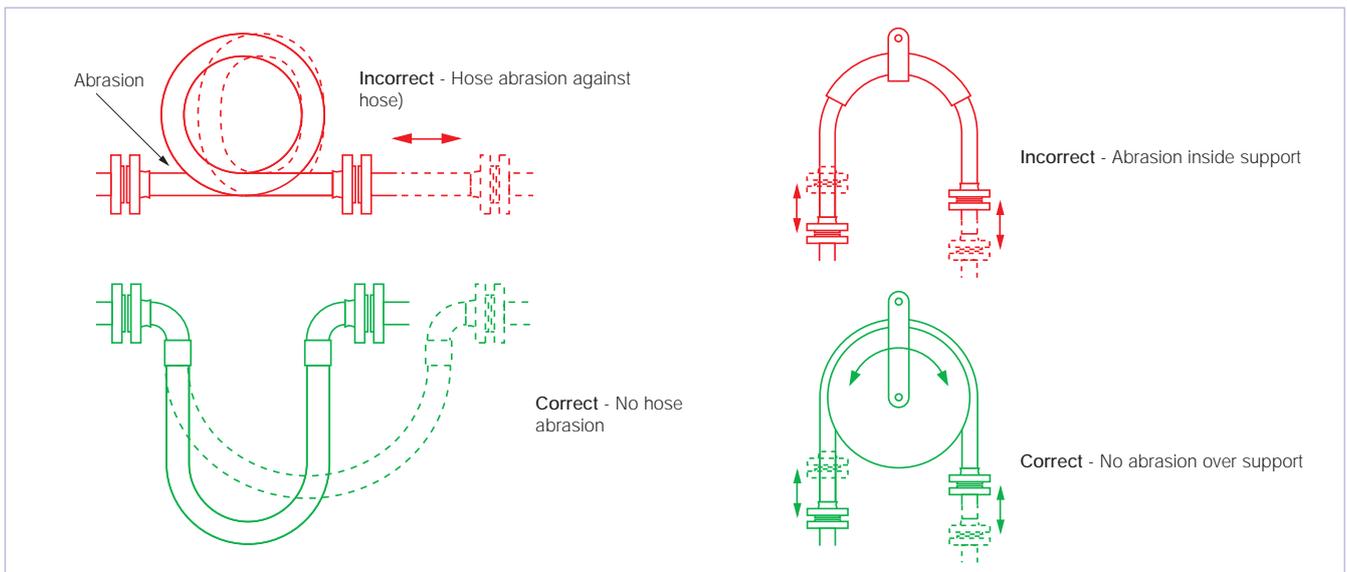
The Fourth Rule is that the hose must not be subjected to torque, either during connection, or as a result of the flexing cycle.

Torque (twist) in the hose can be applied during connection if the hose is accidentally twisted, or if the second end being connected is a screwed connection, and the hose is subjected to torque during final tightening.

In a flexing application, if any flexing cycle of the hose occurs in 3 dimensions instead of 2, then torque will also occur:
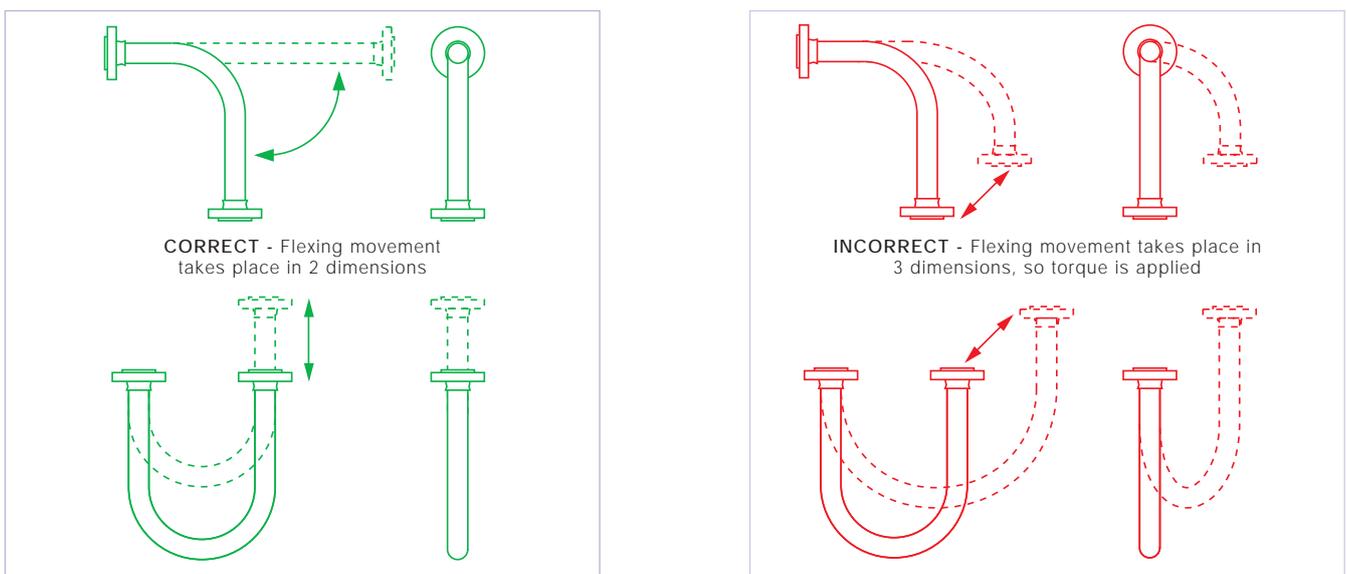
Both Corroflon and Bioflex hose have good resistance to a small level of torque, much better resistance that rubber or SS hose types, but it is still the best practice to take whatever steps are necessary to eliminate torque. If in doubt, consult Aflex Hose.

Hose Configurations & Length Calculations
- for Length Calculation

CALCULATING THE HOSE LENGTH

The formula for calculating the bent section of the hose length around a radius is derived from the basic formula that the circumference of a circle $= 2\pi R$, where R = the radius of the circle, and π = a constant, = 3.142.

So, if the hose goes around a 90˚ bend, which is $^1/4$ of a full circumference, and the radius of the bend is R, then the length of the hose around the bend is $= ^1/4$ x $2\pi R$. Or half way round, in a U-shape, $= ^1/2$ x $2\pi R$.

Note :
In calculating the length of a hose assembly, the (non-flexible) length of the end fittings must be added in, also the length of any straight sections of hose, as in the following example:

Example :
To calculate the length for a 2″ bore size hose with flange end fittings, to be fitted in a 90˚ configuration with one leg 400mm long, the other 600mm long.

Length of Bent Section (yellow) $= ^1/4$ x $2\pi R$ (334)
$= ^1/4$ x 2 x 3.142 x 334 = 525mm

Length of top, Straight Section, including the top end fitting length
= 600 - 334 =   266mm

Length of bottom end fitting   =   66mm

Total length of Hose Assembly = 525 + 266 + 66 =   857mm

Things to consider
(a) A hose will normally take the longest radius available to it to go around a corner, not the MBR! Also - always remember to include the non-flexible end fitting lengths.

(b) In dynamic applications, remember to always calculate the lengths for the most extended configuration during the flexing cycle, not the least extended.

(c) If the configuration is simply too complex for calculation, then obtain a length of flexible tubing of some kind, mark on paper, or a wall, or floor, or both where the connection points will be relative to each other, scaled down if necessary, then manually run the flexible tubing between them with full radii round bends. Measure the extended length, then scale up if necessary to determine the approximate length of the hose.

If in doubt, consult Aflex Hose.