Rubber Dock Hose Care, Use & Maintenance

Prepared by:
Thomas J. Wise
VP Corporate Development

Contents

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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 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 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 hardhat, eye protection, protective clothing, gloves, safety shoes, breathing equipment, etc.
2. 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.
3. 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.
4. 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.
5. The outlet end of the hose is to be backed up with piled sandbags to prevent an ejected fitting from propelling any distance.
6. 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.
7. Testing personnel must never stand in front of, behind, or on top of the hose being pressure tested.
8. 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

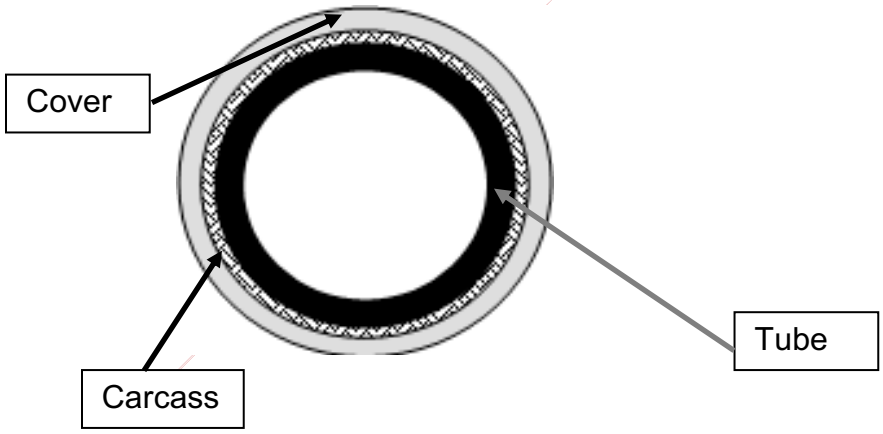
2.2 Hose Inspection - Each hose tester or dock person may be responsible for testing and inspecting hose. Rubber Dock hose is generally considered to be a heavy and robust design. These features also lend the hose to being misused and abused. It is very important that the hose exterior be physically 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).

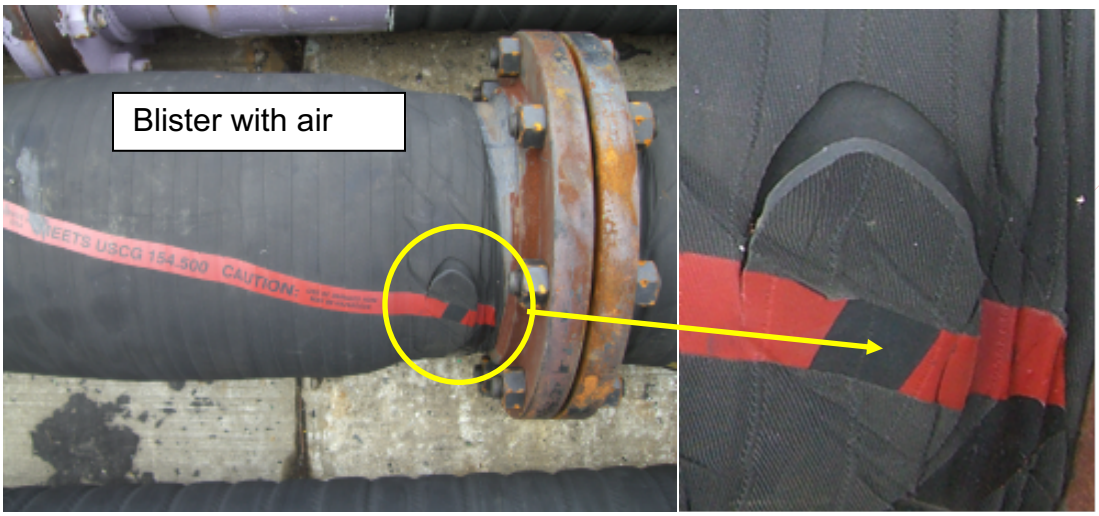
2.1.1 External inspection (no pressure)

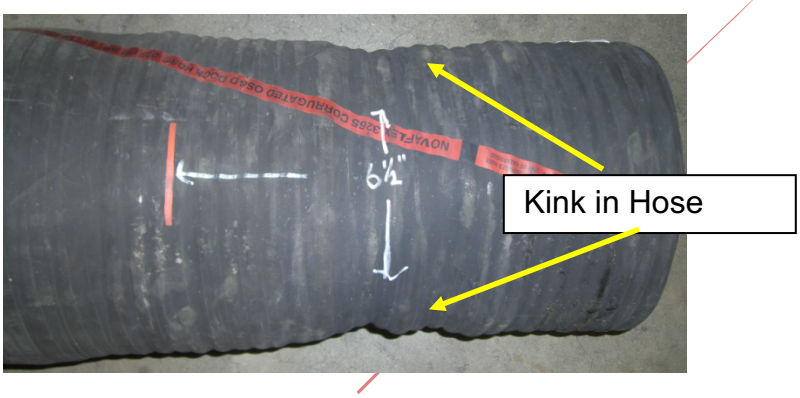
The external portion of the hose or its "cover" serves the primary function of protecting the reinforcement members of the hose from physical or chemical damage. The cover should be carefully examined in order to detect areas where possible reinforcement damage may have occurred.

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 were 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
g. Check the end of the coupling ferrule where it meets the hose. Look for evidence of hose slippage.

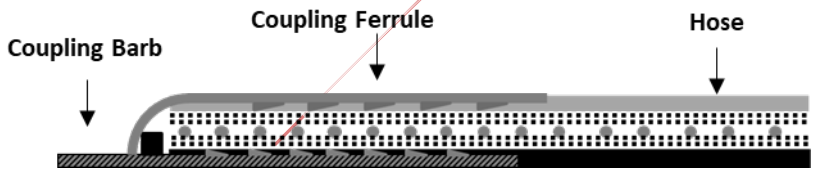
Used hose must be inspected closely in the area just behind the fitting to make sure there is no evidence of stress on the hose was caused by pulling and/or hanging of the hose against the coupling shank. If this is observed the hose must be removed from service.

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.

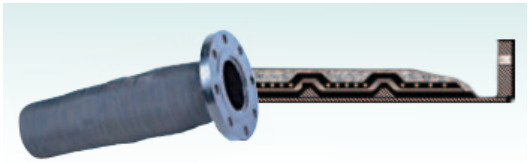
2.1.4 Method of Attachment

Different couplings are attached in different manners. Dock hose generally utilizes a crimped type or a built in nipple. Crimped on couplings have become the over whelming common attachment method. 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 Type Hose Coupling (crimp type couplings are attached using large crimping machines that exert thousands of pounds of pressure to compress the outer ferrule so it has been embedded into the hose carcass permentally.)



Built in Nipple Type (this type of attachment method has been in use for over 100 years. The coupling is individually hand built in to the hose end.)



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 **Pressure testing with any compressed gas will damage the dock hose tube**. This method of testing will promote tube blistering resulting in the tube possibly coming out of the hose. The tube is impervious to liquid petroleum product but is susceptible to permeation of small gas molecules. (These gas molecules form small pockets in the rubber and over repeated gas testing and elevated temperatures these bubbles become enlarged).

2.4 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

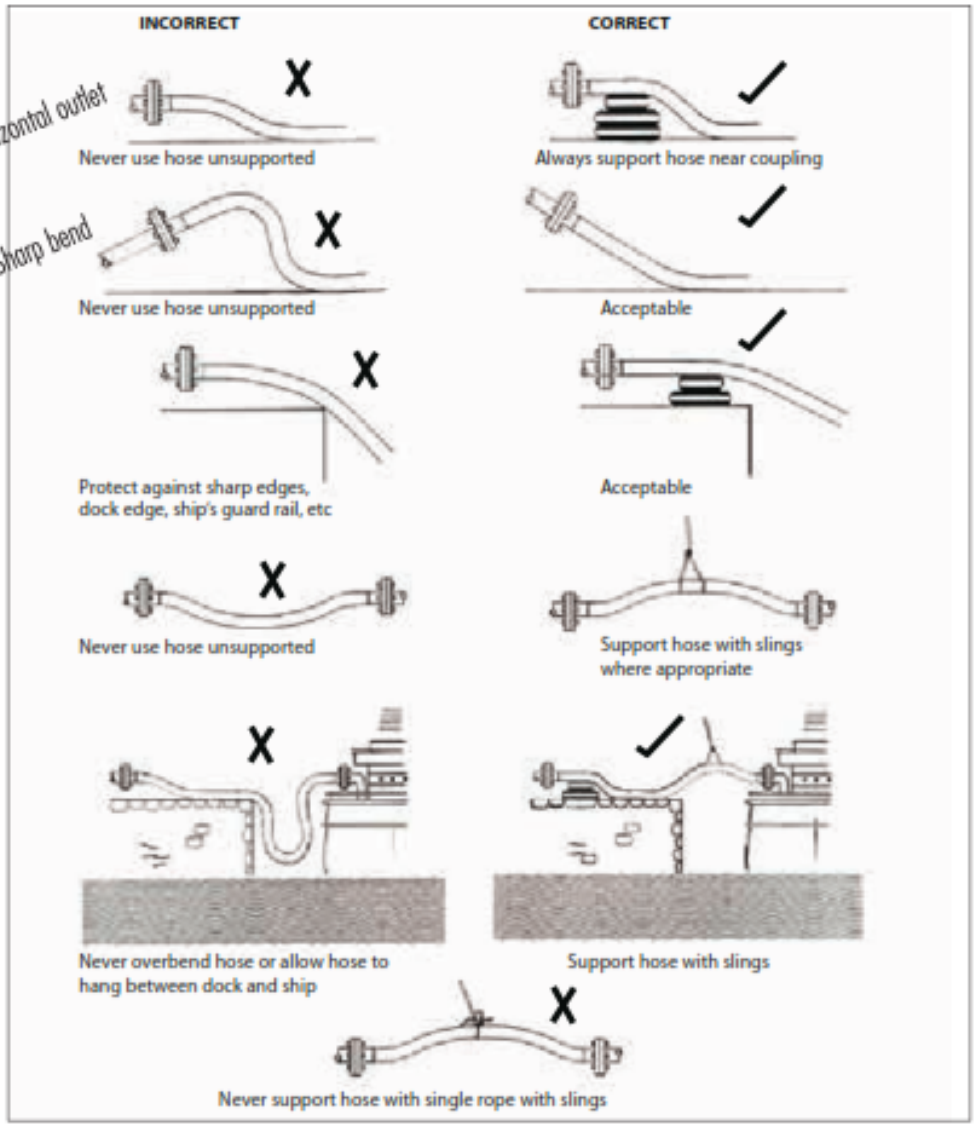
2.5 If elongation testing is required, follow the NAHAD guidelines for this requirement.

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.

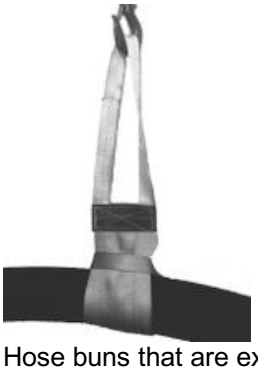
3. **Dock Hose Handling** – This section is a guideline presented to assist in the customer in obtaining maximum service life. Every installation has different requirements and different equipment to handle Dock Hose. Below are basic suggestions to facilitate hose handling.

   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 mm²/s). This flow velocity should be further reduced where a known accumulator liquid is transferred.

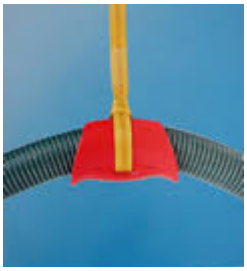
   a. **Typical correct & incorrect handling situations**



   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.



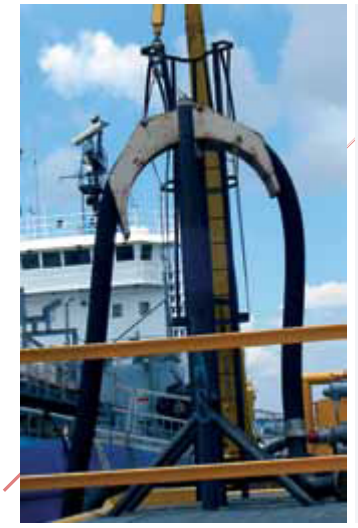
ii. Hose buns that are excellent for listing and provides superior support to the hose.

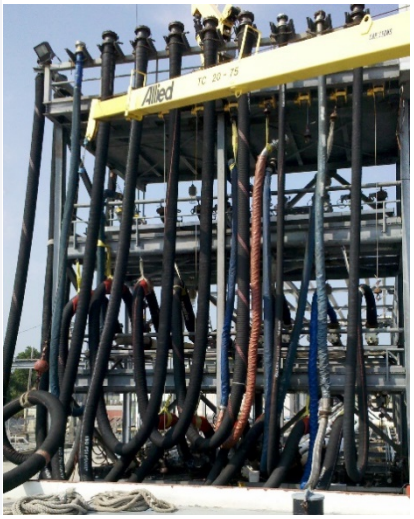




iii. Hose dollies – for moving the hoses on a hard surface

iv. Supporting cradles – custom devices/supports made for a specific application.

Hose Cradle | Modern Hose Tower | Hose Tower

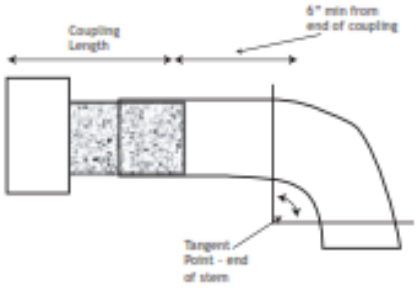




c. All of the above devices should be installed so that the hose is installed at 1.5 times (or greater) the min. bend diameter to provide maximum service life. Never bent the hose tighter than the minimum bend radius. The handling devices should be designed to accommodate a variety of hose sizes where 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.

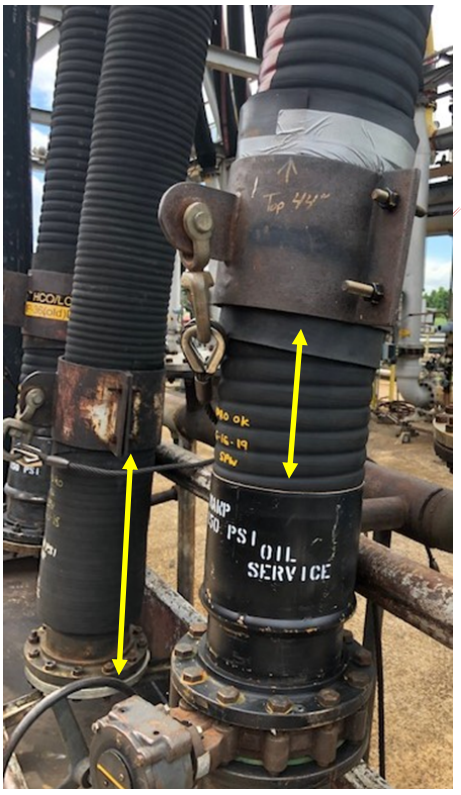
d. Dock hose can be installed in a variety of positions. It is important to support all dock hose as shown in para. 3 a. When other installations are required it is important to insure that the end of the hose is

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. Some Dock hose applications transfer products with higher temperatures, such as Asphalt Hose and Hot Sulfur Hose or other. These temperatures will shorten hose service life when compared to normal dock hose applications. Temperature is a natural enemy of rubber, it causes rubber to stiffen and harden. When a hose operates above 200°F, (92°C) the life of the hose is affected adversely by the amount of time hose is used in the elevated temperature. It is impossible for Novaflex to project service life of this type product. After 6 months in service, it is incumbent on the user to inspect and test the hose before each use to ensure its continued safe operation or retire it should it fail inspection.

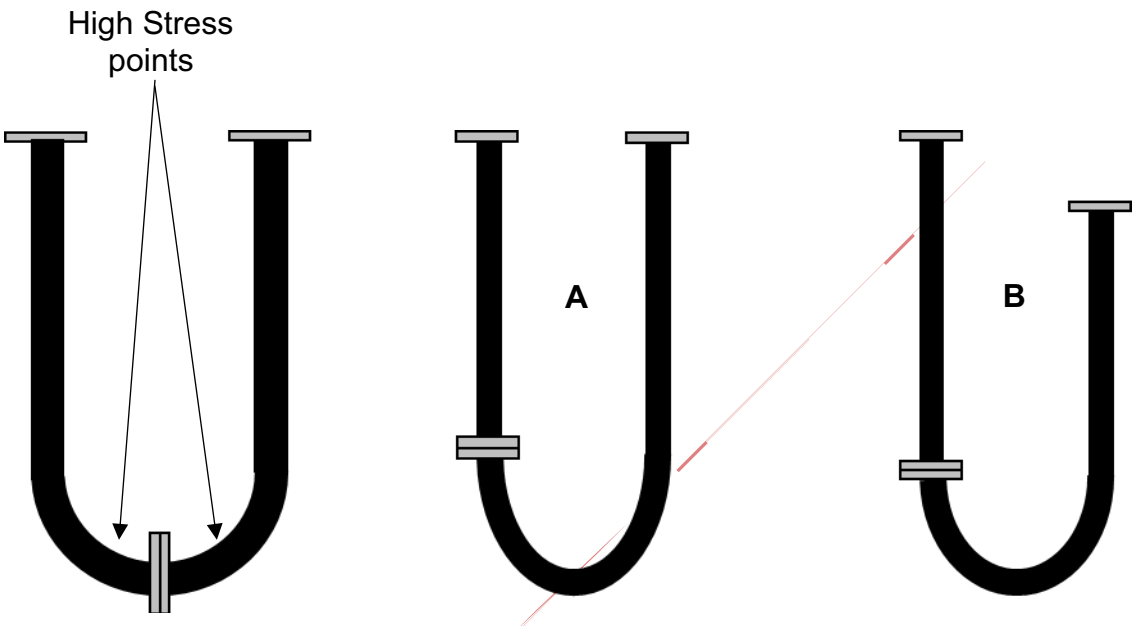
5. The lifting clamps / slings need to be installed in a consistent manor to eliminate the inducement of a bending force at the back of the coupling. In the case shown, the added weight of the valve, blind flange and the other parts imparts a heavy bend force directly at the point where the steel nipple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



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.

6. It should be noted; that when a hose is hung vertically, care should be taken to make sure that the hose length is limited so that there is not excessive weight being supported by one hose end. Long length hoses should be hung in a U shape so that each hose end is supporting the hose weight in an equal fashion. Hoses should be purged of fluid when being stored to reduce weight. When multiple length hoses are stored in a U position, the lengths should be managed so that the couplings of connected hoses are positioned so they are not in the bottom of the U.



Incorrect – places stress on the hose due to the steel nipples not being able to flex. Ridged couplings can be as long as 3' each (6' of steel when combined in the middle of the bend)

Correct – permits the hose to easily flex and the weight is supported by both ends.
A – Hoses of 2 different lengths to keep couplings out of bend
B – Using 2 hoses of same length but hanging one higher so that the coupling is out of the bend.

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

Modern Hose Tower

Single Hose Loading Arm

Marine Loading Arm