

Finding A Perfect Fit For Mix-And-Match Piping

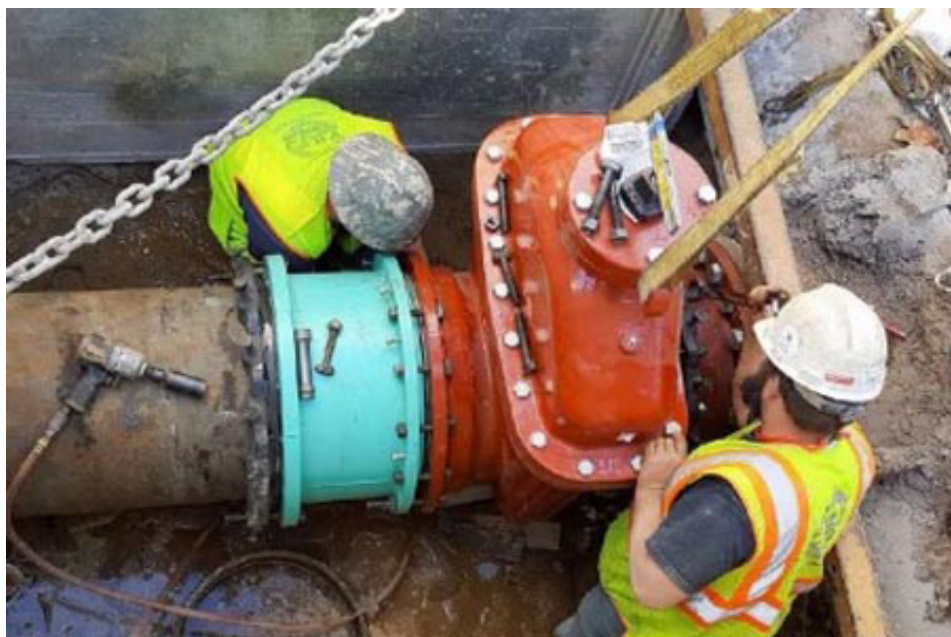
Today's water/wastewater piping options offer numerous advantages in terms of cost, performance, and anticipated service life. Unfortunately, utilities must still deal with what's already in the ground — steel, cast iron, ductile iron, asbestos cement, plastic, concrete, and even wood. Here are guidelines on making transitions between old and new pipes of varying sizes and materials as smooth as possible.

Taking Stock Of Aging Infrastructure

Just as arborists can analyze the age of a tree and its growing conditions over the years, so too can utilities tell the history of their distribution and collection systems by the types and conditions of the pipelines under their streets — cast iron (maybe even wood) in the oldest parts of town, asbestos cement from the post-WWII construction boom, ductile iron and PVC in more recent decades, and HDPE for some of the newest main installations and replacements.

Planning to make connections for repairs or replacement of such older infrastructure, or extending it into new service areas, can be a challenge in terms of reliable, cost-effective fitting solutions. By taking careful measure of the existing piping and matching the right coupling and gasket constructions, it is possible to make secure transitions among different materials of the same 'nominal' pipe size or among larger and smaller pipes of any materials (Figure 1).

Part of the experience includes having a good map and inventory of installed mains and pipelines in order to know



(Photo courtesy of JCM)

the most likely size and material combinations. With that information in hand, it can make sense to stock spares for the most commonly experienced connection parameters.

Benefit From Unusual Experience

When it comes to making transitions among identical, similar, or disparate pipe sizes or materials, it makes sense to speak with a pipe-fittings supplier who has experience with diverse combinations under challenging field conditions (Figure 2). Prepare by recording as much detail about the connection as practical:

- **Material Type And Outside Diameter.** Remember that the



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Figure 1. An optimum range coupling accommodates wide gaps between pipe ends and allows for deeper pipe insertion.



(Photo courtesy of JCM)

Figure 2. Pipes of the same nominal size can each have different outside diameters based on their material construction. Look for fitting designs that can accommodate identical, slightly different, or drastically different O.D. dimensions as required by the applications.

actual O.D. for piping of the same nominal size can vary by the material used. This makes it critical to identify and measure each segment of piping to be connected.

- **Standard Dimension Ratio (SDR)/Wall Thickness** (as applicable).
- **Maximum Working Pressure And Maximum Test Pressure.**
- **Line Contents.** Both the type of fluid being conveyed and the maximum temperature of that fluid can have an impact on pipe-fitting and gasket material selections.
- **Coupling Construction Material.** Depending on the application and soil conditions (acidic, alkaline, electrical conductivity, etc.), standard carbon steel or ductile iron might be acceptable. More extreme conditions could require 304 SS or 316 SS construction.
- **Coating (for iron alloy couplings).** Choices of shop coat, epoxy coat, or other coatings are available to meet the requirements of the application

and the environment.

- **Hardware (for iron alloy couplings).** Just as with fitting construction materials and coatings, bolt construction could use alloy, 304 SS, or 316 SS materials.
- **Size Limitations (for installation access or shipping).** In highly congested infrastructure, where the 'fourth dimension' of space around the installation zone is limited, how a fitting is designed and assembled can have a big impact on the cost and the ease of installation. Conversely, the size of the largest fitting components can also have a big impact on shipping alternatives and costs — including the ability to negate some of the fastest shipping alternatives for rush emergencies. Talk with fitting fabrication experts to consider those two implications before agreeing on the final design.
- **Flange Type And Size.** When matching connections to flanged coupling adapters, be sure to communicate clearly the size and bolt pattern required.
- **Restraint Requirements.** It is important to note that standard couplings do not tolerate axial pipe movement. For applications in which lateral pipe pull-out may occur, pipe restraint must be provided. Refer to manufacturer recommendations for applications on all types of pipe.
- **Alignment Issues.** In cases with awkward alignment, an experienced fittings supplier might recommend installing more fittings to make up the extreme offset in multiple smaller increments that will allow the cumulative distortion to be corrected within the 4-degree tolerance of each coupling's gasket design (Figure 3).



(Photo courtesy of JCM)

Figure 3. Not all existing pipework is perfectly aligned. Look for fitting designs and fitting fabricators that can adapt quickly to conditions discovered when the infrastructure is initially excavated.

Getting Down To The Nitty Gritty

Whether the transition is a perfectly aligned connection between two pipes of the same size and material or two slightly misaligned pipes of disparate sizes and constructions, follow all manufacturer-recommended installation steps. *(Yes, that includes using a **torque wrench** to tighten retention bolts to the proper torque!)* As with any gasketed fitting, the sequence of steps and the fastening procedures can impact the integrity of the connection. Here are some installation guidelines to ensure better fit and function with transition or reducing couplings:

- **Clean pipe surfaces** of all dirt, rust, mud, or loose scale from pipe ends. Inspect the pipe ends where gaskets will contact the pipe for any gouges, grooves, irregularities, or imperfections that will interfere with the gasket seal. Use a mirror to inspect difficult-to-reach or cramped areas on the backside or underside of the pipe.
- **Place reference marks 2"** beyond the ideal installed position for the fitting. These marks will be a visual reference point for centering the middle ring over the joint area for optimal effectiveness.
- **Install follower rings, then gasket onto the pipe ends.** NOTE: Flat side of the gasket face meets the follower ring, the tapered side inserts into the middle ring. To ease installation, gaskets and pipe should be lubricated with water or soap-water mixture. DO NOT use pipe lubricant or grease-based products to lubricate. In freezing weather, alcohol may be added to water.
- **Center the middle ring of the coupling over the joint,** between the two reference marks. Lift the middle ring to ensure that gaskets are evenly centered in the ends and center the follower rings on the pipe to ensure even gasket compression into the middle ring. Short shims will assist in keeping the follower centered on the pipe and can be removed as bolts are tightened.
- **Torque coupling bolts,** using a star rotation pattern. Use a properly calibrated torque wrench to ensure appropriate tightness, drawing up the follower rings evenly until all bolts have been tightened to the torque recommended by the manufacturer for the type of pipe and coupling. ■