Simple Steps Ease Installation of Mechanical Joint Fittings

By MICHAEL LUNSTROM

The American Water Works Association standard C600 covers the installation of ductile-iron water mains and their appurtenances. Since it is not often that one sees an AWWA standard being read in the trench, it seems appropriate to review this portion of the standard as a training tool for new and experienced installers. The following is a discussion of the standard. Each step in the standard is listed in italics, followed by a brief explanation of the important aspects of that step.

ANSI/AWWA C600-93
§ 3.4 Joint Assembly

1. *Clean the socket and plain end. Lubrication and added cleaning should be provided by brushing both the gasket and the plain end with soapy water or an approved pipe lubricant meeting the requirements of ANSI/AWWA C111/A21.11 just prior to slipping the gasket onto the plain end for joint assembly. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket.*

Cleaning the sealing surface is of obvious importance. No one would expect a gasket to seal if it has rocks and sand under it. Take the time to clean both the pipe and the gasket cavity of the fitting. While cleaning, inspect the sealing surfaces. Deep scratches in the pipe or a chunk of cement mortar lining in the bell of the fitting will make the joint nearly impossible to seal.

Give the gasket a good inspection. Since you are assembling a joint that may be in service for 50 to 100 years, don't take a chance on a questionable gasket.

Lubrication of the gasket also is very important. Anyone who has assembled a push-on joint knows that it is nearly impossible to do without lubrication. In the push-on joint, the gasket is moved into position and compressed during the insertion of the spigot.

The mechanical joint seals by the force of the t-bolts pushing the gland, which moves and compresses the gasket. With the gasket being trapped in a confined volume and the gland pushing from one side, the gasket experiences an increase in internal pressure. This pressure causes the gasket to exert enough force against the surfaces of the pipe and fitting to form a seal.

Rubber is well known for its friction properties. If too much of the force generated by the t-bolts is being used to overcome this friction, then there may not be enough force left to create the necessary sealing pressure in the gasket. Lubrication simply allows the gasket to slide into its sealing position more easily so that the effort you are exerting by tightening the t-bolts is being transferred more efficiently.

Gaskets, being made of rubber, also have a tendency to creep or cold flow into their area of confinement. This characteristic is also referred to as gasket relaxation, but its effect is the same. In some ways rubber can act like a solid yet at the same time can act like a fluid when it tries to expand to fill an area. In the case of the mechanical joint gasket, gasket relaxation is easily identified as a noticeable reduction in the torque of the t-bolts starting within minutes of finishing the joint assembly as the material continues to flow into the irregularities of the pipe and fitting surfaces. This reduction is very pronounced when the joint is assembled with a dry unlubricated gasket.

You can see the effect of lubrication and gasket relaxation by trying the following experiment. Install a fitting on each end of a piece of pipe. On one end, use an unlubricated gasket and on the other use a properly lubricated gasket. Tighten the t-bolts on each end to the same torque. Now let the pipe and fittings stand undisturbed for a hour or even overnight. Then re-tighten the t-bolts while counting the number of turns required to attain the same torque set earlier. It is quite certain that the non-lubricated end will require significantly more turns to recover the original torque.

In cold weather it is a good practice to warm the gasket just prior to placement on the pipe. This can be done by keeping them in the cab of the truck or backhoe or in a cooler filled with hot water. (Be careful about setting the gasket on an engine or an engine cowling. You want to warm the gasket, not melt it.) Again, it stands to reason that a warm, soft, lubricated gasket is going to compress and seal better than a cold, stiff, dry one.

2. *Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.*

In this step notice the word " press ". If the joint is properly aligned and the pipe spigot and fitting bell are within tolerance, it should not be necessary to pound the gasket in with a hammer. (Note: It is very difficult to press something with a 20 oz. ball peen hammer and getting a bigger hammer is not the same as pressing harder.) Gaskets are made to be very close to the outside diameter of the pipe. When a gasket is pounded into position, a loop of excess rubber is often formed, especially if the fit is tight. This means that some part of the gasket has been stretched with a related excess of gasket being stuffed into one area. A pinched gasket is usually an indication that one of the components is out of tolerance.

3. *Push the gland toward the socket and center it around the pipe with the lip against the gasket. Insert bolts and hand tighten nuts. Make deflection after joint assembly but before tightening bolts.*

Before inserting the t-bolts, double check to see that they are the right length. This may sound somewhat simplistic but when a 4 1/2" bolt is installed in a 6" fitting that requires a 3 1/2" bolt, there is a strong chance that the nut will bottom out on the threads before the gasket is compressed. If this occurs, it doesn't matter how tight you get the nut, the joint is still not going to seal. Since the threaded length of t-bolts varies between manufacturers, what worked last week on a joint may not work today. Double check the length and remember that the length is measured from under the t-head to the end of the threads.

4. *Tighten the bolts to the normal range of bolt torque [see table] while at all times maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This can be accomplished by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, finally the remaining bolts. Repeat the process until all bolts are within the appropriate range of torque. The use of a torque indicating wrench will facilitate this procedure.*

ANSI/AWWA C600-93
§ 3.4 Joint Assembly

Pipe Size (in.)	Bolt Size (in.)	Torque Range (in.)
3	5/8	45-60
4-24	3/4	75-90
30-36	1	100-120
42-48	1 1/4	120-150

Drawing the gland evenly is important to assure uniform compression on the gasket as well as keeping the pipe centered in the bell. If the gland is cocked to one side, stop and correct the problem before continuing to tighten the bolts. Alternating around the gland, just like tightening the lug nuts on a car wheel, will help to assure a uniform seal.

" Repeating the process " until all of the t-bolts are tight may take quite a few passes around the gland, especially in the larger sizes. On the larger sizes you may find that it is easier to have one person on either side of the pipe rather than having to jump back and forth. Just make sure that someone is tightening the very bottom bolt.

Although torque wrenches are typically too delicate to use as a ratchet, it is a good idea to keep one handy for use as a periodic check and to train someone new to the job. 75 to 90 foot pounds takes a fair amount of physical strength to achieve consistently throughout a long day. A crew foreman may want to keep a torque wrench in the trunk to double check his crew's work before backfilling.

Conclusion

As one can see, the steps involved in the proper assembly of a standardized mechanical joint are simple and straightforward. Clean and inspect, lubricate, assemble and tighten. When all of these steps are carefully followed in a true workman like manner, your chances of leakage during testing and operation are greatly reduced. Rework should be all but eliminated with an obvious economic advantage.