

Service Life Factors

Hose and hose assemblies have a finite life. There are a number of factors that will reduce hose life. Consideration should be given to the following factors.

1. **Operating Pressure** - The maximum operating pressure within the hose should not exceed the recommended working pressure as specified by Continental ContiTech as shown in the catalog specifications. Hose selection must be made so that the recommended maximum operating pressure is equal to or greater than the system pressure. Burst pressure, which is four times the working pressure, should not be used as the operating pressure of the hose. Exposing the hose to pressures higher than the working pressure is dangerous and will shorten hose life.
2. **Exposing the hose to a surge pressure**, above the working pressure of the hose, will shorten hose life. If surges are severe, select a hose with a higher recommended working pressure.
3. **Burst Pressure** - The burst pressure should never be considered in a hydraulic system design. The burst pressure is for test purposes only. Burst pressure is detrimental to the hose.
4. **Operating Temperatures** - High heat conditions may have an adverse affect on hose due to the degradation of the rubber and the affect on fitting retention. Continuous use at or above the maximum operating temperature of the hose will cause deterioration of the tube, cover and reinforcement, reducing the hose life. Care should be taken to ensure that fluid and ambient temperatures, both static and transient, do not exceed the limitations of the hose. It is important to operate a hose assembly within the specified temperature range of the specific hose.
5. **Bend Radius** - Flexing the hose to less than its recommended minimum bend radius will decrease hose life. Optimize routing to minimize inherent problems.
6. **Excessive external forces** such as flexing, twisting or kinking will reduce hose life. Use the correct fitting or adapter to prevent any unnecessary external force.
7. **Chemical Resistance** - Consider the chemical resistance of the tube, cover and the fitting, including the O-ring, to maximize hose performance and life. Hose selection must assure compatibility of the hose, tube, cover and fittings with the fluid used.
8. The size of the hose assembly components must be adequate to keep pressure losses to a minimum and avoid damage to the hose due to heat generation or excessive turbulence.
9. Extend hose assembly life by making sure hose and fittings are compatible with the environment or sufficiently protected from the elements, such as ultraviolet light, ozone, salt water or chemicals that can cause degradation of assembly components and shorten hose life.
10. A hose is designed with a certain level of abrasion resistance, but care should be taken to avoid excessive abrasion, which can damage the hose cover, accelerating hose failure.
11. Use the proper end fittings and crimp or install to the proper crimp specification to ensure a safe and proper hose assembly. Make sure that hose fittings are compatible with the hose.

Safety Considerations

Fabricators, end users and installers should be aware of the safety factors when handling or when in proximity of hydraulic hose assemblies. The following are some potential conditions that can lead to personal injury and property damage.

1. As certain fluids may permeate the hose cover, the hose should always be used in well-ventilated areas.
2. Hydraulic systems generally operate at very high pressures. Any leak of pressurized fluid can penetrate the skin, causing severe tissue damage and burns. Consider the use of guards or shields around the hose assembly to reduce the risk of injury.
3. Whipping Hose - Under high operating pressures, the hose and/or fitting can come loose or blow, causing the end of the hose to whip with great force. Again, the hose assembly should be shielded or guarded, even possibly secured, to avoid injury or damage from this whipping action.
4. Hydraulic fluids are flammable and can explode with a source of ignition. To avoid possible injury or property damage, care should be taken to eliminate ignition sources and to properly route the hose assembly to minimize the chance of combustion.
5. Most all hose is conductive. In some cases a non-conductive hose is required. To avoid electrocution or other serious mishap, the correct hose specification, either conductive or nonconductive, should be used.
6. Should a hydraulic hose assembly fail, loss of hydraulic pressure will affect the operation of equipment. Care should be taken that a sudden power loss of the equipment will not cause personal injury.
7. When air or gaseous materials are being conveyed, the correct hose should be used. A pin-perforated cover may be required. Perforations in the cover will prevent permeated gases from accumulating and blistering the cover. Check Continental ContiTech for the correct hose specification.
8. Extreme care should be used when operating handheld hydraulic tools where the operator is in proximity to the hydraulic hose assembly. The following steps should be taken to avoid injury.
 - a. Use strain relievers on each end of the hose to prevent kinking, excessive bending or stress on the hose at the coupling.
 - b. Never use the hose assembly to pull or carry the tool.
 - c. Exposed hose near the operator should be guarded in case hose assembly fails, to prevent injury from high pressure or high temperature fluid.
 - d. Operators of the tool should be protected with the required safety clothing, considering the job and fluids being used.
 - e. The hose should be protected against any external damage.
9. Hose assemblies should be properly routed to avoid strain and the possibility of the hose bursting. Proper routing will also protect the assembly against flex fatigue, excessive heat or abrasion.
10. When selecting a hose style and assembly, check for hose compliance to all relevant government, industry and safety standards or regulations.

Proper Installation & Hose Routing

Proper Hose Installation

Warning: Improper selection, installation or maintenance of a hose assembly may result in premature failures, bodily injury or property damage.

The following practices should be used when replacing a hydraulic hose assembly or installing a new hydraulic assembly.

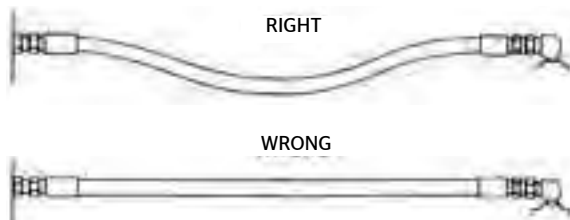
1. A pre-installation inspection should include the following:
 - a. Check to ensure the hose is the correct specification in style, size and length.
 - b. Check that the hose assembly has no visible non-conformity.
 - c. Check fittings for any damage including nicks or burrs.
 - d. Check that the hose is routed properly using suggested guidelines.
 - e. Check that the hose is not damaged (kinked, crushed, twisted).
2. Handle assembly with care. Avoid bending hose beyond the recommended bend radius.
3. Hose assemblies should not be installed in a torqued or twisted condition.
4. Use necessary restraints and protective devices when necessary to reduce wear and stress points on the assembly.

Correct Assembly Installation & Routing

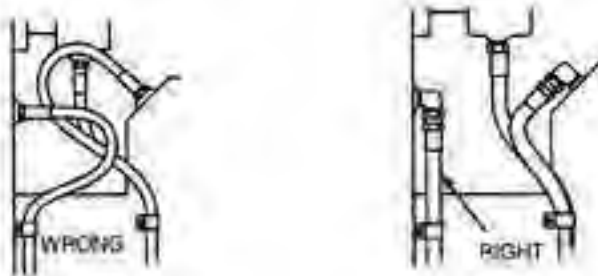
Satisfactory performance and appearance depend upon proper hose installation. Excessive length destroys the trim appearance of an installation and adds unnecessarily to the cost of the equipment. Hose assemblies of insufficient length to permit adequate flexing, expansion or contraction will cause poor power transmission and shorten the life of the hose.

The diagrams below offer suggestions for proper hose installations to obtain the maximum in performance and economy.

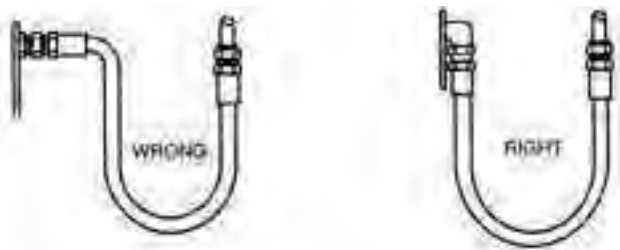
Since hose may change in length from +2% to -4% under the surge of high pressure, provide sufficient slack for expansion and contraction.



Obtain direct routing of the hose through use of 45° and 90° adapters and fittings. Improve appearance by avoiding excessive hose length.

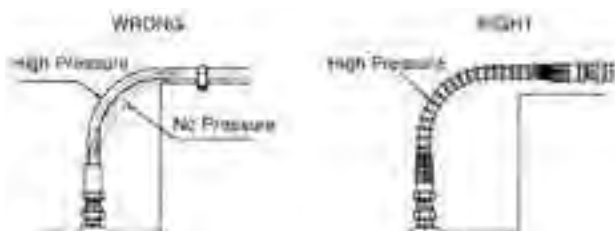


Avoid sharp twist or bend in hose by using proper angle adapters compatible with the hose.



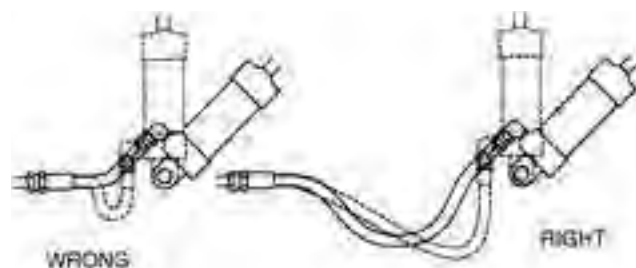
Proper Installation & Hose Routing

Due to changes in length when the hose is pressurized, do not clamp at bends so the curves can absorb changes and protect the hose with a spring guard. Do not clamp high and low pressure lines together, and protect the hose with a spring guard.

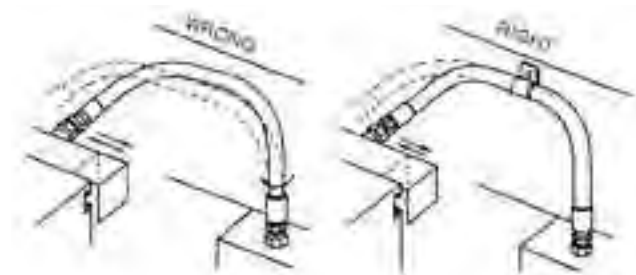


Where the radius falls below the required minimum, an angle adapter should be used as shown on previous page to avoid sharp bends in the hose.

Adequate hose length is most important to distribute movement on flexing applications and to avoid abrasion.



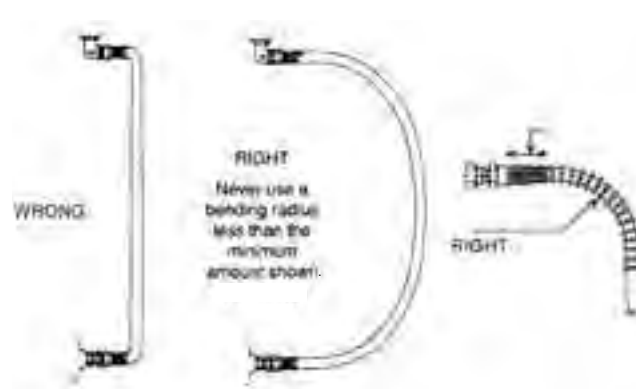
To avoid twisting in hose lines bent in two planes, clamp hose at change of plane, as shown.



Hose should not be twisted. Hose is weakened when installed in a twisted position. Also, pressure in twisted hoses tend to loosen fitting connections. Design so that machine motion produces bending rather than twisting.



To prevent twisting and distortion, the hose should be bent in the same plane as the motion of the boss to which the hose is connected.



Never use a bending radius less than the minimum shown in the hose specification tables. To reduce collapsing of line and restriction of flow, avoid a sharp bend in the hose by using proper spring guard. Exceeding minimum bend radius will greatly reduce hose assembly life.



Hose Maintenance & Storage

Hose Maintenance

A hose and fitting maintenance program can reduce equipment downtime and maintain peak operating performance of the hydraulic system. Here are a few maintenance reminders.

1. Hose assemblies should be inspected on a regular basis with frequency based on prior history of the equipment, a set maintenance/inspection program, and the severity of the application or risk potential.
2. Always use Safety Considerations (page 618) when inspecting hose assemblies. To avoid personal injury during system checkouts, do not touch the assembly and be aware of the potentially hazardous area surrounding the hose assembly.
3. Inspect hose and fittings for the following:
 - a. Exposed, broken or corroded reinforcement wires.
 - b. Leaks in the hose or at the fitting.
 - c. Cracked, damaged or corroded fittings.
 - d. Other signs of significant deterioration.

If any of the above conditions exist, the hose assembly should be replaced immediately.

4. The hydraulic system should also be inspected for the following:
 - a. Leaking ports.
 - b. Damaged or missing hose clamps, guards or shields.
 - c. Excessive dirt or grease on the assembly.
 - d. Condition of system fluid, fluid temperature, contamination and air entrapment.

If any of the above conditions are found, appropriate corrective action should be taken.
5. Functional tests should be conducted to determine if systems are leak-free and operating properly.

6. If hose assembly can be inspected and detached from the hydraulic system, additional steps can be taken to ensure a properly maintained assembly.
 - a. With hose assembly detached, clean assembly by blowing out with clean, compressed air or rinsed with a compatible cleaning fluid.
 - b. Inspect hose tube for cuts, obstructions and cleanliness.
 - c. Check layline of the hose to make sure the hose is not twisted.
 - d. Check fittings to ensure they are in good condition and properly crimped or attached to the assembly.

If any of the above conditions are found, the hose assembly should be replaced.

7. The hose assembly should be hydrostatically tested, using the approved test stands and procedures as outlined in SAE J517. Test at proof pressure, or twice the working pressure of the hose, for 30 seconds to one minute. When test pressure is reached, visually inspect the hose for any signs of weakness, leaks or any hose movement relative to the fitting that would indicate a loose fitting. If any of these conditions exist, the assembly should be replaced.
8. Specific hose assembly replacement intervals must be considered based on previous service life, government or industry recommendations, or when failures could result in injury risk or property damage.

Hose Storage

Temperature, humidity, ozone, sunlight, oils, solvents, corrosive liquids, insects, rodents and radioactive materials can adversely effect hose products. Hose should be stored in a dark, dry atmosphere away from heat sources, electrical equipment and the above adverse elements. The ideal storage temperature for rubber hose is 50°F to 70°F (10°C to 21.1°C), with a maximum of 100°F (37.8°C).