



# PENFLEX

## METAL HOSES FOR SAFE CHLORINE TRANSFER

Chlorine is an essential building block in many everyday products and processes. Water purification facilities as well as wastewater and desalination plants rely on it as a disinfectant. Chemical plants need it to make bleach. Paper mills need bleach, and thus the chlorine contained therein, to make paper. These are just a few examples of businesses that rely on chlorine—and thus require chlorine transfer hoses.

However, chlorine is toxic and there are serious health risks in the event of exposure. Given these risks, safe transfer is a key area of focus.

### METALLIC VS. NON-METALLIC TRANSFER HOSES

The Chlorine Institute's Pamphlet 6 sets the standard for safe chlorine transfer, providing parameters for the design, fabrication, installation and maintenance of hoses used in chlorine applications. It allows for both metallic and non-metallic materials of construction.

In the case of metallic hose, the inner core must be Monel 400 or Hastelloy C-276 and for non-metallic hoses, the inner core must be PTFE. While temperature ranges are greater and pressure ratings higher for metallic hoses, in most chlorine applications PTFE will meet both temperature and pressure requirements.

However, PTFE hoses do suffer from permeability, especially at higher temperatures, which prevents their use in indoor applications. Pamphlet 6 addresses this concern, stating "the use of non-metallic hoses shall be limited to applications where adequate ventilation has been provided."

Permeability is the most commonly cited disadvantage to non-metallic hoses and, in general, given the porosity of PTFE, Monel and Hastelloy do provide a greater degree of safety.

### At a glance

Penflex's C-276 and Monel 400 offer the heaviest wall thicknesses available for this application.

ASME Sec. IX welders and on-site CWI, CWE, and NDE ensure highest quality fabrication.

Penflex hoses are sold through a worldwide distribution network.

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Penflex is a member of The Chlorine Institute.

## COMPLIANCE WITH THE CHLORINE INSTITUTE PAMPHLET 6

Penflex's chlorine transfer hoses fully comply with CI Pamphlet 6, Appendix A, per the specifications listed below. They are often used in loading and unloading barges, rail cars, tankers and filling cylinders and an example of one is pictured here.

Visit [Penflex.com](http://Penflex.com) for more information on [Hastelloy C-276](#) and [Monel 400](#).

- **Maximum Allowable Working Pressure (MAWP):** Both Monel and Hastelloy chlorine transfer hoses exceed MAWP minimums of 500 PSIG for hoses ½" ID and smaller and 375 PSIG for hoses larger than ½" ID.
- **Burst Pressure:** Hoses comply with the Pamphlet's 5:1 safety factor.
- **Vacuum Rating:** Corrugated metal hose is commonly used in both full and partial vacuum applications. Hoop strength prevents the corrugations from collapsing and the hose from deforming.
- **Leak Testing:** Metal hoses are tested to a maximum leak rate of  $5 \times 10^{-6}$  at two times MAWP using a Helium Mass Spectrometer, the most sensitive leak testing method. Given its porosity, PTFE cannot be tested using helium.
- **End Fittings:** Schedule 80 stub ends or nipples with hex wrench pads of at least 1" minimum or Type A carbon steel Lap Joint flanges with stub ends of the corresponding alloy are used. These configurations prevent damage to the assembly during installation.
- **End Fitting Attachment Method:** Welding is carried out by an ASME Sec. IX certified welder with a WPS in accordance with a PQR (Procedure Qualification Record).
- **Cleaning:** Hoses are cleaned to remove reactive materials and inspected for cleanliness and to ensure inside of the hose is completely dry.
- **Marking:** A metal tag with the type of information contained in the drawing below is welded to armor ferrule.
- **Documentation:** Positive Material Inspections (PMI) are carried out and reports supplied along with Material Test Reports (MTR) to ensure hose, braid and end fittings meet design specifications.

