



**Industrial Hose
Correct Hose Use
Care & Maintenance**

**Corporate Headquarters
4805 Bowling St SW
Cedar Rapids, IA 52404
ph: 800.553.5455
fax: 319.365-2522**

www.apache-inc.com



Table of Contents

	Page No.
Introduction.....	3
STAMPED.....	4
Elements of a Hose.....	5
Operator Requirements for a Safe Hose Assembly.....	5-6
Instructions for Visual Inspection of Hose & Coupled Assemblies.....	7-8
General Instructions for Hose Hydrostatic Testing and Inspection.....	9
General Instructions for Proper Hose Storage.....	10
Do's and Don'ts of Hose Care and Use.....	11-12
Correct Assembly Installation.....	13
Cleaning Tips for Apache Hose.....	14
Elements of a "Hose Safety Program".....	15
Composite Hose Information.....	16

Apache Inc. has implemented a quality policy to supply to our customers the correct hose or hose assembly for the application.

Nothing in this booklet is intended to create any warranties, express or implied. No warranties, express or implied, have been created by any statement or language contained in this booklet. Any warranties, including but not limited to any implied warranty of merchantability or implied warranty of fitness for a particular purpose that may have arisen by operation of law or otherwise are hereby disclaimed and are null and void.

Consistent with this policy Apache has prepared this technical booklet to assist our customers and users of Apache hose assemblies with information directed toward maximum safe hose assembly life and user safety.

This booklet also addresses Apache's "Duty to Warn" responsibility regarding misuse of these products.

The information contained in this booklet is intended to be a guide. It is the responsibility of the user to apply this information in the appropriate manner to insure safe operating procedures.



Introduction

General Instructions for Hose Use,
Care and Maintenance

This technical booklet is intended solely for the use of Apache's customers as a guide for the use, care and maintenance of Apache's hose and hose assemblies.

Apache customers have requested information pertaining to the use, care and maintenance of Apache's assemblies. As a result Apache has developed this technical booklet to improve users' understanding. This information should be made available to all of the customers' representatives who use Apache's hose assemblies.

Hoses are designed to convey products and to operate in a dynamic work environment. This operation can present a serious safety hazard if safe operating procedures are not followed! **ALL HOSES WILL FAIL IN TIME!**

This booklet is designed to supplement safe operating procedures, not replace them. All hose and couplings are designed for specific uses and it is critical for the user to understand how and what is important for the safe and correct use of a hose assembly. Users of industrial rubber hose should have in place, a preventative maintenance program designed to identify potential problems before failures occur.

It is always necessary to know the data presented in this booklet concerning the intended service and application of any particular hose before you use or request a hose.

Every industrial hose user should have in place a safety procedure to implement in the event of a hose failure (see page 15).

Should you have any questions on any topic covered in this booklet, please contact Apache at: 1-800-553-5455.

STAMPED

'S' Size	The hose inside diameter (I.D.) and length required to meet the applications requirements (i.e. 3" x 10').
'T' Temperature	Maximum & minimum temperature of the product conveyed through the hose assembly (i.e. 200°F).
'A' Application	Describe the actual use of the hose (i.e. Ship to Shore unloading, LPG transfer, in plant chemical use, etc.).
'M' Material Conveyed	Air, water, the specific chemical, product or material conveyed (i.e. compressed air).
'P' Pressure	The pressure or vacuum at which the material is being conveyed through the hose assembly (i.e. 100 psi).
'E' Ends	Type of end connections required to attach the Apache hose to the mating connection (i.e. NPT male, Cam & Groove, Acme swivel etc).
'D' Delivery	Date the product is required (i.e. June 6, 2003).

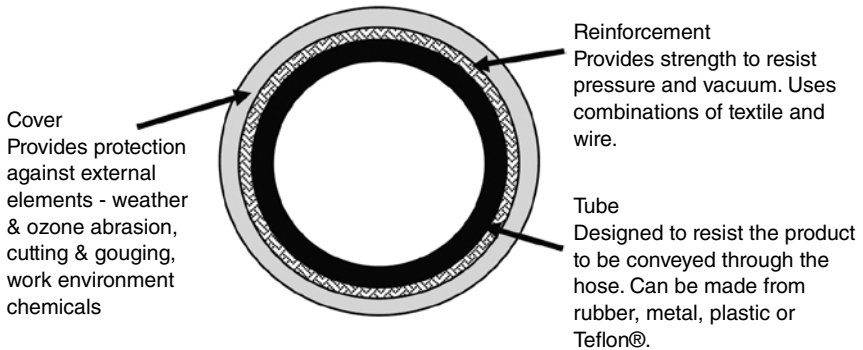
All customers are responsible for supplying Apache Inc. with correct information regarding size, temperature, application, material conveyed, pressure, ends and delivery as set forth above. Customers are also responsible for advising Apache Inc. of any changes in that information which arise for whatever reason in their process, equipment or any changes in the specifications for the size, temperature, application, material conveyed, pressure, ends or delivery dates.

Once the information in the acronym "STAMPED" referenced above is obtained, it is essential that a hose and coupling combination meet all of the "STAMPED" requirements as recommended by the manufactures.

"Always use the printed information from the manufactures to insure accuracy of any recommendation." Do not exceed the printed, recommended service criteria. It is the ultimate objective to obtain maximum safe service life for a product; to accomplish this Apache recommends the user maintain specific care during the use of the hose assembly to insure continued safe operations.

Elements of a Hose

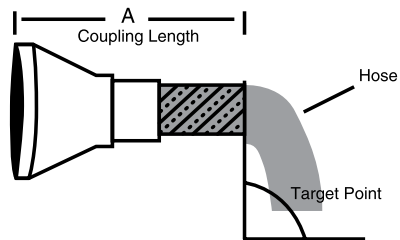
Tube	Its purpose is to handle the liquid, solid or gaseous material the hose is transferring. The tube is the innermost element of the hose and is intended to be resistant to the product conveyed.
Reinforcement	Its purpose is to withstand the working forces necessary to transfer the product conveyed by the hose tube in the application. Typically this is rated in a maximum 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.



Operator requirements for a safe hose assembly

1. Working Pressure (WP) should never be exceeded. Never leave liquids or gasses trapped in a hose with each end sealed or valves closed. Thermal expansion of some products may cause pressures to exceed working pressure.
2. Always rate the Working Pressure of the coupled hose assembly by the lowest rated element (hose WP or coupling WP which ever is lowest). Try to identify all Critical Applications-those hazardous applications such as: high pressure (over 50 psi), petroleum products, chemicals or high heat (over 120°F).
3. Only use the hose assembly for the service marked on the hose or for the service recommended in the printed literature.
4. Have a **HOSE INSPECTION & TEST PLAN** to insure unsafe hoses and/or worn or damaged couplings are removed from service.
5. Test all hose assemblies as required every six (6) months (or sooner) to insure the assembly is safe for continued use. (Use NAHAD, RMA, ASTM, OSHA, NFPA, LPGA or other regulatory agency recommendations for pressure testing along with these guidelines.)

6. Educate your Hose Handlers/Users as to the conditions associated with unsafe hose; the operator is the last line of defense against spills and injuries. Teach your employees that **“When in doubt, Remove the Hose From Service!”** **Maintain a HOSE Inspection & Test Plan that requires a visual inspection prior to each hose use with pressure test** (see Para. #5).
7. Always use appropriate Chemical Resistance Charts to verify that the chemical or product conveyed is compatible with the hose tube and alloy of the coupling. “Remember, the temperature and concentration of the chemical/product conveyed must not exceed the manufacturer’s recommendations.” It is recommended to always flush chemicals from hose after each use. Different chemical concentrations may cause damage to couplings or to hose. In some situations a hose assembly may be recommended for high (90%) concentrations but low concentrations (30%) may cause damage. After chemical use, cap the hose - prevent atmosphere & moisture from entering the hose.
8. Always use a coupling made from material suitable for the application and product conveyed. (Refer to alloy chart).
9. Before each use always check the coupling for slippage. Look for misalignment, exposed cover from under the ferrule. If there are questions contact Apache 1-800-553-5455.
10. In many cases the loading & unloading of Tank Truck Trailers develops hose pulsations as a result of the pumps used in these applications. This pulsation can cause the hose cover to wear very quickly. It is important to train the trailer operators to take care when using hose so that cutting, gouging and kinking can be avoided. In some cases a scuff-guard is added to the hose to protect the cover from abrasion. This extra guard will wear over time. Operators can add extra life to hose by simply rotating the hose so that cover wear is uniform. Should the scuff-guard be worn excessively, the operator should advise management to replace the scuff-guard. Hose life can be safely extended through this simple maintenance procedure (some users have improvised and placed mats or other protection under hoses in this type application to reduce cover wear).
11. When measuring a hose for specific installation, it is important to remember that the tangent point for hose bending is at the end of the hose nipple portion inside the hose. It is recommended to add a minimum of 6" to dimension 'A' shown. Always keep the bend radius of the hose within the recommended dimensions published for the specific hose.
12. If there is the potential of a pull-away, buttressing of the piping system is a must. This will prevent piping fracture and make the hose the weakest link, causing it to separate. It is recommended to use a break-away device along with dry-brake couplings for those applications with hazardous chemicals that may cause human injury or environmental damage.



General Instructions for Visual Inspection of NAHAD 500 (2005) Hose Assemblies

Information obtained from RMA Hose Handbook IP-2 [1987] & National Propane Gas Association Flyer #114-91 & #134-81)

All hose should be externally inspected prior to each use and thoroughly inspected every six (6) months or sooner. All hose should be hydrostatically tested to 1.5 times working pressure (or to appropriate industry standards) every six (6) months to verify the hose assembly's integrity. Hose, prior to inspection, must be depressurized and laid out straight for inspection. Coupling selection should be made with the intent of providing the maximum level of safety with the best performance capability possible.

INSPECT DAILY FOR:

1. Look for cuts, gouges, or worn spots in the hose cover that expose textile or wire reinforcement.
2. Inspect for soft spots, bulges or blisters in cover, sections of mashed flat hose or kinked areas.
3. Carefully examine a length of the hose (18" in length adjacent to where the coupling is attached) for any damage such as kinks, soft spots, cover cracks, or permanent deformation of the hose from its original form.
4. Check couplings for any slippage which is evidenced by misalignment of the coupling or scored/exposed areas on the hose cover next to the coupling which indicates movement of the coupling.
5. Check couplings for worn threads, loose clamps or bands, worn gaskets, worn or broken handles, cam-arms and pins.

CORRECTIVE ACTION:

- Remove hose from service. Contact Apache for repair instructions
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- Remove hose from service. Remove suspect couplings from the hose and replace with new coupling.

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|--|--|
| 7. Inspect for hose cover blisters or loose outer cover. This may indicate conveyed product is passing through the carcass of the hose. | Remove hose from service. Contact Apache for repair instructions |
| 8. Before each use look down the inside of the hose couplings for damage or blockages. | If broken parts or blockages are found, remove from service. |
| 9. Inspect couplings for any worn parts that may prevent normal function, damage to any safety device that prevents them from working, worn threads, excessive corrosion or rust, or cracks in any part of the coupling. | Remove hose from service. If possible, remove suspect couplings from the hose and replace with new coupling. |
| 10. Look for changes in cover color. This may indicate chemical attack. | Remove hose from service. Contact Apache for repair instructions. |

General Instructions for Hose Hydrostatic Testing and Inspection

(Information obtained from RMA Hose handbook IP-2 [1987] NAHAD 500 (2005))

An inspection and hydrostatic test should be made at periodic intervals (at least once a year) to determine if a hose is suitable for continued service.

A visual inspection of hose as described previously should be made for loose cover, kinks, bulges, soft spots which might indicate broken or displaced reinforcement. The couplings (or fittings) should be closely examined and, if there is any sign of movement of the hose from the couplings, the hose must be removed from service.

The periodic inspection should include a hydrostatic test for one minute at 150% of the recommended working pressure of the hose. During the hydrostatic test, the hose should be straight, not coiled or in a kinked position. Water is the usual test medium and following the test the hose may be flushed with alcohol (if the hose is resistant to alcohol) to remove the traces of water.

Safety Warning

Before conducting any pressure tests on hose, provisions must be taken to ensure the safety of personnel performing the test and to prevent any possible damage to property. Only trained personnel using proper tools and procedures should conduct any pressure test. Hydro test the hose after it has been completely inspected as described.

1. Air or other compressed gases should not be used for pressure testing.
2. All air should be removed from the hose prior to testing by bleeding it through an outlet valve attached to one end of the hose.
3. Hose to be pressure tested should be restrained by placing steel rods or strap close to each end and at approximate 10 foot intervals along its length to keep the hose from "whipping" if failure occurs. The steel rods or straps are to be firmly anchored to the test structure in such a manner that they do not restrict the movement of the hose under pressure.
4. The outlet ends of the hose should be placed so that an ejected fitting will be restrained by a wall, sand bags, etc.
5. Provision must be made to protect personnel from the forces of the pressure media if a failure occurs.
6. Testing personnel must never stand over, in front of, or in back of the ends of a hose being pressure tested.
7. Inspect the hose tube for hardness, color change, cracks, blisters, erosion, etc.

General Instructions for Proper Hose Storage

(Information obtained from RMA Hose Handbook IP-2[1987])

Hose products in storage can be affected adversely by temperatures, humidity, ozone, sunlight, oils, solvents, corrosive liquids and fumes, insects, rodents and radioactive materials.

The appropriate method for storing hose depends to a great extent on its size (diameter and length), the quantity to be stored and the way in which it is packaged. Hose should ***not be piled or stacked to such an extent that the weight of the stack creates distortions on the hose lengths stored at the bottom (plastic hoses are very susceptible to this on hot days)***. Since hose products vary considerably in size, weight and length, it is not practical to establish definite recommendations on this point. Hose having a very light wall will not support as much load as a hose having a heavier wall or hose having a wire reinforcement. Hose shipped in coils or bales should be stored so that the coils are in a horizontal plane.

Whenever feasible, hose products should be stored in their original shipping containers, especially when such containers are wooden crates or cardboard cartons which provide some protection against the deteriorating effects of oil, solvents and corrosive liquids; shipping containers also afford some protection against sunlight and ozone.

Certain rodents and insects will damage hose, protection from these elements should be provided.

The ideal temperature for storage of hose products ranges from 50°-75°F(10-24°C) with a maximum of 100° (38°C). If stored below 32°F (0°C) some products will become stiff and will require warming before bending or being put in service. Hose product should not be stored near sources of heat, such as radiators, heaters etc. Nor should they be stored under conditions of high or low humidity.

To avoid the effect of ozone, hose should not be stored near electrical equipment that may generate ozone. Direct or reflected sunlight even through windows should be avoided. Florescent or mercury lamps may create light waves harmful to hose. Protection from such lighting should be provided.

Items should always be stored on a first in first out basis, even under the best of conditions, unusually long shelf life could deteriorate plastic or rubber hose.

Do's and Don'ts of Hose Care and Use

Hose is a very vulnerable link in most process and transfer applications. **All hoses will fail in time!** It handles valuable and potentially dangerous materials, and hose failures can be expensive in terms of lost product, ruined equipment, spill clean up, and – most important, personal injuries.

For this reason, hose is carefully designed and built to do a specific job safely and economically. Yet, unfortunately, the years of research and development invested in hose construction can be canceled by improper storage, misuse, and other abuse by the hose user, warehousemen, and other work personnel.

Apache recommends careful observation of the following points to improve service, safety and economy from the hose you use.

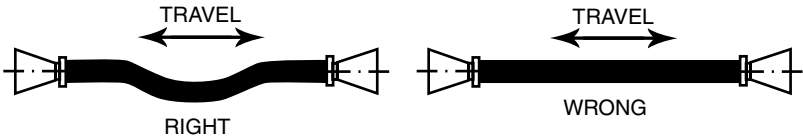
- Do** – Use hose designed and recommended for the service intended. Contact Apache and our staff will assist you in the selection of the best hose product for your requirements.
- Do** – Make sure hose is easily identifiable as to the type and use. Where dangerous misuse can occur, use different fittings or end connections.
- Do** – Make sure your Apache hose is the correct length for the job intended. Remember to engineer for a possible -4% contraction to +5% elongation at max working pressure on the hose assembly.
- Do** – Set up regular hose inspections before each use so that damaged or worn hose assemblies can be replaced.
- Do** – Attach hose using proper elbows and nipples, so that its operation (including its own weight and heavy end connections) will not cause it to bend sharply at the coupling. Support hose ends with heavy couplings attached.
- Do** – Avoid subjecting hose to damage by vehicles, falling rocks, or other objects. It is easy to install protective covers on hose.
- Do** – Check manufacturer's chemical resistant charts to insure the hose will transfer the chemical **before** it is put in the hose.
- Do** – Store hose in a cool, dry, dark and clean place.
- Do** – **Always wear safety clothing, gloves, boots, hard hat and eye protection when using a hose.**
- Do** – Test hoses every six (6) months or sooner to 1.5 times the working pressure or to industry recommended pressures based on RMA, USCG, OSHA, DOT, API, NPGA or others.
- Do** – Educate all employees on how to inspect a hose before each use to insure it is safe to use along with correct hose use and care. Teach employees to "Error on the side of safety!" **When in doubt, remove the hose from service!**

- Do** – Store hose in a flat coil. Be sure no kinks are left in the coil. Lay it on the floor, a shelf or table. Long lengths are best stored on hose reels.
- Do** – Protect hose from the effects of ozone (O₃), the active form of oxygen which is more prevalent than most people think. Store away from electrical or ozone producing equipment. Paper, wood and rags are good O₃ absorbers.
- Don't** – Crush or kink hose. Avoid repeated bending which may eventually break the reinforcement of the hose leading to a rupture.
- Don't** – Substitute hose types. All hoses are not equal. Consult your hose supplier for the correct recommendations.
- Don't** – Use a hose if any of the reinforcement is exposed through the cover due to cuts, gouges or just prolonged use.
- Don't** – Exceed the working pressure of the hose for any reason (including pressure spikes).
- Don't** – Use damaged or worn fittings. Check to see if the coupling is loose or has moved, has worn threads, worn gasket or is corroded. Successful hydro testing will help verify the integrity of the coupled assembly.
- Don't** – Store hose after use, without rinsing & draining if it carried substances that ultimately deteriorate the hose tube.
- Don't** – Use a hose outside its recommended temperature limits.
- Don't** – Pull on a hose by its coupling.
- Don't** – Kink a hose to stop the flow of product. Kinking can seriously damage the tube and reinforcement.
- Don't** – Lift a hose by the middle with the ends hanging down. This can kink the hose in the middle (especially in hoses over 3" ID). Use hose lifting saddles to prevent kinking.
- Don't** – Bend a hose beyond its minimum bend radius
- Don't** – Subject a hose to temperatures above its rated temperature recommendations (especially any hose with plastic parts- PVC, etc).

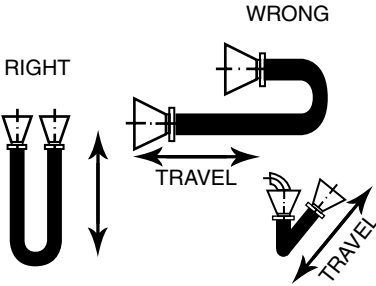
Correct Assembly Installation

Satisfactory performance and appearance depends upon proper hose installation. Excessive length destroys the trim appearance and adds unnecessary stress to the hose if it causes the hose to exceed minimum bend radius. Hose assemblies of insufficient length may cause coupling pull out or over stress the hose causing short service life.

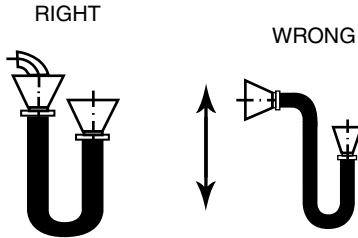
The diagrams below offer suggestions (for other configurations contact Apache) for proper hose installation.



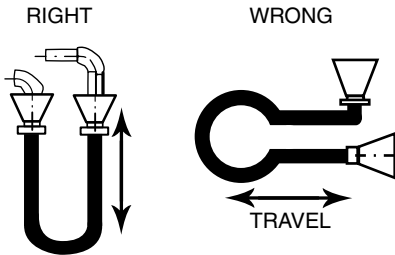
Under pressure hose may change in length. Always provide some slack for the hose to move -4 to +5%.



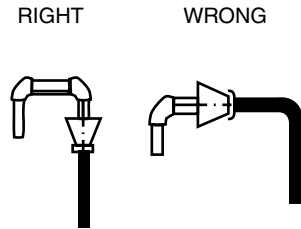
Prevent twisting, torque or distortion, hose should be bent in same plane as motion.



Never place sharp hose bends near coupling. Hose should be installed so that flexing takes place in one plane only & direction of motion must be perpendicular.



When the hose minimum bend radius is exceeded, use angled adapters to meet radius requirements.



Avoid hanging hose from horizontal fixtures.

Cleaning Tips for Apache Hose

In many hose applications it is “Best Practice” to clean the hose after each use. This prevents the:

1. Long term effects of potentially hazardous chemicals from damaging hose & couplings (even 316 stainless steel is effected over time by some common chemicals).
2. Contamination of product, should one hose be used to convey multiple products.
3. Prevent accidental spillage and the potential for personal injury from chemical residue left in the inside of a hose.

This process is typically accomplished by flushing the interior of the hose with water or a cleaning solution. Cleaning procedures may differ by industry but should at least include the below Apache recommendations.

- All staff must wear personnel protective gear, i.e. eye protection & hard hat, gloves, protective clothing, etc.
- Cleaning solutions should be able to dissolve or remove the residue material in the hose assembly and must be compatible with the hose tube & couplings.
- All material flushed along with the cleaning solution must be processed in accordance with EPA requirements.
- Extreme care must be taken when inserting cleaning devices into the I.D. of an Apache hose, such as brushes, steam wands etc. Hose tubes can be damaged during this process.
- The use of open end, low pressure steam (200°F or less) can be use for cleaning certain Apache hoses. Contact Apache for cleaning instructions by hose specification 1-800-553-5455.
- To insure no cleaning chemical residue is left in the hose assembly, the hose can be hung vertical for a brief time to drain. It is common to hang hose to facilitate draining (hose with a convoluted tube surface may require this method).
- Warm air (120°F) can be circulated through the hose for drying.
- Hose cleaning and the control of the waste water and solutions must be handled in accordance with EPA regulations.
- If hose is cleaned in a dip tank, do not exceed the temperature limits of the hose.
- Steam cleaning is not a preferred method of cleaning. Only use steam when it is recommended for the specific type of hose.
- NEVER use superheated steam
- The use of high pressure wands, piping or brushes can cause damage to the tube of a hose. Extreme care must be exercised if these devices are used.

Companies that conform to “Best Practice” programs realize that all safety programs and safety products are only as good as the human element responsible for using and maintaining the products used in the industrial arena. Hose can be dangerous and it is important that companies take reasonable care to educate their employees to correctly use hoses in their respective work environments. To this end it is incumbent on the employer to institute the simple elements of a hose safety program to maintain safe hose operations by their work staffs.

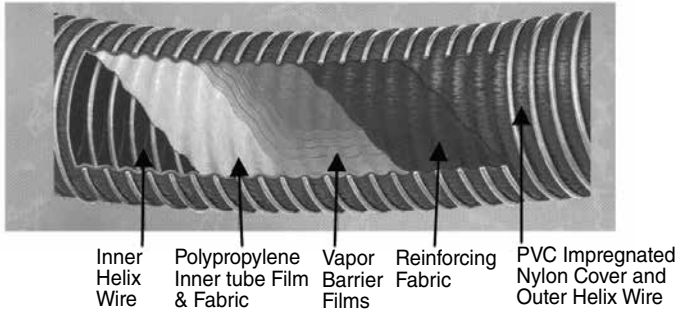
Elements of a hose safety program

In an effort to provide assistance for hose safety, Apache recommends that a safety program involving (but not limited to) these key elements be used.

1. Hose identification system
2. Coupling identification system
3. Hose application identification program
4. Employee training program on Hose Care, Use and Maintenance
5. Root Cause Analysis of hose failures
6. Hazardous Application Hose Failure Action Plan

Composite Hose Information

Composite hose is a unique hose composed of many layers of special materials, held together between an inner and outer wire. This type of hose is still subject to the same operational parameters as regular hose.



This type of hose can be maintained in accordance with the instructions in this booklet. The only additional points are:

1. Care should be taken to not damage the exterior of the hose. If the outer wire is broken or damaged, the hose should be replaced.
2. If the outer cover plies are abraded to the point the inner carcass plies are exposed, the hose should be replaced.
3. Insure the hose is used to transfer products in accordance with the chemical resistance chart.



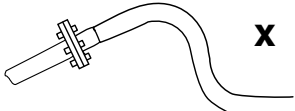

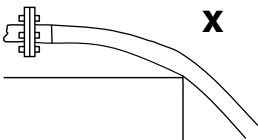
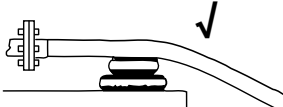

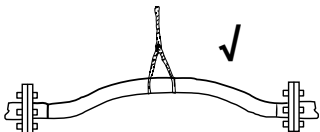
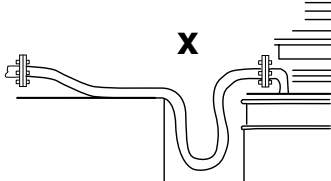
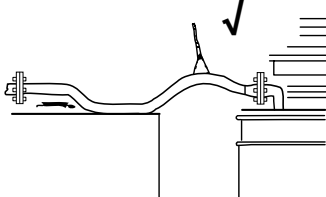
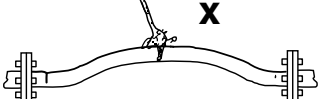
Inspection and Testing of Composite Hose

This document provides procedures for the inspection and testing of composite hoses in-service, as well as criteria for their retirement. These include visual inspection, hydrostatic testing and service/age retirement criteria.

In the case of damaged or defective hose that may pass the hydrostatic test but does not satisfy the remaining criteria, burst testing of the hose is suggested to assess remaining hose strength as well as the mode of failure. This data is useful to verify or reassess the current retirement criteria.

To ensure long trouble free service with Apache composite hoses, it is recommended that the following installation and maintenance procedures be followed:

Visual Inspection

INCORRECT	CORRECT
 <p data-bbox="121 305 426 326">NEVER USE HOSE UNSUPPORTED</p>	 <p data-bbox="561 305 934 326">ALWAYS SUPPORT HOSE NEAR COUPLING</p>
 <p data-bbox="121 472 442 496">NEVER USE HOSE UNSUPPORTED</p>	 <p data-bbox="717 472 836 496">ACCEPTABLE</p>
 <p data-bbox="121 683 469 732">PROTECT AGAINST SHARP EDGES. DOCK EDGE, SHIP'S GUARD RAIL, ETC.</p>	 <p data-bbox="724 683 841 708">ACCEPTABLE</p>
 <p data-bbox="153 857 458 886">NEVER USE HOSE UNSUPPORTED</p>	 <p data-bbox="650 862 913 911">SUPPORT HOSE WITH SLINGS WHERE APPROPRIATE</p>
 <p data-bbox="121 1211 497 1260">NEVER OVER BEND HOSE OR ALLOW HOSE TO HANG BETWEEN DOCK AND SHIP</p>	 <p data-bbox="657 1211 866 1235">SUPPORT WITH SLINGS</p>
 <p data-bbox="355 1365 742 1390">NEVER SUPPORT HOSE WITH SINGLE ROPE</p>	

Visual Inspection:

Details of visual inspection should be recorded on the Inspection Form indicating location of significant damage or defects. The hose itself should also be marked at these locations prior to hydrostatic testing in order to determine if point of failure corresponds to observed damage or defect.

Composite hose retirement criteria based on visual inspection includes the following:

1. Dents or kinks in the carcass and the inner or outer wire
2. Displacement of 2 or more adjacent inner or outer wire helix from their normal pitch
3. Corrosion or abrasion of the outer wire
4. Displacement of end fittings or signs of leakage from the ends
5. Damage to the outer cover and underlying reinforcement fabric
6. Moderate abrasion of the outer cover is acceptable and repairable if the reinforcing fabrics below the cover are not damaged

Always	Never
Support the hose near flange connections	Use the hose unsupported
Support the hose at the appropriate points	Support the hose with a single rope
Cushion the hose against sharp edges: Dock edges, Ship's Rail ect.	Allow the hose to hang unsupported between ship and dock

Hydrostatic Test:

The hydrostatic test shall be performed as described below. Electrical continuity checks, as per part 4, shall also be done during the test.

Hose assembly lengths shall be measured between flange faces.

Warning: The use of air and other gaseous material as testing media shall be avoided because of the risk to operators. Any failure during test is likely to be of a highly explosive nature. In special cases, where such media are required for the tests, compliance with strict safety measures is mandatory. It shall also be stressed that when a liquid is used as the test medium it is essential that all air is expelled from the hose or hose assembly because of the risk of injury to the operator due to the sudden expansion of trapped air being released when the hose bursts.

1. Lay the hose straight out and permit free movement under pressure
2. Place blanks over both ends and fill the hose with fresh water
3. Vent the trapped air raising one end of the hose. Raise the
4. Pressure to 50 psi (345 kPa) and hold for 10 min. while
5. Examining for leaks
6. Check for electrical continuity
7. Raise the pressure to 150% of rated pressure.
8. Hold pressure for 10 minutes while checking for leaks.
9. Measure L] the hose length from end-of-fabric to end end-of-fabric
10. Check for electrical continuity

Note: Due to the inherent nature of composite hose it is susceptible to stretching in length while under charge. Hose elongation while under pressure is not an indication of failure of films and fabrics.

Electrical Continuity:

Electrical continuity shall be maintained during and on completion of the hydrostatic testing (part 2) To simply check continuity, connect both end flanges with wire and check electric bond using a 4.5 volt battery and a 4 volt 0.3 amp test lamp. A dimly lamp is sufficient to indicate satisfactory continuity.

A measured electrical resistance on each hose assembly shall not exceed 0.25 ohm/ft. (0.75 ohms/m).

Cleaning:

1. Hoses should be thoroughly flushed out and drained before testing and after service or prolonged storage
2. Flush with fresh water, detergent or suitable solvent at ambient temperatures
3. Cleaning fluids should be flushed out with clean water to avoid chemical reactions with service products

Note: *Hoses should be electrically grounded during cleaning. When cleaning to avoid internal damage to hose. Do not exceed maximum working temperature and pressure.*

Apache Inc. is committed to safe hose programs that are designed to provide our customers with the tools necessary to utilize hoses in a safe and productive manner. This booklet in conjunction with our industrial hose services which include plant surveys, hose testing and inspection, and plant maintenance training seminars are designed to provide the end user with useful information in safe hose handling practices. However, the end user is responsible for implementation of practices that will result in safe hose usage. We highly recommend that these practices be adopted and that plant operators be tasked with removal of a hose whenever there is a doubt about the hose's serviceability. Remember, "When in doubt, remove the hose from service."