given in Table 502.3.1-1. It is not necessary to consider wind and earthquake as occurring concurrently.

(b) Test. Stresses due to test conditions are not subject to the limitations of para. 502.3 of this Code. It is not necessary to consider other occasional loads, such as wind and earthquake, as occurring concurrently with the live, dead, and test loads existing at the time of test.

502.4 Allowances

502.4.1 Corrosion and Erosion. When corrosion or erosion is expected, an increase in wall thickness of the components over that dictated by other design requirements shall be provided, consistent with the expected life of the particular piping involved.

502.4.2 Threading and Grooving. See definition for c in para. 504.1.1(b).

502.4.3 Mechanical Strength. When necessary to prevent damage, collapse, or buckling due to superimposed loads from supports, backfill, or other causes, the pipe wall thickness shall be increased, or, if this is impractical or would cause excessive local stresses, the factors that would contribute to damage of the piping shall be compensated for by other design methods.

Section 502 pertains to ratings, stress values, stress criteria, design allowances, and minimum design values, and formulates the permissible variations to these factors used in the design of piping.

PART 2
DESIGN OF PIPING COMPONENTS

503 CRITERIA FOR DESIGN OF PIPING COMPONENTS

The design of piping components, considering the effects of pressure, and providing for mechanical, corrosion, and erosion allowances, shall be in accordance with section 504. In addition, the designs must be checked for adequacy of mechanical strength under other applicable loadings as given in section 501.

504 PRESSURE DESIGN OF PIPING COMPONENTS

504.1 Straight Pipe

504.1.1 General

(a) The required wall thickness of straight sections of pipe shall be determined in accordance with eq. (2). (Also, see section 503.)

\[ t_m = t + c \]  

(b) The notations described below are used in the equations for the pressure design of straight pipe.

\[ c = \text{for internal pressure, the sum, in. (mm), of the mechanical allowances (thread depth, groove depth, and manufacturer's minus tolerance) plus corrosion and erosion allowances (see para. 502.4.1). For threaded components, the nominal thread depth (dimension h of ASME B1.20.1, or equivalent) shall apply. For machined surfaces or grooves, where the tolerance is not specified, the tolerance shall be assumed to be } \frac{1}{64} \text{ in. (0.5 mm) in addition to the specified depth of the cut.} \]

\[ d = \text{inside diameter of pipe, in. (mm), excluding metal required for corrosion or erosion allowance, manufacturer's minus tolerance, and any allowance required for the depth of internal threads or grooves} \]

\[ D_o = \text{outside diameter of pipe, in. (mm)} \]

\[ P = \text{internal design pressure (see para. 501.2.2), psi (kPa), or external design pressure (see para. 501.2.3), psi (kPa)} \]

\[ S = \text{applicable allowable hoop stress in accordance with para. 502.3.1 and Table 502.3.1-1, psi (kPa)} \]

\[ t = \text{pressure design wall thickness, in. (mm), as calculated from eqs. (3a) and (3b) for internal pressure, or in accordance with the procedures given in para. 504.1.3 for external pressure} \]

\[ t_m = \text{minimum required wall thickness, in. (mm), satisfying requirements for design pressure and mechanical, corrosion, and erosion allowances} \]

\[ y = \text{coefficient for materials indicated: for ductile nonferrous materials, use } y = 0.4 \text{ (see Note); for ferritic steels, use } y = 0.4 \text{ (see Note); for austenitic steels, use } y = 0.4 \text{ (see Note). For cast iron, use } y = 0.0 \text{.} \]

NOTE: If \( D_o/t \) is in the range of 4–6, use \( y = d/(d + D_o) \) for ductile materials.

504.1.2 Straight Pipe Under Internal Pressure. For metallic pipe with diameter-thickness ratios \( D_o/t > 4 \), the internal pressure design wall thickness, \( t \), shall be calculated using eq. (3a) or (3b).

\[ t = \frac{PD_o}{2(S + yP)} \]  \( \text{(3a)} \)

\[ t = \frac{Pd}{2(S + yP) - P} \]  \( \text{(3b)} \)

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