§ 154.448

have allowable stresses determined by the following formulae:

\[ \sigma_m \leq f \]
\[ \sigma_L \leq 1.5 f \]
\[ \sigma_b \leq 1.5 F \]
\[ \sigma_m + \sigma_L \leq 1.5 F \]
\[ \sigma_m + \sigma_b \leq 1.5 F \]

where:

\( \sigma_m \) = equivalent primary general membrane stress
\( \sigma_L \) = equivalent primary local membrane stress
\( \sigma_b \) = equivalent primary bending stress
\( f \) = the lesser of \( \sigma_B/A \) or \( \sigma_Y/B \)
\( F \) = the lesser of \( \sigma_B/C \) or \( \sigma_Y/D \)
\( A, B, C, \) and \( D \) = stress factors in Table 2.

<table>
<thead>
<tr>
<th>Stress factors:</th>
<th>Nickel steel and carbon manganese steel values</th>
<th>Austenitic steel values</th>
<th>Aluminum alloy values</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>B</td>
<td>2.0</td>
<td>1.6</td>
<td>1.5</td>
</tr>
<tr>
<td>C</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>D</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

(b) An independent tank type B designed from plane surfaces must have allowable stresses specially approved by the Commandant (CG–522).


§ 154.449 Model test.

The following analyzed data of a model test of structural elements for independent tank type B must be submitted to the Commandant (CG–522) for special approval:

(a) Stress concentration factors.

(b) Fatigue life.


§ 154.450 General.

Independent tanks type C and process pressure vessels must be designed to meet the requirements under Part 54 of this chapter, except §54.01–40(b), and:

(a) The calculation under §54.01–18(b)(1) must also include the design loads determined under §154.406;

(b) The calculated tank plating thickness, including any corrosion allowance, must be the minimum thickness without a negative plate tolerance; and

(c) The minimum tank plating thickness must not be less than:

(1) 5mm (3⁄16 in.) for carbon-manganese steel and nickel steel;

(e) A finite element analysis using the loads determined under §154.406.

(f) A fracture mechanics analysis using the loads determined under §154.406.

(g) The cumulative effects of the fatigue load from the following formula:

\[ \sum \frac{n_i}{N_i} + 10^3 \leq C_w \]

where:

\( n_i \) = the number of stress cycles at each stress level during the life of the vessel;

\( N_i \) = the number of cycles to failure for corresponding stress levels from the Wohler (S-N) curve;

\( N_j \) = the number of cycles to failure from the fatigue load by loading and unloading the tank; and

\( C_w \) = 0.5 or less. A \( C_w \) of greater than 0.5 but not exceeding 1.0 may be specially approved by the Commandant (G-MTH).