Common Sense and Uncommon Insight

Tapping Tips from a Real Expert

By Craig Fisher, P.E.
Technical Director

Through their continued and extensive use of PVC pipe for their water system, Calgary has amassed a wealth of experience in all aspects of PVC pipe - including tapping. Since meeting John McConnell at the AWWA Annual Conference and Exhibition in Anaheim, I have had a burning desire to get up to Calgary, interview John ad nausea, and write an article on everything you wanted to know about tapping PVC pipe - and more, much more, much, Much, MORE!

[Author's Note: In this article, the word "tapping" is used in the manner common in the waterworks industry, where it serves as a synonym for the drilling operation (as is the case in "saddle taps") or where it serves as a synonym for both the drilling and the tapping operation (as is the case in "direct taps").]

I was first introduced to John by a member of Uni-Bell's Operating Committee on the exhibit floor in Anaheim during AWWA's 2003 ACE. The member introduced me to John and wryly added: "I think you guys may have a common interest." Minutes that had seemed to crawl by up until that point at glacial speed began to zip by at warp speed. We talked endlessly about (yes, I am a geek) tapping PVC pressure pipe. Our topics were craftsmanship issues, and were definitely not requirements for successfully tapping PVC pressure pipe.

Two months ago, I had the opportunity to conduct the interview I imagined during the 2003 AWWA ACE, and I visited with John at Calgary's impressive training facilities. After the interview, I felt obliged to share John's practical suggestions with the readers of the PVC Pipe News. (These are NOT requirements. They are shared for those wishing to climb from the mediocrity of the average tapper to the rarefied air of the superb tapper.)

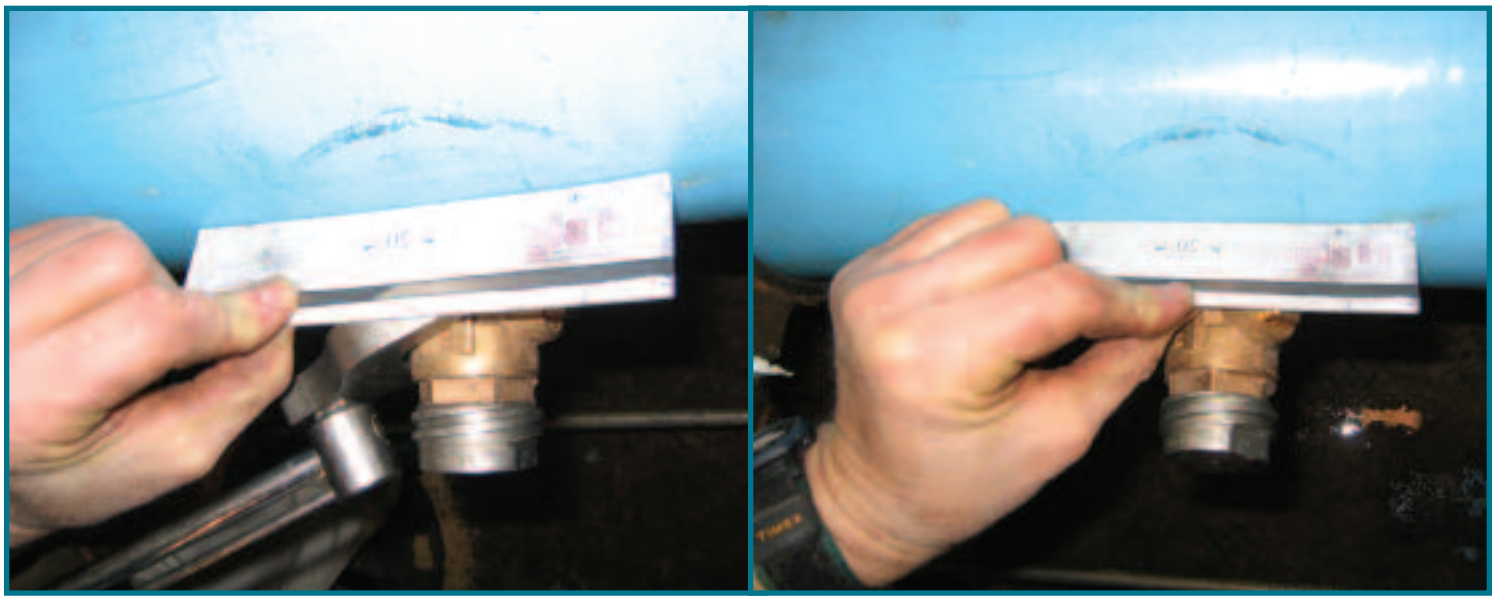

Figure 1: Checking for excessive bulging around the corporation stop

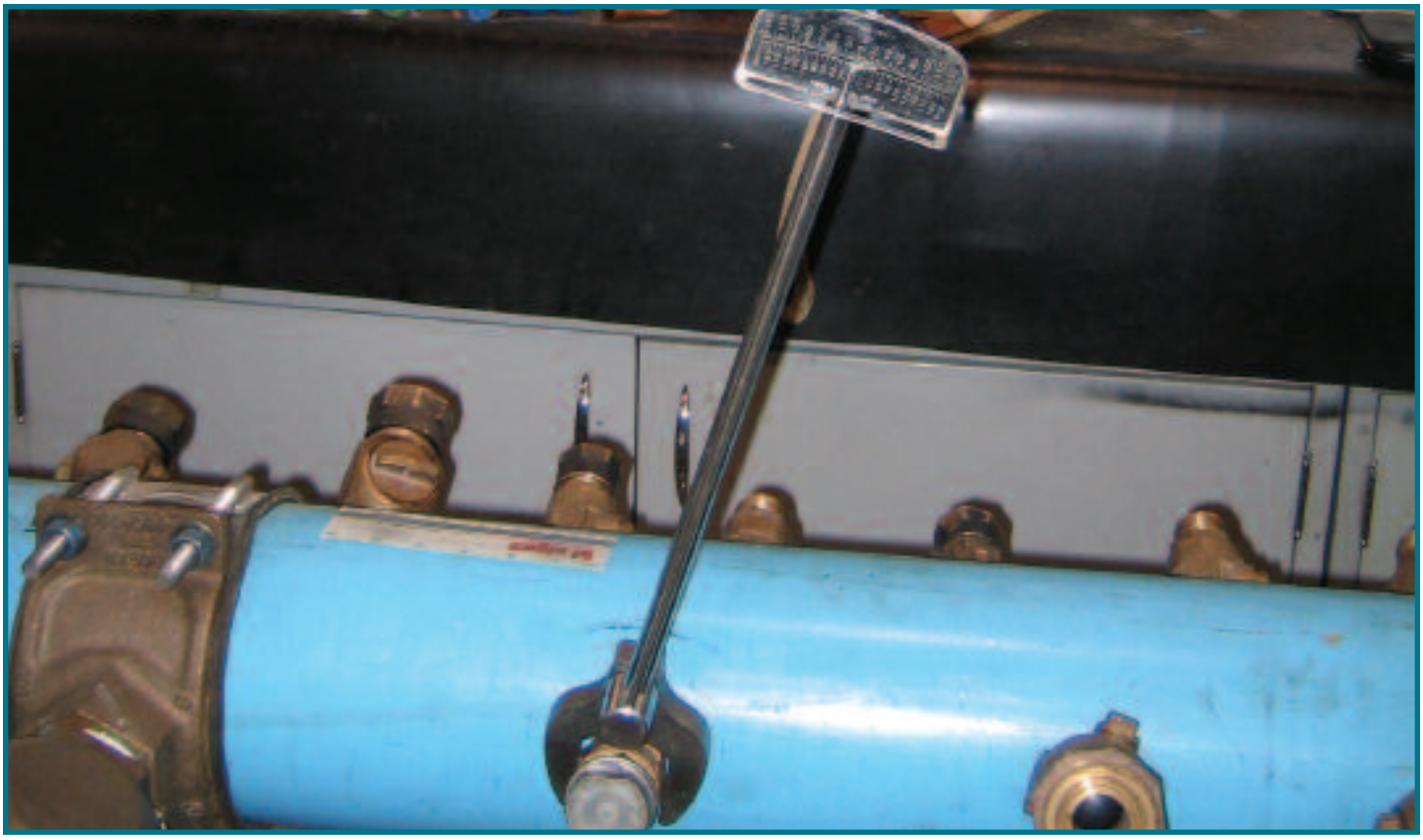

Figure 2: Measuring the torque required to rotate the corporation the last few turns

I quickly found out that a News article would not be sufficient for sharing all of these details. There is just too much information for the space available. Instead, the suggestions I found most fascinating are addressed here. Other pointers will be shared in later editions of the News.

JOHN RECOMMENDS THAT THE EXPOSED THREAD REQUIREMENT GOVERN. IN OTHER WORDS, JOHN ADVISES THAT PROPER INSERTION REQUIRES THAT ALL BUT TWO TO THREE THREADS OF THE CORPORATION STOP REMAIN VISIBLE.

THE BATTLE OF THE BULGE

No, this is not a weight loss clinic, nor is it an analysis of the final conflict prior to VE day in World War II. Instead, it is one of the unstated goals that underpins Uni-Bell's recommendation that a corporation stop installed via a direct tap be torqued to approximately 27 foot-pounds.

The torque needed for proper insertion is dependent upon - among other items - the pipe's wall thickness and diameter, the ambient temperature, and whether or not Teflon® tape is being used. The intent of the torque recommendation is to avoid over-stressing the pipe wall and give the worker an idea of what torque would be needed to have 2 to 3 threads of the corporation stop showing when inserting an AWWA threaded corporation stop directly into the wall of a PVC pipe to the proper depth.

John has made quite a few bench taps to optimize the size of the tapped hole and the depth of insertion of the corporation stop. When optimizing, he used two tools to evaluate the bench tap: a torque wrench and a ruler. He uses the ruler to check the amount of bulging adjacent to the inserted corporation stop. The photos in Figure 1 show him checking the bulging around the direct tap I made. There should only be a slight bulge on the pipe exterior due to the advancement of the tapered (wedge) shape of the threaded end of the stop through the pipe wall. A pronounced bulge indicates the possibility of excessive stresses.

John says it is a balancing act, though. The deeper the hole is tapped, the larger the diameter of the tapped hole. If the hole is too large, the bulge would be minimal, but there would not be sufficient torque to keep a tight seal when the stop

CONTINUED ON PAGE 16

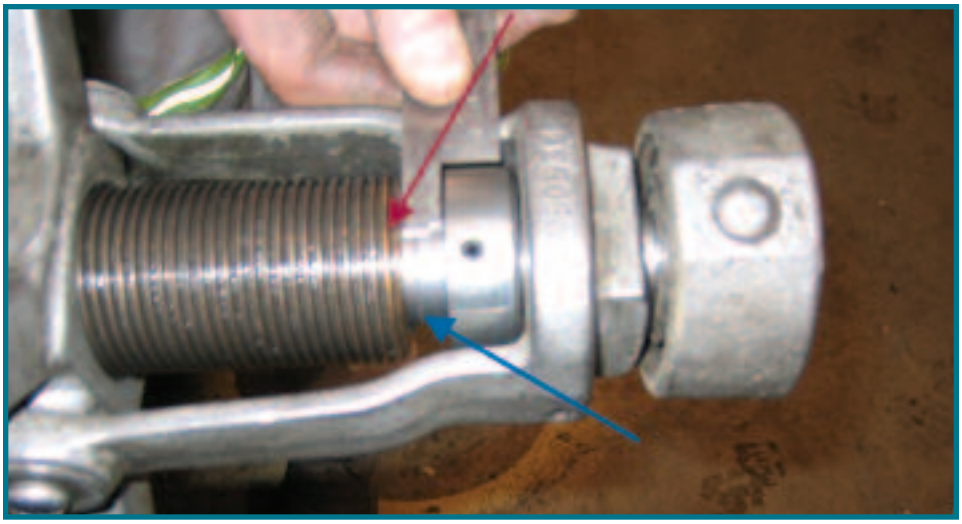

Figure 3: Using the Gage to check the depth of the tapping operation

THE GAGE PROVIDES FLEXIBILITY BY MAKING IT SIMPLER TO ACCOMMODATE DIFFERENT PIPE WALL THICKNESSES, THE DIFFERENT SIZES OF SERVICES BEING CONNECTED, AND THE DIFFERENT TYPES OF CORPORATION STOPS AVAILABLE.

CONTINUED FROM PAGE 15

is "leaned" on during the installation of the water service. On the other hand, if the hole is too small, the torque is more than sufficient, but the bulge is larger than he likes.

How much torque was required to have three threads showing for my direct tap of 6-inch, DR 18, C900 pipe at 68°F? Fifteen foot-pounds. (See Figure 2.)

With the ordeal of demonstrating the ability to correctly direct tap PVC pressure pipe behind me, John showed me some of the crutches that he has developed to help his students make the grade at his installation boot camp.

THE GAGE

John's torque wrench in the Calgary training facility was the first one I have seen associated with the tapping of PVC pipe since the filming of Uni-Bell's tapping video in the late 1980s. Realizing that field personnel rarely use a torque wrench, combined with the fact that controlling torque is a surrogate for limiting stress and strain in the pipe wall surrounding the corporation stop, John devised a simpler solution. I call it the Gage.

Since Calgary prefers direct taps over saddle taps, the Gage serves a dual purpose. First, it indicates the proper depth for the tapping portion of the operation. Second, it indicates how deep the corporation stop should be fed into the hole just tapped in the PVC pipe wall.

The picture in Figure 3 shows the first of the two functions of the Gage. It shows the proper depth to which the tapping portion of the cutter should be fed to properly prepare the female threads in the recently cut hole in the PVC pipe wall. The distance under observation is that between the top edge of the machine's threaded brass feed sleeve (end of the red arrow) and the scored line on the boring bar (end of the blue arrow).

The scored line on the boring bar at the end of the blue arrow is often referred to as the "cast iron mark". Had this tap been on an iron pipe, the tapping bit would have been advanced a little farther

Figure 4: Using the Gage to check the depth of the insertion of the corporation stop

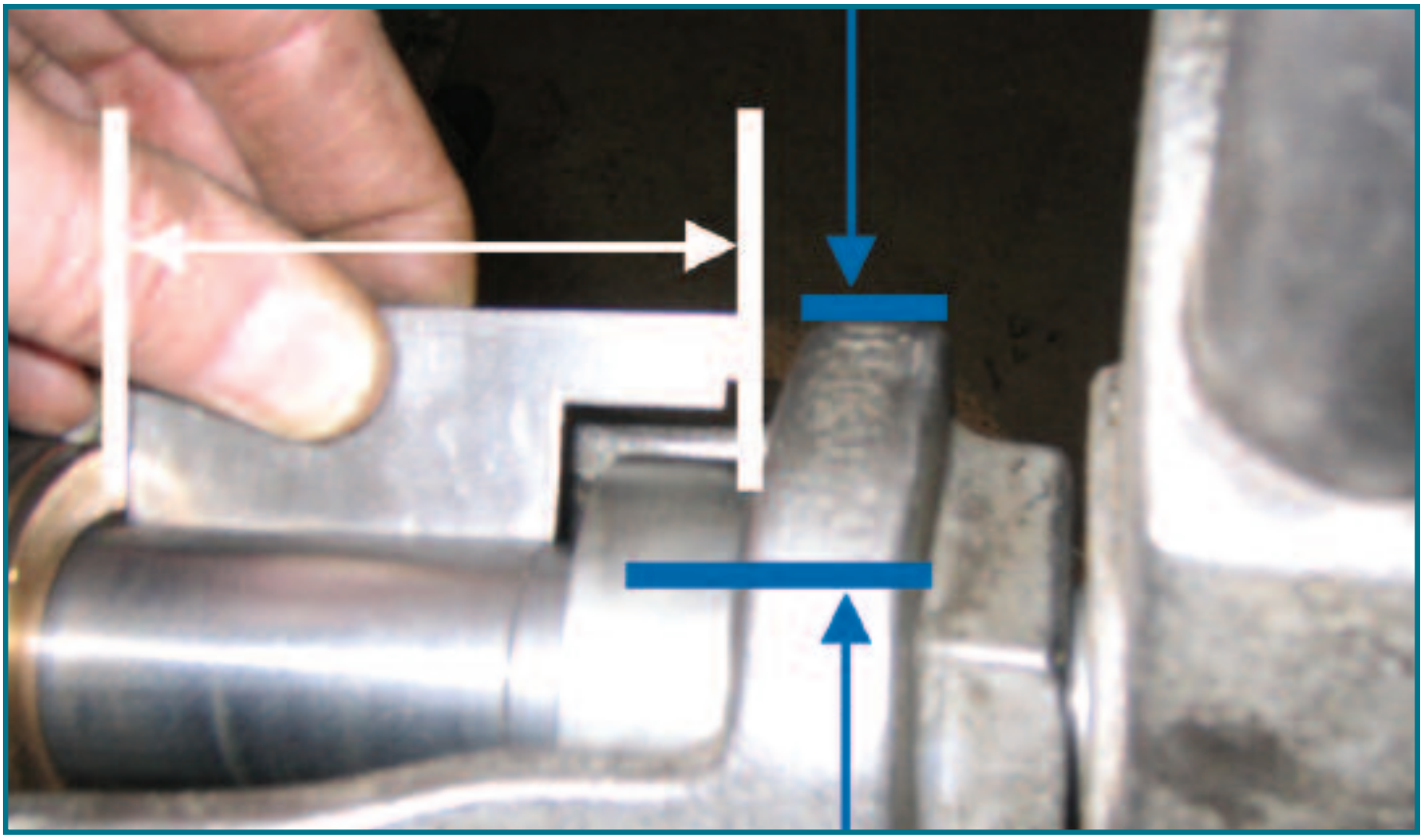

Figure 5: The longer dimensions of the Gage are used when making a 1-inch service connection.

- until the cast iron mark was flush with the upper edge of the machine's brass threads.

With the same gage, the proper depth of insertion of the corporation stop may be confirmed. By rotating the Gage 90 degrees, this depth is easily checked, as John is shown doing in Figure 4.

The gage John uses in training is slightly longer. A few rotations are left for the operator to gain a feel for the torque required to properly insert the corporation stop. In the Calgary training facility, the final few turns are done with a torque wrench after the direct tapping machine has been removed. John reports that in most scenarios, the torque required is below the 27 foot-pounds indicated in our Uni-Bell tapping guide and in the AWWA C605 installation standard for PVC water pipe. Also, the torque does not usually increase (as one would expect) as the wedge shape of the stop is further advanced into the wall of the PVC pipe. (However, he says the torque does rapidly increase if the shoulder of the stop is advanced to the pipe wall. Also, the use of Teflon® tape reduces the torque required by up to 50%.)

THE GAGE PROVIDES ACCURACY BY CONSISTENTLY POSITIONING THE DEPTH OF PENETRATION OF THE TAPPING BIT AND THE DEPTH OF INSERTION OF THE CORPORATION STOP.

Instead of using the Gage, one could make a series of marks on the boring bar for various wall thicknesses of PVC pipe. John's preference for the Gage is its flexibility and accuracy. The Gage provides flexibility by making it simpler to accommodate different pipe wall thicknesses, the different sizes of services being connected, and the different types of corporation stops available. (The inlet depth on a corporation stop varies by model and sometimes by the type of outlet specified.) The Gage provides accuracy by consistently positioning the depth of penetration of the tapping bit and the depth of insertion of the corporation stop.

To demonstrate the Gage's flexibility, refer to Figure 5. If it were a one-inch service connection, instead of the 3/4-inch connection I made, one just uses the longer dimensions on the gage.

While these are tried and proven suggestions for those wishing to hone their tapping procedure, the suggestions are not requirements to be successful at tapping.

We want to thank John for sharing these practical suggestions with us, which enables us to pass them along to you. Here's to your tapping successes!