INTERNATIONAL STANDARD

ISO 5771

Second edition
1994-10-01

Rubber hose and hose assemblies for transferring anhydrous ammonia — Specification

Tuyaux et flexibles en caoutchouc pour le transfert d'ammoniac anhydre — Spécifications

Reference number
ISO 5771:1994(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 5771 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

This second edition cancels and replaces the first edition (ISO 5771:1981), which has been technically revised.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Rubber hose and hose assemblies for transferring anhydrous ammonia — Specification

1 Scope

This International Standard specifies the minimum requirements for rubber hose used for transferring ammonia, in liquid or in gaseous form, at ambient temperatures between – 40 °C and + 55 °C. It does not include specifications for end fittings, but is limited to the performance of the hose and hose assemblies.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 37:1994, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties.*

ISO 188:1982, *Rubber, vulcanized — Accelerated ageing or heat-resistance tests.*

ISO 471:—[1], *Rubber — Times, temperatures and humidities for conditioning and testing.*

ISO 1402:—[2], *Rubber and plastics hoses and hose assemblies — Hydrostatic testing.*

ISO 4671:1984, *Rubber and plastics hose and hose assemblies — Methods of measurement of dimensions.*

ISO 4672:1988, *Rubber and plastics hoses — Sub-ambient temperature flexibility tests.*

ISO 7326:1991, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions.*

ISO 8033:1991, *Rubber and plastics hose — Determination of adhesion between components.*

3 Pressure rating

The pressure rating of the hose shall comply with the requirements of table 1.

Table 1 — Pressure requirements

Parameter	Pressure requirements	
	MPa	bar
Maximum working pressure	2,5	25
Proof test pressure	6,3	63
Minimum burst pressure	12,5	125

1) To be published. (Revision of ISO 471:1983 and ISO 1826:1981)

2) To be published. (Revision of ISO 1402:1984)

4 Materials, construction and performance

4.1 Lining

The lining shall be of uniform thickness, reasonably concentric, and free from holes, porosity and other defects. It shall comply with the relevant requirements for physical properties specified in table 2. The material used shall be resistant to hardening or other deterioration due to the action of ammonia.

4.2 Reinforcement

The reinforcement shall consist of a material not adversely affected by permeating ammonia. It shall be applied evenly and uniformly, and in such a way that it complies with the relevant requirements for physical properties specified in table 2.

A suitable material is corrosion-resistant stainless steel.

4.3 Cover

The rubber cover, if used, shall be uniform in quality and thickness and shall be free from injurious defects. It shall comply with the relevant requirements for physical properties specified in table 2 and shall be so compounded or constructed that it will not blister in service. It shall be resistant to deterioration due to exposure to ammonia and due to exposure to the environment. A gas-tight cover shall be pricked during manufacture to permit the release of any permeating gas in service. The pricking shall not penetrate beyond the thickness of the cover.

4.4 Assembly

The whole assembly shall comply with the requirements of table 3 in order to ensure good operation.

4.5 General requirements

The hose or hose assembly shall comply with the requirements of table 2 and table 3 and there shall be no evidence of blistering or cracking of the cover or of the lining or of leakage after ammonia conditioning (6.2.2) or after flexing of the conditioned hose (6.2.3).

Table 2 — Requirements for physical properties of lining, reinforcement and cover

Property	Requirement	Method of test
Proof test pressure	6,3 MPa	ISO 1402
Change in length	± 5 % at maximum working pressure	ISO 1402
Burst pressure	12,5 MPa	ISO 1402
Adhesion Lining Reinforcement Cover	 1,5 kN/m 1,5 kN/m 1,5 kN/m	ISO 8033 NOTE — Sample taken upon completion of 30-day ammonia resistance test (see 6.2).
Physical properties — Lining thickness, min. — Tensile strength, lining, min. — Elongation at break, lining, min. — Tensile strength, cover, min. — Elongation at break, cover, min.	 1,5 mm 7,0 MPa 200 % 8,5 MPa 200 %	 ISO 4671 ISO 37 ISO 37 ISO 37
Low-temperature test	No cracks or breaks	See 6.1
Ammonia resistance — Minimum burst pressure for both test pieces after flexing — Maximum change in tensile strength after flexing, lining and cover — Maximum change in elongation at break after flexing, lining and cover	 15,6 MPa 20 % 50 %	 See 6.2
Ozone resistance, cover	No cracks	ISO 7326:1991, method 1
Accelerated ageing — Change in tensile strength, cover, max. — Change in elongation at break, cover, max.	 20 % 50 %	 ISO 188, (70 $^{+2}_{0}$) h at 70 °C

Table 3 — Delivery and annual proof test requirements

Property	Requirement	Method of test
Proof test pressure on assemblies — Delivery test — Annual proof test	 6,3 MPa 6,3 MPa	 ISO 1402 ISO 1402

5 Dimensions and tolerances

5.1 Bore sizes

Bore sizes and tolerances shall be as shown in table 4.

Table 4 — Bore sizes and tolerances

Dimensions in millimetres

Nominal bore	Tolerance
12,5 16 20	± 0,75
25 31,5	± 1,25
40 50	± 1,50

5.2 Outside diameter

No requirements are given for outside diameter since the hose may be used with a variety of end fittings not requiring precise outside-diameter control. Any outside diameter and tolerance thereon may be agreed between manufacturer and purchaser. Fittings shall be applied in accordance with the manufacturer's recommendations.

5.3 Length

The tolerance on cut lengths shall be as specified in table 5.

Table 5 — Tolerances on length

Length, l mm	Tolerance (all bores)
$l \leqslant 300$	± 3 mm
$300 < l \leqslant 600$	± 4,5 mm
$600 < l \leqslant 900$	± 6 mm
$900 < l \leqslant 1\,200$	± 9 mm
$1\,200 < l \leqslant 1\,800$	± 12 mm
$1\,800 < l$	± 1 %

6 Special test methods

6.1 Low-temperature test

Carry out the test in accordance with method B of ISO 4672:1988.

Condition a straight piece of hose, of sufficient length, to − 40 °C ± 2 °C for 24 h, and bend it through 180°, in a period of 10 s ± 2 s, around a mandrel of diameter 10 times the nominal inside diameter of the hose. Examine the test piece for breaks or cracks in the tube or cover.

After allowing the test piece to regain room temperature, proof-test it at the pressure specified in table 1 for 1 min to determine if any cracks have occurred in the tube.

6.2 Ammonia resistance tests

WARNING — The operator in charge of the installation and inspection shall ensure compliance with all safety precautions concerning the handling of ammonia.

6.2.1 Test lengths

The total amount of hose conditioned shall be sufficient to carry out the flexing and the burst and tensile tests. The length required for flexing (hose "B") will depend on the flex unit design and the hose size, but could be from 3 m to 6,2 m. For the burst test, 600 mm is required. The length of the feed hose (hose "A"), when specified, is 910 mm.

6.2.2 Ammonia conditioning

Fill a length or lengths of hose with liquid anhydrous ammonia by connection to a tank and flushing out with ammonia to remove all the air. Seal one end of each length and leave the other end connected to the liquid space of a tank of anhydrous ammonia. Condition the hose for 30 days at standard temperature. Any valve between the ammonia tank and the hose may be closed, provided that it is opened completely at least once each day to fill the hose with liquid anhydrous ammonia. If the hose is closed off by means of stop valves at each end when full of liquid, a hydrostatic relief valve shall be provided between the stop valves. Examine the hose each day for visible defects and note any evidence of blistering, cracking or perceptible leakage.

6.2.3 Flexing of conditioned hose

Place a length of conditioned hose (see 6.2.1) in a flexing-test machine [see figure 1 (hose "B")]. Connect one end of the hose to the travelling block (see figure 2) and pass the free end around two pulleys of the diameters shown in table 6. Then attach to the free end a weight of just sufficient mass to cause the hose to conform to the circumference of the pulleys. This hose shall be sufficiently long to prevent the free end from touching the pulley when the hose is pressurized and the travelling block is in the "up" position.

Table 6 — Pulley diameters and feeder hose lengths for flexing

Dimensions in millimetres

Hose size	Pulley diameter	Feeder hose length
12,5	350 ± 6,0	910
16	350 ± 6,0	910
20	350 ± 6,0	910
25	350 ± 6,0	910
31,5	350 ± 6,0	—
40	460 ± 6,0	—
50	610 ± 6,0	—

Place a 910 mm length of conditioned hose on the flexing-test machine [see figure 1 (hose "A")]. Connect one end to the vertical travelling block as shown in figure 2 and connect the other end to a water source with a pressure of 2,5 MPa.

NOTES

1 The test on the feeder hose does not apply to sizes over 25 mm.

2 To conduct flexing on the larger sizes, any convenient hose may be used as a feeder hose.

3 Flexing should begin within 6 h to 8 h of completion of the 30-day conditioning period.

Carry out the flexing for 72 h at standard temperature as specified in ISO 471, at a rate of approximately 0,13 Hz with a vertical movement of the travelling block of 1 m. Examine the hose each day for visible defects and note any evidence of blistering, cracking or leakage.

6.2.4 Burst test on conditioned and flexed hose

At the conclusion of the flexing period, cut a 600 mm test piece from the middle of hose "A" and from the middle of hose "B" and subject each test piece to the hydrostatic burst test specified in ISO 1402.

6.2.5 Tensile test on conditioned and flexed hose

At the conclusion of the flexing period, carry out a tensile test on each test piece as specified in ISO 37.

7 Marking

The hose shall be marked at least once every 1,5 m with the following information and with such additional information as may be agreed between manufacturer and purchaser:

a) manufacturer's name or recognized symbol or trade-mark;

b) the number of this International Standard, i.e. ISO 5771;

c) the words "anhydrous ammonia";

d) the nominal bore size, in millimetres, for example 31,5;

e) the quarter and year of manufacture, for example 4/94;

f) the maximum working pressure, i.e. 2,5 MPa.

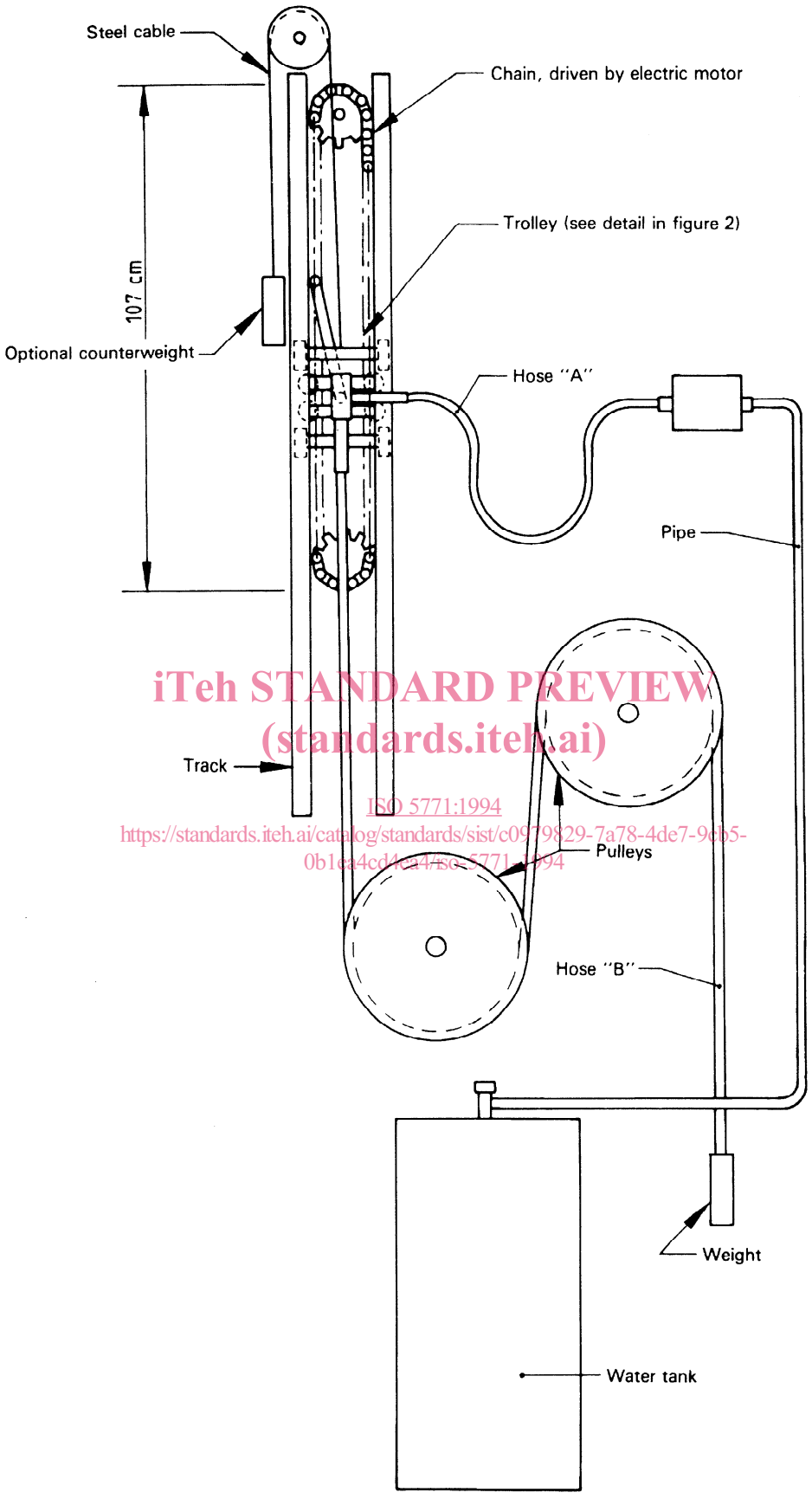

Figure 1 — Typical hose-flexing machine

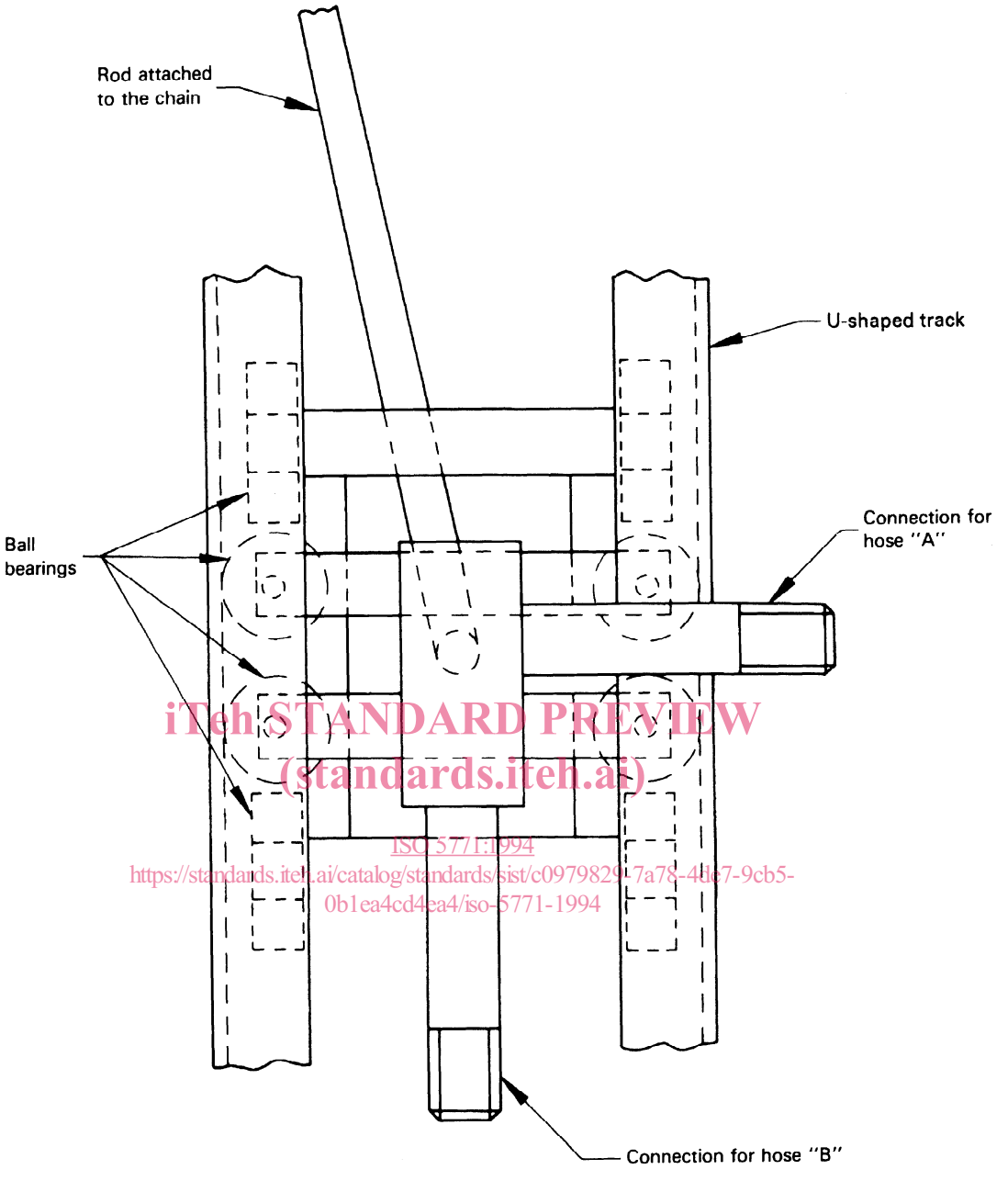

Figure 2 — Detail of trolley and track