

ENGINEERING BULLETIN #132

Loose Braid Consideration: Vacuum Pump Tightening Method

Often braid must be compressed and secured on the hose prior to welding as the braid must always be reasonably tight on the finished assembly.

Loose braid can lead to two primary problems.

- Under pressure, the hose expands axially, or gets longer, even under low pressure. If the braid is not tight, the hose will grow in length until it takes up all of the slack in the braid. The assembly overall length will increase, and this can cause over bending and kinking of the assembly in service.
- If the braid collars are crimped or a rolled type braid collar clamped in place while the braid is loose, it is possible that the braid is slightly angled or is cocked on the hose. This results in the braid wires along some carriers being shorter than those of other carriers. The shorter wires will be overly tensioned when the assembly is put under pressure. The longer wires have slight slack in them and will not assume any of the pressure-induced tensile load until the shorter wires stretch and all of the wires are of equal length. The assembly is likely to squirm or deform before the braid wires equalize in length.

In [Engineering Bulletin #123](#), we looked at the procedures for tightening loose braid with filament tape, screw clamps and plastics cable ties. In this bulletin, we'll look at procedure for tightening large bore (8 – 12" ID) assemblies using the vacuum pump tightening method.

1. Measure the hose length.
2. Calculate 90% of the hose length. (Hose length x .9. This equals the compressed length or the length that the hose will be shortened to during the braid tightening procedure.) The hose must not be shortened more than the compressed length figures above. Compressing more than this length may plastically deform the corrugations.
3. Slide the hose into the braid.
4. Place a screw clamp around the braid approximately 2" behind the hose end and tighten firmly.
5. Place a vacuum plug on one end of the hose. Have an assistant hold the plug in place or tape it in position with filament tape. Make sure that the plug is centered on the hose and the rubber seal is pressing on the corrugation sidewall, not on a sharp cut edge.

6. Connect the vacuum pump to the second vacuum plug.
7. Place the second plug in position on the hose end.
8. Open the vacuum valve.
9. Turn on the vacuum pump.
10. Close the vacuum valve and closely monitor the hose length as it shrinks in length under the braid. Control the vacuum and the hose shrinking in length by partially opening or closing the vacuum valve.
11. When the hose shrinks down to the calculated compression length, close vacuum valve.
12. Place a second screw clamp around the braid approximately 2" behind the hose end and tighten firmly.
13. Partially open the vacuum valve very slowly. As air bleeds into the hose and the vacuum decreases, the hose will try to extend in length. As the braid is held to the hose by the clamps, the lengthening hose will pull down and tighten the braid.
14. When the braid is tight on the hose, loosen the second hose end clamp slightly, allowing the hose slide under the braid and return to its original length.
15. The few inches of braid between the second end clamp and the end of the relaxed hose can be tightened with one or two added screw clamps or cable ties.