

pipeline will maintain its structural integrity.

(b) Components of carbon dioxide pipelines that are subject to low temperatures during normal operation because of rapid pressure reduction or during the initial fill of the line must be made of materials that are suitable for those low temperatures.

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§ 195.104 Variations in pressure.

If, within a pipeline system, two or more components are to be connected at a place where one will operate at a higher pressure than another, the system must be designed so that any component operating at the lower pressure will not be overstressed.

§ 195.106 Internal design pressure.

(a) Internal design pressure for the pipe in a pipeline is determined in accordance with the following formula:

$$P=(2 St/D) \times E \times F$$

P=Internal design pressure in p.s.i. (kPa) gage.

S=Yield strength in pounds per square inch (kPa) determined in accordance with paragraph (b) of this section.

t=Nominal wall thickness of the pipe in inches (millimeters). If this is unknown, it is determined in accordance with paragraph (c) of this section.

D=Nominal outside diameter of the pipe in inches (millimeters).

E=Seam joint factor determined in accordance with paragraph (e) of this section.

F=A design factor of 0.72, except that a design factor of 0.60 is used for pipe, including risers, on a platform located offshore or on a platform in inland navigable waters, and 0.54 is used for pipe that has been subjected to cold expansion to meet the specified minimum yield strength and is subsequently heated, other than by welding, or stress relieving as a part of welding, to a temperature higher than 900 °F (482 °C) for any period of time or over 600 °F (316 °C) for more than 1 hour.

(b) The yield strength to be used in determining the internal design pressure under paragraph (a) of this section is the specified minimum yield

strength. If the specified minimum yield strength is not known, the yield strength to be used in the design formula is one of the following:

(1)(i) The yield strength determined by performing all of the tensile tests of API Specification 5L on randomly selected specimens with the following number of tests:

Pipe size	No. of tests
Less than 6¾ in (168 mm) nominal outside diameter.	One test for each 200 lengths.
6¾ in through 12¾ in (168 mm through 324 mm) nominal outside diameter.	One test for each 100 lengths.
Larger than 12¾ in (324 mm) nominal outside diameter.	One test for each 50 lengths.

(ii) If the average yield-tensile ratio exceeds 0.85, the yield strength shall be taken as 24,000 p.s.i. (165,474 kPa). If the average yield-tensile ratio is 0.85 or less, the yield strength of the pipe is taken as the lower of the following:

(A) Eighty percent of the average yield strength determined by the tensile tests.

(B) The lowest yield strength determined by the tensile tests.

(2) If the pipe is not tensile tested as provided in paragraph (b) of this section, the yield strength shall be taken as 24,000 p.s.i. (165,474 kPa).

(c) If the nominal wall thickness to be used in determining internal design pressure under paragraph (a) of this section is not known, it is determined by measuring the thickness of each piece of pipe at quarter points on one end. However, if the pipe is of uniform grade, size, and thickness, only 10 individual lengths or 5 percent of all lengths, whichever is greater, need be measured. The thickness of the lengths that are not measured must be verified by applying a gage set to the minimum thickness found by the measurement. The nominal wall thickness to be used is the next wall thickness found in commercial specifications that is below the average of all the measurements taken. However, the nominal wall thickness may not be more than 1.14 times the smallest measurement