THE NOVAFLEX GROUP

Rubber Dock Hose Care, Use & Maintenance

1. Novaflex Dock Hose Testing & Inspection Program

1.1 Introduction - This instruction booklet is intended solely for the use of The Novaflex Group customers as a guide for hose Care, Use & Maintenance of Dock Hoses. This booklet is not intended for distribution to the general public. In all cases readers are instructed to follow local, state and federal guidelines, requirements and law regarding safety and environmental issues. For additional information see Novaflex's general "Hose Care Use & Maintenance" Booklet.

All customers are expected to follow all prudent safety warnings and instructions throughout the process of inspection, testing, and handling of hose products. This booklet is not intended to cause or promote the selection of a particular hose product or coupling. With respect to the operating of Dock Hose, their uses and applications, the reader should rely upon and closely follow the local plant and mandates imposed by regulatory agencies as to the capability and limitations, as well as the proper use of the product (always refer to Novaflex specific product operating information by specification number).

All tests performed on hoses involved in this instruction manual are non-destructive. Non-destructive tests are conducted on a length of hose or hose assembly and are for the purpose of eliminating hoses with defects which cannot be seen by visual examination or in order to determine certain characteristics of the hose while it is under internal pressure.

1.2 PRESSURE TEST WARNING

Before conducting any pressure test on hose, provision must be made to insure the safety of the personnel performing the test and to prevent any possible damage to property. Only trained personnel using proper tools and equipment should follow detailed procedures when conducting pressure test.

1. Personnel must wear all appropriate personal safety equipment – not limited to hard hat,eye protection, protective clothing, gloves, safety shoes, breathing equipment, etc. Air or any other compressible gas must never be used as the test media because of the explosive action of the hose should a failure occur. Such a failure could result in damage to property and serious bodily injury.
2. All air should be removed from the hose by bleeding it through an outlet valve while the hose is being filled with the test media. Novaflex will only use water as the test media.
3. Hoses to be pressure tested must be restrained by the placing of sandbags on top of the hose at each end of the hose. On long lengths of hose sandbags can be placed alongside of the hose to prevent whipping in the event of a failure.
4. The outlet end of the hose is to be backed up with piled sandbags to prevent an ejected fitting from propelling any distance.
5. Provision must be made to protect testing personnel from the forces of the pressure media if a failure occurs. All personnel should be clear of the hose testing area to prevent the effects of the pressurized water from causing bodily injury.
6. Testing personnel must never stand in front of, in back of, or on top of the hose being pressure tested.
7. When testing is in process, adequate alarms and signs should be placed in the general area to advise all nonessential personnel to avoid the test area.

2. Personnel Training Program for Novaflex Hose Coupling and Testing

2.1 Personnel Requirements - It is important in any hose-testing program that the human factor is taken into consideration. The individuals responsible for the inspection and testing of our hose products must be properly trained and competent. The minimum requirements should include:

a. Ability to read and write Basic English.
b. Possess basic math skills so that they can read and understand:
   i. Pressure gauges
   ii. Test procedures
   iii. Acceptance charts
   iv. Label and test products
   v. Measuring equipment and coupling data sheets

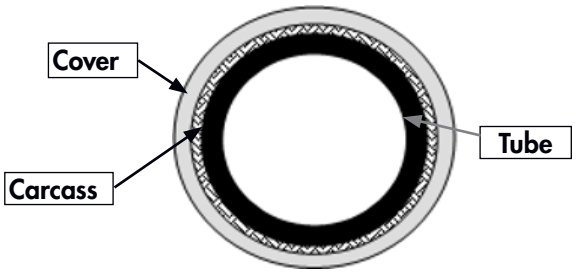
2.2 Hose Inspection - Each hose tester or dock person may be responsible for testing and inspecting hose. Rubber Dock hose is generally considered to be a heavy and robust design. These features also lend the hose to being misused and abused. It is very important that the hose exterior be physically inspected before each use. In the case of used hose, when testing inspect the assembly in its entirety both internally and externally so that it does not present a safety hazard regardless of its ability to withstand pressure. The object of this procedure is to detect any weakness in the structure of a hose assembly before a weakness might cause the failure of the hose in service. While these testing and inspection procedures may apply to any hose, this paper is specifically tailored to Rubber Dock Hose (either used or new hose). The intent is to prevent the release of the material being conveyed in a hose under pressure that could result in serious injury to personnel, property damage, or pollution to the environment. A Rubber Dock Hose is composed of 3 elements:

Elements of a Hose

Tube — its purpose is to handle the liquid, solid or gaseous material the hose is transferring. The tube is the innermost element of the hose and is intended to be resistant to the product conveyed. Always insure that the media conveyed in the hose is compatible with the hose tube. See Novaflex's Chemical resistance charts (www.novaflex.com) or contact Novaflex directly.

Reinforcement — its purpose is to withstand the working forces necessary to transfer the product conveyed by the hose tube in the application. Typically this is rated in a maximum rated working pressure (WP) in pounds per square inch (psi).

Cover — its primary purpose is to protect the tube and reinforcement from external factors such as, abrasion, weather, ozone and external abuse.



2.1 Rubber Dock Hose - The rubber Dock Hose inspection procedure consists of four main elements (some of the elements are more applicable to hose that has previously been in service).

2.1.1 External inspection (no pressure)

The external portion of the hose or its "cover" serves the primary function of protecting the reinforcement members of the hose from physical or chemical damage. The cover should be carefully examined in order to detect areas where possible reinforcement damage may have occurred.

Any cuts, abraded areas, cracks in the cover that result in exposing the reinforcement, whether it be wire or textile, must result in the hose being rejected. It must be remembered that the rubber hose covers may show signs of surface cracking due to prolonged exposure to sunlight, ozone, and/or chemicals, but this by itself does not require the hose to be removed from service unless it completely penetrates the cover down to the hose reinforcement.

If in the event a used hose has become extremely soft or has visible stress areas behind the coupling stem evident on the cover, this is cause for removal from service. Some used hoses may display bubbles* in the cover or loose spots under the cover. This phenomenon requires the hose be retired from service. In some cases a cover blister (separation of the cover from the underling carcass) may be discovered. In this case if the hose is in service, carefully slice (personal safety equipment must be worn) this area to see if any of the product conveyed is under the blister. If oil or the chemical conveyed material is found the hose must be pulled from service. If air is found in the blister, the hose can be used to finish the loading process and then removed from service. If a hose is kinked (kink is where the hose is dented greater than 20% of it diameter) or mashed flat, this hose must be removed from service. If a hose has a kink less than 20% of it diameter the hose can be used to finished the load process and then removed from service.

2.1.2 Internal Inspection

This inspection mainly applies to used product but should be performed on all hoses during the coupling process. The internal inspection must be performed through the use of back lighting or a flashlight shown down through the tube. It recommended too apply a 20HG vacuum to the hose and observe the hose Id through a clear Plexiglas plate. Observe as much of the inside diameter of the hose as possible. Where this is not practical because of extremely long lengths, the end of the hose inspected must be considered representative of the entire length. (This would not be the case if there is evidenced and/or loose covers on the outside of the hose previously noted during the external inspection. In this case, cut out loose spots and check the hose tube again in this area.)

Cause for rejection of hose during the internal inspection is usually a result of the tube being subjected to product it was not designed to handle. The following phenomena if observed must result in the entire hose length being retired from service.

- Loose tube – looking in from coupling

- Cracks in the tube
- Soft or gummy texture of the tube
- Blisters in the tube

- Tube scared or worn excessively

2.1.3 Coupling Inspection

Each style of fitting must be inspected based upon its own merits and requirements. This process involves the wiping of the inside of the coupling and the outside of the coupling with a rag prior to inspecting.* If the following phenomena if observed requires that the fitting be rejected and removed from the hose and serviced.

a. Any worn parts that prevent the fitting from performing its designed function.
b. Damage to any safety devices, which result in them not working correctly.
c. Threads worn or damaged
d. Excessive corrosion or rust
e. Any cracks observed in any part of the fitting
f. Flange face damage – scratched or nicked

Used hose must be inspected closely in the area just behind the fitting to make sure there is no evidence of stress on the hose was caused by pulling and/or hanging of the hose against the coupling shank. If this is observed the hose must be removed from service.

Kink in Hose at end of coupling

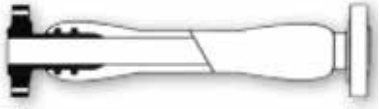
All couplings must be inspected for evidence of coupling movement. If movement has taken place there will be marks or scuffed areas just behind the coupling ferrule. If this is observed, the hose must be removed from service.

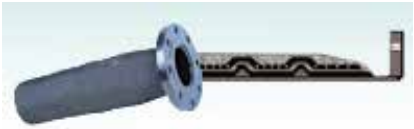
2.1.4 Method of Attachment

Different couplings are attached in different manners. Dock hose generally utilizes a crimped/ swage type or a built in nipple. It is important that the dock hose staff be familiar with the main types of attachments as mentioned earlier in the program. The type of attachment refers to the method with which the coupling is attached to the hose. Novaflex recommends the use of floating flanges to eliminate hose torque.

Crimped on / Swage Type Hose Coupling

Built in Nipple Type





Once the hose assembly has passed this inspection procedure, it must then be hydrostatically pressure tested in accordance with local, state & federal requirements.

2.2 HYDROSTATIC TEST PROCEDURES

To obtain maximum efficiency and safety in using hose, hose couplings and other fittings must be of the proper type and be installed in a manner recommended by the manufacturer. Based on the specific type hose & Coupling involved used the appropriate testing criteria per NAHAD, USCG, BS-EN, ISO and others.

- Connect test pump to water source.
- Connect manifold to test pump (if required).
- Layout straight the lengths of hose to be tested. Dock hose should be tested on hose dollies so that the hose can move freely during the test. NOTE: These hoses should have been previously inspected per prior instructions.
- Attach hose to the manifold.
- Install hose blind test flanges with new gaskets complete with valves on the ends. NOTE: one end of hose should be elevated to allow any trapped air to escape. Tighten all connections.
- Begin to fill hose with water. Be sure ball valve is open to allow trapped air to escape.
- After all air is bled off, close outlet and allow test pump to build pressure Hose working pressure shown on hose label or to levels outlined by USCG/NAHAD procedures.
- While at working pressure (never higher than working pressure), examine each length for leaks (especially near the couplings). Also inspect for any noticeable bulging or swollen areas along the hose. Finally, inspect for any coupling movement.
- Any hose that leaks or shows signs of wear, bulging or swollen areas should be removed from service.
- Raise pressure in the hose to 1.5 timed the rated working pressure. Test time is also in accordance with USCG/NAHAD, or local, state or federal requirements. Test should never be shorter than 10 minutes. Look for any leaking or other pressure related issues.
- During the test, all ends should be secured and protected should a coupling be ejected.
- Upon completion, turn off test pump release the pressure.
- Open valve and drain water.
- All used couplings, if required, should be buffed, oiled, and all gaskets replaced.

2.3 Proper records should be kept showing the date of the test. The Hose length should be appropriately tagged with the test date and all pertinent data

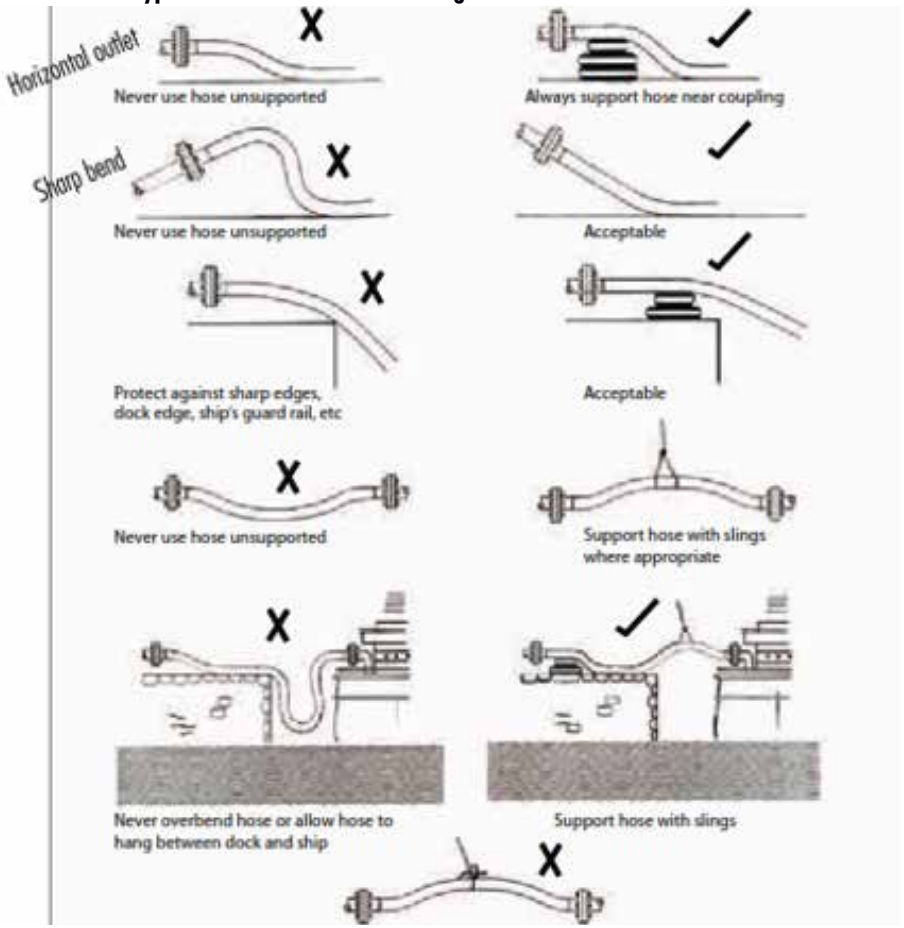
2.4 If elongation testing is required, follow the NAHAD guidelines for this requirement.

Once all the inspections and testing have been completed a Dock Hose can be placed into service. This testing should be repeated at least every 6 months. Remember, each hose should be visually inspected before each use for external damage.

3. **Dock Hose Handling –** This section is a guide line presented to assist in the customer in obtaining maximum service life. Every installation has different requirements and different equipment to handle Dock Hose. Below are basic suggestions to facilitate hose handling.

Each Rubber Dock hose should be only be used to transfer the media listed in the Novaflex Chemical Resistance Charts and at the pressures and temperatures listed on the hose label (if a chemical is not found contact Novaflex or check www.novaflex.com. In the effort to maximize safe hose life, and in line with OCIMF guidance, Novaflex takes a conservative approach to velocity in composite hose, and recommend that the maximum velocity not exceed 40 ft./sec with a fluid viscosity of 400 cSt (400 mm^2/s). This flow velocity should be further reduced where a known accumulator liquid is transferred.

a. Typical correct & incorrect handling situations



b. Novaflex recommends the use is lifting slings (min. 12" wide), lifting buns and cradles designed to reduce stress on the hoses.






i. Hose slings – woven strapping that included a center portion with a wide support area.

ii buns that are excellent for listing and provides superior support to the hose.
iii. Hose dollies – for moving the hoses on a hard surface
iv. Supporting cradles – custom devices/supports made for a specific application.

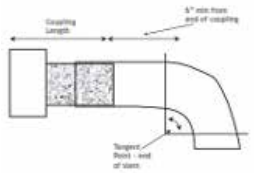
Hose Cradle

Modern Hose Tower

Hose Tower

c. All of the above devices should be installed so that the hose is installed at 1.5 times (or greater) the min. bend diameter to provide maximum service life. Never bent the hose tighter than the minimum bend radius. The handling devices should be designed to accommodate a variety of hose sizes where possible. There are many styles of Dock Hose based on specific design requirements due to regulatory requirements, these hoses have different ends, weights and range in outside diameters.

d. Dock hose can be installed in a variety of positions. It is important to support all dock hose as shown in para. 3 a. When other installations are required it is important to insure that the end of the hose is supported so that the bend is moved away from the tangent point starting at the point where the ridged steel part of the coupling meets the rubber hose.



4. The lifting clamps / slings need to be installed in a consistent manor to eliminate the inducement of a bending force at the back of the coupling. In the case shown, the added weight of the valve, blind flange and the other parts imparts a heavy bend force directly at the point where the steel nipple ends

On a <u>built in hose nipple</u> - The lifting clamp should be no further than 20" behind the hose flange
On a <u>crimped on coupling</u> - The lifting clamp should be no further than 4" behind the coupling ferrule.

when the hose is lifted. This downward flex force puts a stress on the outside radius of the hose and can cause damage (depending on hose ID this can be as heavy as 300 to 500 pounds).

5. The Use of a modern hose tower or the use of a Marine Loading Arm can greatly eliminate or totally eliminate all hazards involved with dock hose.

Modern Hose Tower

Single Hose Loading Arm

Marine Loading Arm

ADVICE

Cleaning & subsequent storage of composite hoses

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As part of your site line clearing procedures, on completion of a transfer operation, hoses should be cleared of all product. If possible, the transfer hose should be elevated to ensure it is completely drained before disconnection.

Once disconnected from the application, end fittings should be blanked securely prior to transporting for cleaning.

Hoses on ships and barges can been cleaned while connected to the manifold in compliance with MARPOL regulations.

Cleaning

Always refer to your own site procedures to establish suitable cleaning methods. If in doubt, consult with your site chemical engineer for specific advice.

Flushing the hose with fresh water at ambient temperature is often adequate when hoses are used to transfer many chemicals.

If the cleaning process requires the use of additional chemicals, ensure such chemicals & temperature of the cleaning solution are compatible with the hose materials of construction.

If flushing / cleaning at elevated temperatures, do not to exceed the maximum working temperature of the hose, & reduce the cleaning cycle time to the minimum required to produce satisfactory results.

Cleaning using open ended steam processes can be undertaken (in the fully disconnected condition), but such cleaning cycles should be limited to a maximum of 15 minutes. Care should be taken not to exceed the working temperature of the hose, nor expose the hose lining to excessive localized heat.

Always ensure used cleaning media is disposed of according to site & local regulations.

Warning

Pigging & use of steam lances should never be considered.

High pressure cleaning wands / lances are not to be used.

Hoses must always be cleaned before pressure testing.

After cleaning & storage

After flushing / cleaning, hoses should be well drained and blanked.

Hoses should be stored so as to protect from external damage.

Hoses should never be stacked, & care taken to ensure end fittings do not damage adjacent hoses.

Where possible, hoses should be protected from potentially adverse environmental impact such as direct sunlight, & should never be stored in standing water.

This document is offered in good faith & without prejudice to provide basic advice on cleaning of Novaflex composite hoses. It should be used in conjunction with Novaflex handling & care guidance, as well as our standard terms & conditions. These documents can be found on https://www.novaflexgroup.com. No reference to specific application circumstances is intended when referencing this guidance, & Novaflex cannot be held responsible for any omissions. Any & all cleaning actions should always follow your site, local, & national regulatory standards.

Custom Hose for Industry

NovaFlex® is proud to be one of the largest **Custom Hose** manufacturing companies in North America and Europe.

The NovaFlex Group® is a privately held company committed to continuous advancement in hose and connector solutions. NovaFlex® has one of the broadest product ranges available in the hose and ducting marketplace, as well as in the HVAC, Industrial Venting and Hose Industries and in Commercial Exhaust Venting Systems.

Design Capabilities

Based on the specifications of the application, NovaFlex® is able to design virtually any required feature into a product.

With close client consultation, the process begins with knowledgeable field staff evaluating the application, followed by hose designers and experienced hose craftsman developing and manufacturing an appropriate hose. With this process, custom solutions for every material transfer requirement can be provided.

Typical Industries Served

Chemical Plants
Concrete Production
Dock (ship & barge operations)
Dredging Operations
Mining
Petroleum Processing
Power Plants
Sand & Gravel Operations
Smelting Facilities
Steel Mills

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