How Full is Your Tank- Fall 2017

Valves used at working temps bellow -55; Requirements for Expansion Bellows

1. Discuss testing requirements for valves intended to be used at a working temperature below –55C.

2. Discuss testing requirements for expansion bellows.

The answer will vary based on Flag Administration (e.g. US Flagged and Non-US Flagged entering US Ports) and Service (e.g. liquefied Gas Carrier & LNG fueled vessel)

Liquefied Gas Carrier

I. Valves

A. US Flagged Subchapter O liquefied gas carrier:

46 CFR 154.620 Design temperature below -55 ≥C (-67 ≥F) and down to -165 ≥C (-265 ≥F). Plates, forgings and forged or rolled fittings, and rolled, forged or extruded bars and shapes for cargo tanks, secondary barriers, and process pressure vessels for a design temperature below -55 °C (-67 °F) and down to -165 °C (-265 °F) must:

(a) Meet § 54.25–10(b)(2), § 54.25–15, or § 54.25–20 of this chapter; or

(b) Be of an aluminum alloy that is specially approved by the Commandant (CG–ENG).

46 CFR 154. 625: Pipes, tubes, forgings, castings, bolting, and nuts for cargo and process piping for a design temperature below 0 °C (32 °F) and down to -165 °C (-265 °F) must meet § 56.50–105 of this chapter.

B. Non-US Flagged entering US Ports:

Foreign Gas Carrier Examiner (FGCE) Tactics, Techniques, and Procedures (CGTTP 3-72.6, April 2016): As outlined in reference (y), CG-CVC-2 Port State Control Information for October 015, there is no requirement for annual pressure testing of cargo lines on liquefied gas carriers. The requirement for testing of cargo lines found in reference (z), Definitions, 33 C.F.R. § 156.105, applies to oil and hazardous materials. However, the definition of hazardous materials in reference (aa), 33 C.F.R. § 154.105 specifically excludes liquefied gases.
A Non-US Flagged liquefied gas carrier with IGC Code COF

IGC Code Chpt. 5.13.1.1 - Valves

Each type of valve intended to be used at a working temperature below –55°C shall be subjected to the following type tests.

· Each size and type of valve shall be subjected to seat tightness testing over the full range of operating pressures for bi-directional flow and temperatures, at intervals, up to the rated design pressure of the valve. Allowable leakage rates shall be to the requirements of the Administration or recognized organization acting on its behalf. During the testing, satisfactory operation of the valve shall be verified;

· The flow or capacity shall be certified to a recognized standard for each size and type of valve;

· Pressurized components shall be pressure tested to at least 1.5 times the rated pressure; and

· For emergency shutdown valves, with materials having melting temperatures lower than 925°C, the type testing shall include a fire test to a standard acceptable to the Administration.

*** Refer to SIGTTO Publication on "The Selection and Testing of Valves for LNG Applications". ***

II. Bellows

A. US Flagged Subchapter O liquefied gas carrier:

46 CFR 154.506 Mechanical expansions joint:

Limits in a piping system. Mechanical expansion joints in a piping system outside of a cargo tank:

(a) May be installed only if offsets, loops or bends cannot be installed due to limited space or piping arrangement;

(b) Must be a bellows type; and

(c) Must not have insulation or a cover unless necessary to prevent damage.

B. Non-US Flagged entering US Ports

Foreign Gas Carrier Examiner (FGCE) Tactics, Techniques, and Procedures (CGTTP 3-72.6, April 2016): As outlined in reference (y), CG-CVC-2 Port State Control Information for October 015, there is no requirement for annual pressure testing of cargo lines on liquefied gas carriers. The requirement for testing of cargo lines found in reference (z), Definitions, 33 C.F.R. § 156.105, applies to oil and hazardous materials. However, the definition of hazardous materials in reference (aa), 33 C.F.R. § 154.105 specifically excludes liquefied gases.

C. A Non-US Flagged liquefied gas carrier with IGC Code COF

IGC Code Chapter. 5.13.1.2 - Expansion bellows

The following type tests shall be performed on each type of expansion bellows intended for use on cargo piping outside the cargo tank and, where required by the Administration or recognized organization acting on its behalf, on those installed within the cargo tanks:

· Elements of the bellows, not pre-compressed, shall be pressure tested at not less than five times the design pressure without bursting. The duration of the test shall not be less than 5 min.

· A pressure test shall be performed on a type expansion joint, complete with all the accessories such as flanges, stays and articulations, at the minimum design temperature and twice the design pressure at the extreme displacement conditions recommended by the manufacturer without permanent deformation.

· A cyclic test (thermal movements) shall be performed on a complete expansion joint, which shall withstand at least as many cycles under the conditions of pressure, temperature, axial movement, rotational movement and transverse movement as it will encounter in actual service. Testing at ambient temperature is permitted when this testing is at least as severe as testing at the service temperature; and

· A cyclic fatigue test (ship deformation) shall be performed on a complete expansion joint, without internal pressure, by simulating the bellows movement corresponding to a compensated pipe length, for at least 2,000,000 cycles at a frequency not higher than 5 Hz. This test is only required when, due to the piping arrangement, ship deformation loads are actually experienced.

LNG fueled vessel

I. For Gas Fueled vessels (Both valves and bellows)

As per Enclosure (1) to CG-ENG Policy Letter 01-12, CH-1; ASME B31.3 is considered the standard acceptable to the Administration for piping systems and components described throughout Chapter 7 of the IGF Code.