BRITISH STANDARD

BS 1435-2: 2005

Rubber hose assemblies for oil suction and discharge services —

Part 2: Recommendations for storage, testing and use

ICS 75.180.99

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BSI British Standards

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PRI/66, Rubber and plastics tubing, hoses and hose assemblies, upon which the following bodies were represented:

British Compressed Gases Association

British Fluid Power Association

British Rubber Manufacturers' Association

Energy Industries Council

Fire Extinguishing Trades Association

Forecourt Equipment Federation

London Fire and Emergency Planning Authority

MoD — UK Defence Standardization

RAPRA Technology Ltd.

Society of Motor Manufacturers and Traders Ltd.

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Contents

Foreword

This British Standard was prepared by Technical Committee PRI/66. It supersedes BS 1435-2:1990, which is now withdrawn.

BS EN 1765 replaced BS 1435-1 in 1998. BS 1435-2 has been revised to reflect that change and is to be read in conjunction with BS EN 1765.

The purpose of this standard is to assist the user in obtaining good service and optimum service life from hose assemblies, as well as to assist in maintaining their safe operation.

Local safety regulations at the place where hose assemblies are used may, however, take precedence over these recommendations.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 9 and a back cover.

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1 Scope

This British Standard recommends conditions for the storage, testing and use of rubber hose assemblies manufactured in accordance with BS EN 1765. It provides advice on the storage, testing and use of rubber hose assemblies for oil suction and discharge duties commonly used for transferring crude oil and other liquid petroleum products, excluding liquid petroleum gas (LPG) and natural gas, to and from tanker and bunkering vessels or for similar duties ashore.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the reference cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN 1765*, Rubber hose assemblies for oil suction and discharge services — Specification for the assemblies.*

BS EN 8330*, Rubber and plastics hoses and hose assemblies — Vocabulary.*

BS EN ISO 7233*, Rubber and plastics hoses and hose assemblies — Determination of suction resistance.*

BS EN ISO 8031*, Rubber and plastics hoses and hose assemblies — Determination of electrical resistance.*

3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS EN 8330 apply.

4 General

The following apply to all types of hose assemblies.

a) In consultation with the hose manufacturer, retirement age should be defined for each hose type/service to determine when it should be removed from service irrespective of meeting inspection and testing criteria.

b) Hose assemblies should be clearly marked for a particular service and checked at the time of issue as being suitable for the intended use (see **5.7**). All persons handling hose assemblies should fully understand the meaning of the marking system.

5 Storage of new hose assemblies

NOTE Rubbers change in physical properties during storage and in use and ultimately can become unserviceable because of excessive hardening, softening, cracking, crazing or other degradation.

The changes can result from the action of oxygen, ozone, light, heat, humidity, chemicals, insects and rodents and from internal pressure. Reinforcement materials can also be adversely affected by unsuitable conditions of storage.

The object of Clause **5** is to advise how these effects can be minimized by careful choice of storage conditions.

5.1 Use of racks

Where possible, racks should be used for storing hose assemblies. These racks enable hose assemblies to be stored up to three high on each rack, reduce the area required for hose storage and minimize the likelihood of damage from storing hose assemblies one on top of another. If racks are not used, hose assemblies should be laid out straight and horizontally on solid supports as shown in Figure 1. Lightweight hose assemblies should be laid out so that they are not subject to flattening.

Hose assemblies should, wherever possible, be stored in a relaxed condition free from tension, compression, or other deformation. If it is not possible to avoid bending the hose assembly because of its length, the hose assembly should be coiled to as large a diameter as possible and not less than twice the minimum bend radius specified in BS EN 1765.

Hose assemblies should be stored in a cool, dark, dry, and well-ventilated area and in a place where they are not liable to mechanical damage.

Where closed storage is not practicable, hose assemblies should be kept in their original shipping containers to provide a measure of protection provided that the hose assembly is not bent to a radius less than twice the minimum bend radius specified in BS EN 1765.

5.2 Temperature

The storage temperature should preferably be below 25 °C, and every effort should be made to keep it below 35 °C, as higher temperatures cause rubber materials to deteriorate more rapidly. Hose assemblies should not be stored close to sources of heat that might raise their temperature above 25 °C.

When hose assemblies form part of mechanical equipment, it might not be possible to store them in ideal conditions. Every effort should, however, be made to ensure that the temperatures to which they will be exposed are kept within the preferred limits.

5.3 Humidity

Very moist or very dry storage conditions should be avoided. An atmosphere of 65 % r.h. is recommended.

5.4 Light

Hose assemblies should be protected from light, particularly direct sunlight and strong artificial light. Unless the hose assemblies are packed in opaque containers, it is advisable to cover all windows in storage rooms with a red or orange translucent coating, or a screen to protect them from direct light.

5.5 Oxygen and ozone

Wherever possible, hose assemblies should be protected from circulating air by storage in airtight containers.

Ozone is injurious to most rubbers and storage rooms should not contain any equipment which can generate ozone, such as mercury vapour lamps, high voltage electrical equipment, welding equipment, electric motors or other equipment which might give rise to electric sparks or silent electrical discharges.

5.6 Contact with other materials

Storage areas should be free from oils, greases, solvents, corrosive substances or any other liquids or gases that can adversely affect the condition of the hose assembly.

Direct contact with some metals (e.g. manganese, iron and, particularly, copper and its alloys) and their compounds can have deleterious effects on some rubbers. Hose assemblies should, therefore, not be stored in contact with such metals, or materials impregnated with their compounds, e.g. wood and wrapping materials impregnated with copper naphthenate. Similarly, contact with wood or fabric impregnated with creosote should be avoided.

Because of the possible transfer of plasticizers or other ingredients, rubber hoses should not be stored in contact with plasticized PVC.

NOTE Other rubber products that have been differently compounded can degrade the hose by migration of constituents if stored in contact with hose assemblies. Oil temperatures in excess of 80 °C will shorten the life of the hose assembly.

5.7 Bringing hose assemblies into use

Hose assemblies conforming to BS EN 1765 are marked with the date of manufacture. Care should be taken to ensure that the oldest assembly is taken into service first. When hose assemblies are stored in their shipping containers, each container should be marked with the month and year of receipt and that hose assemblies are used in date order.

Hose assemblies should be clearly marked for a particular service and checked at the time of issue as being suitable for the intended use.

6 Inspection and testing

6.1 Inspection during service

The condition of the hose assembly should be determined by internal and external inspection and by hydrostatic testing for all types.

Inspection and testing, together with knowledge of local service conditions such as the products conveyed by the hose assembly, the age of the hose assembly and the type of handling equipment used, should be considered when deciding if a hose assembly should be withdrawn from service.

Hose assemblies should be visually inspected on a regular basis. When hose assemblies are in constant or frequent use, the assembly should be inspected before each loading/unloading operation. When it is not practicable to do this, inspections should be not less frequent than one per day. Hose assemblies subject to infrequent use should be inspected each time they are brought into use.

Visual inspection should consist of:

a) examining the hose assembly for irregularities in the outside diameter, e.g. kinking;

b) examining the hose cover for damaged or exposed reinforcement or permanent deformation;

c) examining the end fittings for signs of damage, slippage or misalignment.

Any hose assembly exhibiting any of the above defects should be removed from service for more detailed inspection. When a hose assembly is withdrawn from service following a visual inspection, the reason for withdrawal and the date should be recorded as shown in Annex A.

6.2 Hydrostatic testing of hose in service

6.2.1 *Frequency*

Hose assemblies should be hydrostatically tested in accordance with BS EN 1765. The interval between tests should be determined in accordance with service experience but should not be more than 12 months in any case. Testing intervals may be shortened accordingly for hoses handling particularly aggressive products or products at elevated temperatures.

A record should be kept of the service history of each hose assembly as shown in Annex A.

6.2.2 *Test procedure*

Lay out the hose assembly straight on level supports that allow free movement of the hose when the test pressure is applied.

Seal the hose by bolting blanking-off plates to both ends, one plate to be fitted with a connection to the water pump and the other to be fitted with a hand operated valve to release air. Fill the hose assembly with water. Connect the test pump at one end and release the trapped air from the other.

Measure and record the overall length of the hose assembly. Slowly increase the pressure up to the factory test pressure marked on the hose and given in BS EN 1765.

Hold the test pressure for a period of 10 min whilst examining the hose assembly for leaks at the nipples or for any signs of distortion or twisting.

At the end of the 10 min period and while the hose assembly is still under full pressure, re-measure the length of the hose assembly.

Reduce the pressure to zero and drain the hose assembly. If while the used hose assembly is under test pressure there are no signs of leakage or movement of the fitting but the hose assembly exhibits significant distortion or excessive elongation, the hose assembly should be scrapped and not returned to service.

6.3 Test records

Test records should be kept of each hose assembly so that the temporary elongation under pressure can be compared with that recorded on the original test certificate (see BS EN 1765). Specimen forms for these records as shown in Annex A should be used.

6.4 Withdrawal from service

In consultation with the hose manufacturer, retirement age should be defined for each hose type/service to determine when it should be removed from service irrespective of meeting inspection and testing criteria.

The temporary elongations at which hose assemblies should be withdrawn from service will vary with the type of hose assembly construction such that either:

a) the temporary elongation when measured in accordance with **6.2** should not exceed 1.5 times the temporary elongation when the hose assembly was new;

for example: temporary elongation of new hose assembly, 4 %;
temporary elongation at test, 6 % maximum; or

b) for hose assemblies where the temporary elongation of a new assembly was 2.5 % or less, the temporary elongation at the test should be not more than 2 % more than that of the new hose assembly.

for example: temporary elongation of new hose assembly 1 %;
temporary elongation of old hose assembly 3 % maximum.

6.5 Electrical continuity and discontinuity

During and after the hydrostatic test, an electrical continuity test should be carried out in accordance with BS EN ISO 8031. For electrically bonded hose assemblies, electrical continuity should exist before, during (10 min after application of the test pressure) and after the hydrostatic test. This should not exceed a maximum of 10 Ω and should be measured with a low voltage test meter.

For electrically discontinuous hose assemblies, the resistance between the end nipples of each length of hose assembly should be not normally less than 25 kΩ and the hose assembly should be taken out of service if the resistance is less than 1 kΩ. The testing of electrically discontinuous hoses should be carried out using a 500 V tester.

6.6 Resistance to vacuum test (for Type “R”, “S” and “A” hose)

A resistance to vacuum test should be applied only if the user has reason to doubt the integrity of the hose lining. Carry out the resistance to vacuum test in accordance with BS EN ISO 7233. Type “L” hoses are for discharge applications only and should not be subjected to a vacuum test.

7 Handling and use of hose assemblies

7.1 Handling

A hose assembly should not be lifted from a single point with the ends hanging down. Hose assemblies should be supported by at least two band slings located near the reinforced ends using a spreading or lifting bar. The number and location of the slings should be such that the hose assembly remains substantially straight during lifting as shown in Figure 2. Slings such as chains or ropes that might cause chafing of the hose cover should not be used.

Hose assemblies should not be dragged over docks or decks; they should be carried on trolleys or rollers or moved by derricks.

Hose assemblies should not be subjected to torsion. It is particularly important that lightweight hoses should not be twisted or kinked.

7.2 Use of hose assemblies

In use, hose assemblies should be supported by a belt sling, a bridle, or a saddle.

These supports should be long enough to maintain an inside bend radius within the assembly not less than that given in BS EN 1765. With lightweight hose assemblies, longer supports should be used if needed to prevent kinking.

NOTE Suitable materials for use as supports that will not contaminate the hose are non-impregnated wood, clean rope matting or “used” hose.

There should be no twist in the hose and no sharp bends at nipples and end connections. Curvature should be evenly distributed over the full length of the hose assembly.

When disconnecting at the end of the operation, the hose assembly should be drained and the flange faces protected with blank flanges.

For marine use, as a ship rises and falls, the hose assembly supports should be adjusted to keep any curvature evenly distributed. Ships' derricks might not provide the necessary degree of support for the hose assemblies and additional equipment should be used where needed. The hose line should be of such length as to allow for changes in the tide and the rise or fall of the ship as it is loaded or unloaded. Hose assemblies should not be allowed to lie in pools of oil or other liquids that might damage rubber compounds.

7.3 Operations

A hose should be chosen such that its "test" pressure, as specified in BS EN 1765, is greater than the no flow pressure of any centrifugal pump in the transfer system. Alternatively, a safety relief valve should limit the transfer system pressure to the hose "test" pressure as specified in BS EN 1765.

Reciprocating pumps should be adjusted to reduce pulsation to a minimum. Their relief valve settings should be set below the factory test pressure of the hose assembly and their air chambers should be kept full of air during the entire pumping operation.

All valves should be checked before oil is admitted to the hose assembly, and care should be taken not to shut off any valve suddenly while the fluid is flowing. This will avoid unnecessary shock pressures on the hose assembly.

Every effort should be made to keep hose assemblies from chafing against the dock or any part of the ship. This is particularly important if reciprocating pumps are used. The hose assembly should not be allowed to touch any hot surface.

The hose assembly should be kept under close observation during use in order to detect any signs of failure. Personnel performing this duty should be able to take necessary action to prevent failure of the hose assembly and to quickly control any loss of its contents.

7.4 Procedure after use

After use, hose assemblies may be left full or drained. Assemblies left in position and full should always be provided with means to allow for relief of the expansion of any trapped liquid. If such means are not available, the assembly should be drained. Assemblies drained and left in position might need to be protected against mechanical damage and, in particular, the end fittings might need to be capped or otherwise closed to prevent the ingress of foreign materials.

For marine use, if hose assemblies are dismantled and stored on the dockside, they should be placed in an area designed for the purpose.

Hose lengths should preferably be laid out straight with wide supports on level ground. Such supports will also allow for the easy insertion of suitable hose slings under and around the hose for lifting or transporting as shown in Figure 2.

When hose assemblies are out of use for prolonged periods, consideration should always be given to returning the hose to the storage area for new assemblies, and protection from sunlight, mechanical damage and excessive temperatures should be part of any storage conditions (see Clause **5**).

Before returning a hose assembly to storage, it should be drained completely. Hose assemblies which have been used in white oil or crude oil service should be flushed to remove any potentially explosive vapours and should be stored in such a way that air can circulate freely around them. Hose assemblies which have been used in black oil service should be flushed out with water if they are to be stored for more than two months.

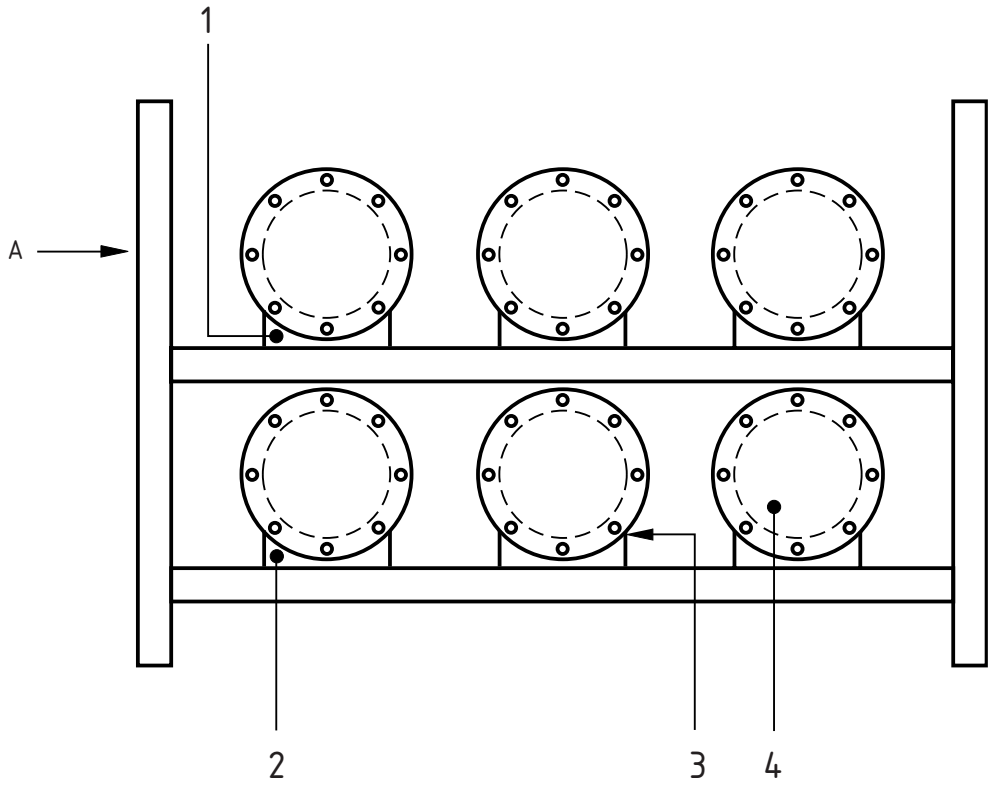
Cleaning of open ended hoses with loose steam or compressed air is permitted if carried out within hose temperature/pressure limitations. Cleaning with sea-water should be followed with flushing with fresh water to minimize corrosion of fittings.

Hoses should be grounded ("earthed") during cleaning operations.

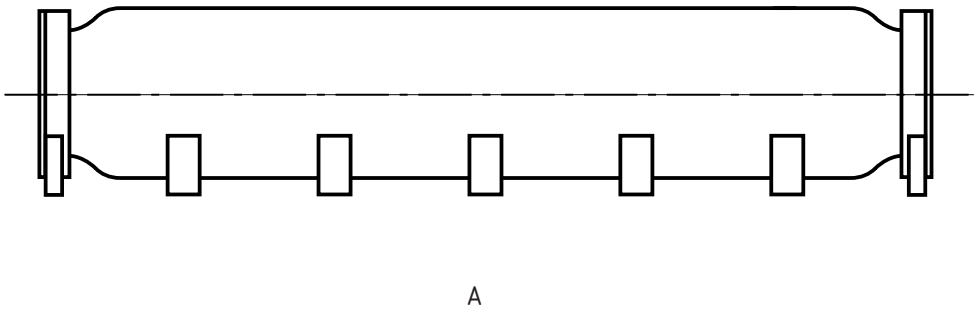
Mechanical methods of cleaning should not be used.

Where hose assemblies have been used for white or crude oils, caps having a vent hole to relieve any vapour pressure build-up within the hose assembly should be provided to prevent air circulation through the hose.

All hose assemblies, whether left in position full or drained, should be visually inspected for obvious mechanical damage before being brought back into use.



a) Front side



b) Side view

Key
1 Hoses supported in cradles at ends and along the hose body
2 Wooden cradle. If wooden cradles are used, it is essential that they are not creosoted or painted with compositions that could have deleterious effect (see **5.6**).
3 Radius at point of support
4 Ends covered

Figure 1 — Storage and support system for new and used hose assemblies

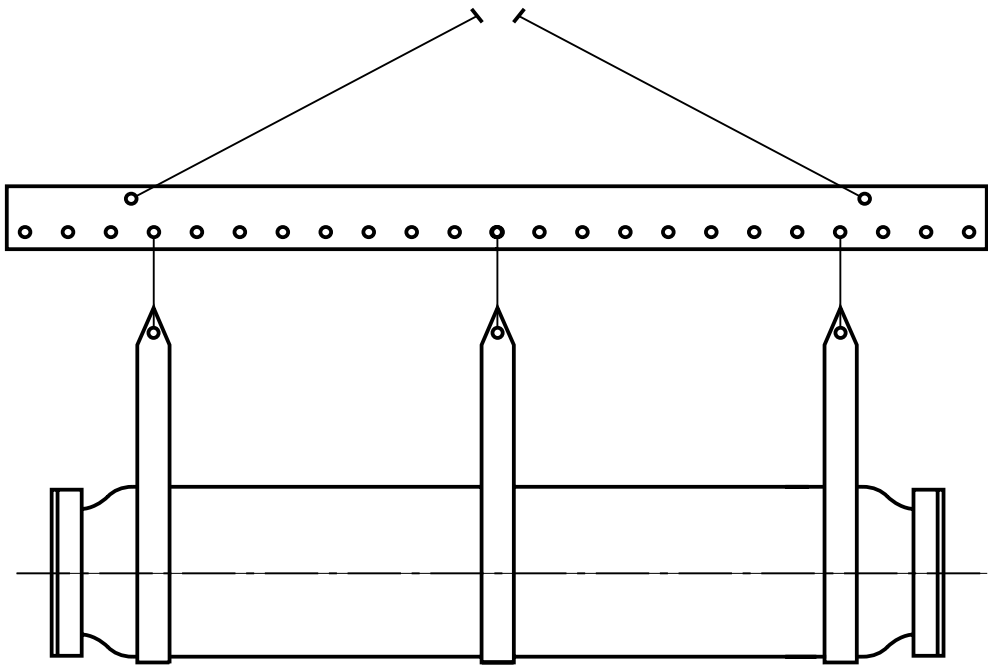


Figure 2 — Lifting system

Annex A (normative)
Log for recording hose assembly service and tests

Log for recording hose assembly service and tests

Location: _____

Manufacturer: _____

Date of manufacturer: _____

Hose size and length: _____

Hose brand and serial number: _____

Factory test pressure: _____

Original elongation under pressure: _____

Date received: _____

Date taken into service: _____

Particulars of service: _____

Date withdrawn from service: _____

Reason for withdrawal: _____

Test results

Date	Unstressed length	Elongation under pressure		Actual test pressures	Vacuum test results	Electrical test results	Remarks
		Actual	%				

Hose assembly service record

Date	Hours in service		Cubic metres pumped		Product	Remarks
	This operation	Total	This operation	Total		

Include any details of results of visual examination and any special testing.

blank

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