have allowable stresses[3] determined by the following formulae:

$\sigma_m \leq f$

$\sigma_L \leq 1.5\ f$

$\sigma_b \leq 1.5\ F$

$\sigma_L + \sigma_b \leq 1.5\ F$

$\sigma_m + \sigma_b \leq 1.5\ F$

where:

σ_m=equivalent primary general membrane stress[4]

σ_L=equivalent primary local membrane stress[4]

σ_b=equivalent primary bending stress[4]

f=the lesser of (σ_B/A) or (σ_Y/B)

F=the lesser of (σ_B/C) or (σ_Y/D)

A, B, C, and D=stress factors in Table 2.

TABLE 2—VALUES FOR STRESS FACTORS

	Nickel steel and carbon manganese steel values	Austenitic steel values	Aluminum alloy values
Stress factors:			
A	4.0	4.0	4.0
B	2.0	1.6	1.5
C	3.0	3.0	3.0
D	1.5	1.5	1.5

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

[CGD 74–289, 44 FR 26009, May 3, 1979, as amended by CGD 82–063b, 48 FR 4782, Feb. 3, 1983]

§ 154.448 Calculations.

The following calculations for an independent tank type B must be specially approved by the Commandant (CG–522):

(a) Plastic deformation, fatigue life, buckling, and crack propagation resulting from static and dynamic loads on the tank and its support.

(b) A three-dimensional analysis of the stress exerted by the hull on the tank, its support, and its keys.

(c) The response of the tank and its support to the vessel's motion and acceleration in irregular waves or calculations from a similar vessel.

(d) A tank buckling analysis considering the maximum construction tolerance.

(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:

$$\sum \frac{n_1}{N_1} + \frac{10^3}{N_j} \leq C_w$$

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).

[CGD 74–289, 44 FR 26009, May 3, 1979, as amended by CGD 82–063b, 48 FR 4782, Feb. 3, 1983]

§ 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.

[CGD 74–289, 44 FR 26009, May 3, 1979, as amended by CGD 82–063b, 48 FR 4782, Feb. 3, 1983]

INDEPENDENT TANK TYPE C AND PROCESS PRESSURE VESSELS

§ 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;

[3] See Appendix B for stress analyses definitions.

[4] See Appendix A for equivalent stress.