Overview
Proper hydraulic hose routing consists of choosing the correct length of hose, the correct adapters (if needed), proper bends and proper clamping to avoid undue stress on the hose and fittings.
Proper hose installation is essential for optimal performance. It reduces hose cost, extends service life, aids in abrasion resistance and is visually appealing.

Hose Failure
Improper hydraulic hose routing can cause system failures and severe injury to machine operators. Hoses can eventually start to leak or could blow apart due to incorrect length or bend radius selections. Listed below are some common failures, their possible causes and a solution to fix each problem.

Weeping at Hose Coupling Interface
Problem: Fluid leaks from the end of the ferrule
Cause: Excessive flexing and tugging
Solution: Replace and check hose length

Hose Blisters
Problem: Blisters under the outer cover of hose caused by fluid leakage
Cause: Excessive bending or twisting of hose
Solution: Use proper fittings and check bend radius

Burst Hose
Problem: Hose burst at body
Cause: Flexing, kinking, crushing, tight bend radius or excessive abrasion
Solution: Check bend radius. Re-route to avoid abrasion and twisting

Hose Abrasion
Problem: Part of the hose cover removed, exposing reinforcement
Cause: Excessive rubbing against machinery or other hoses
Solution: Re-route and/or bundle hoses together; use hose guards

Hose Burst at Coupling
Problem: Hose burst at coupling
Cause: Excessive bending
Solution: Use proper fittings or adapters to make bends

Blown Hose
Problem: Hose coupling blown off
Cause: Insufficient hose slack
Solution: Check hose length
Proper Hose Routing Procedures

The following diagrams depict incorrect routing, correct routing and an explanation of the correct procedure. These examples are followed by simple ways to prevent common hose failures and machine downtime.

**Length Change**

Incorrect: Hose routed straight with insufficient slack.
Correct: Hose routed with sufficient slack to accommodate length change.

- **Wrong**: Hose routed straight with insufficient slack.
- **Right**: Hose routed with sufficient slack to accommodate length change.

**Tight Bend**

Incorrect: Hose routed with tight bend.
Correct: Hose routed with proper angle adapters to avoid tight bend.

- **Wrong**: Hose routed with tight bend.
- **Right**: Hose routed with proper angle adapters to avoid tight bend.

**Movement/Flexing**

Incorrect: Hose routed without adequate slack.
Correct: Hose routed with adequate slack to allow for movement.

- **Wrong**: Hose routed without adequate slack.
- **Right**: Hose routed with adequate slack to allow for movement.

**Tight Bend**

Incorrect: Hose routed with tight bend.
Correct: Hose routed with proper angle adapters to avoid tight bend.

- **Wrong**: Hose routed with tight bend.
- **Right**: Hose routed with proper angle adapters to avoid tight bend.

**Twist**

Incorrect: Hose routed with twisting.
Correct: Hose routed without twisting.

- **Wrong**: Hose routed with twisting.
- **Right**: Hose routed without twisting.

**Reduce Connections**

Incorrect: Hose routed with many pipe thread joints.
Correct: Hose routed with hydraulic adapters instead of pipe fittings.

- **Wrong**: Hose routed with many pipe thread joints.
- **Right**: Hose routed with hydraulic adapters instead of pipe fittings.

**Appearance**

Incorrect: Hose routed with excessive length.
Correct: Hose routed with direct routing using 45° and/or 90° adapters.

- **Wrong**: Hose routed with excessive length.
- **Right**: Hose routed with direct routing using 45° and/or 90° adapters.

**Twist**

Incorrect: Hose routed with twisting.
Correct: Hose routed without twisting.

- **Wrong**: Hose routed with twisting.
- **Right**: Hose routed without twisting.

**High Pressure**

Incorrect: Hose routed with twisting.
Correct: Hose routed without twisting.

- **Wrong**: Hose routed with twisting.
- **Right**: Hose routed without twisting.

**No Pressure**

Incorrect: Hose routed with twisting.
Correct: Hose routed without twisting.

- **Wrong**: Hose routed with twisting.
- **Right**: Hose routed without twisting.

Hoses expand under pressure. To allow for length changes when hose is pressurized, do not clamp at bends. Allow the curves to absorb changes. Do not clamp high-pressure and low-pressure lines together.
Proper Hose Routing

Procedures (cont.)

High Heat

Wrong

Right

High ambient temperatures shorten hose life, so make sure hose is kept away from hot parts. If this is not possible, insulate the hose.

Strain

Wrong

Right

Elbows and adapters should be used to relieve strain on the assembly and to provide neater installations which will be more accessible for inspection and maintenance.

Collapse

Wrong

Right

To avoid hose collapse and flow restriction, keep hose bend radii as large as possible. Refer to hose specification tables for minimum bend radii.

Abrasion

Wrong

Right

Run hose in the installation so that it avoids rubbing and abrasion. Often, clamps are required to support long hose runs or to keep hose away from moving parts. Use clamps of the correct size. A clamp which is too large allows hose to move inside the clamp and cause abrasion.

Determining Bend Radius

When determining the proper length of hose, it is important to make sure that the minimum bend radius is not exceeded. If the bend radius is smaller than the minimum, the hose could kink and burst. For example, if a hose has a minimum bend radius of 6", anything less than 6" would exceed this.

Measuring the bend radius from the correct spot is critical. Bend radius is determined by dividing the distance between the hose ends by two.

\[
\text{Bend Radius (R) = B} \div 2
\]

Fitting Selection and Orientation

Proper fitting selection and orientation is an important part of hose routing. Using two rigid fittings on a hose will cause the hose to twist during installation. If a rigid fitting is used on one end of the hose, that end should be the first end installed. The other end should have a swivel fitting. This will enable the hose to stay straight without twisting. A hose twisted as little as 7° can have a 90% reduction in service life.

If the hose must bend, it should do so in only one plane. This can be achieved through the use of angle fittings and/or adapters. Before making final crimps, the fitting orientation should be checked to make sure that there is no twisting in the hose.