May 86 SAE Recommended Practice Report of the Fluid Conductors and Connectors Technical Committee, approved September 1979 and reaffirmed May 1986.

1. Scope

Hose (also includes hose assemblies) has a finite life and there are a number of factors which will reduce its life. This recommended practice is intended as a guide to assist system designers and/or users in the selection, installation, and maintenance of hose. The designers and users must make a systematic review of each application and then select, install, and maintain the hose to fulfill the requirements of the application. The following are general guidelines and are not necessarily a complete list.

WARNING: IMPROPER SELECTION, INSTALLATION, OR MAINTENANCE MAY RESULT IN PREMATURE FAILURES, BODILY INJURY, OR PROPERTY DAMAGE.

2. Selection

The following is a list of factors which must be considered before final hose selection can be made:

2.1 Pressure

After determining the system pressure, hose selection must be made so that the recommended maximum operating pressure is equal to or greater than the system pressure. Surge pressures higher than the maximum operating pressure will shorten hose life and must be taken into account by the hydraulic designer.

2.2 Suction

Hoses used for suction applications must be selected to insure the hose will withstand the negative pressure of the system.

2.3 Temperature

Care must be taken to insure that fluid and ambient temperatures, both static and transient, do not exceed the limitations of the hose. Special care must be taken when routing near hot manifolds.

2.4 Fluid Compatibility

Hose selection must assure compatibility of the hose tube, cover, and fittings with the fluid used. Additional caution must be observed in hose selection for gaseous applications.

2.5 Size

Transmission of power by means of pressurized fluid varies with pressure and rate of flow. The size of the components must be adequate to keep pressure losses to a minimum and avoid damage to the hose due to heat generation or excessive turbulence.

2.6 Routing

Attention must be given to optimum routing to minimize inherent problems.

2.7 Environment

Care must be taken to insure that the hose and fittings are either compatible with or protected from the environment to which they are exposed. Environmental conditions such as ultraviolet light, ozone, salt water, chemicals, and air pollutants can cause degradation and premature failure and, therefore, must be considered.

2.8 Mechanical Loads

External forces can significantly reduce hose life. Mechanical loads which must be considered include excessive flexing, twist, kinking, tensile or side loads, bend radius, and vibration. Use of swivel type fittings or adapters may be required to insure no twist is put into the hose. Unusual applications may require special testing prior to hose selection.

2.9 Abrasion

While a hose is designed with a reasonable level of abrasion resistance, care must be taken to protect the hose from excessive abrasion which can result in erosion, snagging, and cutting of the hose cover. Exposure of the reinforcement will significantly accelerate hose failure.

2.10 Proper End Fitting

Care must be taken to insure proper compatibility exists between the hose and coupling selected based on the manufacturer's recommendations substantiated by testing to industry standards such as SAE J517d (November, 1976).

2.11 Length

When establishing proper hose length, motion absorption, hose length changes due to pressure, as well as hose and machine tolerances must be considered.

2.12 Specifications and Standards

When selecting hose, government, industry, and manufacturers specifications and recommendations must be reviewed as applicable.

2.13 Hose Cleanliness

Hose components vary in cleanliness levels. Care must be taken to insure that the assemblies selected have an adequate level of cleanliness for the application.

2.14 Electrical Conductivity

Certain applications require that hose be non-conductive to prevent electrical current flow. Other applications require the hose to be sufficiently conductive to drain off static electricity. Hose and fittings must be chosen with these needs in mind.

3. Installation

After selection of proper hose, the following factors must be considered by the installer:

3.1 Pre-Installation Inspection

Prior to installation, a careful examination of the hose must be performed. All components must be checked for correct style, size, and length. In addition, the hose must be examined for cleanliness, I.D. obstructions, blisters, loose cover, or any other visible defects.

3.2 Follow Manufacturers' Assembly Instructions

3.3 Minimum Bend Radius

Installation at less than minimum bend radius may significantly reduce hose life. Particular attention must be given to preclude sharp bending at the hose/fitting juncture.

3.4 Twist Angle and Orientation

Hose installations must be such that relative motion of machine components produces bending of the hose rather than twisting.

3.5 Securement

In many applications, it may be necessary to restrain, protect, or guide the hose to protect it from damage by unnecessary flexing, pressure surges, and contact with other mechanical components. Care must be taken to insure such restraints do not introduce additional stress or wear points.

3.6 Proper Connection of Ports

Proper physical installation of the hose requires a correctly installed port connection while insuring that no twist or torque is put into the hose.

3.7 Avoid External Damage

Proper installation is not complete without insuring that tensile loads, side loads, kinking, flattening, potential abrasion, thread damage, or damage to sealing surfaces are corrected or eliminated.

3.8 System Check Out

After completing the installation, all air entrapment must be eliminated and the system pressurized to the maximum system pressure and checked for proper function and freedom from leaks.

NOTE: Avoid potential hazardous areas while testing.

4. Maintenance

Even with proper selection and installation, hose life may be significantly reduced without a continuing maintenance program. Frequency should be determined by the severity of the application and risk potential. A maintenance program should include the following as a minimum:

4.1 Hose Storage

Hose products in storage can be affected adversely by temperature, humidity, ozone, sunlight, oils, solvents, corrosive liquids and fumes, insects, rodents, and radioactive materials. Storage areas should be relatively cool and dark and free of dust, dirt, dampness, and mildew.

4.2 Visual Inspections

Any of the following conditions requires replacement of the hose:

(a) Leaks at fitting or in hose.
(Leaking fluid is a fire hazard.)

(b) Damaged, cut, or abraded cover.
(Any reinforcement exposed.)

(c) Kinked, crushed, flattened, or twisted hose.

(d) Hard, stiff, heat cracked, or charred hose.

(e) Blistered, soft, degraded, or loose cover.

(f) Cracked, damaged, or badly corroded fittings.

(g) Fitting slippage on hose.

4.3 Visual Inspections

The following items must be tightened, repaired, or replaced as required:

(h) Leaking port conditions.
(i) Clamps, guards, shields.
(j) Remove excessive dirt buildup.
(k) System fluid level, fluid type, and any air entrapment.

4.4 Functional Test

Operate the system at maximum operating pressure and check for possible malfunctions and freedom from leaks.

NOTE: Avoid potential hazardous areas while testing.

4.5 Replacement Intervals

Specific replacement intervals must be considered based on previous service life, government or industry recommendations, or when failures could result in unacceptable down time, damage, or injury risk.