

# GUIDA DI SICUREZZA PER L'UTILIZZO DEI TUBI SECURITY GUIDE FOR USING HOSES

**DANGER:** Failure or improper selection or improper use of hose, fittings, or related accessories can cause death, personal injury and property damage. Possible consequences of failure or improper selection or improper use of hose, fittings, or related accessories included but are not limited to:

- Fittings thrown off at high speed;
- High velocity fluid discharge;
- Explosion or burning of the conveyed fluid;
- Electrocution from high voltage electric power lines or other sources of electricity;
- Contact with suddenly moving or falling objects that are to be held in position or moved by the conveyed fluid;
- Dangerously whipping hose;
- Contact with conveyed fluids that may be hot, cold, toxic or otherwise injurious;
- Sparking or explosion caused by static electricity build-up;
- Sparking or explosion while paint or finable liquid spraying.

Before selecting or using any Ractek hose or fittings or related accessories, it is important that you read and follow the following instructions.

## 1.0 GENERAL HINTS

### 1.1. Scope

This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) hose (including thermoplastic products commonly called hose or tubing), fittings (including all products commonly called fittings or couplings for attachment to hose), and related accessories (including crimping and swaging machines and tooling). This safety guide is supplement to and is to be used with, specific Ractek publications for the specific and related accessories that are being considered for use.

### 1.2. Fail safe

Hose and hose assemblies can and do fail without warning for many reasons. Design all system and equipment in a fail-safe mode, so that failure of the hose or hose assembly will not endanger persons or property.

### 1.3. Distribution

Provide a copy of this safety guide to each person that is responsible for selecting or using hose and fitting products. Do not select or use hose and fittings without thoroughly reading and understanding this safety guide as well as the specific Ractek publications for the products considered or selected.

### 1.4. User Responsibility

Due to the wide variety of operating conditions and uses for hose and fittings, Ractek and its distributor do not represent or warrant that any particular hose or fittings is suitable for any specific end use system. This safety guide does not analyse all technical parameters that must be considered in selecting a product. The user, through his own analysis and testing, is solely responsible for:

- Making the final selection of the hose and fitting.
- Assuring that the user's requirements are met and the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the hose and fittings are used.

### 1.5. Additional Questions

Call the appropriate Ractek technical service department if you have any questions or require any additional information. See the Ractek publication for the product being considered or used, for telephone numbers of the appropriate technical service department.

## 2.0 HOSE AND FITTINGS SELECTION INSTRUCTIONS

### 2.1. Electrical Conductivity

Certain applications require that a hose be non-conductive to prevent electrical current flow. Other applications require the hose to be sufficiently conductive to drain off static electricity. Extreme care must be exercised when selecting hose and fittings for these or any other applications in which electrical conductivity or non-conductivity is a factor. For applications that require hose to be electrically non-conductive, including but not limited to applications near high voltage electric lines, only special non-conductive hose can be used. The manufacture of the equipment in which the non-conductive hose is to be used must be consulted to be certain that the hose and fittings selected are proper for the applications. Do not use any Ractek hose or fittings for any such applications requiring non-conductive hose, including but not limited to applications near high voltage electric lines, unless (1) the applications is expressly approved in the Ractek technical publication for the product, the hose is marked

non-conductive, (2) the manufacture of the equipment on which the hose is to be used specifically approves the particular Ractek hose and fittings for such use.

The electrical conductivity or non-conductivity of hose and fittings is dependent upon many factors and may be susceptible to change. These factors include but are not limited to the various materials used to make the hose and the fittings' manufacturing methods (including moisture control), how the fittings contact the hose, age and amount of deterioration or damage or other changes, moisture content of the hose at any particular time and other factors.

Ractek manufactures a special hose for conveying paint in airless paint spraying applications. This hose is labelled Electrically Conductive Airless Paint Spray Hose on its layline and on its packaging. This hose must be properly connected to Ractek fittings and properly grounded in order to dissipate dangerous static charge build-up which occurs in all airless paint spraying. Do not use any other hose, even if electrically conductive, for airless paint spraying. Use of any other hose or failure to properly connect the hose can cause a fire or an explosion resulting in death, personal injury, and property damage.

## **2.2. Pressure**

Hose selection must be made so that the published maximum recommended working pressure of the hose is equal to or greater than the maximum system pressure. Surge pressure in the system higher than the published maximum recommended working pressure will cause failure or shorten hose life. Do not confuse burst pressure or other pressure values for this purpose.

## **2.3. Suction**

Hoses used for suction applications must be selected to insure that the hose will withstand the vacuum and pressure of the system. Improperly selected hose may collapse in suction applications.

## **2.4. Temperature**

Be certain that fluid and ambient temperatures, both steady and transient, do not exceed the limitations of the hose. Care must be taken when routing hose near hot objects such as manifolds.

## **2.5. Fluid Resistance**

Hose selection must assure resistance of the hose tube, cover, reinforcement, and fittings with the fluid media used. See the fluid resistance chart in the Ractek publication for the product being considered or used.

## **2.6. Permeation**

Permeation (that is seepage through the hose) will occur from inside the hose to outside when hose is used with gases, liquid and gas fuels, and refrigerants (including but not limited to such materials as helium, fuel oil, natural gas, or refrigerant gas). This permeation may result in high concentrations of vapours which are potentially flammable, explosive, or toxic, and in loss of fluid. Dangerous explosions, fires, and other hazards can result when using the wrong hose for such applications. The system designer must take into account the fact that this permeation will take place and must not use hose if this permeation could be hazardous. The system designer must take into account all legal, Government, insurance, or any other special regulations which govern the use of fuels and refrigerants. Never use a hose even though its fluid resistance is acceptable without considering the potential hazardous effects that can result from permeation through the hose assembly.

Permeation of moisture from outside the hose to inside the hose will also occur in hose assemblies, regardless of internal pressure. If this moisture permeation would have detrimental effects (particularly but not limited to refrigeration and air conditioning system), incorporation of sufficient drying capacity in the system or other appropriate system safeguards should be selected and used.

## **2.7. Sizes**

Transmission of power by means of pressurised 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 due to heat generation or excessive fluid velocity.

## **2.8. Routing**

Attention must be given to optimum routing to minimise inherent problems (kinking or flow restriction due to hose collapse).

## **2.9. Environment**

Care must be taken to ensure that the hose and fittings are either compatible with or protected from the environment (that is, surrounding conditions) to which they are exposed. Environmental conditions, including but not limited to ultraviolet radiation, sunlight, heat, ozone, moisture, water, salt water, chemicals, and air pollutants, can cause degradation and premature failure

## **2.10. Mechanical Loads**

External forces can significantly reduce hose life or cause failure. Mechanical loads which must be considered include excessive flexing, twisting, kinking, tensile or side loads, bend radius, and vibration. Use of swivel type

fittings or adapters may be required to ensure no twist is put into the hose. Unusual applications may require special testing prior to hose selection.

#### **2.11. Physical Damage**

Care must be taken to protect hose from wear, snagging and cutting, which can cause premature hose failure.

#### **2.12. Proper End Fitting**

See instruction 3.2 to 3.5 below. These recommendations may be substantiated by testing to industry standards such as SAE J517.

#### **2.13. Length**

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

#### **2.14. Specifications and Standards**

When selecting hose and fittings, government, industry, and Ractek specifications and recommendations must be reviewed and followed as applicable.

#### **2.15. Hose Cleanliness**

Hose components may vary in cleanliness levels. Care must be taken to ensure that the assembly selected has an adequate level of cleanliness for the application.

#### **2.16. Fire Resistant Fluids**

Some fire resistant fluids require the same hose as petroleum oil. Some use a special hose, while a few fluids will not work with any hose at all. See instructions 2.5 and 1.5. The wrong hose may fail after a very short service. In addition, all liquids but pure water may burn fiercely under certain conditions, and even pure water leakage may be hazardous.

#### **2.17. Radiant Heat**

Hose can be heated to destruction without contact by such nearby items as hot manifolds or molten metal. The same heat source may then initiate a fire. This can occur despite the presence of cool air around the hose.

#### **2.18. Welding and Brazing**

When using a torch or arc welder in close proximity to hydraulic lines, the hydraulic lines should be removed or shielded with appropriate fire resistant materials. Flame or weld spatter could burn through the hose and possibly ignite escaping fluid resulting in a catastrophic failure. Heating of plated parts, including hose fittings and adapters, above 232°C such as during welding, brazing, or soldering may emit deadly gases.

#### **2.19. Atomic Radiation**

Atomic radiation effects all materials used in hose assemblies. Since the long-term effects may be unknown, do not expose hose assemblies to atomic radiation.

### **3.0 HOSE AND FITTING ASSEMBLY AND INSTALLATION INSTRUCTIONS**

#### **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, catalogue number and length. In addition, the hose must be examined for cleanliness, obstructions, blisters, cover looseness, or any other visible defects.

#### **3.2. Hose and Fittings Assembly**

Do not assemble a fittings on a Ractek hose that is not specifically listed by Ractek for that fitting unless authorised in writing by the chief engineer of the appropriate Ractek division. Do not assemble a Ractek fitting on another manufacturer's hose or a Ractek hose on another manufacturer's fitting unless (1) the chief engineer of the appropriate Ractek division approves the assembly in writing, and (2) the user verifies the assembly and the application through analysis and testing. See instruction 1.4 above.

Ractek published instructions must be followed for assembling the fittings on the hose. These instructions are provided in the Ractek Fitting Catalogue for the specific Ractek fitting being used.

#### **3.3. Related Accessories**

Do not crimp or swage any Ractek hose or fitting with anything but the proper listed Ractek swage or crimp machine and dies and in accordance with Ractek published instructions. Do not crimp or swage another manufacturer's hose fining with a Ractek crimp or swage die unless authorised in writing by the chief engineer of the appropriate Ractek division.

#### **3.4. Parts**

Do not use any Ractek hose fitting part (including but not limited to socket and nipple) except with the correct Ractek mating parts, in accordance with Ractek published instructions, unless authorised in writing by the chief engineer of the appropriate Ractek division.

### **3.5. Reusable Fittings**

Do not reuse any reusable hose fitting that was blown or pulled off a hose. Do not reuse a Ractek permanent hose fitting (that is, crimped or swaged) or any part thereof.

### **3.6. Minimum Bend Radius**

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

### **3.7. Twist Angle and Orientation**

Hose installations must be such that relative motion of machine components does not produce twisting.

### **3.8. 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 ensure such restraints do not introduce additional stress or wear points.

### **3.9. Proper Connection of Ports**

Proper physical installation of the hose requires a correctly installed port connection while ensuring that no twist or torque is transferred to the hose.

### **3.10. External Damage**

Proper installation is not complete without ensuring that tensile loads, side loads, kinking, flattening, potential abrasion, thread damage, or damage to sealing surfaces are corrected or eliminated. See instruction 2.10.

### **3.11. System Checkout**

All air entrapment must be eliminated and the system pressurised to the maximum system pressure and checked for proper function and freedom from leaks. Personnel must stay out of potential hazardous areas while testing and using.

### **3.12. Routing**

Hose should be routed in such a manner that if a failure does occur, oil mist will not come into contact with hot surfaces, open flame, or sparks, and the chance of personal injury is minimised.

## **4.0 HOSE AND FITTING MAINTENANCE INSTRUCTION**

### **4.1. Maintainance**

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 must be established and followed by the user and must include the following as a minimum.

### **4.2. Visual Inspection of Hose/Fitting**

Any of the following conditions require immediate shutdown and replacement of the hose assembly:

- Fitting slippage on hose
- Damage, cut or abraded cover (any reinforcement exposed)
- Hard, stiff, heat cracked, or charred hose
- Cracked, damaged, or badly corroded fittings
- Leaks at fitting or in hose
- Kinked, crushed, flattened or twisted hose
- Blistered, soft, degraded, or loose cover.

### **4.3. Visual Inspection All Other**

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

- Leaking port conditions.
- Excess dirt build-up
- Clamps, guards, shields
- 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. Personnel must avoid potential hazardous areas while testing and using.

#### 4.5. Replacement Intervals

Specific replacement intervals must be considered based on previous service life, industry recommendations, or when failures could result in unacceptable downtime, damage, or injury risk. See instruction 1.2.

#### 4.6. Inspecting a Pressurised System

Hydraulic power is accomplished by utilising high-pressure fluids to do work. Hoses, fittings and hose assemblies all contribute to doing work by transmitting fluids at high pressures. Fluids under pressure can be dangerous and potentially lethal and therefore, extreme caution must be exercised when working with fluids under pressure and handling the hoses transporting the fluids.

Usually these failures are the result of some form of misapplication, abuse, or simple wear. When hoses fail, generally the high-pressure fluids inside escape in some sort of stream which may or may not be visible to the user. High-pressure fluids can and will penetrate the skin and cause severe tissue damage and possibly loss of limb. Even seemingly minor hydraulic fluid injection injuries must be treated by a physician with knowledge of the tissue damaging properties of hydraulic fluid.

If a hose failure occurs, immediately shut down the equipment and leave the area until pressure has been completely released from the hose assembly. Simply shutting down the hydraulic pump may or may not eliminate the pressure in the hose assembly. Many times check valves, etc., are employed in a system and can cause pressure to remain in a hose assembly even when pumps or equipment are not operating. Tiny holes in the hose, commonly known as pinholes, can eject small, dangerously powerful but hard to see streams of hydraulic fluid. It may take several minutes or even hours for the pressure to be relieved so that the hose assembly may be examined safely.

Once the pressure has been reduced to zero, the hose assembly may be taken off the equipment and examined. It must always be replaced if a failure has occurred. Never attempt to patch or repair a hose assembly that has failed. Consult the nearest Ractek distributor or the appropriate Ractek division for hose assembly replacement information.

Never touch or examine a failed hose assembly unless it is obvious that the hose no longer contains fluid under pressure. The high-pressure fluid is extremely dangerous and can cause serious and potentially fatal injury.

#### 4.7. Refrigerant Gases

Special care should be taken when working with refrigeration system. Sudden escape of refrigerant gases can cause blindness if the escaping gases contact the eye and can cause freezing or other severe injuries if it contacts any other portion of the body.