

PPI HSB Task Group Charter

Task Group:	PEX 0.63 DF
Task Group No.	DFTG2-0214
Committee/ opened	<ul style="list-style-type: none"> ▪ DF Committee, February 2014/ San Diego, California
Original Scope	<ul style="list-style-type: none"> ▪ To propose a 0.63 DF for PEX compounds at 73°F in PPI TR-3.
Background	<ul style="list-style-type: none"> ▪ In 2011, the PPI Building & Construction Division (BCD) requested use of a 0.63 DF applied to PEX compounds listed with the PPI HSB. Their initial presentation was made during the February 2014 PPI HSB meeting [8].
Rationale	<ul style="list-style-type: none"> ▪ The historical performance of PEX compounds is well proven since first introduced in pressure pipe applications where use spans multiple applications, residential to industrial; a full range of operating conditions and pipe sizes [1, 2]. <ul style="list-style-type: none"> – Historical documents record that crosslinking was invented in ~1966 and PEX pipe first use in hot-water radiant heating was in early 1970 [1, 2]. ▪ The resistance to cracking is technically proven well beyond that of polyethylene grades due to the crosslinked structure [4, 11, 12]. ▪ Exceptional temperature resistance is proven within the applications where many PEX compounds successfully achieve an HDB performance not only at baseline temperature of 73°F, but also at 180°F and 200°F [11, 14]. ▪ Increases in the long-term strength performance since first introduced [1, 2, 14]. ▪ PEX is not known to have failures that are inherent to material [1, 2].
Scope Modification	<ul style="list-style-type: none"> ▪ None at this time
Related Projects	<ul style="list-style-type: none"> ▪ PEX Initial Listing Policy (POTG10-0816) – completed. ▪ PEX Colorant Substitution Policy (POTG2-0213) – completed. ▪ PPI TR-9 (Review/ Reapproval) – in progress. ▪ DF Methodology (DFTG1-0814) – in progress. ▪ Elevated Temperature HDS Policy (HSBTG27-0219) – in progress.

<p>Resources</p>	<ol style="list-style-type: none"> 1. R.A. Roseen. J.E. Bergman. Examination of Crosslinked Polyethylene for Heating Systems. Plastics Pipes IV (Brighton, UK). 1979. 2. M. Ifwarsson/ P. Eriksson (Sutdvik Energiteknik AB). Experience from 12-Years Evaluation of Crosslinked Polyethylene. PPXVI (York, UK). 1985. 3. ASTM F876 Standard Specification for Crosslinked Polyethylene (PEX) Tubing. 4. ISO 14531 Plastics Pipes and fittings – Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels – Metric series – Specification 5. ASTM D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products. 6. ISO 9080 Plastic Piping and ducting systems – Determine of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation. 7. ISO 12162 Thermoplastics materials for pipes and fittings for pressure applications – Classification, designation and design coefficient. 8. PPI BCD Presentation of February 2014 (initial request) and August 2021 (additional information). 9. Historical review of ASTM F876 test requirements. 10. Historical review of ISO 14531-1 requirements, where possible. 11. S. Dreckoetter, H. Hammar. Prolonged ISO 9080 Testing Revealing the Full Capabilities of PE-X. Plastics Pipe PXVII. 2014. 12. C.F. Baker. PENT Study of Cross-Linked Polyethylene Pipe Resins. Plastics Pipe PPXVIII (Berlin, Germany). 2016 13. Slow Crack Growth Resistance (SCGR) data provided confidentially by PEX manufacturers. 14. PEX regressions submitted to the PPI HSB over the many years.
<p>Ballots</p>	<p>A total of 7 HSB ballots were issued/ completed for this project.</p>

PART G. PEX SPECIFIC POLICES, PRACTICES AND PROCEDURES

G.4 POLICY FOR RECOMMENDING A 0.63 DF FOR A PEX COMPOUND AT 73° F

A listing holder who has a cross-linked polyethylene (PEX) compound with a Standard Grade HDB recommendation may request a 0.63 DF for the compound at 73°F provided the following requirements are met.

This policy, G.4, can only be applied to a PEX compound whose data was developed by testing solid wall pipes for all of the requirements of G.4. See the definition of Solid Wall Pipe in the Acronyms and Definitions at the beginning of this document.

A recommended 0.63 DF cannot be applied to a multilayer PEX pipe structure unless all PEX compounds in the structure have individually qualified for the 0.63 DF.

A recommended 0.63 DF cannot be applied to a PEX compound that is not crosslinked to the range on which the HDB is based.

NOTE: See Notes to Reader No. 4 regarding design factors at temperatures other than 73°F.

G.4.1 The PEX compound must have a Standard Grade recommended HDB at 73°F, 180°F and 200°F.

NOTE 1: An interpolated value for the 180°F HDB may be used per the policy in Section D.2.

G.4.2 The LCL/LTHS ratio, per ASTM D2837, shall be greater than 90% for all data sets submitted for the Standard Grade Listing.

G.4.3 The LTHS of the PEX compound shall not be greater than 125% of extrapolated strength of the PEX compound at 50 years at any temperature for all data sets submitted for the Standard Grade Listing.

G.4.4 The PEX compound shall have a minimum material designation code of PEX 5306 as described in ASTM F876 for resistance to oxidation by chlorine and resistance to UV exposure.

G.4.5 The range of % crosslinking for a PEX compound with a 0.63 DF shall be the range established by the 3 lots submitted for a Standard Grade recommendation at the 200°F temperature by subtracting 4 from the lowest value reported for a lot and adding 4 to the highest value reported for a lot of those lots submitted. However, the minimum and maximum value of % crosslinking for a PEX compound cannot be outside the range specified in **G.4.6**.

NOTE 1: The ± 4 is based upon the Precision and Bias section of ASTM D2765 Section 30.

NOTE 2: If the size of a PEX pipe is so large that samples for % crosslinking must be taken from several locations across the wall thickness or around the circumference of the pipe in order to confirm the uniformity of crosslinking, the minimum value determined in the sampling shall be the value used.

G.4.6 The range of % crosslinking for PEX compounds shall be within the following limits, depending on the method of crosslinking:

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|------------------------------|-----------|
| a. Peroxide or PEX-a method | 70% - 89% |
| b. Silane or PEX-b method | 65% - 89% |
| c. Radiation or PEX-c method | 65% - 89% |