

## EXTERNAL JOINT-RESTRAINT DEVICES FOR PVC PIPE

Sustained growth of the North American municipal water-pipe market has led to the need for thrust-restraint options other than concrete thrust blocks. The most common thrust-restraint method in use today is external joint-restraint devices. These devices have been used with PVC pipe for over 25 years and have established a record of safe and effective use for a wide range of sizes and pressure ratings.

### DESIGN

Unbalanced thrust forces are developed in a pipeline whenever there is a change in flow (such as a change of direction at an elbow or a change in velocity at a partially closed valve). A properly restrained buried pipeline uses the soil's bearing strength and frictional resistance to prevent movement in response to these forces.

To determine the restrained length of pipe required on both sides of an appurtenance, EBAA Iron's restraint-length calculator program is recommended. For more information, see Uni-Bell Tech Brief "Thrust Forces – Restraint-Length Calculator" – [click here](#). Also see EBAA's website: [www.ebaa.com/calculator](http://www.ebaa.com/calculator).

### PRODUCTS

A typical restraint system for PVC pipe consists of:

1. Mechanical-joint (MJ) restraints at fittings
2. Bell-harness restraint (where required) at the pipe's gasketed-bell joints – the bell harness consists of restraint devices on either side of the bell with rods that transfer the thrust forces across the joint.

### INSTALLATION

Joint restraint is a two-step process:

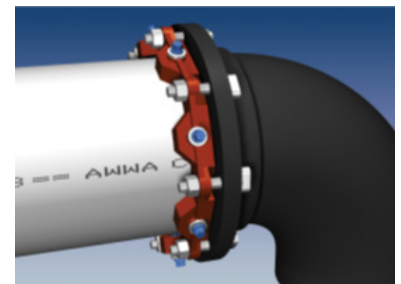
1. Properly complete the joint assembly (unrestrained), following the recommendations of the pipe and appurtenance manufacturers. It is especially important to lubricate the gasket for assembly.
2. Restrain the joint:
  - a. For MJ joints, complete the prescribed process of engaging and tightening the wedges onto the pipe.
  - b. For pipe-to-pipe restraint, install the restraint rings on either side of the pipe joint and then assemble the connecting rods.

#### Note:

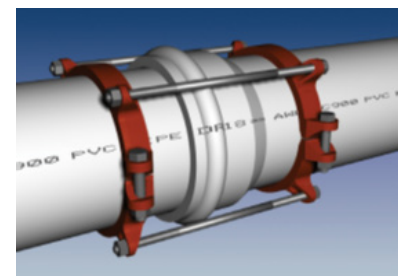
Tightening of bolts – there are three types of bolted connections found on restraint devices. It is critical that the proper installation technique be used for each type.

1. Twist-off nuts – found on wedge assemblies. These nuts achieve proper torque and then break off – further tightening of the remaining hardware is not recommended.
2. Nuts to be tightened to a specific torque value – for example, T bolts/nuts. Use of a torque wrench is recommended.
3. Hand-tightened nuts – found on bell-harness connecting rods. Wrench-tightening can cause over-insertion of the pipe joint.

References: EBAA Iron website: [www.ebaa.com](http://www.ebaa.com); *Handbook of PVC Pipe*, Uni-Bell (2013) Technical Brief: "Installation of PVC Pipe into a Mechanical Joint (MJ)," Uni-Bell (2016); Technical Brief: "Thrust Forces – Restraint-Length Calculator," Uni-Bell (2016)



*Mechanical Joint Restraint at Fitting*



*Bell Harness Restraint*