Comparing 3-Piece Y-Lateral Fittings

Fully Pressure Rated Non ID-Controlled and Fully Pressure Rated ID Controlled Fittings

1.0 Introduction

Non ID-Controlled (NIDC) and ID-Controlled (IDC) fabricated fittings differ in the way they achieve the required 25% wall-thickness to maintain the pressure rating of the pipe system. The manner by which the IDC fitting meets the requirement also offers a significant increase in the structural strength of the fitting, by engaging more surface area in the mitred fusions.

2.0 Codes and Standards

The following standard is referenced:

ASTM F2206-02
Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE) Plastic Pipe, Fittings, Sheet Stock, Plate Stock or Block Stock

3.0 Pressure Rating & Wall Thickness

To maintain the pipe system pressure rating in the fabricated y-lateral, the wall thickness of the fitting in the region of the mitred fusion must be *25%* greater that the pipe system. The method this is accomplished differs between Non ID-Control (NIDC) and ID-Control (IDC) fittings

The NIDC fitting increases the wall thickness inward toward the long axis of the pipe. This reduces the inside diameter as compared to the rest of the pipe system, and can hinder flow and pigging.

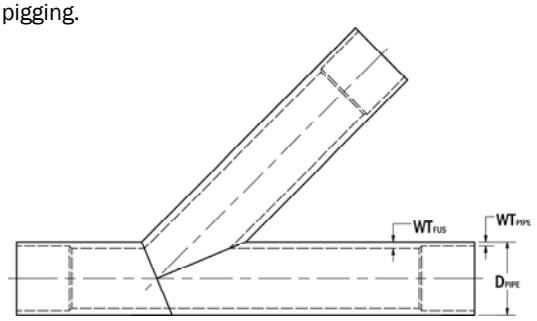

Figure 3.2 Dimensional Overview of NIDC Y-Lateral

Common practice in manufacturing NIDC fittings decreases the DR in the region of the fusion to the next nominal SDR. For example, if the pipe system is *SDR 7.3*, the DR in the region of the fusion would be the next lower SDR: *6.3*. Strictly speaking however, this method does not always provide the additional *25%* wall thickness required by the ASTM F2206.

An IDC fitting increases the wall thickness outward from the long axis of the pipe, increasing the outside diameter of the fitting in the region of the fusion to the next nominal pipe size. This maintains a constant inside diameter throughout the fitting, matching the inside diameter of the rest of the pipe system.

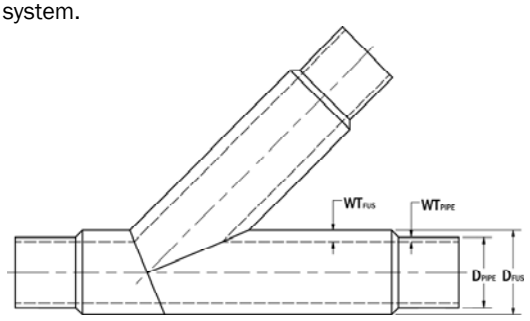

Figure 3.1 Dimensional Overview of IDC Y-Lateral

The IDC method, for pipe system sizes between *2* and *12 NPS*, and *SDR*'s between *6.3* and *17*, will, at minimum, provide a *31%* larger WT, with the average WT increase of *126%*.

4.0 Fusion Areas

It can be shown that the fusion areas for a three-piece y-lateral are described by the following equations:

$$A_1 = \frac{\pi \cdot WT^2}{\sin\left(\alpha/2\right)} \cdot \left(\frac{D}{WT} - 1\right) \qquad \textbf{Eq. 4.1}$$

And,

$$A_2 = \frac{\pi \cdot WT^2}{\cos\left(\alpha/2\right)} \cdot \left(\frac{D}{WT} - 1\right) \qquad \textbf{Eq. 4.2}$$

Where:

A1=First Fusion Area
A2=Second Fusion Area
WT= Wall thickness, in region of fusion
D=Pipe Diameter, in Region of Fusion
α=Branch Angle

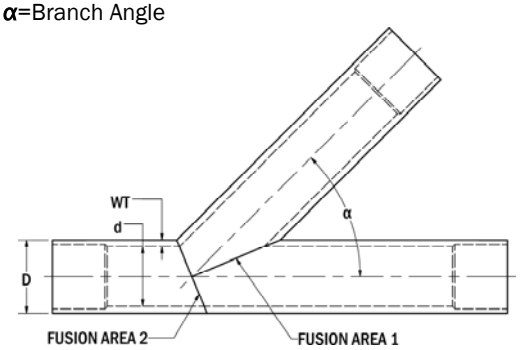

Figure 4.1 Dimensions used in Fusion Area Calculations

Using the dimensions for a fully pressure rated y-lateral designed to connect to *4 NPS SDR 7.3* pipe system, the following fusion areas are calculated:

	NIDC		IDC		
	WT *(in)*	Fusion Area *(in^2)*	WT *(in)*	%> NIDC WT	Fusion Area *(in^2)*
Fusion 1	0.779	23.80	1.148	47%	41.61
Fusion 2	0.779	9.86	1.148	47%	17.23

Figure 4.2 Sample Fusion Area Caluclations
For fully pressure rated *4 NPS SDR 7.3 y-lateral*. Note IDC wall thickness is approximately *47%* greater than NIDC wall thickness.

The values in *Figure 4.2* indicate that both the wall thickness and the fusion areas of the IDC fitting are greater than that of the NIDC fitting, for the same size pipe system. The greater wall thickness not only imparts more strength and rigidity to the joint in the region of the fusion, but consequently increases the fusion area. Since more material is engaged in the fusion, the joint is stronger and more resistant to structural forces stemming from installation and service – including the so-called "wishbone" forces.