

# PENFLEX

## HOSE HANDLING FOR TERMINAL OPERATORS

### Installation recommendations and common mistakes

Given the necessity of transferring corrosive media, metal hose is a critical component of a terminal operator's business. To preserve hose life, the following recommendations for assembly installation should be adhered to and routine inspections should be administered to monitor for common causes of hose or assembly failure.

## RECOMMENDATIONS FOR HOSE ASSEMBLY INSTALLATION

### AVOID TORQUE

Do not twist the hose assembly during installation when aligning the bolt holes in a flange or in making up pipe threads. The utilization of lap joint flanges or pipe unions will minimize this condition. It is recommended that two wrenches be used in making the union connection; one to prevent the hose from twisting and the other to tighten the coupling.

### IN PLANE LATERAL OFFSET INSTALLATION

Prevent out-of-plane flexing in an installation. Always install the hose so that the flexing takes place in only one plane. This plane must be the plane in which the bending occurs.

### AVOID OVER BENDING

The repetitive bending of a hose to a radius smaller than the radius listed in the specification tables for corrugated hose will result in premature hose failure. Always provide sufficient length to prevent over bending and to eliminate strain on the hose.

### AVOID SHARP BENDS

Utilize sound geometric configurations that avoid sharp bends, especially near the end fittings of the assembly.

## PROVIDE SUPPORT

When installing the assembly in a horizontal loop, provide support for the arms to prevent the hose from sagging.

## DO NOT EXTEND OR COMPRESS AXIALLY

A piping system which utilizes metal hose to absorb movement must be properly anchored and/or guided. Always support the piping to prevent excessive weight from compressing the hose and relaxing the braid tension.

## HANDLE WITH CARE

Avoid careless handling of the hose assembly. Always lift or carry metal hose to prevent abrasion damage particularly to braided corrugated hose. Store metal hose assemblies away from areas where it can be subjected to spillage, corrosive fumes or sprays, weld splatter, etc.

# COMMON CAUSES OF HOSE AND ASSEMBLY FAILURE

## EXTREME OVERBENDING

When hoses are bent beyond the recommended Minimum Bend Radius, the hose beneath the braid can be damaged, fatigue cracks may appear in the hose, potential for leak failures increases and there is a higher likelihood for braid bagging.

Damage to the hose and fatigue cracks can significantly decrease hose life. As a general rule, do not bend hose 90 degrees at fitting. Instead, use 45- or 90-degree elbows where tight bends are required.



## HOSE STACKING

Stacking hose on top of hose can create damage under the braid to the hose tube that cannot be seen. As mentioned above with regard to extreme overbending, damage to the hose can shorten its life.

In addition to ushering in premature hose failure, hose stacking contributes to braid bulging and braid wire damage. Avoid stacking hoses wherever possible.



## BRAID BULGING

All metal hose, as well as most hoses, grow longitudinally under pressure then contract when pressure is released. It is important to not restrict this movement so that the hose can function optimally.

Hose stacking can restrict the natural expansion or contraction of the hose with the common result being braid bulging. Try to avoid stacking hoses wherever possible.



## BRAID WEAR

Braid wear can occur by dragging the assembly, improper or undersized lifting support or snagging the braid on another object.

Since the braid is the “pressure carrier,” damage to it reduces working pressures and can result in premature failures. Braid bulging is an example of braid wear.

Prevent dragging exposed braid over concrete, railings or other exposed hoses and consider using hose buns instead of undersized lifting straps.

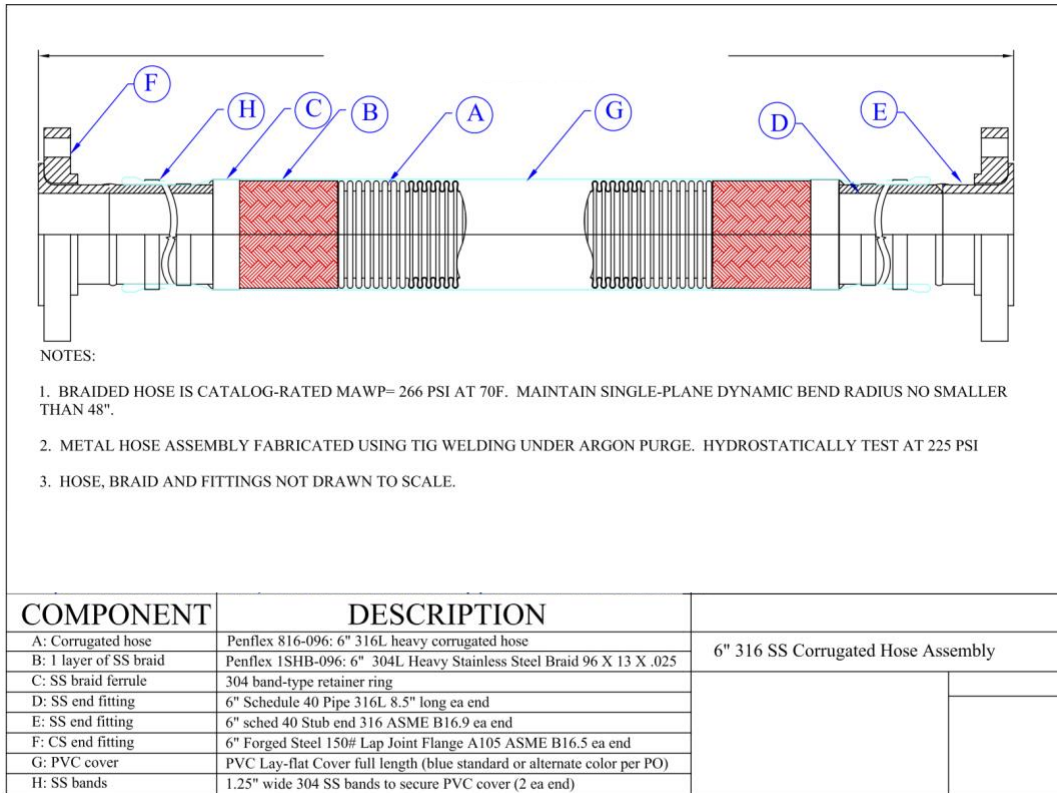


### TOO TIGHT PROTECTIVE COVERING

Using protective covers does provide protection from braid wear. However, overtightening the clamps that hold the cover restricts the natural movement of the hose and braid. As the hose elongates under pressure, the braid stretches. If the clamps are too tight, when pressure is released, the hose will shrink but the braid will not be able to contract. This causes braids to bulge, reducing the efficacy of the assembly as a pressure carrier.



Clamps should never be put directly on the braided portion of the hose assembly. We recommend moving clamp to position past fitting attachment weld and onto pipe section, per the drawing below.



## HOSE ASSEMBLY FIELD INSPECTION CHECKLIST

Periodically inspect hose assemblies in order to recognize features which lead to failure in order to schedule replacement before actual failures occur.

If any of these items are observed, replacements should be considered.

- Loose, broken, bulged, frayed or worn braid
- Deformation of the hose, including braid wear, twisting, kinking, denting, flat spots
- Coupling slippage, cracks, severe dents or excess corrosion
- Traces of media on or around the assembly
- Loose or damaged guard or covers
- Indications of corrosion of the hose or braid
- Loose fitting attachments
- Hose assembly rubbing or making contact with adjacent machinery or piping
- Unreadable or missing identification or tag if this information is required