



# Standard Practice for Liquefied Natural Gas (LNG) Bunkering Hose Transfer Assembly<sup>1</sup>

This standard is issued under the fixed designation F3312/F3312M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

## 1. Scope

1.1 This practice covers the minimum requirements for the design, manufacturing, and deployment of bunker hose transfer assemblies for cryogenic service pertaining to bunkering of liquefied natural gas (LNG)-fueled vessels. The bunker hose transfer assemblies addressed by this practice are for connections between the LNG-fueled vessel bunker manifold presentation flange connections and the LNG supplier bunkering manifold presentation flange connections.

1.2 Transfer assemblies are suitable for use in multiple maritime bunkering applications, including but not limited to facilities, vessels, trucks, and other LNG bunkering supply services. This practice will directly address the hose assembly, dry quick disconnect couplings (DQD), breakaway couplings, gaskets, insulating flange, strainers, and associated fittings.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.11 on Machinery and Piping Systems.

Current edition approved Dec. 1, 2023. Published December 2023. Originally approved in 2018. Last previous edition approved in 2018 as F3312/F3312M – 18. DOI: 10.1520/F3312\_F3312M-23.

## 2. Referenced Documents

### 2.1 ASME Standards:<sup>2</sup>

ASME B16.5 Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard

ASME B16.20 Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral-Wound, and Jacketed

ASME B36.19M Stainless Steel Pipe

ASME B31.3 Process Piping

### 2.2 ASTM Standards:<sup>3</sup>

ASTM D566L Metals and Alloys in the Unified Numbering System (UNS): 13th Edition

### 2.3 EN Standards:<sup>4</sup>

EN 1474-1 Installation and Equipment for Liquefied Natural Gas. Design and Testing of Marine Transfer Systems. Design and Testing of Transfer Arms

EN 1474-2 Installation and Equipment for Liquefied Natural Gas. Design and Testing of Marine Transfer Systems. Design and Testing of Transfer Hoses

EN 1474-3 Installation and Equipment for Liquefied Natural Gas. Design and Testing of Marine Transfer Systems. Offshore Transfer Systems

EN 13766 Thermoplastic Multi-Layer (Non-Vulcanized) Hoses and Hose Assemblies for the Transfer of Liquefied Petroleum Gas and Liquid Nitrogen, Liquefied Natural Gas

### 2.4 IMO Regulations:<sup>5</sup>

IGF Code International Code of Safety for Ships using Gases or other Low-Flashpoint Fuels

IGC Code International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk

<sup>2</sup> Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>4</sup> Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, <http://www.cen.eu>.

<sup>5</sup> Available from International Maritime Organization (IMO), 4, Albert Embankment, London, SE1 7SR, United Kingdom, <http://www.imo.org>.

## 2.5 ISGOTT Publications:

ISGOTT 5th Edition International Safety Guide for Oil Tankers and Terminals

## 2.6 ISO Standards:<sup>6</sup>

ISO 527-1 Plastics — Determination of Tensile Properties — Part 1: General Principles

ISO 1402 Rubber and Plastics Hoses and Hose Assemblies — Hydrostatic Testing

ISO 1746 Rubber or Plastics Hoses and Tubing — Bending Tests

ISO 2768 General Tolerances

ISO 10380 Pipework — Corrugated Metal Hoses and Hose Assemblies

ISO 13934-1 Textiles — Tensile Properties of Fabrics — Part 1: Determination of Maximum Force and Elongation at Maximum Force Using the Strip Method

ISO 14726:2008 Ships and Marine Technology — Identification Colours for the Content of Piping Systems

ISO TS 18683 Guidelines for Safety and Risk Assessments of LNG Bunkering Operations

ISO 21593:2019 Ships and marine technology — Technical requirements for dry-disconnect/connect couplings for bunkering liquefied natural gas

ISO 21593:2018-12 Ship and Marine Technology — Technical Requirements for Liquid Natural Gas Bunkering Dry-Disconnect/Connect Coupling

## 2.7 MSS Standards:<sup>7</sup>

MSS SP-43-2003 Wrought and Fabricated Butt-Welding Fittings for Low Pressure, Corrosion Resistant Applications

## 2.8 USCG Policy:<sup>8</sup>

CG-521 Policy Letter No. 01-12, CH-1 Equivalency Determination – Design Criteria For Natural Gas Fuel Systems (Change-1)

CG-ENG Policy Letter No. 02-15 Design Standards for U.S. Barges Intending to Carry Liquefied Natural Gas in Bulk

CG-OES Policy Letter No. 01-15 Guidelines for Liquefied Natural Gas Fuel Transfer Operations and Training of Personnel on Vessels Using Natural Gas as Fuel

CG-OES Policy Letter No. 02-15 Guidance Related to Vessels and Waterfront Facilities Conducting Liquefied Natural Gas (LNG) Marine Fuel Transfer (Bunkering) Operations

## 3. Terminology

### 3.1 Definitions:

3.1.1 *breakaway coupling, n*—coupling which separates at a predetermined section when required and each separated section contains a self-closing shut-off valve which seals automatically.

3.1.2 *design pressure, n*—the pressure to which each piping component of a piping system is designed.

3.1.3 *design temperature, n*—the temperature at which each piping component is designed to operate.

3.1.4 *dry quick disconnect (DQD), n*—a device designed to make a quick, secure connection and disconnection between a hose and pipe, two pipes or between two hoses.

3.1.5 *flange, n*—a joint in a bolted connection.

3.1.6 *insulating flange, n*—a flanged joint incorporating an insulating gasket, sleeves, and washers to prevent electrical continuity between ship and shore.

3.1.7 *gasket, n*—a mechanical seal which fills the space between two or more mating surfaces, generally to prevent leakage from or into the joined objects while under compression.

3.1.8 *hose assembly, n*—components of the hose including inner liquid barriers, reinforcement, protective covers, and end configurations like flange or threads that have been assembled and tested to meet specification requirements.

3.1.9 *maximum allowable working pressure (MAWP), n*—the maximum pressure of a piping system determined, in general, by the weakest piping component in the system or by the relief valve setting.

3.1.9.1 *Discussion*—The MAWP is not to exceed the design pressure.

3.1.10 *polytetrafluoroethylene (PTFE) reinforced gasket material, n*—a flat gasket material made from PTFE with special fillers designed to increase the materials tensile properties and decrease the creep relaxation that can occur with virgin PTFE material in cryogenic applications.

3.1.11 *presentation flange, n*—the last permanent flange at the transfer manifold of both the bunker receiver and supplier.

3.1.12 *seal, n*—a mechanical device that helps join mechanisms together by preventing leakage, containing pressure, or preventing contamination.

3.1.12.1 *Discussion*—In most cases a seal is dependent on compression between a compressible material or device and solid mating surface.

3.1.13 *spiral wound gasket, n*—a gasket categorized as semi-metallic gasket consisting of sealing elements formed by winding two materials (one for sealing, one for resilience) into thin v-shaped spirals.

3.1.14 *transfer assembly, n—liquid or vapor transfer assembly*, components of the transfer system that include the hose assembly, dry quick disconnect couplings (DQD), breakaway couplings, insulating flange, and gaskets that connect the bunker supply of LNG to the bunker manifold of an LNG-fueled vessel.

<sup>6</sup> Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

<sup>7</sup> Available from Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), 127 Park St., NE, Vienna, VA 22180-4602, <http://www.mss-hq.org>.

<sup>8</sup> Available from United States Coast Guard (USCG), 2703 Martin Luther King Jr Ave SE, Washington, DC, 20593-700, <https://www.uscg.mil>.