# International Standard 5771

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# Rubber hose and hose assemblies for transferring anhydrous ammonia

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

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.



International Standard ISO 5771 was developed by Technical Committee ISO/TC 45, *Rubber and rubber products*, and was circulated to the member bodies in January 1980.



It has been approved by the member bodies of the following countries :



| | | |
|---|---|---|
| Australia | India | Sri Lanka |
| Austria | Indonesia | Sweden |
| Belgium | Korea, Rep. of | Thailand |
| Brazil | Mexico | Turkey |
| Canada | Netherlands | United Kingdom |
| China | Poland | USA |
| Czechoslovakia | Romania | USSR |
| Egypt, Arab Rep. of | South Africa, Rep. of | |
| Hungary | Spain | |

The member bodies of the following countries expressed disapproval of the document on technical grounds :

France
Germany, F.R.



Printed in Switzerland

# Rubber hose and hose assemblies for transferring anhydrous ammonia

## 1 Scope and field of application

This International Standard specifies 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.

It applies to hose used for transfer to or from pressure tanks or refrigerated tanks, but is not necessarily for applications where the hose is downstream from a pressure regulator and is open to the atmosphere at one end.



## 2 References

ISO/R 36, *Determination of the adhesion strength of vulcanized rubbers to textile fabrics.*

ISO 37, *Rubber, vulcanized — Determination of tensile stress-strain properties.*

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

ISO 471, *Rubber — Standard temperatures, humidities and times for the conditioning and testing of test pieces.*

ISO 1307, *Rubber hose — Bore sizes, tolerances on length, and test pressures.*

ISO 1402, *Rubber hose — Hydrostatic testing.*

ISO 1431/1, *Rubber, vulcanized — Resistance to ozone cracking — Part 1 : Static strain test.*

ISO 4672, *Rubber products — Hoses — Low-temperature flexibility tests.*

## 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 | 5,0 | (50) |
| Minimum burst pressure | 12,5 | (125) |



## 4 Materials and construction

### 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 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 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 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.

Table 2 — Requirements for physical properties

| Property | Requirement | Method of test |
|---|---|---|
| Proof test pressure | 5,0 MPa | ISO 1402 |
| Change in length | ± 5 % at maximum working pressure | ISO 1402 |
| Burst pressure | 12,5 MPa | ISO 1402 |
| Adhesion<br>Lining<br>Reinforcement<br>Cover | <br>1,5 kN/m<br>1,5 kN/m<br>1,5 kN/m | ISO/R 36<br>NOTE — Samples taken upon completion of 30 day ammonia resistance test (see 7.2). |
| Physical properties<br>— Tensile strength, lining, min.<br>— Elongation at break, lining, min.<br>— Tensile strength, cover, min.<br>— Elongation at break, cover, min. | <br>7,0 MPa<br>200 %<br>8,4 MPa<br>200 % | ISO 37 |
| Low temperature test | No cracks or breaks | See 7.1 |
| Ammonia resistance | Minimum burst pressure 12,2 MPa (for both samples after the flexing test) | See 7.2 |
| Ozone resistance, cover | No cracks when viewed at X 2 magnification at 20 % elongation | ISO 1431/1 (50 ± 5) × $10^{-8}$ ($V/V$), 70 $^{+2}_{0}$ h at 40 °C |
| Accelerated ageing<br>— Change in tensile strength, cover, max.<br>— Change in elongation at break, cover, max. | <br>20 %<br>50 % | ISO 188, 70 $^{+2}_{0}$ h at 100 °C |



## 5 Dimensions and tolerances

### 5.1 Bore sizes

Bore sizes and tolerances shall be as shown in table 3.

Table 3 — Bore sizes and tolerances

Dimensions in millimetres

| Nominal bore | Tolerance* |
|---|---|
| 12,5<br>16<br>20 | ± 0,75 |
| 25<br>31,5 | ± 1,25 |
| 40<br>50<br>63 | ± 1,50 |
| 80 | ± 2,00 |

* The tolerances are in accordance with ISO 1307.

### 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 ISO 1307.

## 6 Requirements

The hose or hose assembly shall comply with the requirements of table 2, and there shall be no evidence of blistering or cracking of the cover or of the bore, or of leakage after the conditioning (see 7.2) and after the hose flexing test (see 7.2.2).

## 7 Special test methods

### 7.1 Low temperature test

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

Condition a straight piece of hose, of sufficient length, to −40 ± 2 °C for 24 h, and bend it through 180°, in a period of 10 ± 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.

### 7.2 Ammonia resistance tests

NOTES

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

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

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 laboratory 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 should be provided between the stop valves. Examine the hose each day for visible defects and note any evidence of blistering, cracking or perceptible leakage.

#### 7.2.1 Conditioned hose burst test

Subject a 600 mm length of conditioned hose (see 7.2) to the hydrostatic burst test specified in ISO 1402.

#### 7.2.2 Conditioned hose flexing test

Place a length of conditioned hose (see 7.2) 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 4. 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 4 — Pulley diameters and feeder hose lengths for flexing test**

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 | — |
| 63 | 760 ± 6,0 | — |
| 80 | 910 ± 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 1 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 the flex test on the larger sizes, any convenient hose may be used as a feeder hose.

3 The flexing test should begin within 6 to 8 h of completion of the 30 day conditioning period.

Carry out the flexing for 72 h at standard laboratory 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.

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

## 8 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 trademark;*

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 4/81;

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

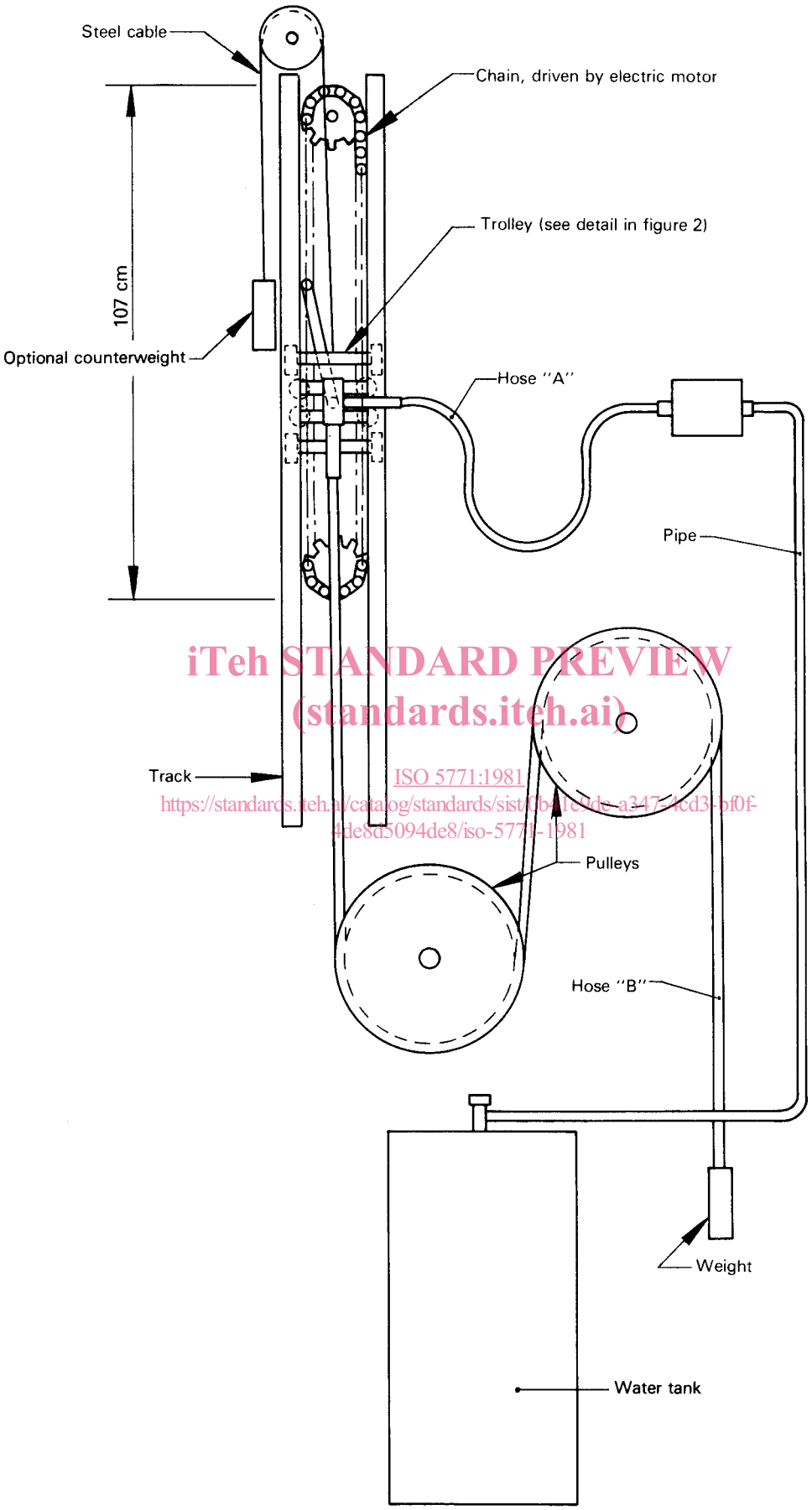




**Figure 1 — Typical hose flexing machine**

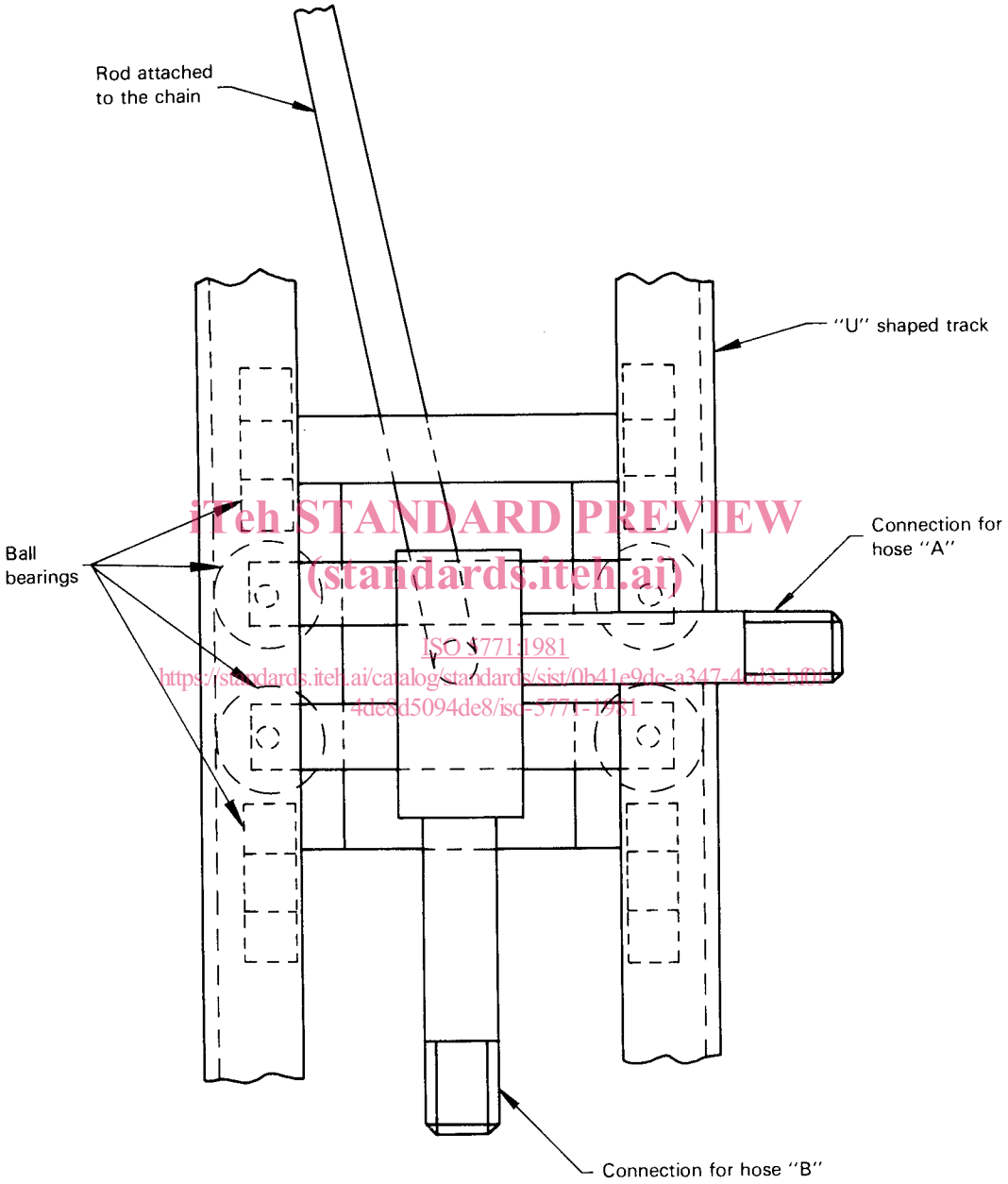




**Figure 2 — Detail of trolley and track**