

PFI Standard ES-40
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METHOD OF DIMENSIONING GROOVED PIPING ASSEMBLIES

Prepared by
Pipe Fabrication Institute Engineering Committee



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PFI neither endorses, approves, or recommends any specific product by issuance of this standard.

METRIC CONVERSIONS

The conversion of quantities between systems of units involves a determination of the number of significant digits to be retained. All conversions depend upon the intended precision of the original quantity and are rounded to the appropriate accuracy.

Pipe sizes together with applicable wall thickness' are not shown with metric equivalents.

The SI (Metric) values where included with the customary U.S. values in this Standard are the rounded equivalents of the US values and are for reference only.

Metric units were derived utilizing the following conversion factor:

<u>Conversion</u>	<u>Factor</u>
inches to millimeter	25.4

1.0 Scope

- 1.1 This standard covers the recommended practices for dimensioning grooved piping assemblies in a manner that would enable the fabricator to furnish a product meeting the geometry intended by the design engineer. This standard may be used in conjunction with additional fabrication processes (i.e., bending, welding, etc.) in accordance with PFI standards.

2.0 Dimensioning

- 2.1 Piping is normally of a circular cross section. Thus the geometry of a piping system can be fully defined by the location of the centerline axis of the pipe. Terminal points and points of change in direction of the pipe axis are known as working points. Since two points determine a straight line, it is recommended that the pipe axes be located by means of working points. Two alternate methods of locating working points are suggested in 2.2 and 2.3.
- 2.2 Fig. 1A illustrates location of the working points along the axis of the pipe by providing information on the length and direction of each consecutive segment of the axis.

- 2.3 Fig. 1B illustrates dimensioning by means of location of the work points from fixed reference planes, such as from ground elevation, column lines, etc.
- 2.4 While not necessary for the determination of the pipeline geometry, it is essential that the engineer provide the fabricator with additional information such as:
 - a. pipe size and wall thickness
 - b. material specification
 - c. type of pipe fittings to be used
 - d. bend radius for bends
 - e. type of branch connections to be used
 - f. type of grooves to be used (rolled or cut)
 - g. type of couplings to be used and location of all rigid joints
 - h. locations of all attachments
 - i. permissible tolerances (see PFI Standard ES-39)
 - j. system operating conditions

3.0 Fabrication Variables

- 3.1 This section is intended to acquaint the engineer with the variables encountered by the fabricator.
- 3.2 In joining the components of a fabricated assembly, the fabricator must consider three factors; joint type and spacing; maximum and minimum pipe end separation and pipe fitting tolerances.

- 3.3 In order to assure proper system alignment and function, pipe ends to be joined with mechanical pipe couplings are set up with a small gap between them called end separation. This separation may vary from 0 to $\frac{1}{4}$ " (6 mm) depending on the type of groove, type of coupling used, and the diameter of pipe.
- 3.4 Pipe end separation will vary as the piping system is assembled and put into service. With guidance from the engineer as to the type of groove, location of required rigid mechanical joints, system operating conditions and fitting tolerances, the fabricator can calculate the cut-length of all pipe segments required to complete the system.
- 3.5 All grooved fittings and flanges are subject to manufacturing tolerances on terminal dimensions (end to end, face to face, center to end, etc.). The fitting manufacturer must be consulted for the specific tolerance to be utilized.

- 3.5.1 In fabricating the assembly, the fabricator must take the foregoing factors into account. To achieve dimension "L" in Fig. 1A, it may be necessary to adjust pipe end separation or change joint type. As an alternate approach, appropriate adjustments could be made to other relevant dimensions in the piping layout to achieve the desired end result.
- 3.5.2 All of the above mentioned variables are beyond the control of the Purchasers' Engineering Department. The Pipe Fabrication Institute recommends that allowances for pipe separation be eliminated from the Engineer's design drawings, and overall dimensions of close assemblies of fittings or fittings and flanges be determined on the basis of the net sum of the nominal dimensions of the component parts.

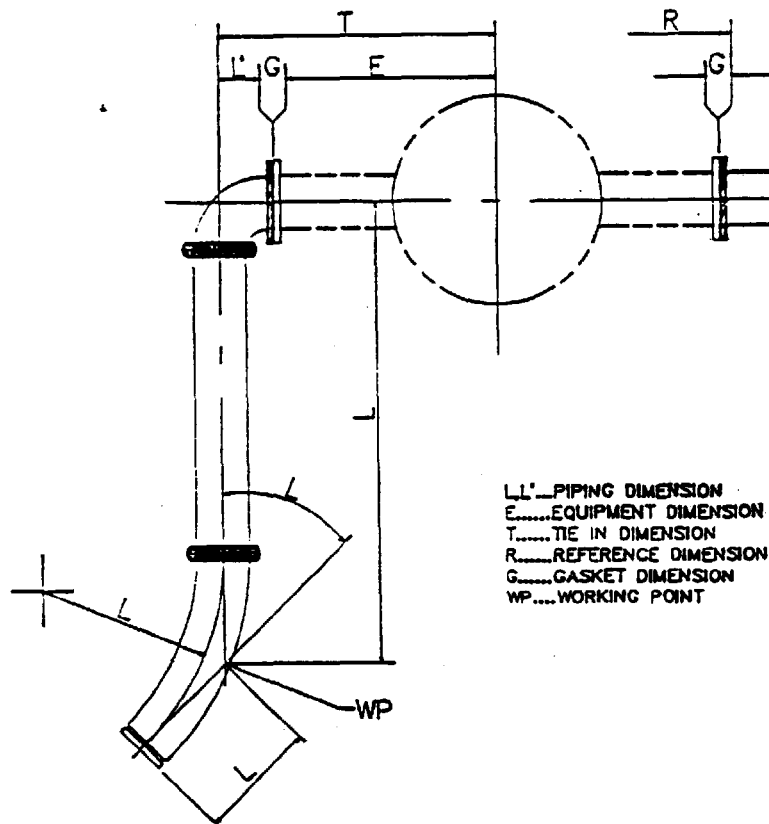


FIGURE 1A

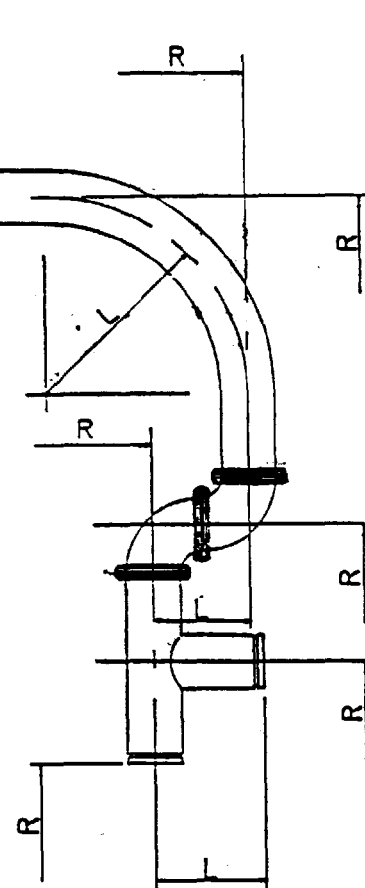


FIGURE 1B

A current index of the latest revised ES Standards and Technical Bulletins is available from the Pipe Fabrication Institute.

PFI Standards and Technical Bulletins are published to serve proven needs of the pipe fabricating industry at the design level and in actual shop operations. Hence, such needs are continually considered and reviewed by the Engineering Committee of the Pipe Fabrication Institute to provide recommended procedures which have been demonstrated by collective experiences to fulfill requirements in a manner for Code compliance. However, as the PFI Standards are for minimum requirements the designer or fabricator always has the option of specifying supplementary conditions in the form of requirements beyond the scope of the PFI publications.