

HOSE TESTING

SAFETY WARNING: *Testing can be dangerous and should be done only by trained personnel using proper tools and procedures. Failure to follow such procedures might result in damage to property and/or serious bodily injury.*

The Rubber Manufacturers Association (RMA) recognizes, accepts and recommends the testing methods of the American Society for Testing and Materials (ASTM).

Unless otherwise specified, all hose tests are to be conducted in accordance with ASTM Method No. D-380 (latest version). Where an ASTM D-380 test is not available, another test method should be selected and described in detail.

RMA participates with ASTM under the auspices of the American National Standards Institute (ANSI) in Technical Committee 45 (TC45) of The International Organization for Standardization (ISO) in developing both hose product and hose test method standards. Many of the hose test method standards published by ISO duplicate or closely parallel those shown in ASTM D-380. Many are unique and, in those cases, the RMA may be able to provide the necessary test standard references which may be purchased from the American National Standards Institute (ANSI).

HYDROSTATIC PRESSURE TESTS

Hydrostatic pressure tests are classified as follows:

1. DESTRUCTIVE TYPE
 - a. Burst test
 - b. Hold test
2. NON-DESTRUCTIVE TYPE
 - a. Proof pressure test
 - b. Change in length test (elongation or contraction)
 - c. Change in outside diameter or circumference test
 - d. Warp test
 - e. Rise test
 - f. Twist test
 - g. Kink test
 - h. Volumetric expansion test

Destructive Tests

Destructive tests are conducted on short specimens of hose, normally 18 inches (460 mm) to 36 inches (915 mm) in length and, as the name implies, the hose is destroyed in the performance of the test.

- a. Burst pressure is recorded as the pressure at which actual rupture of a hose occurs.
- b. A hold test, when required, is a means of determining whether weakness will develop under a given pressure for a specified period of time.

Non-Destructive Tests

Non-destructive tests are conducted on a full length of a hose or hose assembly. These tests are for the purpose of eliminating hose with defects which cannot be seen by visual examination or in order to determine certain characteristics of the hose while it is under internal pressure.

- a. A proof pressure test is normally applied to hose for a specified period of time. On new hose, the proof pressure is usually 50% of the minimum specified burst except for woven jacket fire hose where the proof pressure is twice the service test pressure marked on the hose (67% of specified minimum burst). Hydrostatic tests performed on fire hose in service should be no higher than the service test pressure referred to above. The regulation of these pressures is extremely important so that no deteriorating stresses will be applied, thus weakening a normal hose.

- b. With some type of hose, it is useful to know how a hose will act under pressure. All change in length tests, except when performed on wire braid or wire spiralled hose, are made with original length measurements taken under a pressure of 10 psi (0.069 MPa). The specified pressure, which is normally the proof pressure, is applied and immediate measurement of the characteristics desired are taken and recorded.

Percent length change (elongation or contraction) is the difference between the length at 10 psi (0.069 MPa) (except wire braided or wire spiralled) and that at the proof pressure times 100 divided by the length at 10 psi (0.069 MPa).

Elongation occurs if the length of the hose under the proof pressure is greater than at a pressure of 10 psi (0.069 MPa). Contraction occurs if the length at the proof pressure is less than at 10 psi (0.069 MPa). In testing wire braided or spiralled hose, the proof pressure is applied and the length recorded. The pressure is then released and, at the end of 30 seconds, the length is measured; the measurement obtained is termed the "original length."

- c. Percent change in outside diameter or circumference is the difference between the outside diameter or circumference at 10 psi (0.069 MPa) and that obtained under the proof pressure times 100 divided by the outside diameter or circumference at 10 psi (0.069 MPa). Expansion occurs if the measurement at the proof pressure is greater than at 10 psi (0.069 MPa). Contraction occurs if the measurement at the proof pressure is less than at 10 psi (0.069 MPa).
- d. Warp is the deviation from a straight line drawn from fitting to fitting; the maximum deviation from this line is warp. First, a measurement is taken at 10 psi (0.069 MPa) and then again at the proof pressure. The difference between the two, in inches, is the warp. Normally, this is a feature measured on woven jacket fire hose only.
- e. Rise is a measure of the height a hose rises from the surface of the test table while under pressure. The difference between the rise at 10 psi (0.069 MPa) and at the proof pressure is reported to the nearest 0.25 inch (6.4 mm). Normally, this is a feature measured on woven jacket fire hose only.
- f. Twist is a rotation of the free end of the hose while under pressure. A first reading is taken at 10 psi (0.069 MPa) and a second reading at proof pressure. The difference, in degrees, between the 10 psi (0.069 MPa) base and that at the proof pressure is the twist. Twist is reported as right twist (to tighten couplings) or left twist. Standing at the pressure inlet and looking toward the free end of a hose, a clockwise turning is right twist and counterclockwise is left twist.
- g. Kink test is a measure of the ability of woven jacket hose to withstand a momentary pressure while the hose is bent back sharply on itself at a point approximately 18 inches (457 mm) from one end. Test is made at pressures ranging from 62% of the proof pressure on sizes 3 inches (76 mm) and 3.5 inches (89 mm) to 87% on sizes under 3 inches (76 mm). This is a test applied to woven jacket fire hose only.
- h. Volumetric expansion test is applicable only to specific types of hose, such as hydraulic or power steering hose, and is a measure of its volumetric expansion under ranges of internal pressure.