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STEEL REAR PLATE

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Publication Date
1979
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The material selected is AISI C1008 plate. It is selected for its magnetic property. The C1008 material is non ASME code approved, but the code does not include 15 psig vessels. The code safety factor of four is followed in calculating the plate thickness. The tensile strength of the C1008 is tested by Anamet Laboratory, Inc in Berkeley, California.

TENSILE STRENGTH OF C1008

LONGITUDINAL DIRECTION = 45,300 psi
TRANSVERSE DIRECTION = 45,600 psi

The allowable stress, $S_a$, is

$$S_a = \frac{45,300}{4} = 11,325 \text{ psi}$$

The flat plate equation from UG-39 (c) 2 on p. 37 (also on p. 16 of M5207) is

$$t = d \sqrt{2 \left( \frac{C P}{S_a E} + \frac{1.9 W_{h_g}}{S_a E} \right)}$$

$d = 90.6 \text{ in}$
$C = 0.3$
$P = 15 \text{ psi}$
$E = 1$
$W_{h_g} = 221,184 \text{ in-lb}$

From p. 15 of M5207
The minimum thickness is

\[ t_{\text{min}} = 90.6 \sqrt{2 \left[ \frac{(0.3)(15)}{(11,325)(1)} + \frac{(1.9)(221,164)}{(11,325)(1)(90.6)} \right]} \]

= 2.710 in

The plate thickness will be 2.875 in. Plugging the thickness back into the equation and calculate \( S_A \)

\[ S_A = 2 \left( \frac{90.6}{2.875} \right)^2 \left[ 0.3(15) + \frac{(1.9)(221,164)}{(90.6)^3} \right] = 10,060 \text{ psi} \]

\[ 4S_A = 4(10,060) = 40,240 \text{ psi} \]

This means the 2.875 in C1008 plate can have a 5,000 psi variation in the minimum tensile strength.
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