

User Information Sheet 024

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PREPARATION, INSTALLATION, INSPECTION, TESTING AND MAINTENANCE OF RUBBER HOSES, UP TO AND INCLUDING 76 mm INTERNAL DIAMETER IN ACCORDANCE WITH BS EN 1762.

1 Introduction.

This information sheet gives supplementary guidance for the preparation, installation, inspection, testing and maintenance of hose assemblies using hose in accordance with BSEN 1762 - type D or SD of internal diameter ≤ 76 mm, for use with LPG in the liquid phase or at vapour pressure at pressures ≤ 25 bar. These hoses may be either electrically bonded (with stainless steel braiding or textile braided with tinned copper strands with the wire elements connected to the metallic end fittings - Type M); or electrical conductive (with conductive rubber layer – Type Ω (Ohm)). The guidance in this Information Sheet is not intended for application to any other type of hose. The part of BS 4089 dealing with similar rubber hose is now obsolescent. That Standard now only relates to stainless steel metallic hose assemblies. These are referred to in CoPI Pt I and CoP22.

As a requirement of BS EN 1762 hose linings are required to have a lining of synthetic rubber resistant to n-pentane so therefore be resistant to leaching by liquid phase LPG.

2 Care of Hoses and Hose Assemblies in Transport and Storage

2.1 General

All hose assemblies should be suitably protected against damage during transportation or whilst in store.

Whenever possible, hoses should be stored in their original shipping or packing containers.

Coiled hoses should be stored in a horizontal plane so that the radii of the coils are not less than the minimum bend radius specified in the relevant specification.

Hoses should not be stored in such a way that distortion can occur due to the weight of the coils or by other objects.

Storage places should be cool, dark and free from damp or other substances which could lead to deterioration of the hose or corrosion of its metal components. Hoses should be kept away from electrical surges and protected from ultraviolet radiation (sunlight) and ozone.

All hoses and hose assemblies should be used on a “first in, first out” basis. The ends of hoses and hose assemblies should be closed with caps or plugs to prevent the ingress of dirt.



2.2 Transfer Hoses at Depots

When not in use, “in-service hoses” should be stored above ground/floor level and free from dirt. Hoses above 50 mm internal diameter should be supported at regular intervals.

3 Hose Assembly

3.1 General

The assembly of end fittings should be carried out by a competent person and in accordance with the assembly instructions provided by the hose manufacturer. Care should be taken that the inner lining is not damaged during assembly. Swaged end fittings should not be reused. Where clamp type couplings are used these should be to EN 14422 and approved by the hose manufacturer.

Securing end fittings using worm type clips is not permitted with this type of hose as there is no control on the compression on to the hose, plus the potential of irregular compression and damage to the outer cover.

Direct fitting of DDGC (Dry Disconnect Gas Couplings) to EN 13760 is permitted provided they are designed to be fitted directly to the hose. When fitted to the hose the couplings will form part of the hose assembly.

3.2 Post assembly and routine testing

All completed assemblies should be identified and tested before dispatch in accordance with BS EN 1762 which includes:

- a hydraulic test in accordance with EN ISO 1402 to a pressure of 37.5 bar;
- an electrical resistance check whilst under hydraulic pressure in accordance with EN ISO 803 1 to confirm that the resistance between the coupling does not exceed 1×10^6 ohms for Ω type hose and 1×10^2 for M type hose;
- a check that the length during the hydraulic test remains within the tolerances specified in EN ISO 1402.

For more details of the test procedure and the retesting of hose assemblies see 7.3

3.3 Identification

The assembly should be fitted with a unique identification using digits at least 3 mm high (see also 7.4.2).

The original manufacturers' serial numbers should always remain. After retesting a sub number should be added and any other sub numbers should be removed.

4 Installation

Before installation each hose should be inspected in accordance with the routine 'in service' inspection and the hose documentation and/or markings checked to show the hose is still within test period. Hoses should be installed and transported in such a manner that abrasion is minimised.

Hose in fixed circuits should be positioned such that under normal operating conditions moving parts does not endanger them.

The length of the hose should not be placed under excessive compression or tension in order to make the connection.

Where practical the hose assembly should be installed following any natural curve and should not be bent tighter than the minimum bend radius specified in BS EN 1762. Care should be taken during installation to ensure that any twist of the hose is kept to a minimum. Where a torsion line is marked on the hose, this should be used as a guide during assembly to minimise any torsional strain.

Where a hose assembly is between positive shut off valves then a hydrostatic relief valve, with a maximum setting of 25 bar, should be fitted to prevent over-pressurisation due to thermal or mechanical affects.

The hose should be routed to avoid rough edges, potential points of abrasion, moving parts or cross-over points. If not possible, protection for the hose should be installed and restraints should be used to prevent the hose from free movement. Any restraints should be positioned so as to avoid any unnecessary strain or mechanical damage; this is usually as near as possible to the middle of the hose length but not on a bend in the hose line.

It is recommended that hose manufacturers advice should be obtained before the fitting of any restraints.

If hoses are not specifically designed to withstand full internal vacuum conditions or if there is any doubt of their specification they should not be used if the pressure of the equipment is reduced below atmospheric pressure. For this application a suction hose type SD may be considered.

The owner of the hose should keep a written record of the installation of the hose with the test and examination record (see 7.4)

5 Hose Protection

Rubber hoses should never be painted. Where other parts, such as the end connections are painted, e.g. for identification or corrosion protection, care should be taken to ensure that their operation is not affected and that identification, test and retest data is not obscured.

As a requirement of BS EN 1762 hose outer covers are required to be resistant to abrasion and outdoor exposure. However if the operator deems it necessary that additional external protection is required to protect the outer cover of a hose then the additional protection must be approved by the hose manufacturer and be either:

- an anti-abrasion procoil;
Wrapped or plastic type coils which may be of non-conductive polyethylene should not cover more than 1/3 of the hoses. They should be free moving so that the hose cover is always visible and can be checked. Care should be taken that there are no sharp edges which might cut into the hose cover.
- an additional outer cover.
Note: If this method is used then additional routine checks will need to be made to confirm that no degradation of the hose beneath the cover takes place.

All joints need to be visible for inspection without the need to remove outer covers.

6 In-Service Inspection of Hoses

All hose assemblies in daily use should be visually checked, daily, looking for defects. Hoses not in daily use should be checked each time before use.

Hoses with suspected defects should be removed from service and the defect reported to a responsible person as soon as possible.

If any of the following defects are observed then the assembly should be withdrawn from service:

- Leakage (other than single bubbles from manufacturers pricked weep holes) from hose or end fittings, valves and end couplings;
- Evidence of severe kinking, flattening, torsional strain, movement at end connection/fitting, severe stretching or other permanent distortion;
- Cuts, abrasions, cracks, or damage to the outer cover which may have damaged inner reinforcement or which has exposed the reinforcement;
- Damaged or worn end fittings, e.g. hose coupling threads;
- Damaged or worn transfer couplings and coupling threads (see UKLPG UIS013 available from www.uklpg.org);
- Blistering or de-lamination;
- Soft spots which may be detected by pressing the hose with the thumb. Particular attention should be paid to the 400 mm length of hose adjacent to each end fitting.

7 Periodic Examination and Testing of hoses

7.1 Written Scheme

No hose should be put into service without a written scheme of periodic examination and testing.

The Written Scheme should be prepared by a competent person and be appropriate to the design, materials of construction and duty of the components considered. Where appropriate (for example tanker hoses) it should include the inspection of loading and unloading couplings and adaptors both visually and by gauge or measurement, to detect wear beyond acceptable limits.

The Written Scheme need not be 'stand alone'. It may be part of a more extensive Written Scheme.

7.1.1 Hose assemblies of internal diameter ≤ 19 mm at consumer installations such as for vehicle or handling equipment (e.g. fork lift trucks) fuelling.

The Written Scheme of Examination should specify at least a documented annual inspection covering the items listed in 6 plus an in-service leak test. The results of the examination/testing should be recorded.

When the hose reaches 5 years then the hose assembly should be removed from service and either:

- scrapped; or
- may only be reused providing there are no visible defects, and then subjected to the Examinations and Tests given in 7.2 and 7.3.

Should the hose be retested it should be recorded and marked in accordance with 7.4 and subsequent examinations and tests carried out at intervals not exceeding one year.

7.1.2 Hose assemblies not covered above.

All other hose liquid and vapour hose assemblies should be subjected to examination and tests at intervals not exceeding 12 months in accordance with 7.2 and 7.3, with the findings recorded and marked in accordance with 7.4.

Transition assemblies, including loading and unloading couplings, should be regularly inspected in accordance with a Written Scheme of Examination drawn up by a competent person.

7.2 Examination and testing of hose assemblies

7.2.1 General

The hose assembly should be depressurised, disconnected and any gas removed in a safe manner. It should then be laid out as straight as possible ideally in a clean, dry area and examined for any of the defects. Threaded hose end couplings which are regularly made and broken should be checked using an appropriate gauge.

7.2.2 Hose Defects

The failure of any hose during post assembly or routine testing should always be cause for rejection.

Assemblies removed from service with suspected hose defects following inspection and examination should be set aside for further examination to determine the extent of the defects.

Where it can be clearly established that the defects are localised then, where practicable, the defective portion of the hose may be removed and the good portion of the hose put back into service following checking of the hose certificate, re-assembly of end fittings and testing.

Any hose which is subsequently found to be defective following the removal of previous localised defects and re-assembly of end fittings should be cut in half and the disposed of in a responsible manner in such a way that they cannot be inadvertently re-used for LPG service.

7.2.3 End Fitting Defects

Defective end fittings should be replaced with new and the hose assembly tested or the hose assembly scrapped.

7.2.4 Procoil Defects

If used a replacement procoil should be fitted in accordance with 5.

73 Testing

Following satisfactory examination the assembly should be subjected to and pass the tests specified below.

73.1 Hydraulic Test (at ambient temperature)

The assembly should be laid out as straight as possible to allow easy movement of the hose when the test pressure is applied. The hose should be filled with water and any air vented.

The length of the assembly should be measured.

The internal pressure should be increased gradually and uniformly to 37.5 bar. After ten minutes the overall length of the hose assembly should be measured to ascertain the *elongation* and the increase, as a percentage of the original length, should not exceed:

Elongation Type D	Elongation Type SD
Not more than 5%	Not more than 10%

The assembly should be checked under pressure to confirm that any change in twist at proof pressure does not exceed 8° per metre of hose.

The electrical resistance measured overall on each hose assembly end fitting to end fitting:

M - Type	Ω - Type
Not more than 1 0 ² Ω	Not more than 10 ⁶ Ω

The pressure should then be released gradually and the water drained from the hose.

7.3.2 Pneumatic Test

Following the successful completion of the hydraulic proof test a pneumatic pressure of 3,5 bar should be applied at ambient temperature and the hose assembly tested for leakage, following the removal of any air trapped between the cover and carcass, either by:

- immersion of the hose and connections in water; or
- applying leak detection fluid or soap/water solution the complete hose assembly.

Care should be taken to ensure any product used is compatible with the materials of which the hose assembly is constructed.

After test the pressure should be released gradually and any leak detection fluid or soap/water solution washed off.

7.4 Results of Examination and Tests

7.4.1 Records

On successful completion of the Examination and Testing a record should be issued which should be retained by the owner. The record should include the following:

- hose manufacturer's name and hose type;
- unique hose identification;
- hose type, size and overall length in relation to the original length after proof testing (where applicable);
- date of inspection/test/and where tested;
- results of inspection/tests;
- details of any repairs carried out;
- identification of test equipment used;
- identification of the person carrying out the testing.

7.4.2 Marking

Each hose assembly should have the month and year of the test marked on it or a unique identity number fitted which cross refers to the test record. The information should be clearly and permanently marked in letters not less than 3 mm in height on either:

- the hose itself;
- a non-corrodible device which should then be securely attached to the hose assembly immediately adjacent to one of the end fittings; or
- on one or both end fittings attached to the hose all previous test dates being obliterated. On plated end fittings, the dates and the obliterations should be painted as necessary with zinc-rich paint.

8 References and Bibliography

8.1 Standards

(EN standards – not yet confirmed as British Standards but have been included for information)

BS 4250:	Specification for commercial butane and propane
BS EN 589	Automotive fuels – LPG – Requirements and test methods.
BS EN 1762	Rubber hoses and hose assemblies for liquefied petroleum gas, LPG (Liquid or Gaseous phase), and natural gas up to 25 bar (2,5 MPa) – Specification
EN ISO 1402	Rubber & plastics hose and hose assemblies – Hydrostatic testing.
EN ISO 8031	Rubber & plastics hose and hose assemblies – Determination of electrical resistance
EN 14422	Clamp type coupling assemblies for LPG transfer hoses.
EN 12252:2005	Equipment and accessories – Equipping of LPG road tankers.
+A1 March 2008.	This standard covers hose and couplings in accordance with EN 14422 (Clamp type coupling assemblies for LPG transfer hoses and /or EN 14424 Hose fittings with screwed ferrules). (Note: The requirement for electrical resistance to not exceed 100 Ohms has been removed in this revision).

8.2 *Hose standards to which this Information Sheet is not applicable*

BS EN 1763	Rubber and plastics tubing, hoses and assemblies for use with commercial propane, commercial butane and their mixtures in the vapour phase
BS 4089	Specification for metallic hose assemblies for liquid petroleum gases and liquefied natural gases.
BS 7838	Specification for corrugated stainless steel semi rigid pipe and associated fittings for low pressure gas pipework of up to 28mm.
BS ISO 8789	Rubber hoses and hose assemblies for LPG on motor vehicles – specification.
BS 3212	Specification for flexible rubber tubing, rubber hose and rubber hose assemblies for use in LPG vapour phase and LPG/air installations