ARTICLE TT-2
REQUIREMENTS FOR PRESSURE TESTING

TT-200 GENERAL
(a) A pressure test shall be conducted on all completed
(1) All fabrication is complete except for cosmetic
sections. This inspection shall be made at a pressure not
(2) All examinations have been performed, except
less than 1.3 times the difference between
those required after the test
the normal atmospheric pressure and the minimum design
(b) The completed vessel shall have successfully passed
internal pressure for the vessel.
the pressure tests prescribed in this Article.

TT-210 TEST REQUIREMENTS
(a) Hydrostatic Test Requirements
(1) Vessels designed for internal pressure shall be
subjected to a hydrostatic test pressure at every point
in the tank at least equal to 1.3 times the maximum
allowable working pressure (MAWP) to be marked on the
vessel, multiplied by the lowest ratio (for the material of
which the vessel is constructed) of the stress value S
for the test temperature on the vessel to the stress value
S for the design temperature (see TD-210). The MAWP
may be assumed to be the same as the design pressure
when calculations are not made to determine the MAWP.
The above requirements shall apply when the vessel
specification provides no test pressure. All loadings that
may exist during this test shall be given consideration.

(b) Unless otherwise specified in the appropriate
Modular Appendix, there is no upper limit on the hydro-
static test pressure. However, if the hydrostatic test pres-
sure is allowed to exceed the value determined as
prescribed in (1) to the degree that the tank shows visible
permanent distortion, the inspector has the right to reject
the tank.

(3) It is recommended that the metal temperature
during hydrostatic test be maintained at at least
35°C (95°F) above the minimum design metal temperature
(see TD-140, General Note 1) to Figure TM-240.3-2, and
TM-240.4, to minimize the risk of brittle fracture, but
need not exceed 48°C (120°F).

(4) Single-wall vessels designed for a vacuum or par-
tial vacuum only, or chambers or multi-chamber vessels
designed for vacuum or partial vacuum only, shall be sub-
jected to internal hydrostatic test or, when a hydrostatic
(5) The metal temperature during the pneumatic
test shall be maintained at least
(6) The pneumatic test pressure of a completed ves-
sel, or a chamber in a multi-chamber vessel, shall not ex-
ceed that value which results in a membrane stress in the
vessel wall greater than 0.065% of the tabulated yield
strength in Section II, Part D, Subpart I, Table Ye.1.

(7) The metal temperature during the pneumatic
test shall be maintained at least
(8) The pneumatic test pressure of a completed ves-
sel, or a chamber in a multi-chamber vessel, shall not ex-
ceed that value which results in a membrane stress in the
vessel wall greater than 0.065% of the tabulated yield
strength in Section II, Part D, Subpart I, Table Ye.1.
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(6) The pressure in the vessel shall be gradually increased to not more than one-half of the test pressure. Thereafter, the test pressure shall be increased in steps of approximately one-tenth of the test pressure until the required test pressure has been reached. Then the pressure shall be reduced to the test pressure divided by 4 and held for a sufficient time to permit visual inspection of the vessel. The visual inspection may be waived, provided

- a suitable gas leak test is applied
- substitution of the above gas leak test is by agreement reached between the Manufacturer and Inspector
- all weld seams that will be hidden by assembly will be given a visual examination for workmanship prior to assembly
- the vessel will not contain a substance listed in TW-100.1(a)

(c) Any evidence of leakage through the base metal or weld joints is reason for rejection. When leakage is observed, the test should be terminated, the pressure released, and the tank repaired, reinspected and retested in accordance with the requirements of this Section.

TT-220 TEST MEDIA

(a) No flammable or combustible liquids shall be used. Only fluid that is liquid at the hydrostatic test temperature and pressure and is not corrosive to the tank parts shall be used for the test. Appropriate measures shall be taken to ensure condensation on exterior surfaces does not mask indications of leakage.

(b) Air or gas is hazardous when used as a testing medium. Special precautions should be taken when air or gas is used for test purposes.

TT-230 APPURTENANCES

(a) Vents shall be provided at all high points of the tank in the position at which it is to be tested to purge possible air pockets while the tank is filling for a hydrostatic test.

(b) Before applying pressure, the test equipment shall be examined to see that it is tight and that all low pressure filling lines and other appurtenances that should not be subjected to the test pressure have been disconnected.

(c) Vessels may be painted or otherwise coated either internally or externally, and may be lined internally prior to the pressure test.

TT-240 TEST GAGES

(a) An indicating gage shall be connected directly to the tank, if the indicating gage is not readily visible to the operator controlling the pressure applied, an additional indicating gage shall be provided where it will be visible to the operator throughout the duration of the test.

(b) Dial indicating pressure gages used in testing shall be graduated over a range of about double the intended test pressure, but in no case shall the range be less than 1½ nor more than four times that pressure. Digital reading pressure gages may be used with a wider range, provided the accuracy is equivalent to or better than the dial indicating gages.

(c) All gages shall be calibrated against a standard deadweight tester or a calibrated master gage. Gages shall be recalibrated at any time there is reason to believe that they are in error.
Proposed new TT-210(b)(3):

(3) Under the following conditions pressure vessels fabricated under the provisions of Section XII may be tested pneumatically in lieu of hydrostatic testing.

For non-jacketed tanks:

a) The test pressure shall not be less than 1.3 MAWP.

b) The MAWP shall be no greater than 3447 kPa (500 psi).

c) The following thickness limitations shall apply:
   (1) For butt joints, the nominal thickness at the thickest welded joint shall not exceed 38mm (1 ½”).

d) If used Pneumatic testing shall be noted on the Manufacture’s Data Report.

For jacketed tanks, one of the following 2 options may be followed:

1. Option 1
   a) The test pressure of the bare inner vessel shall not be less than 1.3 x (MAWP + liquid head + Vacuum Pressure), where Vacuum Pressure = 101.4 kPa (14.7 psi).
   b) When the tank is jacketed, assembled, and vacuum jacket is evacuated, the test pressure of the inner vessel shall not be less than 1.3 x (MAWP + liquid head + Vacuum Pressure) – Vacuum Pressure, where Vacuum pressure = 101.4 kPa (14.7 psi).
   c) The MAWP shall be no greater than 3447 kPa (500 psi).
d) The following thickness limitations shall apply:
   (1) For butt joints, the nominal thickness at the thickest welded joint shall not exceed 38mm (1 ½”).

e) If used Pneumatic testing shall be noted on the Manufacture’s Data Report.

2. Option 2
   a) The test pressure of the bare inner vessel shall not be less than the MAWP of the tank.
   b) When the tank is jacketed, fully assembled, and vacuum jacket is evacuated, the test pressure of the inner vessel shall not be less than 1.3 x (MAWP + liquid head + Vacuum Pressure) – Vacuum Pressure, where Vacuum Pressure = 101.4 kPa (14.7 psi) and the tank shall be pressurized with a 10% Helium and 90% Nitrogen mixture. While the inner tank is pressurized with the Helium/Nitrogen mix, tie into annular space with a helium mass spectrometer and check for leakage of helium into the annular space.
   c) The MAWP shall be no greater than 3447 kPa (500 psi).
   d) The following thickness limitations shall apply:
      (1) For butt joints, the nominal thickness at the thickest welded joint shall not exceed 38mm (1 ½”).
   e) If used Pneumatic testing shall be noted on the Manufacture’s Data Report.

**Caution:** For all pneumatic testing listed above, the vessel shall be tested in such a manner as to ensure personnel safety from a release of total stored energy of the vessel during testing. Safe distance calculations for bare tank pressure testing shall be calculated per ASME PCC-2 Article 501, Mandatory Appendix III.