

## **SECTION 34**

### **PRESSURE PIPE RESTRAINT**

#### **34.1 GENERAL**

Pressure pipe fittings and other items requiring restraint shall be braced with thrust blocks or other restraining assemblies all as specified in Section 34 herein.

For PVC pipe, twelve (12) inches and smaller, all blocking to prevent movement of lines under pressure at bends, tees, caps, valves, hydrants etc., shall be by using thrust blocks as specified in Section 34.2.

All pressure pipe and fittings fourteen (14) inches and larger shall be restrained as specified in Sections 34.3 and 34.4. Use of thrust blocks for pressure pipe and fittings fourteen (14) inches and larger shall not be allowed.

Ductile iron pressure pipe and fittings twelve (12) inches and smaller may be restrained following the criteria established in Sections 34.3 and 34.4.

#### **34.2 THRUST BLOCK CONSTRUCTION**

Thrust blocks shall be provided as shown on the DRAWINGS. Where undisturbed trench walls are not available for thrust blocking, the CONTRACTOR shall furnish additional concrete or install suitable pipe harnesses or ties designed and manufactured specifically for this purpose. Additional concrete, harnesses, and/or ties shall be approved by the ENGINEER and the CITY.

Fittings shall be protected by polyethylene film, minimum 8 (eight) mil thick, prior to placing concrete thrust block

Concrete for thrust blocking shall have a minimum compressive strength of 2500 psi. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts or nuts, or interfere with the removal of any joint. Wooden side forms shall be provided for thrust blocks where trench conditions require. Thrust blocks shall be properly set and adequately cured prior to pressurizing the system.

#### **34.3 RESTRAINED JOINT CONSTRUCTION**

Sections of piping requiring restrained joints shall be constructed using pipe and fittings with restrained "Locked-type" joints manufactured by the pipe and fitting manufacturer and the joints shall be capable of holding against withdrawal for line pressures fifty (50) percent above the normal working pressure. Mechanical joint ductile iron pipe retainer glands shall not be permitted. Any restrained joints that allow for elongation upon pressurization will not be allowed in those locations where the pipe comes out of the ground.

Restrained pipe joints that achieve restraint by incorporating cut out sections in the wall

of the pipe shall have a minimum wall thickness at the point of cut out that corresponds with the minimum specified wall thickness for the rest of the pipe.

The minimum number of restrained joints required for resisting forces at fittings and changes in direction of pipe shall be determined from the length of restrained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil.

The required lengths of restrained joint ductile iron pipe shall be determined by the ENGINEER and shown in a tabular form as depicted on the "Restrained Pipe Table" in the STANDARD DRAWINGS. All calculation shall be based on the method outlined in the publication entitled "Thrust Restraint Design for Ductile Iron Pipe", latest edition, published by Ductile Iron Pipe Research Association, Birmingham, AL 35244.

Wherever two (2) forty-five (45) degree bends are used in place of a ninety (90) degree bend and the minimum restrained joints required from one (1) forty-five (45) degree bend extend beyond the other forty-five (45) degree bend, the two (2) forty-five (45) degree bends will be considered as though a ninety (90) degree bend were located midway between the two (2) forty-five (45) degree bends.

#### **34. 4 MECHANICAL RESTRAINING DEVICES**

##### 34. 4. 1 GENERAL

Mechanical Restraining Devices as specified herein may be substituted for the restrained "Locked-Type" joints manufactured by the ductile iron pipe and fitting manufacturer. The number of joints to be restrained shall be based on the "Restrained Pipe Table" in the STANDARD DRAWING.

##### 34. 4. 2 JOINT RESTRAINT DEVICE

Mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A 536. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI A21.11 and ANSI/AWWA C153/A21.53. Twist-off nuts shall be used to insure proper actuating of the restraining devices.

The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1.