

4.1.6 Design Allowable Stress

4.1.6.1 Design Condition – The allowable stresses for all permissible materials of construction are provided in Annex 3.A. The wall thickness of a vessel computed by the rules of Part 4 for any combination of loads (see paragraph 4.1.5) that induce primary stress (see paragraph 5.12.17) and are expected to occur simultaneously during operation shall satisfy the equations shown below.

$$P_m \leq S \quad (4.1.1)$$

$$P_m + P_b \leq 1.5S \quad (4.1.2)$$

4.1.6.2 Test Condition – The allowable stress for the test condition shall be established by the following requirements. Controls shall be provided to ensure that the Test Pressure is limited such that these allowable stresses are not exceeded. When applicable, the static head and any additional pressure loadings shall be included.

a) Hydrostatically Tested Vessels – when a hydrostatic test is performed in accordance with Part 8, the hydrostatic test pressure of a completed vessel shall not exceed that value which results in the following equivalent stress limits:

1) A calculated P_m shall not exceed the applicable limit given below:

$$P_m \leq 0.95S_y \quad (4.1.3)$$

2) A calculated $P_m + P_b$ shall not exceed the applicable limits given below:

$$P_m + P_b \leq 1.43S_y \quad \text{for } P_m \leq 0.67S_y \quad (4.1.4)$$

$$P_m + P_b \leq (2.43S_y - 1.5P_m) \quad \text{for } 0.67S_y < P_m \leq 0.95S_y \quad (4.1.5)$$

b) Pneumatically Tested Vessels – when a pneumatic test is performed in accordance with Part 8, the pneumatic test pressure of a completed vessel shall not exceed that value which results in the following equivalent stress limits:

1) A calculated P_m shall not exceed the applicable limit given below:

$$P_m \leq 0.80S_y \quad (4.1.6)$$