THE MOST FUNDAMENTALS ABOUT PEX PIPES - UNDERSTANDING ASTM F876 AND F877

All PEX manufacturers need to comply to the ASTM F876 and F877 methodologies in order to meet the minimum requirements in USA and Canada or any other locations where PEX pipes must meet those quality standards.

This document is to demystify false representations that have circulated over the years by companies trying to convince customers that their PEX pipes are better than anyone else. If there is one postulate that you should remember at the end of this document it’s this one: “All certified ASTM F876/ F877 PEX pipes are made equally. Period.”

At GTGlobe, we only believe in true facts and verifiable data. We are providing you information that is not coming from GTGlobe, but from reliable independent sources that can be verified and trusted.

Who is ASTM?
ASTM (American Society for Testing and Materials) is the most important independent standardization organization recognized to develop standards around the world. It is fully independent from any companies or other commercial organizations. ASTM “is a globally recognized leader in the development and delivery of international voluntary consensus standards. Today, some 12,000 ASTM standards are used around the world to improve product quality, enhance safety, facilitate market access and trade, and build consumer confidence.”

What are ASTM F876 and F877?
These are the only 2 accepted methodologies, in North America, that specify all the aspect of a PEX pipe and the minimum required to meet North American plumbing code standards.

ASTM F876 in details
Here is the exact ASTM published text: “This specification covers cross-linked polyethylene (PEX) tubing that is outside diameter controlled, made in standard thermo plastic tubing dimension ratios, and pressure rated for water at three temperatures (see Appendix X1). Included are requirements and test methods for material, workmanship, dimensions, sustained pressure, burst pressure, environmental stress cracking, stabilizer migration resistance, and degree of crosslinking. Methods of marking are also given.”

In simple terms, the ASTM F876 specifies all the following minimum requirements:
- Outside diameters
- Tubing dimension ratios
- Sustained pressure rate
- Sustained burst rate
- Crosslinking degree of the material

1 [http://www.astm.org/ABOUT/aboutASTM.html](http://www.astm.org/ABOUT/aboutASTM.html)
**ASTM F877 in details**

Here is the exact ASTM text: “This specification covers requirements, test methods, and methods of marking for cross linked polyethylene plastic hot –and cold- water distribution systems components made in one standard dimension ratio and intended for 100psi (0.69MPa) water service up to and including a maximum working temperature of 180°F (82°C). Components are comprised of tubing and fittings. Requirements and test methods are included for materials, workmanship, dimensions and tolerances, burst pressure, sustained pressure, excessive temperature and pressure, temperature cycling tests, and bend strength. Also included are tests related to system malfunctions. The components covered by this specification are intended for use in residential and commercial, hot and cold, potable water distribution systems as well as sealed central heating, including under-floor heating systems.”

In simple terms, ASTM F877 specifies all the following minimum requirements:
- Outside diameters and tolerances for PEX tubing
- Wall thicknesses and its diameters
- Maximum bending radius
- Required burst strength
- Minimum sustained pressures
- Expansion coefficient
- Types of fittings that can be used with PEX, including:
  - Insert fittings (crimp ring with swivel nut)
  - Compression fittings (copper crimp ring) (or metal compression sleeve closure)
  - Expansion fittings (pipe expanded with plastic or metal ring around)
- Hot bending technique or what others also use to explain how to repair a kinked PEX pipe

**The truth behind the facts**

Now that you understand where these methodologies are coming from, let’s see what the true facts are and why some companies are using your lack of knowledge to make you believe that only their products have criteria that others don’t.
<table>
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<tr>
<th>ASTM SAYS</th>
<th>F876</th>
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<tr>
<td>Material</td>
<td>High Density Polyethylene</td>
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| Approved PEX production receipts | PEXa: Peroxides  
PEXb: Silane  
PEXc: Electron beaming  
PEXd: Azo compounds |      |
| Crosslinking levels | 65% to 89% |      |
| Marking | A certified ASTM F876 and F877 PEX pipe should be marked with such designation every 5 feet maximum |      |
| Maximum rated temperature | 200F |      |
| Excessive temperature | Should sustain short term conditions of 48 h at 210F, at 150PSI |      |
| Max rated pressure at 200F | 80PSI |      |
| Max burst pressure, ½"@73.4F | 480PSI |      |
| Fittings that can be used with |      | F1960: Cold expansion fittings with PEX reinforcing rings  
F1961: Metal mechanical cold flare compression fittings with disc spring  
F1807: Metal insert fittings utilizing a copper crimp ring  
F1865: Mechanical cold expansion fittings with compression sleeve |
| Fittings performance and test method requirements | All fittings above must meet the performance and test method requirements of F877 |      |
| Fittings dimensions | All fittings above must meet the Outside Diameters and Tolerances for PEX as per ASTM F877 |      |
| Hot bending minimum radius | 2.5 times the outside diameter |      |
| Cold bending minimum radius | 6 times the outside diameter |      |
| UV effects | All PEX pipes should be covered to avoid long-term exposure to sunlight. |      |
| Fixing a kinked PEX pipe | In section X2.3.5, ASTM describes the methodology on how to realize a hot bending on a PEX pipe which we can also translate on how to unbend or unkink a bended of a kinked PEX pipe, as long as material as not be altered. Use a heat gun at 265F until the bended point becomes translucent. |      |