

## PE PROFILE WALL PIPE *WHAT YOU DON'T SEE*

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The outward appearance of profile wall plastic pipe products typically show a good looking surface that is relatively smooth and tends to exhibit a certain degree of uniformity. Such appearance, however, **can be misleading** in that the consumer perceives appearance as an indication of quality.

For an "engineered" product designed to perform under certain external and internal conditions, the assurance of long-term performance is a very important consideration. Certain pipe characteristics, including dimensional reliability, should always enter into the performance evaluation.

In order to more accurately assess such a performance potential, random samples of PE profile wall pipe were cut to reveal the cross-section of the product. Measurements were taken from these cross-sections. The question of quality, consistency and reliability of performance, as related to dimensional reliability, can now be addressed.

The following presents a few typical cross-section dimensional measurements of 18" diameter pipe:

- The exterior wall providing the corrugated shape -  
**Extremely non-uniform**, measuring from 0.058" to 0.200" along the perimeter of the corrugations.
- Interior waterway surface -  
**Very thin**, measuring between 0.042" and 0.049" in thickness under the arch of the corrugation.  
**Undulating surface** along the pipe axis (direction of flow). Amplitude of approximately 0.15" each - 2-1/2 inches.

The above mentioned measurements are not worst case examples, there were a random representation of sections for that product.

Cross-sections have been observed showing greater variations and thinner waterway surfaces than that mentioned above. No attempt has been made to focus on specific severe irregularities, but rather to emphasize **dimensional limits must be established to provide the consumer with assurance** the product is manufactured with uniform quality, thus assuring that performance will be consistent.

It is, therefore, recommended that project specifications address **dimensional requirements and tolerances** accordingly. Such requirements are typical of specifications for pipe products produced from other materials, such as metal, ductile iron and concrete.

It is further recommended that specifying engineers address the affect such variations and/or minimal structural thicknesses have on:

- **Structural response to load**
- **Buckling resistance**
- **Abrasion performance**
- **Hydraulic capacity**
- **Beam strength**
- **Creep**
- **Stress concentrations**
- **Environmental stress crack resistance**

For example, let's briefly address abrasion independent of structural aspects. **It is a waterway wall, of 0.042" for 18" diameter pipe, of sufficient thickness to provide for abrasion performance, or will the waterway surface be destroyed?**

ASTM F 894, for profile wall PE pipe, requires a minimum waterway wall thickness of 0.18 to 0.22 for 18" diameter, with 0.22 being required for the higher strength class.

In comparing the 0.042" wall with non-structural liners used in pipe applications, such a thin wall does not even meet minimum liner thickness requirements.

In the course of manufacturing PE profile wall pipe products, the quality of the basic material can have a significant effect on dimensional control of a production run of pipe. Blending of various post-consumer, reground, or using non-rated materials, not only have unknown long-term mechanical properties, they are also **subject to greater dimensional variations during processing.**

## **CONCLUSION**

1. Require profile dimensions and allowable tolerance limits to assure a consistent product will be furnished.
2. Require coupons (small representative sections) be randomly cut from the pipe (1 per 500' of product) to verify the product cross-section complies with specified dimensions and allowable tolerances.
3. Require a HDB rated material be used to minimize the potential of dimensional variations.
4. Require procedures that are implemented at the manufacturing plant, for inspection and acceptance of a production run of product.