

THE ORIGINAL DOCUMENT:

Y-5410 ANALYSIS OF ATTACHMENT WELDED TO PIPE WITH A FULL PENETRATION WELD

(a) Calculate the stresses: S_{MT} , S_{NT} , S_{PT} , and S_{NT}^{**}

$$S_{MT} = \frac{B_W W}{A_T} + \frac{B_N M_N}{Z_T} + \frac{B_I M_I}{Z_T} + \frac{2Q_1}{A_T} + \frac{2Q_2}{A_T} + \frac{B_T M_T}{J} \quad (1)$$

$$S_{NT} = \frac{C_W W}{A_T} + \frac{C_N M_N}{Z_T} + \frac{C_I M_I}{Z_T} + \frac{2Q_1}{A_T} + \frac{2Q_2}{A_T} + \frac{C_T M_T}{J} \quad (2)$$

$$S_{PT} = K_T(S_{NT}) \quad (3)$$

$$S_{NT}^{**} = \frac{C_W W^{**}}{A_T} + \frac{C_N M_N^{**}}{Z_T} + \frac{C_I M_I^{**}}{Z_T} + \frac{2Q_1^{**}}{A_T} + \frac{2Q_2^{**}}{A_T} + \frac{C_T M_T^{**}}{J} \quad (4)$$

(b) The following modified Code equations shall be satisfied, where all terms except attachment stresses are defined in NC-3652.

(1) NC-3652 eq. (8) becomes

$$S_{SL} = B \left(\frac{PD_o}{2t_n} \right) + B_2 \frac{M_A}{Z} + S_{MT} \leq 1.5S_h \quad (NC-8)$$

where $B_1 = 0.5$ and $B_2 = 1.0$ for straight pipe.

Hoop pressure stress

(2) NC-3653.1 eq. (9) becomes

$$S_{CL} = B_1 \left(\frac{P_{\max} D_o}{2t_n} \right) + B_2 \frac{M_A + M_E}{Z} + S_{MT} \leq 1.8S_h \text{ but not greater than } 1.5S_y \text{ for Level A and B loadings} \leq 2.25S_h \text{ but not greater than } 1.8S_y \text{ for Level C loadings} \leq 3.0S_h \text{ but not greater than } 2.0S_y \text{ for Level D loadings} \quad (NC-9)$$

(3) NC-3653.2 eq. (10) becomes

$$S_E = \frac{iM_C}{Z} + \frac{S_{PT}}{2} \leq S_A \quad (NC-10)$$

(4) NC-3653.2 eq. (10a) becomes

$$\frac{iM_D}{Z} + \frac{S_{PT}}{2} \leq 3.0S_c \quad (NC-10a)$$

(5) NC-3653.2 eq. (11) becomes

$$S_{TE} = \frac{PD_o}{4t_n} + 0.75i \left(\frac{M_A}{Z} \right) + i \left(\frac{M_C}{Z} \right) + S_{MT} + \frac{S_{PT}}{2} \leq (S_h + S_A) \quad (NC-11)$$

In eq. (NC-11), S_{MT} is the same as used in eq. (NC-8), and S_{PT} is the same as used in eq. (NC-10).

(c) In addition to the Code equations, the following equations shall also be satisfied.

$$S_{NT}^{**} \leq 2S_y \quad (5)$$

$$\frac{2Q_1^{**}}{A_T} + \frac{2Q_2^{**}}{A_T} + \frac{M_T^{**}}{J} \leq S_y \quad (6)$$

11.3.7 Stress analysis of the run pipe

The following modified equations of clause 12 shall be satisfied.

a) For sustained loads

$$\sigma_{SL} = \frac{p D_o}{4e_{ord}} + \frac{0,75i M_A}{Z} + \sigma_{MT} \leq 1,5f, \text{ and } 0,75i \geq 1,0 \quad (11.3.7-1)$$

b) For sustained and occasional loads

$$\sigma_{SL} = \frac{p D_o}{4e_{ord}} + \frac{0,75i (M_A + M_B)}{Z} + \sigma_{MT} \leq 1,8f, \text{ and } 0,75i \geq 1,0 \quad (11.3.7-2)$$

EN 13480-3:2002 (E)
Issue 1 (2002-05)

long. pressure stress,
should be the hoop stress
in acc. with original
document.

c) For exceptional loads

$$\sigma_{SL} = \frac{p D_o}{4e_{ord}} + \frac{0,75i (M_A + M_B)}{Z} + \sigma_{MT} \leq 2,7f, \text{ and } 0,75i \geq 1,0 \quad (11.3.7-3)$$

d) For loads caused by restrained thermal expansion

$$\sigma_E = \frac{i M_C}{Z} + \frac{\sigma_{PT}}{2} \leq f_A \quad (11.3.7-4)$$

e) For combined dead weight, sustained and restrained thermal expansion loads

$$\sigma_{TE} = \frac{p D_o}{4e_{ord}} + 0,75i \frac{M_A}{Z} + i \frac{M_C}{Z} + \sigma_{MT} + \frac{\sigma_{PT}}{2} \leq f + f_A, \text{ and } 0,75i \geq 1,0 \quad (11.3.7-5)$$

In addition to the modified equations above, the following equations shall be also satisfied :

$$\sigma_{NT}^{**} \leq 2,0R_{eH}, \text{ at temperature} \quad (11.3.7-6)$$

f) With hollow round cross section

$$\frac{Q_1^{**}}{2L_1L_a} + \frac{Q_2^{**}}{2L_2L_b} + \frac{M_T^{**}}{J} \leq R_{eH}, \text{ at temperature} \quad (11.3.7-7)$$

g) With rectangular cross section

$$\frac{Q_1^{**} + Q_2^{**}}{A_{\Pi}} + M_{TT}^{**} \leq R_{eH}, \text{ at temperature} \quad (11.3.7-8)$$

Should be Am in
EN 13480.