

SCOPE

- I,R 1.1 This practice covers the specifications for hoses used at fixed marine berths (docks) or in ship-to-ship lightering operations within protected harbors and waters. It is not intended for offshore marine floating and submarine hoses, or hoses used for truck or rail loading.
- These specifications shall apply to rubber and composite types of hoses for use in one of the following services:
- Oil and Petroleum Products** at temperatures ranging from -20°F (-29°C) to 180°F (80°C) for rubber hoses and 140°F (60°C) for composite hoses.
 - Hot Asphalt and Sulfur** at temperatures ranging from -20°F (-29°C) to 350°F (175°C) for rubber hoses.
 - Non-Refrigerated LPG Liquid or Vapor** at temperatures ranging from -20°F (-29°C) to 115°F (45°C). (Refrigerated LPG should only be transferred via marine hard pipe loading arms and thus is not within the scope of this practice.)
 - Vapor Recovery** (excluding LPG Vapor) at temperatures ranging from -20°F (-29°C) to 140°F (60°C).
- I 1.2 An asterisk (*) indicates that a decision by the Purchaser is required, or that additional information must be furnished by the Purchaser.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I,R * 2.1 Hoses shall be constructed in accordance with this practice and the appropriate standards listed in **Table 1**. Where both the RMA and BSI standard are referenced, the manufacturer can select either one. The vendor shall also comply with any local rules or regulations specified by the Purchaser.

TABLE 1

STANDARDS			
ASME Code		ASTM Standards (Cont)	
IX	Boiler and Pressure Vessel Code: Qualification Standard for Welding and Brazing	A106	Seamless Carbon Steel Pipe for High-Temperature Service
ASME Standard		British Standards Institute (BSI) Standards	
B16.5	Pipe Flanges and Flanged Fittings	BS EN 1765	Rubber Hose Assemblies for Oil Suction and Discharge Services
API Standards		BS 4089	Hoses and Hose Assemblies for Liquefied Petroleum Gas
5L	Line Pipe	BS 5842	Thermoplastic Hose Assemblies for Dock, Road and Tanker Use
1104	Standard for Welding Pipelines and Related Facilities	BS 6130	Hose and Hose Assemblies for Asphalt and Bitumen
ASTM Standards		Rubber Manufacturer's Association (RMA) Standard	
A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless	IP-8	Rubber Hose for Oil Suction and Discharge
A105	Carbon Steel for Forgings, Seamless Carbon Steel		

DEFINITIONS

- I 3.1 **General:**
- Aromatic content** is based on the volume % toluene.
 - Bore** is the measurement of the inside nominal diameter of a hose and is used to define the hose size.
 - Burst pressure** is the pressure at which any part of the hose assembly fails, resulting in a leak, rupture, separation or distortion in any part of the hose assembly.
 - Minimum Bend Radius (MBR)** is a measure of the smallest radius around which a hose can be bent without mechanical damage or permanent deformation of the hose. The radius is measured to the innermost surface of the bent section of hose.
 - Minimum Bend Radius Ratio (MBR Ratio)** is the ratio of the hose bending radius (at maximum allowable bend) to the nominal hose diameter.
 - Rated working pressure (RWP)** is the maximum operating pressure at which a hose is designed to be in service.

- I 3.2 **Rubber Hose:**
- Rough bore rubber hose** refers to a rubber hose with an internal wire helix.
 - Softwall rubber hose** refers to a rubber hose that lacks any helix wire and which has a lightwall construction with a vacuum capacity less than 25 in. Hg (-85 kPa). Softwall hose shall not be used in ship-to-ship lightering. However, softwall hoses may be used for floating hoses for shore to ship transfers in protected harbors and waterways.
 - Smooth bore rubber hose** refers to a rubber hose without an internal wire helix.
 - Internal wire helix** refers to the reinforcement steel wire used to support the internal lining or tube of **rough bore** rubber hose, distinguishing it from the **smooth bore** type.

- I 3.3 **Composite Hose:**
- Composite hose** consists of a synthetic film and fabric carcass built up on a helix of wire, wrapped in a protective cover and secured by an outer helix of wire. **Composite hoses** are not suitable for use in the transfer of light or heavy crude [maximum fluid viscosity shall be less than 4000 cSt (400 mm²/s)] or in ship-to-ship lightering service.
 - Inner or outer wire helix** refer to the reinforcement steel wires used to secure the synthetic film and fabric carcass of composite hose.

PERFORMANCE REQUIREMENTS

- I,R * 4.1 The hose shall be designed for the operating temperature range specified in **Par. 1.1** and shall meet the minimum performance criteria specified below for both rubber and composite hoses unless otherwise specified by the Purchaser in the data sheet(s) attached to this practice:

SERVICE	RATED WORKING PRESSURE (RWP) psig (kPa)	RATED BURST PRESSURE
Oil & Petroleum Products	200 (1380)	4 x RWP
Hot Asphalt & Sulfur	200 (1380)	6 x RWP
LPG Liquid or Vapor (Non-Refrigerated)	300 (2070)	5 x RWP
Vapor Recovery (excl. LPG Vapor)	150 (1035)	4 x RWP

- The **burst pressure rating** shall be determined at 68°F ± 20°F (20°C ± 10°C).
- Rubber (except softwall) hose** shall be suitable for a minimum **vacuum rating** of at least 25 in. Hg (-85 kPa).
- Hose shall be capable of bending at the manufacturer's **rated minimum bend radius (MBR)** without kinking or permanent deformation. The **MBR to hose diameter ratio** shall not exceed:
 - 6:1 for **Rubber smooth bore and rough bore hoses**.
 - 4:1 for **Composite hoses**.
 - 6:1 for **Rubber softwall hoses** under an internal pressure of 50 psi (345 kPa).
- Rubber hose**, in general cargo transfer service, shall be suitable for a maximum **flow velocity** of 50 ft/sec (15 m/s). **Lightering service** shall require rubber hose to be suitable for a maximum **flow velocity** of 70 ft/sec (21 m/s).
- Composite hose** shall be suitable for use in petroleum product cargo transfer service, and shall be suitable for a maximum **flow velocity** of 23 ft/sec (7.0 m/s) and a maximum **fluid viscosity** of 400 cSt (400 mm²/s).

CONSTRUCTION REQUIREMENTS

- O,R 5.1 The hose actual **bore** dimensions shall not vary from the nominal bore by more than $\pm 2\%$. Maximum hose sizes for each of the various hose types are shown below:

HOSE	NOMINAL BORE	
Rubber:	in.	mm
Rough Bore	12	300
Softwall	4	100
Smooth Bore	12	300
Composite	10	250

- R 5.2 **Reinforcement wires** shall be single continuous lengths. Joining wires (welding or mechanical) is not permitted.

END FITTINGS

- O,R * 5.3 **Flange end fittings** shall be either:
- Steel pipe Built-in-Nipple (BIN)** with flanges, or
 - Swaged** fittings with flanges, except swage fittings for **smooth bore rubber** hoses shall not exceed 8 in. (200 mm) nominal bore diameter.
- R 5.4 **Flange end fittings** shall be Grade B, seamless, black finish, carbon steel conforming to ASTM A106, ASTM A53 or API 5L. **Nipples** shall be standard pipe weight for hose nominal bore. **Ferrules** shall have a minimum nominal thickness of 0.25 in. (6.4 mm). **Ferrules** used in swaged fittings for hoses to be used only for vapor service (excluding LPG vapor) shall have a minimum nominal thickness of 0.18 in. (4.7 mm).
- R 5.5 **Built-in-nipples (BIN)** on **rubber hose** shall be anchored to the hose body by at least two built-up bands welded to the nipple.
- O 5.6 The **exterior of the rubber hose** over the built-in nipples shall taper smoothly into the body of the hose. No outside bands or clips shall be fitted to the hose. The design of the hose body shall be such that threaded bolts appropriate to the flange can be easily inserted into the flange bolt holes.
- R 5.7 For composite hose, a **rubber or synthetic seal** shall be provided to prevent any fluid or vapor penetration in the area between the ferrule and hose body. An epoxy coating shall also be applied to bond and seal this area.
- S,R * 5.8 For **electrically continuous** hoses, a low resistance connection shall be provided by bonding the nipples at each end to the body wire. Composite hose shall be electrically continuous. Rubber hose may be either electrically continuous or discontinuous.
- Electrical continuity shall be provided by securing the body wire to both end fittings by soldering or welding. For composite hoses, the inner-helical body wire shall be used for this connection.
- Electrical continuity of a **swaged fittings** assembly shall employ 2 stainless steel wire connectors, each consisting of at least 9 strands. One end of each connector shall be secured to the built-in body wire by soldering or welding; the other end shall be spiraled, for at least 3 turns around the hose end, and secured in a manner which will ensure electrical continuity through contact with the swaged fitting assembly.
- S,R 5.9 For **electrically discontinuous** hose assemblies, all metallic components in the hose shall be isolated from the fittings at both ends.
- R 5.10 For **Composite hoses** the complete processes and steps necessary to properly assemble swaged end fittings on the hose body shall be described in the manufacturer's assembly procedures document. End fittings shall be installed by the **external swage process**, whereby the ferrule and nipple are swaged on to the hose by means of a hydraulic ram, permanently engaging the end fitting to the hose.