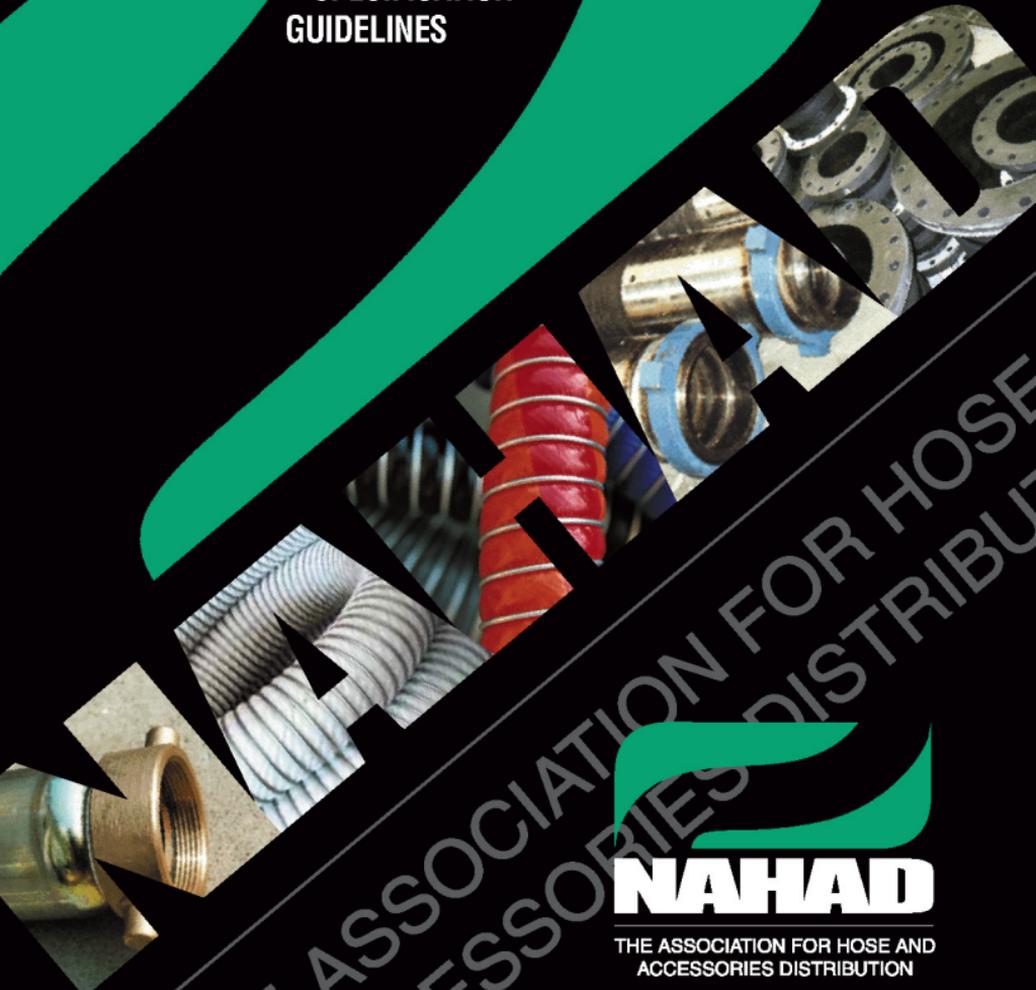


**COMPOSITE
HOSE
ASSEMBLY
SPECIFICATION
GUIDELINES**



THE ASSOCIATION FOR HOSE AND
ACCESSORIES DISTRIBUTION



THE ASSOCIATION FOR HOSE AND
ACCESSORIES DISTRIBUTION

NAHAD 600
2005

IMPORTANT NOTE TO READER:

NAHAD - The Association for Hose and Accessories Distribution - is pleased to provide this *comprehensive set of basic Hose Assembly Specification Guidelines* for customers seeking to acquire fabricated hose assemblies for various industrial applications. The information contained within this document has been developed through the concerted efforts of dozens of member volunteers, association staff and industry leaders, with the common goal of helping to improve the safety, quality and reliability of fabricated hose assemblies.

In addition to this document, NAHAD has produced four other Hose Assembly Specification Guidelines publications, addressing a total of five hose product groups, including: Composite Hose; Corrugated Metal Hose; Hydraulic Hose; Industrial Hose and Fluoropolymer Hose. These five publications are intended to complement existing industry and federal regulations. Aerospace and hydraulic brake hose assemblies are specifically excluded from this and the other four documents.

Hose, hose fittings and hose couplings come in various sizes and designs. Although there are standards published by manufacturers and independent testing organizations, such as ANSI, ASME, ASTM, ASQ, UL, ISO, SAE, RMA and others which relate to hoses and hose fittings, there are no generally recognized standards for hose assemblies. This publication is indebted to these organizations and, in specific cases, refers the reader to designated existing standards and recommendations provided by these other sources in an attempt to encourage the fabrication of safer, higher quality and more reliable hose assemblies.

NAHAD has published these Hose Assembly Specification Guidelines in order to create reference works that compile information of value to NAHAD members, manufacturers and customers in developing hose assemblies that meet specific individual needs. To the extent that each assembly has unique characteristics, it must be custom designed, engineered and tested. Hopefully, these Guidelines will be useful in the process.

In compiling standards and recommendations published by others and in developing these Guidelines, NAHAD has not and will not engage in independent testing or verification of the information provided to it. Users of these Guidelines should not, and cannot, rely on these Guidelines as a standard, certification or approval of the data published herein. NAHAD, and the member company volunteers, association staff and industry leaders who participated in the creation of these Guidelines do not assume, and expressly decline and deny, any and all liability for any product failures, damages or injuries that may result in any way from utilization of these Guidelines or products based on these Guidelines.

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Section 1 – Scope

This NAHAD Guideline is intended to complement existing industry standards and federal regulations. This document recommends methods and requirements necessary for the selection of components, fabrication, and testing of hose assemblies pertaining to Composite Hose.

Aerospace and hydraulic brake hose assemblies are excluded from this document.

This document is not intended to prohibit either supplier or customer from attaching additional requirements for hose, couplings or hose assemblies, if necessary, to satisfy the application. It is the responsibility of the fabricator and user to separately qualify these applications and their unique requirements necessary to ensure performance capability.

Section 2 – Application Requirements – STAMPED

2.1 Purpose

The purpose of this section is to provide a simple to use guide to assist in determining the correct hose, coupling and attachment method that will satisfy your customers needs.

2.2 General

The guide uses the STAMPED process. STAMPED is an acronym and stands for the 7 major information areas required to provide a quality hose assembly for your customer, as follows:

S stands for **SIZE**; I.D., O.D. and length

T stands for **TEMPERATURE** of the material conveyed and environmental

A stands for the **APPLICATION**, the conditions of use

M stands for the **MATERIAL** being conveyed, type and concentration

P stands for the **PRESSURE** to which the assembly will be exposed

E stands for **ENDS**; style, type, orientation, attachment methods, etc.

D stands for **DELIVERY**; testing, quality, packaging, and delivery requirements

2.3 Directions

Using the form:

1. Inform the customer you will be using an application format called STAMPED.
2. Ask your customer the pertinent questions outlined on the form, in sequence.
3. After completing the form, ask your customer to confirm their answers as you repeat them, in sequence.
4. Provide the completed format to your assembly area or order entry as required

The following list of special considerations may help to clarify application parameters:

1. Abrasion
2. Electrical conductivity
3. Environment
4. Flammability
5. Flow rate
6. Fluid velocity
7. Movement (type, distance, frequency)
8. Ozone
9. Permeation (vapor conveying hose)
10. Routing
11. Salt water
12. Static electricity
13. Ultraviolet light
14. Vibration (frequency rate – Hz, amplitude – "G" load)

(See **STAMPED** Form on next page)

Customer Information:

Company: _____
 Contact: _____
 Address: _____
 Phone: _____

Fax: _____
 E-mail: _____
 P.O.#: _____
 Terms: _____

Size	I.D.	O.D.	Overall Length	Tolerance

Temperature	Materials Conveyed		Environmental Temperature	
	Min.	Max	Min	Max
	°F/°C	°F/°C	°F/°C	°F/°C

Application	Type:
-------------	-------

Material/ Media	Material Conveyed		
	Internal Media		External Environment

Pressure	Max Working Pressure	Spikes	Vacuum
	PSI/kPa	PSI/kPa	Inches of Hg/kPa

Ends	End	Style/ Material	Size	Threads/Bolts Hole Alignment	Orientation	Attachment Methods	Capped
	1						Y N
	2						Y N

Delivery	Quantity Required:		Date Required:	
	Package Type:			
	Pick Up Date:		Ship Via:	
	Testing Required:		Y N	Type:
	Certification Required:		Y N	Type:

Special Requirements:

Section 3 – Composite Hose

3.1 Scope

This section specifies the methods and requirements necessary for the fabrication and testing of composite hose assemblies, and pertains to multi-layered, non-vulcanized, thermoplastic hose assemblies suitable for hydrocarbons products, aromatic hydrocarbons, solvents, cryogenic hydrocarbons and chemicals with nominal diameters from 1 to 12 inches (25.4 mm to 304.8 mm).

3.2 Hose Data Sheet

General Uses:

Composite hose, consisting of thermoplastics and wire reinforcement, can be used in selective petroleum and chemical service where flexibility combined with strength is required.

Limitations:

The type of hose selected is dependent on application. The hose supplier or manufacturer should be consulted to determine the style of hose needed.

Warnings: Special attention needs to be given to the following:

- A. When using composite hose to convey gaseous products, solids or abrasive slurries, consult manufacturer for correct hose type and construction.
- B. Before cleaning or examining composite hose, it is important that MSDS sheets be supplied of all media that hose has transferred to avoid serious injuries.
- C. All media is thoroughly drained prior to cleaning to avoid chemical or exothermic reactions when the hose is returned to service.
- D. Pigging of lines should not be used with composite hose.
- E. Compressed air may be used but hose must be open ended. Consult manufacturer for maximum pressure rating.
- F. Consult with manufacturer for temperature limitations as composite hose is constructed with thermoplastic materials, which tend to weaken at elevated temperatures. Care must be taken when cleaning with hot water so as not to exceed the maximum working temperature of hose. If steam

must be used contact the manufacture for approval and for any special recommended practices.

- G. During any cleaning operation, the assembly must be electrically grounded to avoid build up of static charge.

3.3 Hose Materials and Construction

3.3.1 Purpose

The purpose of this section is to provide a general description of composite hose construction and pressure rating requirements.

3.3.2 Materials

- A. An internal metal wire helix. This may be stainless steel, galvanized carbon steel, aluminum, or carbon steel sheathed in a polymeric material resistant to the materials of service.
 - 1. Stainless steel wire as specified and agreed between purchaser and manufacturer.
 - 2. Galvanized carbon steel wire as specified and agreed between purchaser and manufacturer.
 - 3. Aluminum wire as specified and agreed between purchaser and manufacturer.
 - 4. Carbon wire sheathed in a polymeric material should be coated as required with material resistant to liquid hydrocarbon, aromatic hydrocarbon or liquid chemicals as specified and agreed between the purchaser and manufacturer.
- B. A multi-ply wall of thermoplastic films and reinforcing fabrics in proportions that give the required physical properties and provide a complete seal. The films may be a flat film, tube, and/or fabric.
- C. A fabric cover with an abrasion and ozone resistant polymeric coating.
- D. An external metal wire helix. Wire material should be as outlined above.

3.3.3 Pressure Ratings

The maximum working pressure of a composite hose should be equal to the Nominal Burst pressure divided by four as a minimum. This may change dependent upon customer requirements and/or regulatory/statutory requirements.

3.4 Composite Hose Customer Information

3.4.1 Purpose

The purpose and intent of this section is to obtain all information necessary to satisfy the requirements of the customer, and reduce the risk of premature failure of hose assemblies in application.

3.4.2 Method for Application Qualification

3.4.2.1 Parameters of Applications

The following should be defined and considered in the design, recommendation and/or quotation of hose and/or hose assemblies:

3.4.2.2 Configurations Parameters

Information should include:

- A. Size (nominal diameter).
- B. Length of assembly (e.g., end to end) Length tolerances (+5%/-2%)
- C. Fittings –
 - 1. End fitting adaptor at both ends (NPT, "C", "E", flange, etc.)
 - 2. Material type: stem
 - 3. Ferrule
 - 4. End adaptor
 - 5. Gasket material on female end adaptor
 - 6. Test requirements, customer and/or regulatory/statutory requirements
- D. Definition of value scale (e.g., inches, millimeters, etc.).

3.4.2.3 Physical Parameters

Information should include:

- A. Material conveyed: media and percent concentration of media.
- B. Product temperature (min / normal operating / max),
- C. External environment temperature (min / max) and definition of value scale (e.g., Fahrenheit, Celsius, etc.)
- D. Specify any environmental conditions.
- E. Installation parameters: Horizontal installation, Vertical installation self supported, End load, Minimum Bend Radius, etc.
- F. Maximum working pressure required for the installation. (including surges any surges and/or spikes in pressure and vacuum)

3.4.2.4 Control Parameters

Information should include:

- A. Drawing or print if applicable and proper revision of drawing or print.
- B. Agency standard(s) applicable.
- C. Test requirements, customer.
- D. Documentation requirements, customer.
- E. Special branding requirement and cover color.
- F. Information of past performance of present hose in place.
- G. Flame resistance.
- H. Special cleaning procedure in use.

3.4.2.5 Contract Parameters

Information should include:

- A. Quantity

- B. Delivery schedule
- C. Cleaning requirements
- D. Packaging requirements
- E. Other items per manufacturer guidelines
- F. Specific Testing or Certification Requirements (i.e. Coast Guard Compliance, etc.)

3.5 Common Hose Assembly Techniques

3.5.1 Purpose

The purpose of this section is to provide common techniques for coupling of composite hose assemblies.

3.5.2 Overview

The technique of attaching fittings onto composite style hose may be accomplished in a number of ways. The early methods used included wire binding, hose clamps and bands. The more recent methods include external swaging or crimping. The latest methods of hydraulically crimping and swaging are now the most popular and are considered more secure for higher pressures.

3.5.3 Preparation for Swaging or Crimping

The preparation of composite hose for the attachment of fittings when the swaging or crimping method is to be used can be described as follows:

- A. Follow the manufacturer's recommendations to prepare the end of the hose to accept the fitting components.
- B. The next stage of assembly is accomplished through varying methods. One method used by some assemblers forms an epoxy seal around the end of the hose once the fitting is attached. This is done by pouring resin into the bowl formed by the ferrule that had been first welded to the fitting. Following the manufacturer's procedures, the fitting is then turned on tightly and swaged or crimped to the proper dimensions.
- C. An alternative method for this stage of assembly involves the installation of a seal supplied by the manufacturer that covers the end of the hose and extends inside and over the hose. The sizes

and lengths of these seals vary with the manufacturers and with the diameter of the hose. Install the seal, ferrule and fitting following the manufacturer's recommendations and swage or crimp to the proper dimensions.

3.5.4 End Connections Used

For all types of end connections used, the part of the fitting which enters the hose, and forms the means by which the fitting is connected to the hose, should be provided with scrolls or protrusions on the surface that correspond to the pitch of the inner reinforcing wire of the hose. In all cases, they should be connected to the construction wire or bonding wire to provide electrical continuity. End fitting to end fitting continuity will not be possible when installing non-metallic end fittings.

3.6 Finished Assembly Dimension Tolerances

3.6.1 Purpose

The purpose of this section is to provide dimension and tolerance guide lines for composite assemblies.

3.6.2 Size

The bore and bend radius of the hose should comply with the nominal dimensions given by the manufacturer.

3.6.3 Length

The length of hose ordered should be the OAL including the end fittings. OAL measurements should be from flange face to flange face, seat to seat, end of threads to end of threads, etc. If in question, this data should be added to the purchase order.

In the as fabricated condition, after testing, the overall length, (OAL), should be within +5%/-2% of the OAL.

The maximum change in length at the maximum test pressure should not exceed 12% of initial length as measured in 3.7.2.2 section B.

Because of the elongation under pressure, the distributor may need to seek the advice of the manufacturer for applications where length in use is critical.

3.7 Testing Procedures

3.7.1 Purpose

The purpose of this section is to define minimum test requirements, which should be routinely carried out on all new hose assemblies before use.

3.7.2 Hydrostatic Pressure Tests

All fitted hose assemblies should be pressure tested to establish that the end fittings have been correctly fitted and the assembly is leak free.

The following criteria should apply when pressure testing hose assemblies:

- A. Composite hose assemblies with 1 inch to 4 inch (25mm to 100mm) nominal bore composite “standard duty” or general purpose oil and chemical hose should be tested to a minimum of the rated working pressure of the end fittings, but must not exceed one and a half times the rated working pressure of the hose for a minimum of five (5) minutes. Longer test times may be required, consult manufacture for specific requirements. (polypropylene, cam and groove, NPT males and flanges do not have the same test criteria)
- B. Composite hose assemblies with 4 inches (100mm) “heavy duty” and 6 inches to 10 inches (150mm to 250mm) nominal bore composite hose should be tested to a minimum of the rated test pressure of the end fittings, but must not exceed one and a half times the rated working pressure of the hose for a minimum period of thirty (30) minutes and/or regulatory/statutory requirements. (polypropylene, cam and groove, NPT males and flanges do not have the same test criteria)

Note: Composite hose manufacturers may differentiate the 4 inch (100mm) nominal diameter between “standard duty” and “heavy duty”. It is common practice to suggest the “standard duty hose is for general purpose in plant applications. Where as the “heavy duty” is used in either more rigorous or marine applications.

- C. Unless otherwise stated by the purchaser, the test medium should be water.

3.7.2.1 Recommended Testing Procedure

The following testing procedure is recommended:

- A. Lay the hose out straight; (slightly elevating one end to ensure trapped air is expelled) allowing space for elongation under pressure, preferably on supports to allow free movement under pressure.
- B. Blank off one end and fill hose with water, taking particular care to ensure that all trapped air is released from the hose.
- C. A composite hose assembly should be tested minimally to the test pressure of the end fittings as end fitting working pressure does not necessarily meet or exceed the working pressure or test pressure of the hose.
- D. While pressure is maintained, examine the assembly for leaks and any unusual appearance and test for electrical continuity between the end fittings. (See Sections 3.7.3 and 3.7.4)
- E. When tested in accordance with the above, the assembly under test should be totally leak free for the duration of the test.

3.7.2.2 Elongation Length Measurement

A characteristic of composite hose is elongation. This characteristic should not be used solely as an assessment of the condition of the hose or an indication of failure. Consult manufacturer for more information. (See Section 3.6.3)

In the event that elongation length measurement is required, the following is an accepted process and may be incorporated into your test procedure.

- A. Pressurize the hose to one time working pressure, hold for 30 seconds, release pressure to 10 psi and take the initial length measurement at 10 psi. $Lo = \underline{\hspace{2cm}}$.
- B. Measure the hose length under pressure (Test Pressure Length), $Lt = \underline{\hspace{2cm}}$. Calculate the temporary elongation as follows:

$$Lt - Lo \times 100 = \underline{\hspace{2cm}} \% Lo.$$

- C. Release the pressure, wait 30 seconds, measure and record the Overall Final Length, and drain hose.

3.7.3 Electrical Continuity Test

All lengths of composite hose that have been fitted with electrically conductive end fittings must be tested from end fitting to end fitting with a calibrated multi-meter to ensure that the hose is electrically continuous.

3.7.4 Electrical Resistance Test

Unless otherwise specified, all lengths of composite hose that have been fitted with electrically conductive end fittings must have an electrical resistance not exceeding 10 ohms. The test should be made from end fitting to end fitting using a calibrated multi-meter to ensure that the hose is electrically continuous.

3.7.5 Test Documentation

If required by the customer, a test certificate may be issued to provide written confirmation that the assembly has been tested, and conforms to certain performance criteria. If a test certificate is not supplied, test results should be maintained and kept on file for five years.

Each test certificate should bear a unique number for traceability.

Test certificates should include the following information as a minimum:

- A. Test Certificate Number
- B. Customers Name and Purchase Order Number
- C. Suppliers Name and Job Number
- D. Hose Serial Number(s)
- E. Hose details including length, type of hose and diameter
- F. End fitting details with types of ferrules and seals used
- G. Test Date
- H. Test Pressure
- I. Electrical Continuity Conformance
- J. Suppliers Authorization Signature

3.8 Hose Assembly Markings

3.8.1 Purpose

The purpose of this section is to establish a method and content of hose assembly marking when required.

3.8.2 Method of Marking

The marking of hose assemblies may be achieved in two ways:

- A. Information pre-stamped in legible characters on metal tag or band affixed to the assembly by approved durable method.

- B. Information in legible characters stamped or engraved directly onto the ferrule(s) or end fitting(s).

3.8.3 Information to be Included

Information to be included on the tag, band or by stamp:

- A. The manufacturer's name, trademark or other identification
- B. The hose serial number or manufacturer's lot/I.D. number.
- C. The nominal bore size
- D. The month and year of hose assembly
- E. The maximum working pressure

Example: Mannname/CH12/3"/Aug97/150psi

3.9 Installation and Handling

3.9.1 Purpose

The purpose of this section is to serve as a guide for the proper and safe installation, and subsequent handling and use of composite hose in service.

3.9.2 Cleaning

It is important that any media be thoroughly drained prior to cleaning to avoid chemical or exothermic reactions when the hose is returned into service.

- A. Typically, composite hose assemblies are cleaned by flushing thoroughly with clean water.

- B. Other media which can be used, depending on the media that has been passing through the hose, include hot water, sea water, detergents and common solvents at ambient temperature. If sea water is used the hose must be well drained after cleaning to minimize corrosion.

- C. Due to the inherent nature of the hose internally, any form of mechanical method of cleaning such as pigging should not be used

under any circumstances.

- D. Also, due to the fact that the hose is constructed using plastics which tend to weaken at elevated temperatures, care must be taken when cleaning with hot water so as not to exceed the maximum working temperature of the hose. If steam is to be used, contact the manufacturer for any recommended practices.
- E. Compressed air may be used but the hose must be open-ended.
- F. During any cleaning operation, the assembly must be electrically grounded to avoid build up of static charge.

3.9.3 Storage

After service, hose assemblies should be flushed out and drained. Ideally, stored hoses should be dry and kept off the ground in a straight line out of direct sunlight.

3.9.4 Packaging and Transportation

Hose and hose assemblies may be transported in coiled form on pallets, in crates or loose within containers. Care should be taken to prevent impact damage.

3.9.5 Installation and Usage

Hoses must be correctly supported during use. These supports should be arranged so that the hoses are never bent beyond the minimum bend radius. Hoses should never be supported along their live length by a single rope. Slings, saddles or some other means of proper support must be used. The support must be wide enough to spread the load sufficiently so that the hose is not deformed in the area of support. Incorrect installation can unduly stress hose assemblies leading to a shortened working life or premature failure.

- A. Flanged hose assemblies should ideally have one end secured with a floating flange.
- B. Hose assemblies must not be twisted either on installation or in use.
- C. Hose assemblies subject to movement while operating should be installed in such a way that flexing occurs in the same plane.
- D. When installing hose assemblies, careful attention should be

paid to minimum bend radii specifications.

3.9.6 Transfer Hose Handling Guidelines while in Service

3.9.6.1 DO'S

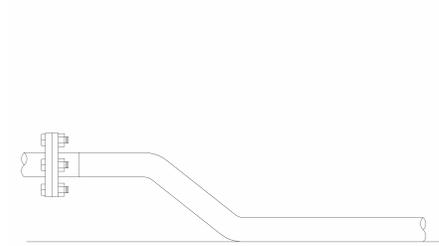
- A. Support the hose within 3 to 4 feet of flange connections always maintaining horizontal plane.
- B. Support the hose using recommended hose supports throughout the balance of the length.
- C. Cushion the hose against sharp edges, dock edge, ships rail, etc.
- D. Cushion the hose when the application demands use of reciprocating machinery. It is recommended that all points of contact be cushioned to avoid potential damage due to the pulsating effect of reciprocating machinery. (See Figure 3.9.6.1)

3.9.6.2 DON'TS

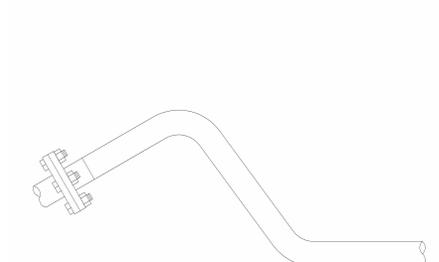
- A. Do not use the hose unsupported.
- B. Do not support the hose with rope, chain or wire.
- C. Do not allow the hose to hang unsupported between ship and quay. (See Figure 3.9.6.1)

Figure 3.9.6.1 Transfer Hose Handling Guide

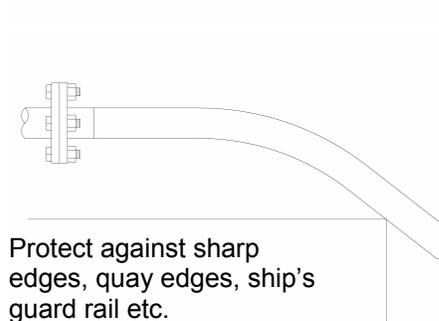
INCORRECT



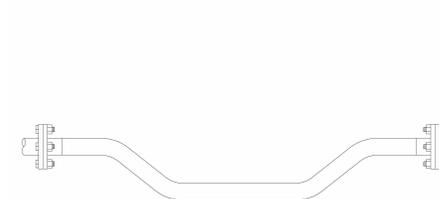
Never Use Hose Unsupported



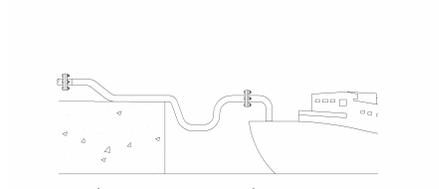
Never Use Hose Unsupported



Protect against sharp edges, quay edges, ship's guard rail etc.

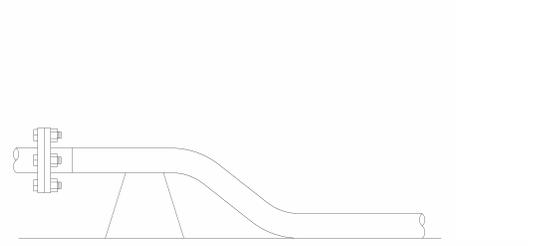


Never Use Hose Unsupported

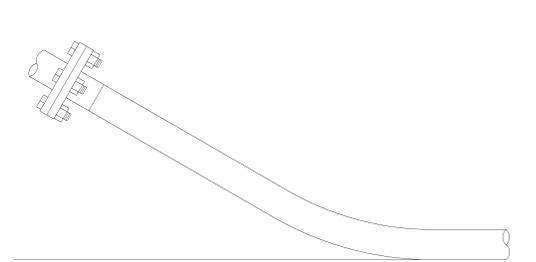


Never overbend hose or allow hose to hang between quay and ship

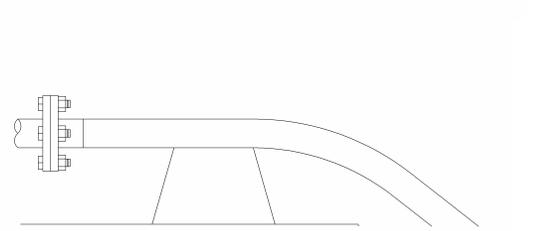
CORRECT



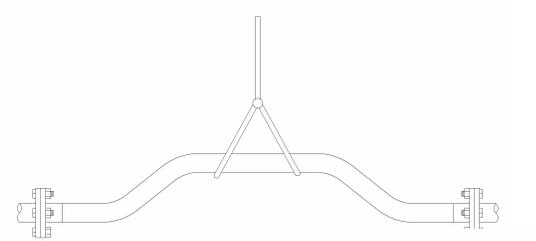
Always support hose near coupling



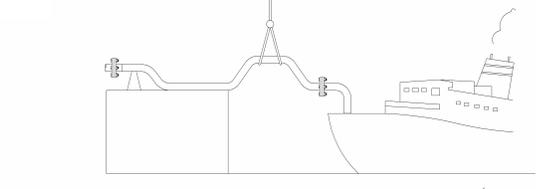
Acceptable



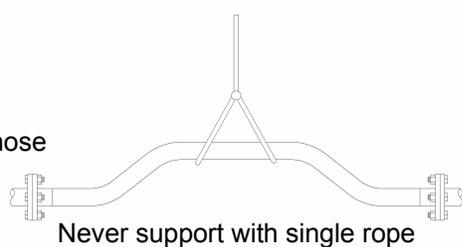
Acceptable



Support hose with slings where appropriate



Support Hose with Slings



Never support with single rope

3.9.7 Inspection of Hose/Troubleshooting

Before each operation, hose assemblies should be visually examined paying attention to the following points:

- A. Displacement of reinforcing wires from their normal pitch.
- B. Abrasion or corrosion of the hose outer wire
- C. Abrasion of the reinforcing fabrics beneath the outer cover.
- D. Dents or kinks.
- E. Damage or displacement of end fittings and/or deformity of end fittings.
- F. Evidence of leakage from end fittings or elsewhere in the body of the hose.
- G. Verify test date and pressure are in conformity with statutory requirements for the application.

Assemblies with any of the above significant defects or any other abnormal feature should be withdrawn from service immediately.

3.9.8 Field Testing of Composite Hose

It is recommended that hose assemblies be tested regularly depending on service. Consult manufacturer and/or contact manufacturer for authorized distributor(s).

APPENDIX A – Glossary*

abrasion: external damage to a hose assembly caused by its being rubbed on a foreign object; a wearing away by friction.

abrasion tester: a machine for determining the quantity of material worn away by friction under specified conditions.

absorption: regarding hose, the process of taking in fluid. Hose materials are often compared with regard to relative rates and total amounts of absorption as they pertain to specific fluids.

accelerated life test: a method designed to approximate in a short time the deteriorating effects obtained under normal service conditions.

acid resistant: having the ability to withstand the action of identified acids within specified limits of concentration and temperature.

adapter, adaptor: 1) fittings of various sizes and materials used to change an end fitting from one type to another type or one size to another. (i.e., a male JIC to male pipe adapter is often attached to a female JIC to create a male end union fitting); 2) the grooved portion of a cam & groove coupling.

adhesion: the strength of bond between cured rubber surfaces or between a cured rubber surface and a non-rubber surface.

adhesion failure: (1) the separation of two bonded surfaces at an interface by a force less than specified in a test method; (2) the separation of two adjoining surfaces due to service conditions.

adhesive: a material which, when applied, will cause two surfaces to adhere.

aerostatic testing: see pneumatic testing.

algaflon®: a registered trademark of Ausimont USA. See PTFE.

air under water testing: see pneumatic testing.

ambient temperature: the temperature of the atmosphere or medium surrounding an object under consideration.

ambient/atmospheric conditions: The surrounding conditions, such as temperature, pressure, and corrosion, to which a hose assembly is exposed.

anchor: a restraint applied to eliminate motion and restrain forces.

angular displacement: displacement of two parts defined by an angle.

anodize, anodized: an electrolytic process used to deposit protective or cosmetic coatings in a variety of colors on metal, primarily used with aluminum.

ANSI: American National Standards Institute.

anti-static: see static conductive.

application working pressure: unique to customer's application. See pressure, working.

application: the service conditions that determine how a hose assembly will be used.

armor: a protective cover slid over and affixed to a hose assembly; used to prevent over bending or for the purpose of protecting hose from severe external environmental conditions such as hot materials, abrasion or traffic.

assembly: a general term referring to any hose coupled with end fittings of any style attached to one or both ends.

ASTM: American Society for Testing and Materials.

attachment: the method of securing an end fitting to a hose (e.g., banding, crimping, swaging, or screw-together-2 piece or 3 piece-style-reusable fittings).

band: (1) a metal ring that is welded, shrunk, or cast on the outer surface of a hose nipple or fitting; (2) a thin strip of metal used as a non-bolted clamp. See hose clamp.

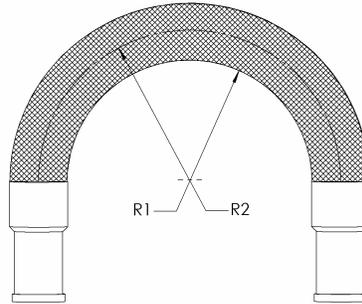
barb: the portion of a fitting (coupling) that is inserted into the hose, usually comprised of two or more radial serrations or ridges designed to form a redundant seal between the hose and fitting.

barbed and ferrule fitting: a two-piece hose fitting comprised of a barbed insert (nipple), normally with peripheral ridges or backward-slanted barbs, for inserting into a hose and a ferrule, usually crimped or swaged.

bench marks: marks of known separation applied to a specimen used to measure strain (elongation of specimen).

bench test: a modified service test in which the service conditions are approximated in the laboratory.

bend radius: the radius of a bent section of hose measured to the innermost surface of the curved portion.



bend radius, minimum: the smallest radius at which a hose can be used.

bend radius, dynamic: the radius at which constant or continuous flexing occurs.

bend radius, static: the smallest fixed radius at which a hose can be subjected.

bending force: an amount of stress required to induce bending around a specified radius and hence, a measure of stiffness.

bevel seat fitting: see fitting, Bevel Seat.

billet: (1) a compressed cylinder of Teflon® (PTFE) resin, from which raw tubing is extruded. Also called a preform. (2) a solid piece of material from which a fitting is manufactured.

bleeding: surface exudation. See bloom.

blister: a raised area on the surface or a separation between layers usually creating a void or air-filled space in a vulcanized article.

bloom: a discoloration or change in appearance of the surface of a rubber product caused by the migration of a liquid or solid to the surface, (e.g. sulfur bloom, wax bloom). Not to be confused with dust on the surface from external sources.

blow out force: the force generated from the internal pressure attempting to push the fitting from the hose.

body wire: normally a round or flat wire helix embedded in the hose wall to increase strength or to resist collapse.

bolt hole circle: a circle on the flange face around which the center of the bolt holes are distributed.

bore: (1) an internal cylindrical passageway, as of a tube, hose or pipe; (2) the internal diameter of a tube, hose, or pipe.

brand: a mark or symbol identifying or describing a product and/or manufacturer, that is embossed, inlaid or printed.

brass: a family of copper/zinc alloys.

brazing: a process of joining metals using a non-ferrous filler metal having a melting point that is lower than the “parent metals” to be joined, typically over +800°F.

bronze: an alloy of copper, tin and zinc.

buffing (sizing): grinding a surface to obtain dimensional conformance or surface uniformity.

butt weld: process in which the edges or ends of metal sections are butted together and joined by welding.

C of C: certificate of conformance or certificate of compliance; a document, typically signed and dated pertaining to a particular lot or purchase order of item(s), which describes any standards, specifications, tests, materials and/or performance attributes to which the referenced item(s) have met or will meet.

cam & groove: see fitting/coupling - Cam & Groove.

capped end: a hose end covered to protect its internal elements.

carcass: the fabric, cord and/or metal reinforcing section of a hose as distinguished from the hose tube or cover.

casing: see armor.

cement: unvulcanized raw or compounded rubber in a suitable solvent used as an adhesive or sealant.

cemented end: a hose end sealed with the application of a liquid coating.

chafe sleeve: an outer sleeve providing resistance to chafing and external resistance to damage to braided hoses, available in wide variety of materials to meet the application requirements (e.g., chafe sleeves include slip-on, heat shrinkable, integrally extruded).

checking: the short, shallow cracks on the surface of a rubber product resulting from damaging action of environmental conditions.

chemical compatibility: the relative degree to which a material may contact another without corrosion, degradation or adverse change of properties.

chemical resistance: the ability of a particular polymer, rubber compound, or metal to exhibit minimal physical and/or chemical property changes when in contact with one or more chemicals for a specified length of time, at specified concentrations, pressure, and temperature.

clamp: see hose clamp.

cloth impression: see fabric impression.

coefficient of friction: a relative measure of the surface lubricity.

cold flex: see low temperature flexibility.

cold flexibility: relative ease of bending while being exposed to specified low temperature.

cold flow: continued deformation under stress. See creep.

collar: 1) the portion of a fitting that is compressed by swaging or crimping to seal the hose onto the fitting barbs and create a permanent attachment; also called a ferrule. (With reusable fittings, the lock and seal are accomplished mechanically by the collar without swaging or crimping); 2) a raised portion on the hose shank which functions as a connection for a ferrule or other locking device or functions as a hose stop.

combustible liquid: a combustible liquid is one having a flash point at or above +100°F (37.8°C).

composite hose: non-vulcanized hose that consists of the following:

- An internal wire helix;
- A multi-ply wall of thermoplastic films and reinforcing fabrics in proportions that give the required physical properties and provide a complete seal. (Note: The film content may be built of tubular films.)
- A cover consisting of fabric with an abrasion resistant polymeric coating; An external helix wire.

compound: the mixture of rubber or plastic and other materials, which are combined to give the desired properties when, used in the manufacture of a product.

compression fitting: see fitting/coupling - Compression

compression set: the deformation which remains in rubber after it has been subjected to and released from a specific compressive stress for a definite period of time at a prescribed temperature. (Compression set measurements are for evaluating creep and stress relaxation properties of rubber.)

concentricity: the uniformity of hose wall thickness as measured in a plane normal to the axis of the hose.

conditioning: the exposure of a specimen under specified conditions, e.g., temperature, humidity, for a specified period of time before testing.

conductive: the ability to transfer electrical potential.

configuration: the combination of fittings on a particular assembly.

control: a product of known characteristics, which is included in a series of tests to provide a basis for evaluation of other products.

controlled flexing: occurs when the hose is being flexed regularly, as in the case of connections to moving components (e.g., platen presses, thermal growth in pipe work).

convoluted: description of hose or innercore having annular or helical ridges formed to enhance flexibility.

copolymer: a blend of two polymers.

core: the inner portion of a hose, usually referring to the material in contact with the medium.

corrosion: the process of material degradation by chemical or electrochemical means.

corrosion resistance: ability of metal components to resist oxidation.

corrugated cover: a ribbed or grooved exterior.

corrugated hose: hose with a carcass fluted, radially or helically, to enhance its flexibility or reduce its weight.

coupler: the female portion of the cam & groove connection with the cam arms.

coupling: a frequently used alternative term for fitting.

cover wear: the loss of material during use due to abrasion, cutting or gouging.

cover: the outer component usually intended to protect the carcass of a product.

CPE: chlorinated polyethylene; a rubber elastomer.

cracking: a sharp break or fissure in the surface, generally caused by strain and environmental conditions.

creep: the deformation, in material under stress, which occurs with lapse of time after the immediate deformation.

crimp diameter: the distance across opposite flats after crimping.

crimp/crimping: a fitting attachment method utilizing a number of fingers or dies mounted in a radial configuration. The dies close perpendicular to the hose and fitting axis, compressing the collar, ferrule, or sleeve around the hose.

CSM: chlorosulfonated polyethylene.

cut off factor: the hose length to be subtracted from the overall assembly length that allows for the hose coupling end connection extension beyond the end of the hose.

cut resistant: having that characteristic of withstanding the cutting action of sharp object.

cycle-motion: movement from normal to extreme position and return.

date code: any combination of numbers, letters, symbols or other methods used by a manufacturer to identify the time of manufacture of a product.

deburr: to remove ragged edges from the inside diameter of a hose end; an important fabrication step for assembling hose of Teflon® (PTFE) in order to insure a good seal.

deduct length: the amount of fitting length deducted from a hose to result in the desired finished assembly length.

design factor: a ratio used to establish the working pressure of the hose, based on the burst strength of the hose.

design pressure: see application working pressure and pressure, working.

developed length: see overall length.

die: a tool used to swage or crimp a fitting onto a hose. Swage dies usually consist of two halves machined to a predetermined diameter, designed for a specific hose type and size. A crimp die set is typically six to eight “fingers” designed for infinite diameter settings within a range or preset to a specific diameter for a given hose type and size.

dielectric strength: the relative measure of a material’s ability to resist conducting an electrical charge.

displacement: the amount of motion applied to a hose defined as inches for parallel offset and degrees for angular misalignment.

dog-leg assembly: two hose assemblies joined by a common elbow.

DOT: Department of Transportation.

duplex assembly: an assembly consisting of two hose assemblies-one inside the other, and connected at the ends; also known as “jacketed assemblies.”

durometer: an instrument for measuring the hardness of rubber and plastic compounds.

durometer hardness: a numerical value, which indicates the resistance to indentation of the blunt indenter of the durometer.

dye penetrant inspection/test: non-destructive inspection method for detecting surface defects.

dynamic bend radius: see bend radius, dynamic.

eccentric wall: a wall of varying thickness.

eccentricity: the condition resulting from the inside and outside diameters not having a common center. See eccentric wall.

ECTFE: ethylene-chlorotrifluoroethylene.

effective thrust area-hose: cross-sectional area described by the mean diameter of the hose.

effusion: the escape, usually of gases, through a material. See permeation.

elastic limit: the limiting extent to which a body may be deformed and yet return to its original shape after removal of the deforming force.

elastic/intermittent flexure: The smallest radius that a given hose can be bent

to without permanent deformation to the metal in its flexing members (convolutions or corrugations).

elastomer: any one of a group of polymeric materials, usually designated thermoset, such as natural rubber, or thermoplastic, which will soften with application of heat.

electrostatic discharge: the sudden discharge of static electricity from an area of buildup to a grounding point.

elongation: the increase in length expressed numerically as a percentage of the initial length.

encapsulated fitting: see fitting/coupling-Encapsulated fittings.

endurance test: a service or laboratory test, conducted to product failure, usually under normal use conditions.

enlarged end: an end having a bore diameter greater than that of the main body of the hose, in order to accommodate a larger fitting.

EPDM: Ethylene Propylene Diene Monomer; an elastomer.

exothermic: releasing heat.

extrude/extruded/extrusion: forced through the shaping die of an extruder; extrusion may have a solid or hollow cross section.

fabric impression: impression formed on the rubber surface during vulcanization by contact with fabric jacket or wrapper.

fabricator: the producer of hose assemblies.

fatigue: the weakening or deterioration of a material occurring when a repetitious or continuous application of stress causes strain, which could lead to failure.

FDA: United States Food and Drug Administration.

FEP: fluorinated ethylene propylene.

ferrule: a metal cylinder placed over a hose end to affix the fitting to the hose. See braid sleeve, interlocking ferrule, and sleeve.

fire sleeve: slip-on or integrally extruded sleeve used to retard the effects of fire in certain applications; most often made with silicone and/or ceramic fiber.

fitting/coupling: a device attached to the end of the hose to facilitate connection. The following is only a partial list of types of fittings available:

- *Banjo Fitting* - a through bolted design featuring a hollow circle or “donut” attached to one end of the fitting barb so that the inner diameter is along the hose axis.
- *Butt Weld Fittings* - a hose fitting designed to be permanently welded to a connecting member such as another pipe or a butt weld flange.
- *Cam & Groove Fittings* - a type of fitting that allows connection and disconnection by means of arm(s) or cam(s) on the female fitting. The seal is accomplished by means of a gasket, available in various materials. These fittings are frequently used on product transfer hose assemblies.
- *Compression Fitting* - a fitting style that seals on a mating tube by compressing an internal ferrule against the tube O.D..
- *Encapsulated Fittings*- a metal fitting of various styles usually encased in a thermoplastic or fluoroplastic material by means of molding or coating. Most often done for sanitary purposes or to eliminate corrosion.
- *Field Attachable Fitting* - a fitting designed to be attached to hose without crimping or swaging. This fitting is not always a Reusable type fitting.
- *Flange Retainer Fittings* - a hose fitting flared to a 90° surface, designed to hold a circular rotating flange, such as a slip-on or lap joint style flange.
- *Flange Style Fittings* - pipe flanges and flanged fitting standards are listed under ANSI B16.5. Flanges are rated for pressure and listed as “American Class 150, 300, 400, 600, 900, 1,500 or 2,500”. Pressure-Temperature ratings can be obtained by consulting the ANSI specification or ASME B16.5 (American Society of Mechanical Engineers). Designs vary by neck and face style, or other dimensional changes based on use. Various finishes or grooves may be applied to the face for sealing on a gasket or o-ring. Bolt holes and other dimensions are per the ANSI standard.
- *Slip-on Flange* - a flange designed to slip over a flange retainer and float freely in place for bolt alignment. Similar to a lap joint flange except with a very small radius on the face side of the inside diameter to mate with a machined flange retainer. May have a flat or raised face.
- *Lap Joint Flange* - a flange designed to float freely on the flange retainer for bolt alignment. Made with a flat face and having a large radius on the I.D. to mate with a flared pipe style flange retainer.

- *Threaded Flange* - a flange, the inside diameter of which is threaded to attach to a male pipe fitting. A leak proof seal, made with thread sealant, usually does not allow for bolt hole alignment. *Inverted Flare Fitting* - a fitting consisting of a male or female nut, trapped on a tube by flaring the end of the tube material to either 37° or 45°.
- *JIC Fittings* - Joint Industrial Council (no longer in existence). An engineering group that established an industry standard fitting design incorporating a 37° mating surface, male and female styles. These standards now governed by SAE.
- *Lined Fitting* - any fitting of which the wetted surface or entire fitting is covered with a protective material. The covering process may be by spray coating, molding or by inserting hose liner through the I.D. of fitting and anchoring.
- *O-ring Fittings* - a fitting that seals by means of an elastomeric ring of a specified material.
- *Pipe Thread Fittings* -
 - NPT- National Pipe Taper. Pipe thread per ANSI B1.20.1
 - NPTF- National Pipe Tapered for Fuels. Same as above except dry-seal per ANSI B1.20.3
 - NPSH- National Pipe Straight Hose per ANSI B1.20.7
 - NPSM- National Pipe Straight Mechanical. Straight thread per ANSI B1.20.1
 - NPSL- National Pipe Straight Loosefit per ANSI B1.20.1
 - BSPP, BSPT- British Standard Pipe Parallel, British Standard Pipe Taper. BS21.
- *Quick Connect Fitting* - a fitting designed to quickly connect and disconnect. These fittings come in many styles and types.
- *Reusable Fitting* - a fitting designed to be attached and unattached to a hose, allowing all or most of the fitting to be reused.
- *Sanitary Fittings* - a fitting whose seal is accomplished by means of a round gasket in a groove on the face of the fitting. The design eliminates the need for a male and female, since the fitting mates to itself. A re-attachable clamp is also used for coupling.

- *Bevel Seat* - a type of sanitary fitting incorporating a 45° beveled sealing surface. Used in the food and pharmaceutical industries.
- *Split Flange Fitting* - a fitting consisting of a flange retainer and a flange of two halves. This design allows the flanges to be installed after the retainer has been attached to the hose, making the flange reusable. SAE Code 61 and 62.
- *Tube Fitting* - a hose fitting of which the mating end conforms to a tube diameter. The mate or male end of a compression fitting.
- *2-Bolt Flange Fitting* - an elliptical flange with two bolt holes. Typically used in steam applications such as laundry and tire presses.

flammable gases/liquid/media: a flammable gas, including liquefied gas, is one having a closed cup flash point below +100°F (+37.8°C) and a vapor pressure greater than 25 psi. (174.2 KPa).

flat spots: flat areas on the surface of cured hose caused by deformation during vulcanization.

flex cracking: a surface cracking induced by repeated bending and straightening.

flex life: the relative ability of an article to withstand bending stresses.

flex life test: a laboratory method used to determine the life of a rubber product when subjected to dynamic bending stresses.

flow rate: a volume of media being conveyed in a given time period.

fluid: a gas or liquid medium.

fluid velocity: the speed of fluid through a cross section expressed in length divided by time.

fluorocarbon: an organic compound containing fluorine directly bonded to carbon. The ability of the carbon atom to form a large variety of structural chains gives rise to many fluorocarbons and fluorocarbon derivatives.

Fluron®: a registered trademark of ICI. A term descriptive of the family of fluorocarbons and fluorocarbon derivatives in general commercial use. See PTFE.

fluoropolymer: a high molecular weight (long chain) chemical containing fluorine as a major element.

free length: the lineal measurement of hose between fittings or couplings. •

frequency: the rate of vibration or flexure in a given time period.

galvanic corrosion: corrosion that occurs on the less noble of two dissimilar metals in direct contact with each other in an electrolyte, such as water, sodium chloride in solution, sulfuric acid, etc.

GMAW: Gas Metal Arc Weld.

GPM: gallons per minute.

GTAW: see Tig Weld/GTAW.

guide (for piping): a device that supports a pipe radially in all directions, but directs movement.

Halar®: Ausimont USA registered trademark. See ECTFE.

hand built hose: a hose made by hand on a mandrel, reinforced by textile or wire or combination of both.

hardness: resistance to indentation. See durometer hardness.

heat resistance: the property or ability to resist the deteriorating effects of elevated temperatures.

heat-shrink sleeving: tubular thermoplastic sleeve used for chafe protection or identification. The sleeve is slipped over the hose and shrunk down by the application of heat to fit tightly on the hose.

helical wire armor/spring guard: an abrasion resistance device.

helical: used to describe a type of corrugated hose having one continuous convolution resembling a screw thread.

helix: a shape formed by spiraling a wire or other reinforcement around the cylindrical body of a hose; typically used in suction hose.

higbee: the thread of a hose coupling, the outermost convolution of which has been removed to such an extent that a full cross section of the thread is exposed, this exposed end being beveled.

hoop strength: the relative measure of a hose's resistance to collapse of the diameter perpendicular to the hose axis.

hose: a flexible conduit consisting of a tube, reinforcement, and usually an outer cover.

hose assembly: see assembly.

hose clamp: a device used to hold a hose onto a fitting.

Hostaflon®: a registered trademark of Dyneon. See PFA.

hydrostatic testing: the use of liquid pressure to test a hose or hose assembly for leakage, twisting, and/or hose change-in-length.

Hypalon®: a DuPont registered trademark. See CSM.

Hytrel®: a DuPont registered trademark.

I.D.: the abbreviation for inside diameter.

identification yarn: a yarn of single or multiple colors, usually embedded in the hose wall, used to identify the manufacturer.

impression: a design formed during vulcanization in the surface of a hose by a method of transfer, such as fabric impression or molded impression.

impulse service: an application parameter characterized by continuous cyclical pressure changes from low to high.

impulse: an application of force in a manner to produce sudden strain or motion, such as hydraulic pressure applied in a hose.

indentation: 1) the extent of deformation by the indenter point of any one of a number of standard hardness testing instruments; 2) a recess in the surface of a hose.

innercore: the innermost layer of a hose; the hose material in contact with the medium.

insert: optional term for nipple. See nipple.

interlocking ferrule: a ferrule, which physically attaches to the fitting preventing the ferrule from sliding off the fitting.

interstice: a small opening, such as between fibers in a cord or threads in a woven or braided fabric.

IPT: iron pipe threads; a reference to NPT or NPTF.

ISO: International Organization for Standardization.

jacket: a seamless tubular braided or woven ply generally on the outside of a hose.

JIC: see fitting/coupling-JIC.

kinking: a temporary or permanent distortion of the hose induced by bending beyond the minimum bend radius.

Kynar®: ELF Atochem registered trademark. See PVDF.

lap seam: a seam made by placing the edge of one piece of material extending flat over the edge of the second piece of material.

lap weld (LW): type of weld in which the ends or edges of the metal overlap each other.

lay: 1) the direction of advance of any point in a strand for one complete turn; (2) the amount of advance of any point in a strand for one complete turn. See pitch.

layer: a single thickness of rubber or fabric between adjacent parts.

leaker: 1) a crack or hole in the tube which allows fluids to escape; 2) a hose assembly which allows fluids to escape at the fittings or couplings.

life test: a laboratory procedure used to determine the resistance of a hose to a specific set of destructive forces or conditions. See accelerated life test.

light resistance: the ability to retard the deleterious action of light.

lined bolt holes: the bolt holes, which have been given a protective coating to cover the internal structure.

liner: flexible sleeve used to line the inside diameter of hose when conveying a high velocity media, also prevents erosion.

live length: see free length.

LJF (lap joint flange): see fitting/coupling - Lap Joint Flange.

long shank: a shank length greater than the nominal diameter, typically two diameters in length, which allows more than a single clamp.

loop installation: the assembly is installed in a loop or “U” shape, and is most often used when frequent and/or large amounts of motion are involved.

low temperature flexibility: the ability of a hose to be flexed, bent or bowed at low temperatures without loss of serviceability.

LPG, LP Gas: the abbreviation for liquefied petroleum gas.

MAWP: see pressure, maximum allowable working.

mandrel: 1) a form, generally of elongated round section used for size and to support hose during fabrications and/or vulcanization. It may be rigid or flexible; 2) a tapered expanding device, fixed in diameter, which is pulled through a shank of a fitting thus expanding the diameter to exert force on the hose between the shank and ferrule.

mandrel built: a hose fabricated and/or vulcanized on a mandrel.

mandrel, flexible: a long, round, smooth rod capable of being coiled in a small diameter. It is used for support during the manufacture of certain types of hose. (The mandrel is made of rubber or plastic material and may have a core of flexible wire to prevent stretching.)

mandrel, rigid: a non-flexible cylindrical form on which a hose may be manufactured.

manufacturer's identification: a code symbol used on or in some hose to indicate the manufacturer.

mass flow rate: the mass of fluid per unit of time passing through a given cross-section of a flow passage in a given direction.

mean diameter: the midpoint between the inside diameter and the outside diameter of a corrugated/convoluted hose.

mechanical fitting/reusable fitting: a fitting attached to a hose, which can be disassembled and used again.

media, medium: the substance(s) being conveyed through a system.

mender: a fitting or device used to join two sections of hose.

misalignment: a condition where two parts do not meet true.

NAHAD: The Association for Hose & Accessories Distribution.

necking down: a localized decrease in the cross-sectional area of a hose resulting from tension.

Neoflon®: a registered trademark of Daikin USA. •

Neoprene®: a registered trademark of DuPont.

nipple: the internal member or portion of a hose fitting.

nitrile rubber (NB/Buna-N): a family of acrylonitrile elastomers used extensively for industrial hose.

nominal: a size indicator for reference only.

nomograph: a chart used to compare hose size to flow rate to recommended velocity.

non-conductive: the inability to transfer an electrical charge.

non-interlocking ferrule: see sleeve.

nozzle end: an end of hose in which both the inside and outside diameters are reduced.

NPT/NPTF: abbreviation for national pipe threads. See fitting/coupling - Pipe Thread Fittings.

nylon: a family of polyamide materials.

OAL: see overall length

O.D.: the abbreviation for outside diameter.

OE/OEM: original equipment manufacturer.

off-center: see eccentricity.

offset-lateral, parallel: the distance that the ends of a hose assembly are displaced in relation to each other as the result of connecting two misaligned terminations in a system, or intermittent flexure required in a hose application.

oil resistance: the ability of the materials to withstand exposure to oil.

oil swell: the change in volume of a rubber article resulting from contact with oil.

operating conditions: the pressure, temperature, motion, and environment to which a hose assembly is subjected.

o-ring fitting: see fitting/coupling, O-Ring.

OS & D hose: the abbreviation for oil suction and discharge hose.

overall length (OAL): the total length of a hose assembly, which consists of the free hose length plus the length of the coupling(s).

oxidation: the reaction of oxygen on a material, usually evidenced by a change in the appearance or feel of the surface or by a change in physical properties.

ozone cracking: the surface cracks, checks or crazing caused by exposure to an atmosphere containing ozone.

ozone resistance: the ability to withstand the deteriorating effects of ozone (generally cracking).

PFA: perfluoralkoxy

penetration (weld): the percentage of wall thickness of the two parts to be joined that is fused into the weld pool in making a joint.

performance test (service test): a test in which the product is used under actual service conditions.

permanent fitting: the type of fitting which, once installed, may not be removed for re-use.

permeation: the process of migration of a substance into and through another, usually the movement of a gas into and through a hose material; the rate of permeation is specific to the substance, temperature, pressure and the material being permeated.

Pharmacopeia Class VI: a standard for sanitary fittings, designating the form, fit, function and finish.

pig: a mechanical projectile used for cleaning hose.

pin pricked: perforations through the cover of a hose to vent permeating gases.

pitch: 1) the distance from one point on a helix to the corresponding point on the next turn of the helix, measured parallel to the axis; 2) the distance between the two peaks of adjacent corrugation or convolution.

pitted tube: surface depressions on the inner tube of a hose.

plain ends: fitting ends without threads, groove, or a bevel typically used for welding, as in a flange.

plaits: an individual group of reinforcing braid wires/strands.

plating: a material, usually metal, applied to another metal by electroplating, for the purpose of reducing corrosion; typically a more noble metal such as zinc is applied to steel.

ply: an individual layer in hose construction.

pneumatic testing: the use of compressed air to test a hose or hose assembly for leakage, twisting, and/or hose change-in-length. NOTE: Use of high pressure air is extremely hazardous.

Polyflon®: a registered trademark of Daikin USA. See PTFE.

polymer: a macromolecular material formed by the chemical combination of monomers, having either the same or different chemical compositions.

preform: the compressed cylinder of PTFE resin that is used to extrude into raw tubing. Also called a billet.

pre-production inspection or test: the examination of samples from a trial run of hose to determine adherence to a given specification, for approval to produce.

pressure: force ÷ unit area. For purposes of this document, refers to PSIG (pounds per square inch gauge).

pressure drop: the measure of pressure reduction or loss over a specific length of hose.

pressure, burst: the pressure at which rupture occurs.

pressure, gauge: relative pressure between inside and outside of an assembly.

pressure, maximum allowable working: the maximum pressure at which a hose or hose assembly is designed to be used.

pressure, operating: see pressure, working.

pressure, proof test: a non-destructive pressure test applied to hose assemblies.

pressure, pulsating: a rapid change in pressure above and below the normal base pressure, usually associated with reciprocating type pumps.

pressure, rated working: see pressure, maximum allowable working.

pressure, service: see working pressure.

pressure, shock/spike: the peak value of a sudden increase of pressure in a hydraulic or pneumatic system producing a shock wave.

pressure, working: the maximum pressure to which a hose will be subjected, including the momentary surges in pressure, which can occur during service. Abbreviated as WP.

printed brand: see brand.

propane: see LPG, LP Gas.

psi: pounds per square inch.

PTFE: polytetrafluoroethylene, a high molecular weight fluoroplastic polymer with carbon atoms shielded by fluorine atoms having very strong inter atomic bonds, giving it chemical inertness.

pull off force: the force required to pull the hose from its attachment not generated by the internal pressure.

PVC: polyvinyl chloride. A low cost thermoplastic material typically used in the manufacture of industrial hoses. The operating temperature range is -500°F to +1750°F (-295.5°C to +954.4°C).

PVDF: polyvinylidene fluoride.

quality conformance inspection or test: the examination of samples from a production run of hose to determine adherence to given specifications, for acceptance of that production.

random motion: the uncontrolled motion of a metal hose, such as occurs in manual handling.

reinforcement: the strengthening members, consisting of either fabric, cord, and/or metal, of a hose. See ply.

reusable fitting/coupling: see fitting/coupling, reusable.

SAE: Society of Automotive Engineers.

safety factor: see design factor.

sampling: a process of selecting a portion of a quantity for testing or inspection, selected without regard to quality.

Santoprene®: a registered trademark of Monsanto.

scale: the oxide in a hose assembly brought about by surface conditions or welding.

serrations: bumps, barbs, corrugations, or other features that increase the holding power of the device.

service temperature: see working temperature.

shank: that portion of a fitting, which is inserted into the bore of a hose.

shelf/storage life: the period of time prior to use during which a product retains its intended performance capability.

shell: see ferrule.

shock load: a stress created by a sudden force.

short shank: shank length, approximately equal to the nominal diameter, but long enough to allow a single clamp at minimum.

simulated service test: see bench test.

sleeve: a metal cylinder, which is not physically attached to the fitting, for the purpose of forcing the hose into the serrations of the fitting.

smooth bore: a term used to describe the type of innercore in a hose.

socket: the external member or portion of a hose fitting, commonly used in describing screw-together reusable fittings.

soft end: a hose end in which the rigid reinforcement of the body, usually wire, is omitted.

specification: a document setting forth pertinent details of a product.

spiral: a method of applying reinforcement in which there is not interlacing between individual strands of the reinforcement.

spiral angle: the angle developed by the intersection of the helical strand and a line parallel to the axis of a hose. See braid angle.

splice: a method of joining two sections of hose.

splicer: a fitting or device used to join two sections of hose.

spring guard: a helically wound component applied internally or externally to a hose assembly, used for strain relief, abrasion resistance, collapse resistance.

standard: a document, or an object for physical comparison, for defining product characteristics, products, or processes, prepared by a consensus of a properly constituted group of those substantially affected and having the qualifications to prepare the standard for use.

static bonding: use of a grounded conductive material between fittings to eliminate static electrical charges.

static conductive: having the capability of furnishing a path for a flow of static electricity.

static discharge: see electrostatic discharge.

static wire: wire incorporated in a hose to conduct static electricity.

stem: see nipple.

stress corrosion: a form of corrosion in metal.

strip wound: see interlocked hose.

surge (spike): a rapid and transient rise in pressure.

swage: the method of fitting attachment that incorporates a set of die halves designed to progressively reduce the collar or ferrule diameter to the required finish dimension by mechanically forcing the fitting into the mating die.

swelling: an increase in volume or linear dimension of a specimen immersed in liquid or exposed to a vapor.

tape wrapped convoluted: a type of flexible hose incorporating layers of tape to form helical ridges and grooves.

tear resistance: the property of a rubber tube or cover of a hose to resist tearing forces.

Teflon®: a registered trademark of E.I. DuPont. See PTFE, FEP and PFA.

TFE: Polytetrafluoroethylene. See PTFE.

tig weld/GTAW: the gas tungsten arc welding process sometimes referred to a “shielded arc” or “heliarc.”

traveling loop, Class A Loop: an application wherein the radius remains constant and one end of the hose moves parallel to the other end.

traveling loop, Class B Loop: a condition wherein a hose is installed in a U-shaped configuration and the ends move perpendicular to each other so as to enlarge or decrease the width of the loop.

tube: the innermost continuous all-rubber or plastic element of a hose.

tube fitting: see fitting/coupling-Tube.

tubing: a non-reinforced, homogeneous conduit, generally of circular cross-section.

twist: (1) the turns about the axis, per unit of length, of a fiber, roving yarn, cord, etc. Twist is usually expressed as turns per inch; (2) the turn about the axis of a hose subjected to internal pressure.

unsintered: material that has not undergone primary heat processing.

vacuum resistance: the measure of a hoses ability to resist negative gauge pressure.

velocity resonance: vibration due to the buffeting of a high velocity gas or liquid flow.

vibration: amplitude motion occurring at a given frequency.

viscosity: the resistance of a material to flow.

volume change: a change in dimensions of a specimen due to exposure to a liquid or vapor.

volume swell: see swelling.

volumetric expansion: the volume increase of hose when subjected to internal pressure.

weathering: the surface deterioration of a hose cover during outdoor exposure, as shown by checking, cracking, crazing and chalking.

wire reinforced: a hose containing wires to give added strength, increased dimensional stability; crush resistance. See reinforcement.

working temperature: the temperature range of the application, may include the temperature of the fluid conveyed or the environmental conditions the assembly

is exposed to in use.

WP: the abbreviation for working pressure.

** The preceding definitions, as utilized in the hose industry, includes some definitions from The Hose Handbook, published by the Rubber Manufacturers Association.*

APPENDIX B – Pressure Conversion Chart

psi	Atms	inches H ₂ O	inches Hg	mm Hg (Torr)	mbar	Bar	Pa (N/m ²)	kPa	MPa
1	0.0681	27.71	2.036	51.715	68.95	0.0689	6895	6.895	0.0069
14.7	1	407.2	29.92	760	1013	1.013	101,325	101.3	0.1013
0.0361	0.00246	1	0.0735	1.866	2.488	0.00249	248.8	0.249	0.00025
0.4912	0.03342	13.61	1	25.4	33.86	0.0339	3386	3.386	0.00339
0.01934	0.001316	0.536	0.0394	1	1.333	0.001333	133.3	0.1333	0.000133
0.0145	0.000987	0.4012	0.0295	0.75	1	0.001	100	0.1	0.0001
14.504	0.987	401.9	29.53	750	1000	1	100,000	100	0.1
0.000145	0.00001	0.00402	0.000295	0.0075	0.01	0.00001	1	0.001	0.000001
0.14504	0.00987	401.9	0.295	7.50	10	0.01	1000	1	0.001
145.04	9.869	401.9	295.3	7500	10,000	10	1,000,000	1000	1

To use this chart:

1. Locate the column with the units you want to convert from.
2. Move DOWN that column until you locate the “1”.
3. Move HORIZONTALLY to the column with the units you want to convert to.
4. MULTIPLY the number in the box by the amount you are changing from to get the converted value.

Length

$$1 \text{ cm} = 0.3937 \text{ in} = 10 \text{ mm} = 0.01 \text{ m}$$

$$1 \text{ m} = 3.2808 \text{ ft} = 1000 \text{ mm} = 100 \text{ cm}$$

$$1 \text{ in} = 2.540 \text{ cm} = 25.40 \text{ mm}$$

$$1 \text{ ft} = 30.48 \text{ cm} = 0.3048 \text{ m}$$

Volume

$$1 \text{ L} = 0.0353 \text{ ft}^3$$

$$1 \text{ L} = 0.2642 \text{ gal}$$

$$1 \text{ L} = 61.025 \text{ in}^3$$

$$1 \text{ L} = 0.001 \text{ m}^3$$

$$1 \text{ ft}^3 = 28.3286 \text{ L}$$

$$1 \text{ Gal} = 0.1336 \text{ ft}^3$$

Pressure

1 psi = 0.0681 atm	1 psi = 68.95 mbar
1 psi = 27.71 in H ₂ O	1 psi = 0.0689 bar
1 psi = 703.8 mm H ₂ O	1 psi = 6895 Pa (n/m ²)
1 psi = 2.036 in Hg	1 psi = 6.895 kPa
1 psi = 51.715 mm Hg (torr)	1 psi = 0.0069 MPa

APPENDIX C – References

ANSI

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ASME

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E-mail: infocentral@asme.org
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ASQ

American Society for Quality
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Global Engineering Documents

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Fax: (303) 397-2740
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Internet: <http://www.ihs.com>

Government Printing Office

732 North Capitol St. NW
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ISO

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NAHAD

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