The *FASTEST* Solutions for Piping Design and Analysis.

Readme Supplement

CAEPIPE

Version 6.70

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Annexure A

Operating Stress for NDE

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The stress (Sopr) due to operating loads (pressure, weight and thermal load T_1) is calculated as

$$S_{opr} = S_a + \sqrt{(S_b)^2 + (2S_t)^2} \leq S_{all}$$

where

$$S_a = \left[\frac{PD}{4t} + \frac{F}{A} \right]_{Operating1}$$

$$S_b = \left[\frac{\sqrt{(i_i M_i)^2 + (i_o M_o)^2}}{Z} \right]_{Operating1}$$

$$S_t = \left[\frac{M_t}{2Z} \right]_{Operating1}$$

P = maximum of CAEPIPE input pressures P1, P2 and P3

D = outside diameter

t = nominal wall thickness

$A =$ un-corroded cross-sectional area of the pipe

$F =$ longitudinal force

$i_i =$ in-plane stress intensification factor according to analysis code selected in CAEPIPE

$i_o =$ out-of-plane stress intensification factor according to analysis code selected in CAEPIPE

Note: If the analysis code selected provides only the stress intensification I, then i_i = i_o = i.

$M_i =$ in-plane bending moment

$M_o =$ out-of-plane bending moment

$M_t =$ torsional bending moment

Z = un-corroded section modulus; for reduced outlets / branch connections, effective section modulus

$S_{all} = f(1.25 S_{cold} + 0.25 S_{hot})$

$f =$ stress range reduction factor = $6/N^{0.2}$

N = Number of equivalent full-range thermal cycles

S_{cold} = basic allowable stress at T_{ref}

S_{hot} = basic allowable stress at CAEPIPE input temperature T_1