



De-Ratings

- Hydrocarbon gases of lower molecular weight, such as methane and hydrogen sulfide – Studies and long-term experience show that the resultant long-term strength is at least equal to that established when using water or air as a test fluid. Therefore, no de-rating is required.
- Vapors generated by liquefied petroleum gases (LPG) – These vapors contain hydrocarbon gases of somewhat greater molecular weight, gases which because of their “plasticizing” or, “solvating” effect on PE tend to somewhat reduce PE’s long term hydrostatic strength. To offset this possible reduction, the PR or PC for water is de-rated by the application of a factor of 0.80 or smaller.
- Common hydrocarbons in the liquid state, such as those in LPG and fuel gas condensates, in crude oil, in fuel oil, in gasoline, in diesels fuels and in kerosene – Because exposure to these liquids results in a larger “solvating” effect, the practice is either to de-rate PE pipe to a greater extent than for vapors or, if this de-rating is impractical, to use an alternate material. For crude oil application a de-rating factor of 0.50 is typically used.
- Aromatic hydrocarbons – Because aromatic hydrocarbons, such as benzene and toluene, have a much greater “solvating” effect, the use of PE should be avoided.



TABLE A.2

Temperature Compensating Multipliers for Converting a Base Temperature HDS or PR to HDS or PR for Another Temperature Between 40 and 100°F (4 and 38°C)

Maximum Sustained Temperature, °F (°C) ⁽¹⁾	Multiplier ^(2,3)
40 (4)	1.25
50 (10)	1.17
60 (15)	1.10
73 (23)	1.00
80 (27)	0.94
90 (32)	0.86
100 (38)	0.78

- (1) Temporary and relatively minor increases in temperature beyond a sustained temperature have little effect on the long-term strength of a PE pipe material and thus, can be ignored.
- (2) The multipliers in this table apply to a PE pipe that is made from a material having at least, an established hydrostatic design stress (HDS) for water, for 73°F (23°C). This HDS is designated by the last two numerals in the PE's standard designation code (e.g., the last two digits in PE4710 designate that the HDS for water, for 73°F (23°C), is 1,000psi – See Introduction and Chapter 5 for a more complete explanation.)
- (3) For a temperature of interest that falls within any pair of listed temperatures the reader may apply an interpolation process to determine the appropriate multiplier.

TABLE 1-2

PE Pipe Environmental Application Factors (A_F)*

Pipe Environment	Environmental Application Factor (A_F) at 73°F (23°C)
Water: Aqueous solutions of salts, acids and bases; Sewage; Wastewater; Alcohols; Glycols (anti-freeze solutions)	1.0
Nitrogen; Carbon dioxide; Methane; Hydrogen sulfide; Non-Federally regulated applications involving dry natural gas or other non-reactive gases	1.0
Fluids such as solvating/permeating chemicals in pipe or soil (typically hydrocarbons) in 2% or greater concentration, natural or other fuel-gas liquids condensates, crude oil, fuel oil, gasoline, diesel, kerosene, hydrocarbon fuels, wet gas gathering, multiphase oilfield fluids, LVP liquid hydrocarbons, oilfield water containing >2% hydrocarbons.	0.5

* Certain codes and standards include prohibitions and/or strength reduction factors relating to the presence of certain constituents in the fluid being transported. In a code controlled application the designer must ensure compliance with all code requirements.

The De-ratings explained and listed above for Hydrocarbons and Temperature are drawn from the Plastic Pipe Institute handbook: chapters 3 and 6.