INTERNATIONAL STANDARD ISO 3807

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Dissolved acetylene cylinders — Basic requirements

Bouteilles d'acétylène dissous — Conditions requises

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FOREWORD

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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 3807 was developed by Technical Committee ISO/TC 58, *Gas cylinders,* and was circulated to the member bodies in July 1975.

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

Belgium	Italy	Sweden
Denmark	Japan	Switzerland
France	Mexico	Turkey
Hungary	Netherlands	United Kingdom
India	Romania	
Israel	Spain	

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

Australia	South Africa, Rep. of
Austria	U.S.A.
New Zealand	

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Dissolved acetylene cylinders — Basic requirements

1 SCOPE AND FIELD OF APPLICATION

This International Standard specified the basic requirements for dissolved acetylene cylinders with a maximum nominal water capacity of 160 l, the procedure for type testing, and the method for determining the porosity of the porous mass.

It does not include details of design for the cylinder shell; these are specified in ISO 4705[1] or ISO 4706[2].

2 DEFINITIONS

For the purpose of this International Standard the following definitions apply :

2.1 dissolved acetylene cylinder : A vessel having a valve, and with or without safety devices, containing a porous mass, a solvent for the storage of dissolved acetylene and at least sufficient acetylene to saturate the solvent at atmospheric pressure and at a temperature of 15 °C.

2.2 tare : The tare of the cylinder is defined in one of the following two ways :

2.2.1 tare A : The mass of the vessel, having a valve and with or without safety devices, containing a porous mass, a solvent for the storage of dissolved acetylene and any valve protection permanently fixed directly to the cylinder.

2.2.2 tare S : The mass of the vessel, having a valve and with or without safety devices, containing a porous mass, a solvent for the storage of dissolved acetylene, the acetylene required to saturate the solvent at atmospheric pressure and at a temperature of 15 °C and any valve protection permanently fixed directly to the cylinder.

The tare actually stamped on the cylinder shall be a number and an indication of the units used followed by either the letter A or the letter S in accordance with the definitions in 2.2.1 or 2.2.2.

2.2.3 manufacturer : The company responsible for filling the cylinder with porous mass and which generally prepares it for charging with acetylene. (Does not apply to sub-clause 10.2.)

3 CYLINDER SHELL

3.1 The dissolved acetylene cylinder shell shall conform to the requirements of the relevant International Standard for cylinder design and construction.

3.2 The minimum test pressure (gauge) for the cylinder shell shall be :

a) 60 bar[3] (853 lbf/in^2) for cylinders not fitted with fusible plugs;

b) 52 bar (750 lbf/in^2) for cylinders fitted with fusible plugs.

4 POROUS MASS

4.1 The porous mass in the cylinder shall be of such quality that it enables the completed cylinder to pass the safety tests included in annex A.

4.2 There shall be no deleterious reaction between the porous mass, the acetylene, the solvent and any parts in contact with acetylene.

5 SOLVENT

The quantity of solvent shall be such that the cylinder can meet the requirements of the tests included in annex A.

6 MAXIMUM ACETYLENE CHARGE

6.1 The total mass of acetylene to be charged into a cylinder shall not exceed the amount authorized for the cylinder.

1) ISO 4705, *Seamless steel gas cylinders — Design and construction.* (In preparation.)

2) ISO 4706, *Welded steel gas cylinders — Design and construction.* (In preparation.)

3) 1 bar = 10^5 Pa = 10^5 N/m^2

6.2 When the cylinder has been charged with acetylene and the pressure has reached equilibrium, the maximum gauge pressure in the cylinder shall not exceed the permitted pressure at 15 °C established for the type of cylinder at the time of approval.

7 CONTENTS OF CYLINDERS FOR TYPE TEST

The characteristics of the porous mass, the quantity of solvent and the mass of acetylene shall be in accordance with the schedule provided by the manufacturer when submitting representative cylinders for test in accordance with sub-clause A.1.2 in annex A.

8 CYLINDER MARKINGS

8.1 Each cylinder shall be stamped on the shoulder or on a reinforced part of the cylinder or on the collar or neck ring with the following marks :

a) the number of this International Standard, i.e. ISO 3807;

b) gas identification – "ACETYLENE" or "ACETYLEN", and the chemical symbol C_2H_2;

c) identification of the manufacturer together with the serial number of the completed cylinder;

d) identification of porous mass;

e) identification mark of owner;

f) tare with suffix A or S as defined in 2.2;

g) maximum mass of acetylene to be charged into the cylinder :

1) inclusive of saturation mass of acetylene in the case of tare marked A (see 2.2.1);

2) not inclusive of saturation mass of acetylene in the case of tare marked S (see 2.2.2);

h) identification of the solvent when not acetone.

i) maximum pressure at 15 °C (see 6.2).

8.2 In addition to the above ISO markings, other markings, such as the last date on which the porous mass was examined and found to be satisfactory, may also be specified provided that these are made in such a way that they are separate from the ISO markings.

9 INFORMATION TO BE AVAILABLE FROM THE MANUFACTURER

The manufacturer shall be in a position to provide the following information concerning the cylinder when completed :

a) identification of approving authority;

b) specification to which the shell is made;

c) test pressure and date of test;

d) date of manufacture of the cylinder.

10 VALVES

10.1 The valve body shall not be manufactured from materials which show porosity or brittleness, and if copper is an ingredient, then the alloy shall not form dangerous acetylides. In the case of copper-zinc and copper-tin alloys, the copper content shall not exceed 70 %.

10.2 The manufacturer of the valve shall not employ any process which will result in surface enrichment of copper.

ANNEX A

PROCEDURE FOR TYPE TESTING OF DISSOLVED ACETYLENE CYLINDERS

A.1 REQUEST FOR APPROVAL

A.1.1 One request for the approval of acetylene cylinders may cover a range of different constructions and sizes, provided these all contain the same porous mass. A separate application shall be made for each type of porous substance.

Cylinders for test shall be selected as follows :

a) for cylinders with a nominal water capacity between 50 l and 160 l, the appropriate approving authority shall select cylinders for test with a capacity considered to be representative of the size under consideration;

b) for cylinders with a nominal water capacity between 10 and 50 l, tests shall be on the smallest and the largest cylinders of every range proposed by the manufacturer having the same acetylene/solvent ratio;

c) for cylinders with a nominal water capacity below 10 l, no test need be carried out on cylinders having an acetylene content of not more that 90 % of the equivalent proportional content used in approved cylinders of 10 l or greater water capacity. For cylinders having an acetylene content greater than 90 %, tests shall be carried out on cylinders of a nominal water capacity representative of the size under consideration.

A.1.2 Each request for approval shall include the following information :

a) a schedule of the different constructions and sizes of acetylene cylinders which form the subject of the request for approval and which includes, for each size of cylinder, the following information :

1) nominal water capacity in litres;

2) solvent to be used;

3) mass of solvent in kilograms;

4) maximum mass of acetylene in kilograms;

b) a description of the porous substance, as it exists in the cylinder, which gives sufficient information to ensure reliable identification;

c) a report on the porosity determinations carried out by the manufacturer on the test cylinders provided, according to the method given in annex B, and a statement of the maximum and minimum limits of porosity within which the porous substance will be manufactured.

A.1.3 The request for approval shall be accompanied by a declaration from the manufacturer stating that in the event of approval, the production of the porous substance will be in accordance with the information given in the request for approval in A.1.2.

A.2 SUBMISSION OF CYLINDERS FOR TEST

A.2.1 Representative cylinders, selected by the appropriate authority, shall withstand successfully the appropriate type tests in this annex prior to approval being granted to the request made by the manufacturer.

A.2.2 The cylinders shall be selected from the sizes specified in A.1.1. The appropriate authority, after having studied the schedule provided, as specified in A.1.2, will ask the manufacturer to submit cylinders for test. These cylinders shall be complete with all accessories including the porous mass, solvent and saturation gas, unless otherwise specified by the appropriate authority.

A.2.3 The appropriate authority, or the approved inspecting agency, has the right to witness the filling of the porous mass and to select and to determine the number of cylinders which are to be tested.

A.2.4 Cylinders of each size selected for test by the appropriate authority shall be tested as follows :

a) not less than three cylinders shall be subjected to the elevated temperature test in accordance with clause A.3;

b) not less than three additional cylinders shall be subjected to the backfire test in accordance with clause A.4.

A.3 ELEVATED TEMPERATURE TEST

This test shall be carried out on cylinders which have been filled with solvent and charged with acetylene to the maximum content as prescribed by the manufacturer plus an overcharge of 5 % acetylene.

Each cylinder shall be placed in a water bath, the mean temperature of which is maintained at 65 ± 2 °C, until the pressure in the cylinder becomes constant or the pressure curve shows that hydraulic pressure has developed.

If during this test the pressure curve indicates that hydraulic pressure has developed in the cylinder, or if the maximum pressure in the cylinder exceeds the cylinder test pressure, the cylinder has failed.

All cylinders selected are required to pass the elevated temperature test.

A.4 BACKFIRE TEST

A.4.1 Drop treatment

Each cylinder, having been filled with the mass of solvent specified by the manufacturer and saturated with acetylene

at atmospheric pressure, shall be dropped ten times without friction between the cylinder and the guides from a height of 0,70 m on to a concrete block covered with a protective plate similar to that in the apparatus shown in figure 1.

Each cylinder shall be fitted with a device that will prevent loss of cylinder contents during the drop treatment.

Any subsidence or other defect of the porous substance which has taken place during the drop treatment shall not be corrected before submitting the cylinders to the backfire procedure.

A.4.2 Backfire procedure

For the purpose of this procedure the cylinder shall be provided with a special outlet connection which connects the cylinder directly to an explosion tube similar to that shown in figure 2. The capacity of the explosion tube shall be 75 ml with an internal diameter of 30 mm terminating in a passage 4 mm in diameter with a length of 70 mm, connecting directly into the cylinder. The explosion tube shall be provided with the means of initiation consisting of a suitable wire, such as tungsten, 0,2 mm in diameter and 15 mm in length.

The cylinders fitted with the appropriate equipment shall be charged with acetylene to the maximum acetylene content proposed by the manufacturer plus an overcharge of 5 % taking all necessary steps to purge the cylinder of non-soluble gases as far as is practicable. The explosion tube shall be purged of air and the accumulation of inert gases in the tube shall be prevented.

The cylinder shall then be

a) stored horizontally for 5 days at a temperature between 15 and 20 °C;

b) placed vertically in a water bath, maintained at a temperature of 35 °C, for 3 h except for cylinders below 10 l water capacity in which case the heating time shall be 1,5 h;

c) placed vertically in the firing position and fired when the pressure inside the cylinder has fallen to a value 3 to 4 % below the maximum pressure attained in the cylinder during its heating as described in b) above.

The cylinder has failed the test if it bursts or if there is any release of gas from safety devices within 24 h from backfire.

All cylinders selected are required to pass the backfire test.

ANNEX B

DETERMINATION OF POROSITY OF THE POROUS MASS

B.1 A cylinder filled with the porous mass is fitted with a valve and weighed. It is subjected to the action of vacuum so that after standing for 12 h, with the valve closed, the pressure does not exceed 27 mbar. It is then filled with acetone under a pressure not exceeding 18 bar. When the solvent no longer penetrates, the valve is closed and the cylinder is weighed.

B.2 The cylinder is again subjected to a vacuum for 15 min and further solvent is admitted. This cycle of operations is repeated until all air is expelled from the cylinder and constant mass obtained.

B.3 The cylinder is then placed in a room where the temperature is constant, the valve being left open and connected to a vessel containing solvent under a head, for a period of 24 h.

B.4 The valve is then closed, the solvent container disconnected and the cylinder weighed.

B.5 The difference between the final mass and that of the cylinder before the introduction of the acetone represents the mass of acetone introduced.

B.6 The porosity P, as a percentage, is given by the following formula :

$$P = \frac{m}{V \times \rho} \times 100$$

where

m is the mass of acetone introduced, in kilograms;

V is the water capacity, in litres, of the cylinder shell without porous mass;

ρ is the density of acetone, in kilograms per litre, at the temperature at which the cylinder is finally weighed.

Dimensions in millimetres

FOUNDATION

Recommended composition for concrete :
Liquid cement 50,8 kg, sand 71 litres, Gravel (5 to 19 mm) 142 litres.

The concrete should be cast in one piece. It is important that the surface on which the protective plate is placed be smooth and perfectly horizontal.

NOTE — The protective plate consists of a 25 mm thick sheet of phenolic resin impregnated cotton fabric (16 to 18 threads/cm).

The Brinell hardness of this plate is 48 HB (10 mm ball, load of 300 kg).

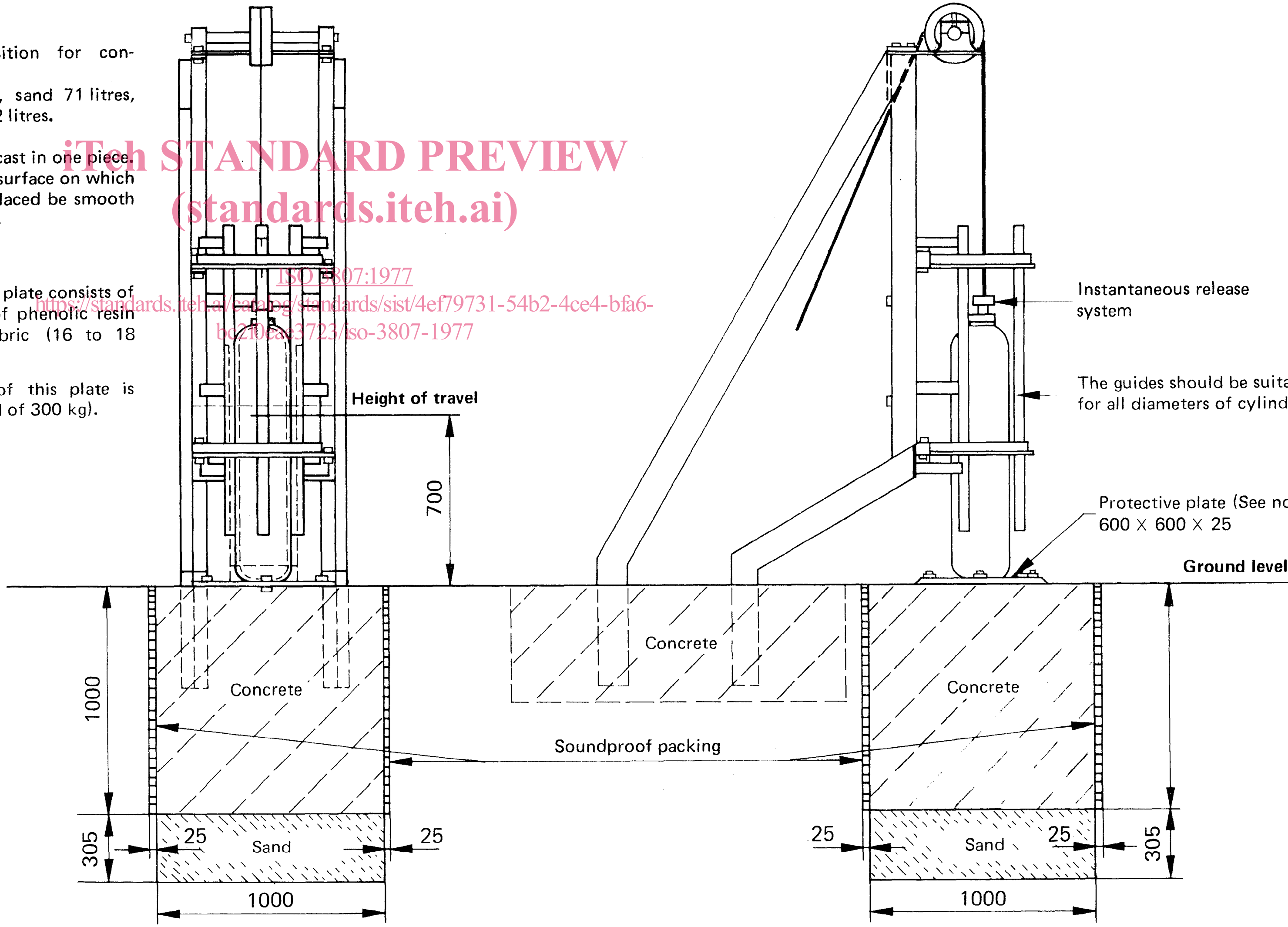

FIGURE 1 — **Typical apparatus for drop treatment**

Dimensions in millimetres

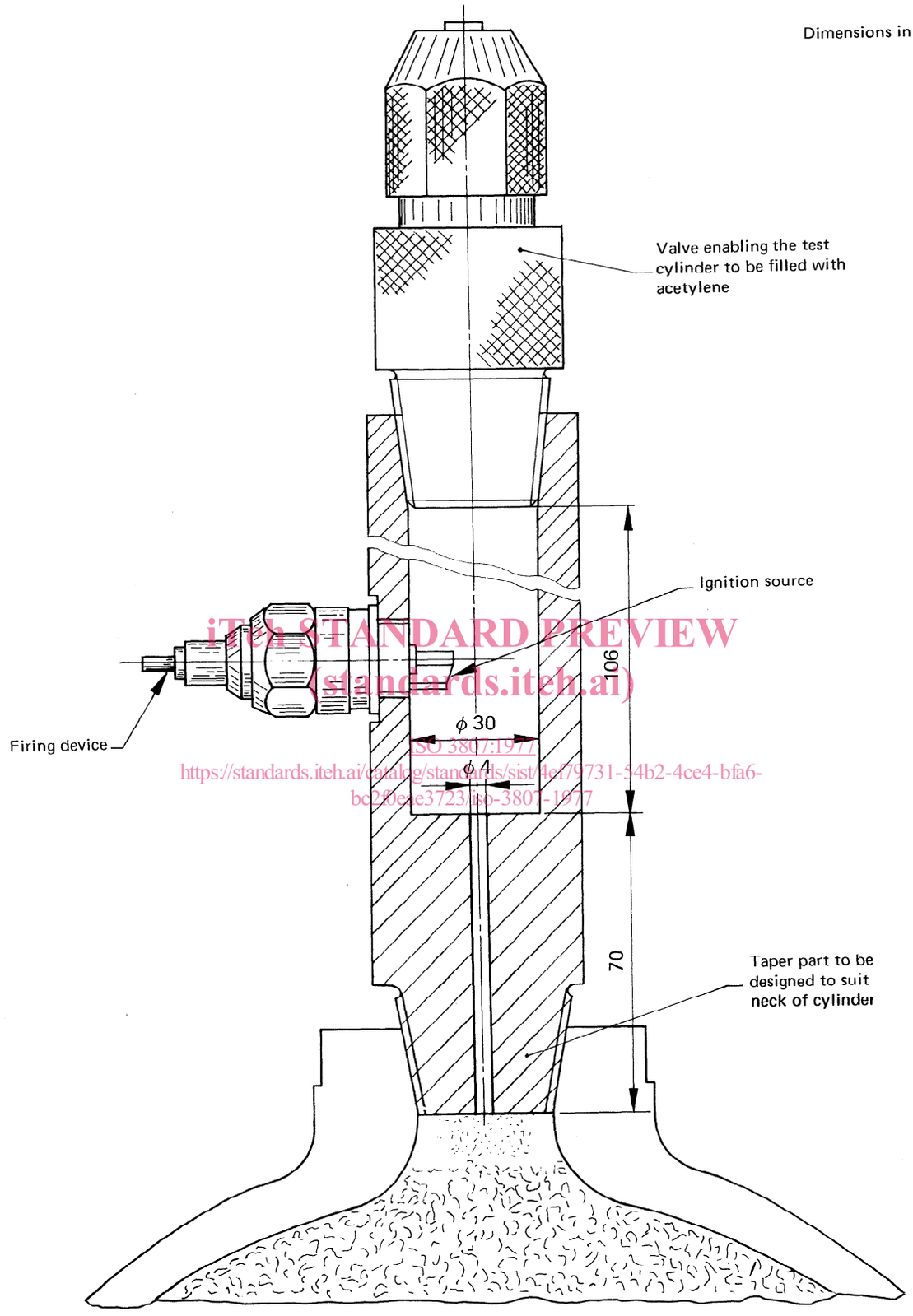

FIGURE 2 – **Typical explosion tube for backfire procedure**