Setting the Restrained Joint

S&B Technical Products HDD Assembly Recommended Practice

Background

US 7,284,310

The gripping insert exterior surface 31 has a sloping profile (42 in FIG. 8) which contacts the upwardly sloping ramp surface (generally at 19 in FIG. 2A) of the housing 18, whereby contact with the exterior surface of a mating male pipe (20 in FIG. 2B) causes the gripping insert 27 to ride along the male pipe exterior surface at an angle while the row of gripping teeth on the gripping insert internal surface engage the exterior surface of the mating male pipe.

Using the language of the patent attorney the above paragraph describes how the Bulldog system restrains the PVC bell and spigot from separating when a force tries to pull them apart. More simply stated the system works in the following steps:

Part 1 - Assembly

1. During assembly a force pushes the spigot bevel (or chamfer) through the bell lip.
2. The bevel enters the grip ring.
3. The bevel centers the grip ring inside the casing
4. The grip ring expands, ever so slightly
5. The grip ring rides on the spigot as it is pushed to the back of the casing
6. The grip ring ends its ride as it butts up against the back of the casing
7. The spigot continues its course toward the Rieber gasket
8. The bevel comes in contact with the Rieber gasket
9. The bevel displaces the rubber sealing portion of the Rieber gasket
10. The spigot continues its course toward the back of the bell
11. When the reference (stop or insertion) line reaches the bell lip, assembly is complete.
So at this point in time the grip ring is ever-so-slightly expanded, it sits at the back of the casing, and the teeth are not engaged (set).

**Part 2 - Restraining**

1. During restraining a force begins to separate the bell and the spigot
2. The grip ring rides on the spigot as it is pulled toward the front of the casing
3. The beveled face of the grip ring comes in contact with the beveled face of the casing.
4. The interface of the two beveled faces reduces the inside diameter of the grip ring
5. The teeth of the grip ring engage (cut into) the surface of the PVC spigot
6. The grip ring continues its course toward the front of the casing, the ID continues to get smaller, the teeth engage deeper.
7. The grip ring ends its ride as it butts up with the front of the casing
8. The teeth are fully engaged, the grip ring is set, restraint is complete

Clearly setting the grip ring is key to restraining the joint. As described, engaging the teeth is dependent on the grip ring riding forward as it sits around the spigot, until it gets compressed by the beveled interface. There are no springs, bolts, or other mechanical forces to engage the teeth.

Several conditions are known that have the potential to impede the teeth of the grip ring engaging the surface of the PVC spigot.

1. Dirt, ice or debris lying inside the bell lip or casing.
2. Excessive Pipe Lubrication in the teeth area
3. Improper fit (too tight) of grip ring inside casing
4. Deformed or out-of-round spigot
5. Deformed or poorly cut bevel on spigot
6. Pipe spigot outside diameter too small
7. Non-conforming grip ring, or casing
8. Grip ring in backwards
9. No grip ring installed
10. IPS grip ring installed in CIOD casing
11. Improper spigot – bell alignment during insertion
Installation, Recommended Practice Bulldog for Horizontal Directional Drilling

S&B Technical Products recommends that Bulldog Restrained Joints be “Set” before the pipe string is pulled into the pilot hole and through the bore. The time it takes a contractor to set the joint is not significant and ensures the joint is set above ground. Simply pulling back on a joint with 3 to 4 times more force than was required to make the assembly will confirm proper setting of the grip ring.

There are several techniques in use to set the joint before pulling.

Clamp and Pull Method

The following photographs show the Clamp and Pull method. A MJ collar is employed for two purposes as it is clamped at the stop line. First it prevents over insertion of the spigot into the bell.

Clamp installed at assembly reference line assists in proper bell assembly.
Secondly the collar acts as an anchor to set the restrained joint.

After assembly, the crew simply hooks a chain on the clamped collar and pulls back on the joint. In the above example the chain was attached to a trackhoe. After the joint is assembled and set, the clamp is removed and used for the next length.

**Bar and Choker Method**

This method is effective on 4” and 6” pipe. A choker is secured around the pipe circumference at the bell shoulder. Then a bar is used to pull on the pipe length setting the joint restraint system on the previous assembly.
Choker and bar method

**Pipe Clamp Method**

For pipe 8” and larger a clamp can be used for attachment and pulled back using an excavator or similar piece of equipment. When used with caution, this method will work with 4” and 6”.

Setting grip ring with clamp
**String Pull method.**

When jobsite conditions allow multiple pieces of pipe to be assembled before the HDD pull, the entire length (string) of assembled pipe can be set in one operation. The string-set can be accomplished in several ways provided each joint is placed under tension.

![Long pipe string being set with backhoe](image1)

![Internal pulling head attached to pipe](image2)
Using straps or pulling head to attach the pipe, the following methods can be used:

A) Attached one end on the pipe assembly to a stationary object and then pull on the other end with an excavator or like type of equipment. A rubber tire vehicle can be used, provided enough tension can be place on the pipe assembly.

B) Attach the pipe assembly to the boring machine using the pulling head in preparation for installation in the bore. Secure the other end of the pipe string and use the boring machine pull back to apply tension to the entire pipe string. The set should be accomplished before pulling the first joint into the bore.

C) The boring machine can also be used as the stationary object by attaching the pipe assembly as described above. Apply tension by pulling on the other end of the assembly as in the first method.

For HDD projects setting the Restrained Joint above ground is necessary to assure all proper conditions have been attained and the engagement of the grip ring.