

PRESSURE PIPE CLEANING AND PREPARATION FOR REHABILITATION

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Pressure pipes, like gravity pipelines, need to be cleaned and prepared for rehabilitation. This NASSCO Tech Tip will discuss pressure pipe cleaning methods and requirements before a pipe rehabilitation is completed.

Pressure pipes, unlike gravity pipelines, are subjected to internal pressures that can change rapidly from a positive to a negative pressure. These internal pressures and pressure cycles can push a rehabilitation liner on to and away from the host pipe wall. Internal negative pressures, i.e., vacuum pressures, can collapse the liner if it is not designed for negative pressures and pressure cycles.

Prior to installation for any pipe rehabilitation system, the interior circumference of a pressure pipe needs to be cleaned to create a structurally sound wall. Thus, all deposits, debris, protrusions, pipe coatings and any other materials must be removed.

AWWA classifies rehabilitation liner systems as Class I to Class IV.¹

Class I linings are essentially non-structural systems used primarily to protect the inner surface of the host pipe from corrosion and/or improve or maintain water quality. They are not intended to improve the structural performance of the host pipe and have a minimal ability to bridge any existing discontinuities, such as corrosion holes, cracks, or joint gaps.

Class II and III linings are both interactive and semi-structural systems. When installed, Class II liners shall adhere to the wall of the host pipe. Class III liners may or may not adhere to the wall of the host pipe but shall be sealed for hydrostatic integrity. Since the stiffness of such a lining is less than that of the host pipe, all

internal pressure loads are transferred to the host pipe, leading to their classification as interactive. Class III linings are essentially required to independently sustain internal pressure loads at existing or future discontinuities in the host pipe, such as corrosion pits, holes, or joint gaps; however, Class III linings are not structurally independent.

Class IV linings, termed fully structural or structurally independent, possess the following characteristics:

1. A long-term hoop strength, when tested independently from the host pipe, equal to or greater than the MAOP of the pipe to be rehabilitated.
2. A short-term hoop strength, when tested independently from the host pipe equal to or greater than all short-term loads, such as sustained and surge (vacuum and occasional and recurrent surge) pressures and live loads.
3. The ability to survive the full range of anticipated failure modes of the host pipe without leakage or damage to the lining.

AWWA Class III and Class IV rehabilitation systems do not require the liner to bond or adhere to the host pipe. Close-fit slip liners and Cured-In-Place Pipe (CIPP) liners are examples of Class III and Class IV rehabilitation systems, which are interactive - they will transfer internal pressures to the host pipe. The host pipe, for all interactive liner systems, must be cleaned so that all protrusions are removed. This requirement is to ensure that the liner is not subjected to sharp contact points which can, over time, reduce the liner structural performance. If the host pipe has protruding services, the cleaning process should also not damage the service connections.

Commonly used pipe cleaning methods for slip lining and CIPP are Drag Scraping, Rack and Bore, and Water Jet cleaning. It should be noted that care must be used with Rack and Bore cleaning, as it can reduce the diameter and shape of brass service connections and may result in service damage in highly deteriorated host pipes. The service diameter reduction may or may not impact flow through the service connection. Since the rehabilitation liner is not bonded to the host pipe, an annular space will exist between the liner and host pipe. To ensure no pressurized water is transferred through this annular space, special considerations may be required at liner termination points and at service connections.



Abrasive airborne pipe cleaning

For AWWA Class I and Class II liner systems, the rehabilitation liner is not considered to have sufficient ring stiffness to be self-supporting. Thus, the liner must rely on adhesion to the pipe wall. Cement mortar and Spray-in-Place-Pipe (SIPP) liners are common AWWA Class I and Class II systems. The host pipe must be clean and prepared for the liner to adhere. Thus, the level of pipe cleaning and pipe preparation is much higher for AWWA Class I and Class II.

Cement Mortar is deemed to be a Class I and is a permeable liner system that stops metal pipe internal pipe wall corrosion by the passivation of metal corrosion in the presence of water. Common pipe cleaning methods for Cement Mortar are Drag Scraping and Rack and Bore.

In contrast to Cement Mortar, SIPP linings can be Class I or Class II. SIPP prevents internal metallic pipe corrosion by creating an impermeable barrier that prevents water from being in contact with the pipe wall. Common SIPP pipe cleaning methods are Rack and Bore and Airborne Abrasives.

Below are additional factors that can be considered to select an appropriate cleaning method for your project:

- 1) Time to complete the cleaning and the quality of pipe cleaning. Airborne abrasives have shown that it produces a higher quality level of pipe cleaning and preparation is quicker than other cleaning methods.
- 2) Water consumption. Rack and bore and water jet cleaning can use a significant amount of water for required removal and disposal from the cleaning pit.
- 3) Targeted cleaning at services, joints, and specific pipe locations. Airborne abrasives can provide targeted cleaning at specialized locations which is difficult using other methods.
- 4) The condition of the pipe and joints after cleaning is complete. Some methods will leave the pipe and services dry while other methods will leave the pipe surface wet.
- 5) Ease to complete the post cleaning CCTV inspection, a pipe condition rating, and to determine if services are leaking prior to the liner installation.
- 6) Contractor and equipment availability and cost.

The cleaning of pressure pipes is much more complex than the cleaning of gravity pipelines and requires specialized contractors. The type of pipe cleaning also depends on the type of rehabilitation liner systems being installed. It is recommended that you consult the liner's manufacturer to determine appropriate pipe cleaning and pipe preparation requirements for the product to be installed.

¹AWWA Committee Report "Structural Classifications of Pressure Pipe Linings - Suggested Protocol for Product Classification" 2019.

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