Understanding Class III vs. Class IV Liners in Pressure and Gravity Pipe Rehabilitation

Trenchless rehabilitation of underground pipelines requires more than just selecting a product—it demands a clear understanding of the pipeline's function, structural condition, and the loads it must carry. A fundamental distinction exists between gravity and pressure pipelines, and this directly informs the choice between Class III and Class IV liners.

Classifications Defined: What Do Class III and IV Mean?

According to the AWWA Manual M28, *Rehabilitation of Water Mains*, liners are classified based on their structural contribution:

- Class III Liners are semi-structural: they rely on the existing pipe (host pipe) to carry external loads.
- Class IV Liners are fully structural: they are designed to carry all internal and external loads on their own—even if the host pipe completely fails.

These classifications help engineers match the liner's performance to the actual demands of the pipe system being rehabilitated.

Gravity Pipes: Designed for External Loads

Gravity pipelines—like sanitary or storm sewers—typically **do not experience internal pressure**. Instead, their structural demands stem from:

- Earth (dead) loads
- Surface traffic (live loads)
- Groundwater pressure

Because these are external forces, any deterioration in the host pipe can pose a serious risk of collapse. For this reason, Class IV structural liners are usually required. They must be capable of carrying all loads even if the original pipe offers no support.

Pressure Pipes: Designed for Internal Forces

Pressure pipes, by contrast, are built to withstand **internal pressure**—not external forces. They feature thicker walls to handle hoop stress and generally remain structurally sound unless damaged by corrosion or external impacts.

When rehabilitating these pipes, the goal is often restoring pressure containment, not rebuilding structural integrity. As long as the pipe is not structurally compromised, a Class III liner is typically sufficient. In this scenario, the composite system of pipe and liner behaves like a Class IV system:

- Host pipe maintains external load capacity
- Class III liner restores internal pressure integrity

The BulletLiner™ System: A Composite Approach

The BulletLiner™ System is a prime example of this approach. As an AWWA Class III liner, it is engineered to contain internal pressure but not carry external loads on its own.

However, when installed in a structurally competent pressure pipe, the combined system meets or exceeds Class IV performance:

- The host pipe delivers the required structural support
- The BulletLiner provides pressure containment

This solution reduces overdesign, speeds up installation, and avoids the complexities of rigid liners.

Testing and Inspection: Gravity vs. Pressure Pipe Protocols

Testing protocols also reflect the functional differences between pipe types:

Gravity Pipes:

- Require CCTV inspection to check for folds, fins, or imperfections
- Structural integrity is visual; defects must be corrected

Pressure Pipes:

- Rely on hydrostatic pressure testing
- Visual defects like minor folds do not impact containment
- Integrity is proven by passing pressure tests, not by internal inspection

BulletLiner is factory-finished and remains flexible after installation. It accommodates minor movements and deflections, avoiding point-load stress that could lead to failure in rigid systems.

If there were any containment failure, it would be revealed immediately during pressure testing—not during later visual inspections.

Why Class Matters—But Design Matters More

Understanding the **original design intent** of your pipeline—whether it was built to carry water under pressure or to convey flow via gravity—is crucial to selecting the right trenchless rehabilitation solution.

The chart below summarizes the key differences:

Attribute	Gravity Pipe	Pressure Pipe
Load Type	External	Internal
Failure Mode	Collapse, infiltration	Leakage, burst
Typical Liner Class	Class IV (Structural)	Class III (Semi-Structural)
Inspection Method	CCTV	Hydrostatic Pressure Test

BulletLiner Application	Not Recommended	Ideal in Sound Host Pipe

Conclusion: Smarter Design, Better Results

The BulletLiner System demonstrates how composite design—combining the strengths of a reliable host pipe with an internal liner focused on pressure containment—can achieve Class IV performance with Class III components.

This results in a cost-effective, efficient, and high-performing solution that avoids the drawbacks of rigid, overbuilt rehabilitation strategies. In the world of trenchless technology, it’s not just about the class of the liner—it’s about how smartly the system works together.

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