PENN-TROY
MANUFACTURING INC.

Telescoping Valves

A guide to better understanding telescoping valves, associated vocabulary, and design elevations and considerations.

Easily the most misunderstood valves offered by Troy Valve today, telescoping valves are commonly a source of frustration from the specification phase, all the way through the installation phase. While there are different types of telescoping valves (rack & pinion rising stem, non-rising stem, and screw type), as well as installation configurations, the information needed to manufacture them is all the same.

The purpose of this whitepaper is to introduce the reader to the vocabulary and the critical elevations needed to manufacture the valves, to help avoid pitfalls and misunderstandings between manufacturer, end users, and/or engineers.

Vocabulary

Travel: Travel is always defined as the distance from the high-water elevation to the low-water elevation.

High-Water Elevation: The highest elevation the top of the slip tube can be set at.

Low-Water Elevation: The lowest elevation the top of the slip tube can be set at.

Flange Elevation: This is the elevation at which the companion flange of the telescoping valve will connect to the riser/receiving pipe.

Floor Elevation: This is the elevation at which the floor stand will be mounted. This can be a floor or a mounting bracket.

Top of Drainpipe Flange: This elevation is where the standpipe, for all intents and purposes, terminates. This is most often a 90-degree elbow or a tee fitting. This is the lowest the bottom of the slip tube can travel before it encounters an obstruction.

Floor Thickness: The thickness of the structure your floor stand will mount to, often a floor but may also be a bracket.

Anti-Rotation Device: A device most commonly used in non-rising and actuated applications; this device prevents the slip tube from rotating during operation. These often mount to the bottom of the floor stand/operator and can have an effect on how much travel can be achieved (more on this later).

Companion Flange: The companion flange connects to the receiving pipe (riser pipe).

Gasket Retainer: This part retains and applies pressure to the wiper gasket.

Wiper Gasket: The gasket that allows the slip tube to move up and down while maintaining a seal.

Floor Stand: The point of operation of the telescoping valve.

Bail: The part that connects the slip tube to the operating stem.

Operating Stem: The part that connects the bail to the internal floor stand stem or rack, depending on the type of valve.

Internal Floor Stand Stem: This can be a threaded rod or a rack (square rod with teeth on one side).

Gear Box/Operator: The gear box, or operator, is mounted to the top of the floor stand and is the part that engages the stem/rack to operate the valve.

Standpipe/Receiving Pipe: While technically not part of the telescoping valve assembly, this pipe will accept the slip tube during operation.

Design Considerations / Relationship of Elevations

Knowing how one elevation effects another is critical in designing a telescoping valve application, as well as the manufacturing of the valve. Here we will attempt to explain these relationships.

High-water & floor elevation: These two elevations relate to each other because the high-water elevation needs to give ample clearance for the equipment at the floor elevation that can impede travel. This can be the floor stand itself, or items like a mounting bracket or anti-rotation device. Remember that at the top of the slip tube is the bail connection. This connection rises above the slip tube opening and needs clearance for travel. A good rule of thumb is to factor in at least 6-inches of clearance for this connection. The other factor that can limit travel of the slip tube is an anti-rotation device, which protrudes downward from the floor stand. For applications that require anti-rotation, you should afford at least 24-inches of clearance between high-water and floor.

Low-water & flange elevations: The relationship between these two elevations is related, once again, to the bail connection. The bail risers are attached to the outside of the slip tube. This is to avoid any obstructions inside the slip tube that might catch foreign objects. When operating the valve in a downward direction toward low-water, the bail risers contact the gasket retainer, acting as a positive stop for travel. Designers should factor in at least 6-inches of clearance above your flange location for the low-water elevation.

Flange elevation and top of drainpipe flange: The most common oversight is having these two elevations too close together. The most important thing to remember here is that your slip tube is going to be 12-inches longer than your travel. This safety factor is added for stability of the slip tube when at high-water, and as a secondary protection against accidentally pulling your slip tube out of the standpipe. This means your slip tube needs to be able to move obstruction free for the full length of travel plus 12-inches.

Other Important Design Considerations

Rising Stem and Non-Rising Stem Designs

Rising stem telescoping valves are the most common types of t-valves offered. The most important feature of this type of valve to consider is the rising stem. As you operate the valve towards high water, the internal stem will rise correspondingly. This feature makes it vital to make sure you have ample room above your installation for the stem to rise unencumbered. There are two types of rising stem telescoping valves - rack & pinion and screw type. Rack & pinion valves use a square rod and a gear to lift and lower the slip tube assembly. In this type, there is no rotation forces applied to the stem to consider, so there is no need for anti-rotation devices. Screw type, however, uses a threaded round stem that passes through a hand wheel that is turned. In this design, the rotation of the hand wheel to lift and lower the slip tube would apply a rotational force to the stem and slip tube, necessitating anti-rotation devices.

Non-rising stem telescoping valves are different from most NRS valves. With your typical valve, the gate, or wedge, can be configured to raise independently on the stem, so the stem doesn't need to raise. Telescoping valves are different because the stem and slip tube move as one, and the stem cannot be in the effluent due to the potential for matter to get stuck in, or on, the threads. This means that while it may be called a non-rising stem valve, the stem is still going to rise - it's just that this travel is captured by the floor stand and hidden from view. The drawback to this is that the overall travel of the slip tube is then limited by other factors such as:

- **The distance between high-water and floor elevations:** If there is a considerable amount of space here, the stem travel can begin to be captured below the floor stand.
- **Tolerance of taller floor stands:** If the job site can accommodate it, and the end user will accept it, custom floor stands can be provided that are tall enough to conceal the travel of the stem. The obvious drawback here is the height can make operation difficult without the aid of elevated platforms or step stools.

Electrically actuated telescoping valves will also have the same limitations as NRS valves, even if they are rising stem designs, because they utilize a round threaded stem that will require anti-rotation devices.

Extreme Travel

Anything over 8-feet of travel is considered extreme. If more travel is needed, it is suggested that a dual installation is utilized. In this configuration, one t-valve will operate half of the travel, a gate valve or plug valve will shut off flow through that valve, and then the second valve will operate the remaining travel. The reason for this type of installation is the difficulty of keeping longer travel valves plumb.

Plumb / In Line

The absolute, 100%, most critical part of every telescoping valve installation is making sure the valve is plumb and in line. The importance of this increases as the amount of travel increases. It also becomes equally as difficult to keep the valve plumb as the amount of travel increases, due to forces like wind, gravity, and regular use. When a valve is out of plumb, they are more difficult to operate, and this puts undue stress on the operator, which leads to premature wear and eventual failure.

No matter what your application looks like, Troy Valve stands at the ready to help you with your telescoping valve needs from the initial design all the way through to final installation.