

(Reprinted from Assogomma "Recommendation regarding choice, storing, use and maintenance of rubber hoses" June 2004.)

1. CHOICE CRITERIA

In order to choose a hose suitable for a specific use it is necessary to determine at least the following basic points:

1.1 Pressure - suction

It is necessary to determine the maximum working pressure or suction values. It should be taken into consideration that the normal life of the hose will be prejudiced in the case of a sudden pressure variation or pressure peaks exceeding the maximum allowed.

1.2 Compatibility of conveyed substances

The nature, designation, concentration, temperature and state (liquid, solid, gaseous) must be determined. In the case of solid substances conveyed, it is necessary to indicate granulometry, density, quantity of the solid substance conveyed as well as the nature, speed and flow of the fluid carrying it.

1.3 Environment

It is necessary to know the place of usage, ambient temperature, hygrometric conditions and exposure to atmospheric agents. Specific environment conditions such as ultraviolet rays, ozone, sea water, chemical agents and other aggressive elements could cause early degeneration of the hose.

1.4 Mechanical stress

The minimum bend radius* must be established as well as any stress related to traction, torsion, bending, vibration, compression, deflection and longitudinal or transversal loads.

1.5 Cover abrasion

Even though the hoses are manufactured to guarantee good resistance to abrasion, it is advisable to use further protection when damage to the hose may be caused by shock, corrosion and/or dragging.

1.6 Working position

Indicate if the hose is either placed on the ground, suspended or immersed.

1.7 Used or foreseen couplings

This must be selected according to:

- couplings and flanges: type, dimension, type of thread, standard references and kind of application;
- hose shank: internal and external diameter and length;
- ferrules/clumps: type and dimension.

In order to guarantee good performance the compatibility between the hose and type of coupling must be ensured. The assembly must guarantee the working pressure suggested by the manufacturer.

1.8 Technical standards

National, European and International technical standards and rules must always be adhered to. In the case of hoses for peculiar purposes it is advisable to establish proper specification with the manufacturer.

1.9 Marking

Manufacturers must mark hoses at regular intervals with the information necessary for the proper use of the product.

When interpretation is not clear or information is insufficient, user should apply to the manufacturer.

2. RECOMMENDATION FOR CORRECT STORAGE

Rubber is subject, by nature, to changes in physical properties. These changes, which normally occur over the course of time, according to the kind of rubber used, can be accelerated by one particular factor or by a combination of these.

Reinforcement materials are also adversely affected by unsuitable conditions of storage. The following recommendations give some precautions to be taken to ensure the minimum deterioration to stored articles.

2.1 Storage life

Storage time should be reduced to the minimum through programme rotation.

When it is not possible to avoid long term storage, it is necessary that the user, as indicated in ISO 8331, carries out a complete check of the hose before its use according to the following criteria:

- maximum two years storage for assembly;
- maximum four years storage for hoses.

2.2 Temperature and humidity

The best temperature for the storage of rubber hoses varies from 10 to 25 degrees centigrade. Hoses should not be stored at temperature above 40 °C or below 0 °C. When the temperature is below -15 °C it is necessary to take precautions when handling.

Hoses should not be stored near sources of heat nor in conditions of high or low humidity. A humidity level of a maximum of 65% is recommended.

2.3 Light

Hoses must be stored in dark places, avoiding direct sun light or strong artificial light. Should store rooms have windows or glass openings, these must be screened.

2.4 Oxygen and ozone

Hoses should be protected from circulating air by suitable packing or by storage in air-tight containers. As ozone has a particularly aggressive action on all rubber products, the store house must not contain material producing ozone like devices under high electrical tension, electric engines or other materials provoking sparks or electric arcs.

2.5 Contact with other materials

Hoses should not come into contact with solvents, fuels, oils, greases, volatile chemical mixtures, acids, disinfectants and other organic liquids in general.

Furthermore direct contact with some metals (for example manganese, iron, copper and its alloys) and relative mixture exercise harmful effects on some types of rubber.

Contact with PVC and creosote impregnated timber or fabrics should be avoided.

2.6 Heat sources

The temperature limits given in point 2.2 must be respected. When this is impossible, it is necessary to use a thermic shield at a distance not less than one meter.

2.7 Electric or magnetic field

Variation in electric or magnetic fields must be eliminated in store houses as these could provoke currents in metal coupling, heating them. Similar fields could be caused by high-tension cables or high frequency generators.

*The **minimum bend radius** is the radius to which the hose can be bent in service without damage or appreciably shortening its life. The radius is measured to the inside of the curvature. **Formula to determine minimum hose length given bend radius and degree of bend required:**

$$L = \frac{A}{360^\circ} \times 2 \pi B$$

Where:

- L = Minimum length of hose to make bend (Bend must be made equally along this portion of hose length).
- A = Angle of bend
- B = Given bend radius of hose
- π = 3.14

Example: To make a 60° bend at the hose's rated minimum bend radius of 15 cm

$$L = \frac{60}{360^\circ} \times 2 \times 3.14 \times 15 = 15.7 \text{ cm} \cong 16 \text{ cm}$$

Thus, the bend must be made over approximately 16 cm of hose length. The bend radius used must be equal to or greater than the rated minimum bend radius. Bending the hose to a smaller bend radius than minimum may kink the hose and result in damage and early failure.

2.8 Storage conditions

Hoses must be stored in a relaxed condition free from tension, compression or other deformation and contact with objects that could pierce or cut must be avoided. It is preferable to store hoses on special shelves or on dry surfaces.

Coiled hoses must be stored horizontally avoiding piling. When this is not possible the height of the piles must be such to avoid permanent deformation of hoses stored underneath.

The inside diameter of the coil, during the storage, must be such as to not compromise the performances of the products. In particular, this diameter must not have value less than those indicated by the manufacturers.

It is advisable to avoid storing coiled hoses on poles or hooks. Furthermore it is advisable to store hoses to be delivered straight, horizontally, without bending.

2.9 Rodents and insects

Hoses must be protected from rodents and insects. When such a risk is probable adequate precautions must be taken.

2.10 Marking or packaged items

It is advisable that hoses are always easy to identify even if packaged.

2.11 Exit from storage

Prior to delivery hoses must be checked for integrity and must correspond to the required use. After long storage if couplings are not clipped, swaged or built-in, it is necessary to check that locking collars are tight.

2.12 Return to storage

Hoses that have been used must be free from all substances prior to storage. Particular attention must be paid when chemical, explosive, inflammable, abrasive and corrosive substances have been conveyed. After cleaning, check whether the hose is suitable to use again.

3. NORMS AND METHOD OF USE

After having chosen the type of hose, the users must keep in mind the following hose installation criteria:

3.1 Preassembly checks

Prior to installation it is necessary to check the characteristics of the hose carefully to verify that type, diameter and length conform with the required specifications. Moreover a visual check must be effected to make sure that there are no obstructions, cuts, damaged cover or any other evident imperfections.

3.2 Handling

Hoses must be moved with care avoiding knocks, dragging over abrasive surfaces and compression. Hoses must not be pulled violently when twisted or knotted. Heavy hoses, normally delivered in a straight line, must be laid on special supports for transport (see attachment). Should wood supports be used these must not be treated with creosote or painted with substances which could damage the rubber.

3.3 Pressure and seal test

The working pressure generally indicated by manufacturer must be respected. Following installation, when air bubbles have been eliminated, increase the pressure to test the assembly and check possible leaks. This test must be carried out in a place free from danger.

3.4 Temperature

Hoses must always be used within the temperature limits generally indicated. In case of doubt apply to manufacturers.

3.5 Conveyed products

Hoses must be used exclusively to convey substances for which they were manufactured. In case of doubt it is always advisable to contact manufacturer. As far as possible, hoses must be empty after usage. Where any risks are involved special precautions must be taken to avoid bursts.

3.6 Environment

Hoses must be used exclusively in the environment conditions for which they were manufactured.

3.7 Bending radius

Installation underneath the minimum bending radius reduces the life of the hose considerably. Moreover it is necessary to avoid bending at fitting ends. *(See attached 1).

3.8 Torsion

Hoses are not manufactured to work in torsion, except for specific purposes.

3.9 Traction

Traction must be within limits specified by manufacturer. In case of doubts it's advisable to get in touch with manufacturers.

3.10 Vibration

Vibrations subject hoses to stress from heat and fatigue above all near couplings and premature bursting may occur. It is therefore advisable to check that hoses have been manufactured to resist such stress.

3.11 Kinking

Some users tend to obstruct the flow of liquids by kinking the hose. This system is not advised by manufacturers because the reinforcement is subjected to excessive stress and could lead to bursting.

3.12 Choice and application of couplings

Provided that the manufacturers instructions are met it is always necessary to check the compatibility between the working pressure of couplings and hoses. Couplings with too large diameters cause abnormal stress which can split the hose reinforcement, whilst too small dimensions can create clumping difficulties and leakage.

Furthermore couplings must be free from sharp and cutting edges which could damage the hose.

Water or soap and water can be used to fit couplings. Do not use products containing oils or solvents except for the kind of hoses destined to be used with the latter.

Softening hoses with mallet or similar tools is forbidden.

Take care to avoid external collars or other tightening tools. The use of makeshift collars (for example wire) with sharp edges or too tight clumping leads to damage of cover and reinforcement.

3.13 Electrical properties

According to ISO 8031: 2009 "Rubber and plastics hoses and hose assemblies – Determination of electrical resistance and conductivity" hoses and hose assemblies are classified in three types depending on their property to conduct electricity:

a) INSULATING

Not incorporating conductive elements and not capable of dissipating electrostatic charges.

The electrical resistance is more than $10^8 \Omega$ per length.

b) CONDUCTIVE (Ω grade)

Incorporating electrically conducting materials in the hose construction.

The resistance along the conductive layer, in case of hoses, or the resistance between fittings, in case of hose assemblies, shall not exceed $10^6 \Omega$ per length.

c) ELECTRICALLY BONDED (grade M)

Incorporating at least two metallic bonding wires into the hose construction. The resistance along the bonding wires, in case of hoses, or the resistance between fittings, in case of hose assemblies, shall not exceed $10^2 \Omega$ per length.

According to EN 12115: 2011 "Rubber and thermoplastics hoses and hose assemblies for liquid or gaseous chemicals – specification", when there is a need for hose assemblies of type b) or c) with an electrical resistance through the hose wall of not more than 10^9 , these hoses shall be marked with the additional symbol "T", e.g. " Ω/T " or "M/T".

Such hose assemblies are required in situations where dissipation of electrostatic charges are a safety requirement (i.e. in explosive environments).

3.14 Installation between two points

The hoses must be supported in a suitable way, so as the normal movement when the hose is under pressure (variations in length, diameter, twisting, etc.) are allowed.

3.15 Mobile pieces

When hoses link mobile pieces, it is necessary to check that the length of the hose is suitable and that the movement does not subject the hose to shock or chafing and that abnormal stress, bending, traction or torsion do not occur.

3.16 Identification

If further marking is necessary, self-adhesive tape may be used. When the use of paint is unavoidable check compatibility of cover with manufacturer.

4. MAINTENANCE

Even though choice, storage and installation have been carried out correctly regular maintenance is necessary.

Frequency of the latter is determined according to use involved. During regular check special attention must be paid to couplings and to the appearance of the following irregularities which show deterioration of hose:

- Cracks, cuts, abrasions, unsticking, tears in cover revealing reinforcement;
- Deformity, bubbles, local swelling under pressure;
- Sticky or soft areas;
- Leaks.

Such irregularities justify hose substitutions. When cover bears date of expiry this must be kept to even if the hose shows no apparent signs of wear.

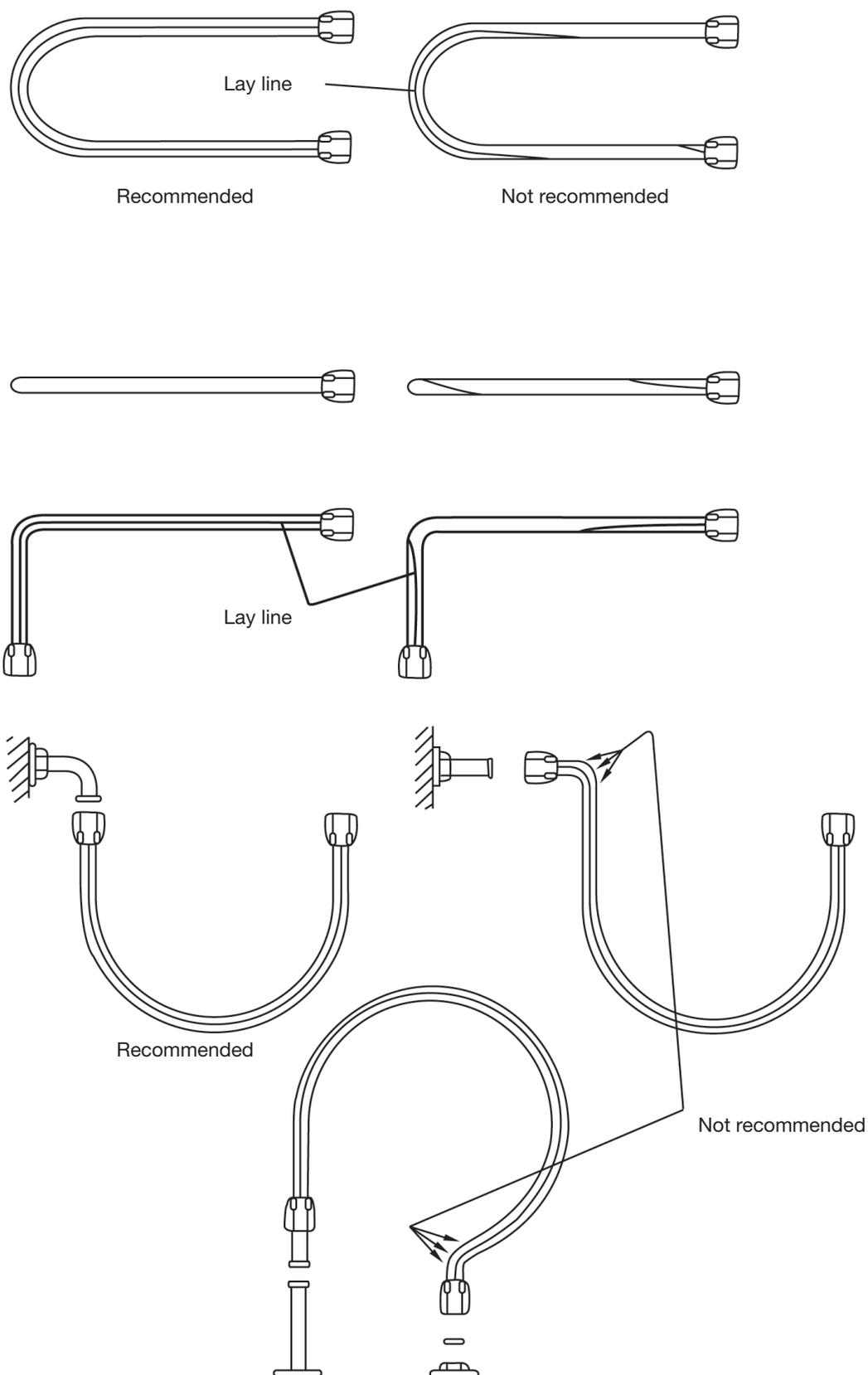
4.1 Repairs

Hose repairs are not advisable. However when deterioration occurs at an end section, and if the full length allows for such, the worn section may be eliminated.

4.2 Cleaning

If cleaning instructions are not supplied by the manufacturer clean, if necessary, with soap and water avoiding use of solvents (petrol, paraffin, etc) or detergents. Never use abrasive, pointed or cutting tools (wire brushes).

*(Attached 1)



This drawings refer to assemble installed in real conditions. Some of these may request layouts violating such recommendations. It is necessary to point out that such cases are only applicable in test conditions and cannot be used for general use.