



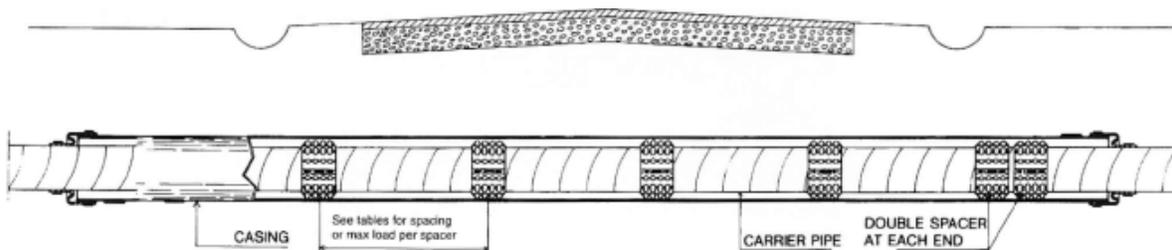
TO: Bulldog Licensees  
FROM: Craig Fisher, P.E.  
DATE: November 2, 2009  
SUBJECT: Bulldog for Casing Applications

### MEMORANDUM

A casing is often required for utilities installed within the Right-of-Way (ROW) of a major roadway or under a railroad. In this memo, it will be assumed that the utility in question is a water line. The reasons for installing a water line inside a casing are listed below.

- If the water line is being installed under an existing highway or railroad, the installation may be done without interrupting traffic.
- If the water line were to break or leak, the casing re-directs the water beyond the highway or railroad and prevents the embankment from being washed away or undermined.
- If the water line needs to be repaired, a casing installation allows the water line to be slid out of the casing so that repairs can be made without disruption of traffic.

Figure 1 shows a sketch of a casing installed under a road. Note that if the water line were to leak, the water would flow out of the casing at a point that is not underneath the road, which would protect the road's sub-base from erosion.



**Figure 1, Casing Installed Under A Road.**

After the water line is in the casing, there are different schools of thought on what to do about the annular space outside of the water line but inside of the casing. One of the following is done:

- The annular space is grouted. This makes it impossible to repair the water line if it were ever to break or leak.
- Sand is blown into the annular space.

- The annular space is left empty and only the ends of the casing are sealed.

Sealing the ends of the casing is common so that a new drainage pathway is not created and to prevent animals from entering the casing. The ends may be sealed with a spray foam, by grouting the ends, or with end seals. Figure 2 shows an end seal being applied to 12-inch Bulldog.



Figure 2, One Method of Sealing the Ends of Casing Pipe

Whether the water line should be restrained when installed inside the casing depends on which school of thought subscribed to. If the water line is grouted inside the casing, there is no need to restrain the joints when installing the pipe inside the casing. With sand in the annular space, or when the annular space is left empty, restraining the gasketed bell-and-spigot joints make sense. Common reasons for requiring restrained joints:

- The ROW owner requires that the water line be capable of being isolated in the event of a failure. To isolate that section of pipe, a valve must be installed near the casing at both ends. When the valve is closed, end thrust is generated by the water pressure. The water line must be restrained so that the valve does not blow off when closed.
- If there is a break, one can not count on being able to push the unbroken sections out of the casing. One will need to pull the unbroken sections from each end of the casing. One can not pull a gasketed bell-and-spigot joint if it is not restrained.
- If there is a leak, but not a break, one may not be able to count on having easy access at both sides of the casing. To be able to remove the line from either side, one must have restrained joints.

In those instances where the utility uses restrained joint water pipe inside a casing, the Bulldog offers some clear advantages. The greatest advantage is that the Bulldog restrained joint allows a smaller casing pipe to be used. See Figure 3.



Figure 3, Installing Restrained Joint PVC Pipe Inside a Casing. Figure 3a, The Traditional External Restraint Harness. Figure 3b, The Bulldog Restraint System™.

By their design, an external harness has to be larger than the outside diameter of the PVC pipe bell. The Bulldog puts the joint restraint inside the PVC pipe bell, which allows for a smaller diameter casing. Table 1 lists the outside diameters of various bell harnesses for AWWA C900 pipe and compares them to the outside diameter of the Bulldog bell.

Table 1. Clearance Dimensions Driving Casing Diameter

| Nominal Pipe Size (Inches) | OD Of AWWA C900 Pipe (Inches) | Approximate OD of the Bulldog Bell (Inches) | Approximate OD of the Uni-Flange Series 1350 (Inches) | Approximate OD of the Star Series 1000 (Inches) | Approximate OD of the EBAA Series 1600 (Inches) |
|----------------------------|-------------------------------|---|---|---|---|
| 4                          | 4.800                         | 6.50  | 9.125   | 9.12  | 9.25  |
| 6                          | 6.900                         | 9.25  | 11.875  | 11.12   | 11.25   |
| 8                          | 9.050                         | 11.75                                       | 14.625  | 14.75   | 14.75   |
| 10                         | 11.100                        | 14.25                                       | 16.625  | 16.82   | 16.85   |
| 12                         | 13.200                        | 16.75                                       | 19.25   | 19.46   | 19.45   |

By putting the restraint inside the PVC pipe bell, a smaller diameter casing may be used. A smaller casing means a smaller auger bit, less spoil, and less time required for jacking-and-boring the casing into place. This adds up to lower costs and higher profit margins.

A 2009 Texas Department of Transportation project quantifies the cost savings potential from using a smaller casing. The average bid cost per linear foot of installed steel casing pipe is listed in Table 2.

Table 2. Average Cost Bid Per Linear Foot of Steel Casing Pipe Installed

| <b>Diameter of Casing Installed</b> | <b>Average Cost Bid</b> |
|-------------------------------------|-------------------------|
| 12" Steel Casing                    | \$166 / Linear Foot     |
| 16" Steel Casing                    | \$191 / Linear Foot     |
| 24" Steel Casing                    | \$284 / Linear Foot     |

The contractor will also save time installing the joint restraint device. With the Bulldog, there are no nuts, bolts, and tie rods to assemble and tighten. Moreover, if the utility is concerned about corrosion and requires polyethylene encasement of the joint restraint harness, the contractor will have to add up to \$50/harness for the time and material of installing the polyethylene encasement.

So far, the memo has described the benefits the Bulldog offers the contractor. The ROW owner also benefits. External restraint harnesses prevent the joints from separating, but they are uni-directional. They do not prevent over assembly of the spigot into the bell. Thus, a restrained PVC system that uses external restraints at the bell, along with casing spacers, will only be allowed to be pulled. If pulled, the harnesses will grab onto the spigot and keep it from being pulled out of the bell. If pushed, the harnesses will not prevent the spigot from being over inserted into the pipe bell.

A Bulldog restrained system, with casing spacers, allows the pipe to be pushed or pulled if the spacers are installed on either side of the gasketed joint. The spacer installed at the insertion line on the spigot prevents the spigot from being over inserted into the pipe bell. (See Figure 5.) Thus, Bulldog offers the ROW owner the option of either pushing or pulling the pipe at any future point in time.



Figure 4. By using the Bulldog, pipe may be pushed or pulled into the casing.

As our ROW's become more crowded, installing smaller diameter casings results in less congestion *or* allows more utilities to be installed in the same amount of space.



Figure 5, Casing spacers should be installed just behind the insertion line to prevent over insertion

To summarize, using the Bulldog for casing installations helps all the stakeholders.

The contractor has a product that saves time and money. For the ROW owner, the installation leaves a smaller footprint and simplifies maintenance of the line. The engineer and the utility owner have a joint restraint system that is stronger and that is less likely to be installed incorrectly.