.

Ref: CL/PP/BID-03 (09-10) **Date: 17 July 2009**

Subject: Supply of Nine Equipments for testing of Fire Extinguisher

Dear Sirs,

Technical & Commercial Bids are invited for the supply of **Nine Equipments for testing of Fire Extinguisher for Central Laboratory,** in **separate SEALED** covers, which should reach the undersigned latest by **1500 h, on 10 Aug 2009,** at the following address:

Director& Head (Planning & Purchase)
BUREAU OF INDIAN STANDARDS
Central Laboratory
Plot No.20/9, Site-IV,
Sahibabad Industrial Area, Sahibabad,
Distt. Ghaziabad-201010 (U.P.)

2. The detailed specification of the above mentioned equipment(s)/item(s) are given in **Annex-I_A, I_B, I_C, I_D, I_E, I_F, I_G, I_H & I_I. The bidders are free to quote for one or more equipments.**

3. Terms and conditions of supply are given in **Annex-II**

4. The technical Bids shall be opened in the **Conference Hall**, of the Central Laboratory, at the address mentioned above at **1500 h on 11 Aug 2009** and in the presence of such tenderers or their duly authorized representatives, who may like to attend.

5. Please note that the envelopes containing Technical & Commercials Bids and EMD are sealed properly i.e. either wax sealed or with adhesive cello tape on both ends. **Unsigned & Unstamped Bids in Unsealed/stapled envelopes** and bids **without EMD** shall be summarily rejected. **No exemption whatsoever for payment of EMD shall be accorded**. The envelope containing EMD shall be stapled separately with the envelope containing the commercial Bids. The value of EMD should not be disclosed in technical bid.

6. The specification and terms & conditions can also be downloaded from BIS Website – www.bis.org.in.

Thanking you,

Yours faithfully,

Encl.: **as above**

-Sd/-

Director& Head (Planning & Purchase)
Ph. 0120-4177109
0120-2770416

Annex-I_A

BUREAU OF INDIAN STANDARTS
(CENTRAL LABORATORY)

EQUIPMENT SPECIFICATION

Equipment/Specification Code	: M/F/01
Name of the equipment	: Oven
Proposed for BIS Lab	: CL/Mech-Fire Fighting Eq. Section
Total Quantity Required	: One

OVEN

i) Temperature Range & Least Count: 0-100 deg. C.

ii) Digital thermal controller (calibrated by NABL accredited Lab).

iii) Air circulation System.

iv) Digital Timer Facility.

v) Internal Size: Ht x Width x Depth:1200mm x 1200mm x 1200mm
Stainless steel duly polished.

vi) Outer Cover: CRC Sheet duly powder coated.

vii) Reference Clause Cl. 7.3 & Cl. 9.8.2.2 (IS 15683:2006), (Cl. 7.1)

Annex-I_B

BUREAU OF INDIAN STANDARTS
(CENTRAL LABORATORY)

EQUIPMENT SPECIFICATION

Equipment/Specification Code	:	M/F/02
Name of the equipment	:	FREEZER
Proposed for BIS Lab	:	CL/Mech-Fire Fighting Eq. Section
Total Quantity Required	:	One

FREEZER

i) Temperature Range & Least Count: -40deg.C to ambient & L.C. 1 deg. C.

ii) Fitted with digital thermal cut off (calibrated by NABL accredited Lab).

iii) Digital Timer Facility.

iv) Internal Size: Ht x Width x Depth:1200mm x 1200mm x 1200mm
Stainless steel duly polished.

v) Outer Cover: CRC Sheet duly powder coated.

vi) Suitable Voltage Stabilizer shall be provided.

vii) Reference Clause Cl. 7.3 & (Cl 7.1) (of IS 15683:2006)

Annex-I_C

BUREAU OF INDIAN STANDARTS
(CENTRAL LABORATORY)

EQUIPMENT SPECIFICATION

Equipment/Specification Code	:	M/F/03
Name of the equipment	:	IMPACT TESTING MACHINE
Proposed for BIS Lab	:	CL/Mech-Fire Fighting Eq. Section
Total Quantity Required	:	One

IMPACT TESTING MACHINE

i) A SS cylindrical hammer of 75mm diameter and total mass of 4.0kg with flat faces.

ii) Hammer should be mounted vertically in loose guides so that it can drop freely through a height of minimum 300 mm and maximum 1250mm with adjustment provided for height as given in Annex-A.

iii) Hammer and the machine position should be such that a fire extinguisher (of size 250mm & height 1000mm) could be kept under it in upright position and lying on its side position.

iv) Annexure-A (Cl. 7.5.1.2 of IS 15683:2006) provided for test method.

Annex-I_D

BUREAU OF INDIAN STANDARTS
(CENTRAL LABORATORY)

EQUIPMENT SPECIFICATION

Equipment/Specification Code	:	M/F/04
Name of the equipment	:	TAPPING TEST MACHINE
Proposed for BIS Lab	:	CL/Mech-Fire Fighting Eq. Section
Total Quantity Required	:	One

TAPPING TEST MACHINE

i) As per Annexure-A (Cl. 7.7.2 & Fig.1 of IS 15683:2006)

ii) Digital counter display be provided.

iii) Should be able to hold fire extinguisher of maximum size of 250 mm diameter and height 1000 mm.

Annex-I_E

BUREAU OF INDIAN STANDARTS
(CENTRAL LABORATORY)

EQUIPMENT SPECIFICATION

Equipment/Specification Code	:	M/F/05
Name of the equipment	:	CRUSHING TEST MACHINE
Proposed for BIS Lab	:	CL/Mech-Fire Fighting Eq. Section
Total Quantity Required	:	One

CRUSHING TEST MACHINE

i) Maximum size of fire extinguisher (10kg capacity, outside diameter: 180mm & height 750 mm)

ii) Annexure-A (Cl. 9.2.3 of IS 15683:2006) & Fig.4 of IS 15683:2006.

Annex-I_F

BUREAU OF INDIAN STANDARTS
(CENTRAL LABORATORY)

EQUIPMENT SPECIFICATION

Equipment/Specification Code	: M/F/06
Name of the equipment	: ELELCTRICAL CONDUCTVITY TESTING MACHINE
Proposed for BIS Lab	: CL/Mech-Fire Fighting Eq. Section
Total Quantity Required	: One

ELELCTRICAL CONDUCTVITY TESTING MACHINE

i) Should be able to test a fire extinguisher (10kg capacity, outside diameter: 180mm & height: 750 mm)

ii) Annexure-A (Cl. 8.6 of IS 15683:2006).

Annexure-A of I_F

8.6 Electrical Conductivity of Extinguisher Discharge (Type Test)

8.6.1 *Water-Based Extinguishers*
Water-based extinguishers that are marked as suitable for use on energized electrical equipment fires shall not pass a current of more than 0.5 mA when tested as described in 8.6.3.

8.6.2 *Requirements*
Test the extinguisher in accordance with 8.6.3. When the extinguisher is in operation and the metallic plate is live, the current between the handle or the nozzle and earth and between earth and the extinguisher shall be no more than 0.5 rnA at any time during the complete discharge duration of the extinguisher.

8. 6.3 *Test for Electrical Conductivity*
Hang a metal plate, of dimensions 1 m $\pm$25 mm x 1 m $\pm$25 mm, vertically from insulating supports. Connect the plate to a transformer so that an alternating voltage of 36 $\pm$ 3.6 kV is established between the plate and earth. The impedance of the circuit should be such that when a voltage equal to 10 percent of the normal primary voltage is applied to the primary, and the secondary is short-circuited, the current in the secondary is not less than 0.1 mA. Mount the extinguisher on an insulating support with the nozzle fixed 1m from the centre of the plate, at right angles to it and directed towards it. Connect the extinguisher to the earth. In the case of an extinguisher with a hose connect it to the earth by connection at the nozzle or in the case of an extinguisher not fitted with a hose, by connection at the handle.

Measure any current flowing between the extinguisher and the earth when the plate is live and the extinguisher discharging.

Annex-I_G

BUREAU OF INDIAN STANDARTS
(CENTRAL LABORATORY)

EQUIPMENT SPECIFICATION

Equipment/Specification Code	:	M/F/07
Name of the equipment	:	ULTRAVIOLET LIGHT EXPOSURE MACHINE
Proposed for BIS Lab	:	CL/Mech-Fire Fighting Eq. Section
Total Quantity Required	:	One

ULTRAVIOLET LIGHT EXPOSURE MACHINE

i) As per Annexure-A (Cl. 9.8.3 of IS 15683:2006).

ii) Digital temperature & time display.

Annexure-A of I_G

9.8.3 *Ultraviolet Light Exposure*

9.8.3,1 Subject at least six components to an artificial weathering test in accordance with 9.8.3 .4 for500 hand then condition them for 5 h at 20 ± 5°C.

9.8.3.2 Following the exposure, inspect the samples for cracking. No cracking shall be permitted.

9.8.3.3 Subject the components to the burst test in accordance with 9.2.2 at 20±5 ‘C using a suitable liquid at a rate of pressure increase of 2 ±0.2 MPa/min. The bursting pressure (P_b) shall be at least equal to that specified for the cylinder.

9.8.3.4 Use two stationary enclosed carbon-arc lamps to obtain the ultraviolet light. The arc of each lamp is to be formed between two vertical carbon electrodes, 12.7 mm in diameter, located at the centre of a removable vertical metal cylinder, 787 mm in diameter and 450 mm in height. Enclose each arc in a clear borosilicate-glass globe. Mount the samples vertically on the inside of the revolvable cylinder, facing the lamps, and revolve the cylinder continuously around the stationary lamps at 1 .rev/min. Provide a system of nozzles so as to spray each sample, in turn, with water as the cylinder revolves. During each operating cycle (total of 20 rein), expose each sample to the light and water spray for 3 min and to the light only for 17 min. Maintain the air temperature within the revolving cylinder of the apparatus during operation at 63± 5°C.

Alternatively, test by using a Xenon arc source, for a period of500 h may be carried out. Use the following conditions:

a) 65± 3°C black panel temperature;
b) 50± 5 percent relative humidity;
c) spray cycle: 102 min dry interval, 18 min water spray; and
d) total dose of exposure : 1 GJ/m^2 (500 h at 550 W/m^2).

Annex-I_H

BUREAU OF INDIAN STANDARTS
(CENTRAL LABORATORY)

EQUIPMENT SPECIFICATION

Equipment/Specification Code	:	M/F/08
Name of the equipment	:	VIBRATION TESTING MACHINE
Proposed for BIS Lab	:	CL/Mech-Fire Fighting Eq. Section
Total Quantity Required	:	One

VIBRATION TESTING MACHINE

i) Machine should be able to meet the parameters as per Cl.7.5.2.5.2 and Cl.7.5.2.5.3 of IS 15683:2006.

ii) Digital timer facility should be provided.

iii) Machine should be able to hold the fire extinguisher (size of diameter 250 mm and height 1000 mm) in three rectilinear axes in the following order: horizontal, lateral and vertical.

iv) Annexure-A (Cl.7.5.2.5.2 and Cl.7.5.2.5.3 of IS 15683:2006) provided.

Annexure-A of I_H

7.5.2.5.2 *General extinguishers*

The vibration applied shall have the following parameters:

Frequency: 40 Hz
Amplitude: 0.25± 0.03 mm
Duration: 2 h (in each orientation specified in 7.5.2.5.1)

7.5.2.5.3 *Vehicle exinguishers*

Subject the vehicle extinguishers to the following tests:

a) Subject the extinguisher to the variable frequency and amplitude specified below in each orientation specified in 7.5.2.5.1.

Frequency, Hz	*Amplitude, mm*
10 to 19	0.75 ± 0.08
20 to 39	0.50 ± 0.05
40 to 60	0.25 ± 0.03

Vibrate the extinguisher for 5 min at each frequency and increase the frequency at discrete intervals of 2 Hz, and

b) Vibrate the extinguisher for 2 h at the frequency which produced the maximum resonance as determined in (a) above or if no resonance is observed subjected to the test specified in 7.5.2.5.2.

Complete the tests specified in (a) and (b) above in one plane before making tests in the next plane.

Annex-I$_I$

BUREAU OF INDIAN STANDARTS
(CENTRAL LABORATORY)

EQUIPMENT SPECIFICATION

Equipment/Specification Code	: M/F/09
Name of the equipment	: PRESSURE CYCLING TEST.
Proposed for BIS Lab	: CL/Mech-Fire Fighting Eq. Section
Total Quantity Required	: One

PRESSURE CYCLING TEST

i) As per Annexure-A (Cl. 9.2.4 earlier Cl. 9.2.5 of IS 15683:2006).

ii) Digital Counter (Calibrated by NABL accredited lab).

Annexure-A of I_I

9.2.5 (Renumbered as 9.2.4) *Pressure Cycling Test (Type Test)*

A minimum of two cylinders shall be tested.

An extinguisher cylinder shall sustain, without rupture, 5000 cycles from 0 to the test pressure (P_j)and back to 0 at the rate of 6 cycles/rein. At the conclusion of testing, the cylinder shall be subjected to and comply with the burst test.

ANNEX-II

BUREAU OF INDIAN STANDARDS
(CENTRAL LABORATORY)

TERMS & CONDITIONS for Limited Tender Enquiry

1. The Tenderers are requested to give detailed tender in the forms of two bids i.e.
   Part - A Technical Bid.
   Part - B Financial Bid.

2. **The Technical & Financial Bids should be sealed and sent separately in sealed envelopes & duly super-scribed (giving Equipment name, technical/financial bid, due date of opening & Ref. No. on the top of the envelope)**. Such Bids shall remain valid for a period of **120 days** from the date of opening.

3. Bidders may be required to arrange practical demonstration of equipment/model quoted by them before finalization of order.

4. The Technical Bid [Part A] should accompany complete specification, Manufacturer's name, address and following details :
   a. Expected life span of equipment and accessories.
   b. List of pre-installation facilities required for installation and commissioning of equipment and also consumables to be arranged by the Bureau,
   c. List of the Users in India especially Govt. Labs. /Institutes with complete postal address to whom the similar equipment has been supplied,
   d. Near locations in India from where after sales services shall be provided along with the name of Servicing Agent,
   e. The optional and any other essential items/accessories required for the maintenance of the equipment for the next three years.
   f. Technical Literature of the equipment along with necessary clause wise photograph/drawings, if any
   g. Compliance statement vis-à-vis specification clauses, including statement of deviation, if any (Annex-III).
   h. **Delivery Period**: The delivery of the equipment is required to be made within 90 days of the date of order. If, it is not possible for you to affect delivery within the period, you are required to specify the date by which you can guarantee delivery of the stores.
   i. **Warranty**: The equipment is to be guaranteed for trouble free performance for a **minimum period of two years after commissioning**. The defects, if any, during the warranty period are to be rectified free of charge by arranging free replacement wherever necessary.
   j. The Tenderer is required to furnish the Permanent Account Number (PAN)/TIN of the firm Allotted by the Income Tax Department.

5. Each tender document shall be accompanied with **EMD of 3% of total cost of the equipment (excluding taxes).** The demand draft for the EMD amount shall be drawn in favour of BUREAU OF INDIAN STANDARDS payable at Sahibabad/Ghaziabad. The sealed envelope containing EMD should be super scribed **"EMD"** and **stapled separately with the envelope containing the commercial Bids. No disclosure of amount of EMD in Technical Bid should be done.**

6. Cost of the items should be mentioned clearly in the **Financial Bid [Part-B]** only. The following details need to be included :
    a. Price break-up of main equipment and accessories and consumables to be supplied by the party,
    b. The rates quoted should separately indicate Basic Cost, Excise Duty, Sales Tax, Packing & Forwarding charges, Freight, Insurance, VAT etc. Rates quoted should specifically state Sales Tax, Excise Duty or any other taxes/charges. In absence of any such stipulation, it will be presumed that the prices include all such charges and no claim for the same shall be entertained. **Form C/D shall not be provided by BIS. In case of foreign supplier BIS shall pay Custom Duty.**
    c. Rebate on the quoted price, if additional equipment is procured for any other BIS Lab, and
    d. The Annual Maintenance Contract charges for next three years after the expiry of warranty period.
    e. CIF (Carriage Inward & Freight), Sahibabad value both by Airfreight and Ocean freight, where applicable.

7. BIS shall pay **90%** of the cost after satisfactory installation & commissioning and the Balance of **10% as contract performance security** would be paid after expiry of warranty period. **In case of foreign suppliers** 100% payment shall be made by an Irrevocable Letter of Credit established in favour of the supplier through the Canara Bank, DDU Marg, New Delhi, for the order value provided an unconditional Performance Bank Guarantee valid till 60 days after the warranty period from a Nationalized Bank for 10% of the order value within 15 days of placement of the order is given to us. The Agency Commission to the Indian Clearing Agent will not be paid by the Bureau. The firm has to arrange for it. BIS shall provide Custom Duty Exemption Certificate at the time of Custom Clearance as well as any applicable Custom Duty.

8. Place of Delivery: **Director& Head (Mechanical),**
    BUREAU OF INDIAN STANDARDS,
    Central Laboratory, Plot No.20/9, Site-IV,
    Sahibabad Industrial Area, Sahibabad, Ghaziabad-201010

9. Quotations/bids qualified by indefinite expressions such as "Subject to immediate acceptance" etc. and incomplete quotations are liable to be summarily rejected.

10. In case of foreign quotation, the address of Principal / Manufacturer and their Banker's details should be furnished. The supplier is required to have an import license for the equipment quoted where applicable as per GOI guidelines.

11. All goods shall be inspected by BIS preferably in the presence of supplier or his authorized representative, when the packages are opened in Labs prior to installation. The decision of BIS shall be binding. Rejected items/goods/stores shall be removed by the supplier at his own cost and risk, within 30 days of receipt of notice for the removal of such goods, and no liability, whatsoever, on the Bureau shall be attached for the rejected/disapproved goods/items/stores.

12. INSTALLATION: Bidder shall be responsible for installation / demonstration wherever applicable and for after sales service during the warranty and thereafter. If the supplier fails to supply, install and commission the system as per specifications mentioned in the order within the due date, the Supplier is liable to pay Penalty of one percent of the value of Purchase Order awarded per every seven days delay, subject to a maximum of 10% of the total value of the order and such money will be deducted from any money due or which may become due to the supplier.

13. The supply of spare parts is to be guaranteed at least for a period of 10 years after the supply of the equipment.

14. The Bureau reserves the right to accept or reject summarily and/or all tenders in whole or part without assigning any reason whatsoever.

15. The Date and Time of opening for Part B (Financial Bid) will be intimated only to technically acceptable/qualified tenderers at a later date.

16. In case of any dispute arising out of this agreement then DG BIS shall nominate any officer of the BIS a sole arbitrator to adjudicate upon the issue involved in the dispute and the provisions of the Arbitration Act shall be applicable.

17. All question, disputes or differences arising under, out of or in connection with this Bid document shall be subject to the exclusive jurisdiction of Delhi/Ghaziabad Court.

-Sd/-

Head (Planning & Purchase)
Bureau of Indian Standards
Central Laboratory

Annex- III

DEVIATION STATEMENT FORM

1) **The following are the particulars of deviations from the requirements of the tender document and specifications:**

SPECIFICATION CLAUSE	DEVIATION	REMARKS (INCLUDING JUSTIFICATION)

PLACE:

DATE: **SEAL & SIGNATURE OF BIDDER**

NOTE: 1.Where there is no deviation; the statement should be returned duly signed an endorsement indicating "No Deviations".

c) CO_2 (kg): 2, 3, 4.5 and 5; and

d) clean agent (kg): 1, 2, 4, 6.

6 PRESSURE REQUIREMENTS FOR LOW PRESSURE EXTINGUISHERS

6.1 Test Pressure (P_t)

The test pressure (P_t) for low-pressure extinguishers shall be 1.43 × P_{ms} but in no case less than 2 MPa (20 bar).

For gaseous extinguisher, it should not be less than 3 MPa (30 bar).

6.2 Minimum Burst Pressure (P_b)

The minimum burst pressure (P_b) for low-pressure extinguishers is 2.7 × P_{ms} but in no case less than 5.5 MPa (55 bar).

7 GENERAL OPERATING PERFORMANCE REQUIREMENTS

7.1 Operating Temperatures

Extinguishers shall be capable of operating reliably within one of the following temperature ranges of temperature:

+ 5 °C to + 55 °C

0 °C to + 55 °C

– 10 °C to + 55 °C

– 20 °C to + 55 °C

– 30 °C to + 55 °C

NOTE — The temperature range selected from the above shall be marked on the fire extinguisher (*see* **10.3.1.5**).

7.2 Minimum Effective Discharge Time and Bulk Range of Discharge

7.2.1 *Class A Rated Extinguishers*

The minimum effective discharge time of extinguishers with 1A rating shall be no less than 8 s. Extinguishers with ratings of 2A or higher shall have a minimum discharge time of 13 s.

7.2.2 *Class B Rated Extinguishers*

The minimum effective discharge time of extinguishers with a Class B rating shall be no less than the value given in Table 1.

Table 1 Minimum Effective Discharge Time of Class B Rated Extinguishers

(*Clause* 7.2.2)

Classification	Minimum Discharge Time s	Throw m
(1)	(2)	(3)
8B	8	1
13B	8	1
21B	8	2
34B	8	2

7.2.3 *Bulk Range/Throw (Type Test)*

7.2.3.1 *Requirements*

The minimum bulk range of extinguishers with a Class A rating shall be no less than 2 m when determined in accordance with **7.2.3.2**.

7.2.3.2 *Test method*

Carry out the test indoors having suitable lighting to give the best possible visibility of the extinguisher media during discharge. Use a black background marked to indicate the horizontal distance. Condition the extinguisher for no less than 18 h at a temperature of 27± 5°C and place it in normal operating position with the discharge nozzle held horizontally 1 m above the floor. Fully discharge the extinguisher with the control valve fully open within 5 min of conditioning. Record the bulk range (through) of the extinguisher as the range at the time corresponding to 50 percent of the effective discharge time that is if discharge time is 15 s. The range should be minimum up to 7.5 s.

NOTE — Where the range of effective discharge is difficult to determine visually, supplementary means, such as collection boxes for powders and condensing plates for liquefied gases may also be used.

7.3 Resistance to Temperature Changes (Type Test)

7.3.1 *Requirements*

Portable extinguishers shall be able to operate at temperatures within one of the temperature ranges given in **7.1** as indicated by the manufacturer and comply with the following requirements after being subjected to the conditions given in **7.3.2**:

a) shall operate as intended;

b) commence discharge within 5 s of the opening of control valve; and

c) not retain more than 10 percent of initial charge within the extinguisher following complete discharge.

7.3.2 *Test Method*

Subject four (two) extinguishers to the temperature cycles given in Table 2, two extinguishers to each cycle.

Operate the extinguisher within 5 min of its removal from the conditioning chamber.

in terms of weight or pressure loss, whichever is applicable.

7.5 Mechanical Resistance (Type Test)

7.5.1 *Resistance to Impact*

This test is intended to prove the resistance of the extinguisher, and particularly that of the head and fittings, to damage from falling objects or from impact with fixed surfaces.

7.5.1.1 *Requirements*

The extinguisher shall not release pressure in a potentially dangerous manner when tested in accordance with **7.5.1.2**.

7.5.1.2 *Test method*

Condition an extinguisher, correctly charged and equipped with all the fittings which are subject to internal pressure in normal operation, for 18 h to the minimum working temperature (*see* **7.1**) with a tolerance of ± 5°C, and maintain it at this temperature during the impact test described below.

If the extinguisher is of the gas cartridge type, fit the charged cartridge and activate the extinguisher with the control valve shut, so as to keep the extinguisher under pressure.

Conduct the impact test as follows:

Mount a steel cylindrical hammer, of 75 mm diameter and total mass of 4.0 kg with flat faces, vertically in loose guides so that it can drop freely through a height h (minimum height 300 mm) given by:

$$h = \frac{m}{20} \text{ and } h \geq 0.3$$

where

h = height, expressed in m; and

m = total mass of extinguisher, expressed in kg.

The extinguisher shall be placed on a rigid flat surface, protecting pressure gauge, in each of the following two positions in turn:

a) in the normal upright position, with the longitudinal axis of the hammer coincident with the longitudinal axis of the valve; and

b) lying on its side so that the valve rests on a rigidly fixed steel block.

In each of the above positions, submit the valve of the extinguisher to an impact by allowing the steel hammer to fall vertically onto it from the height h. The point of impact is to be examined.

7.5.2 *Resistance to Vibrations (Type Test)*

7.5.2.1 *Test principle*

An extinguisher shall be capable of withstanding exposure to the conditions of a vibration test without development of physical weakness, which would impair its normal operation.

7.5.2.2 *Extinguisher mounting requirements*

Extinguishers supplied with a wall hook or bracket not intended for use in vehicles shall be subjected to the test specified in **7.5.2.5.2**.

Extinguishers supplied with a bracket for use in vehicles shall be subjected to the test specified in **7.5.2.5.3**.

Extinguishers supplied with a bracket suitable for both general and vehicle use shall be subjected to the test specified in **7.5.2.5.3**.

7.5.2.3 *Test criteria*

The test criteria are as follows:

a) Following exposure to the vibration test the extinguisher shall comply with the discharge requirements specified in **7.2**; and

b) Physical failure of components which would require repair or replacement of the extinguisher and/or components before it can be returned to normal service shall be cause for rejection.

7.5.2.4 *Mounting of the test specimen*

Mount a fully charged extinguisher in an upright position. Mount extinguishers intended for use in vehicles in their intended bracket. Extinguishers not intended for use in vehicles may be tested without a bracket.

7.5.2.5 *Test orientation*

7.5.2.5.1 *Axes of orientation*

Subject the extinguisher to the vibration test specified in **7.5.2.5.2** or **7.5.2.5.3** in each of the three rectilinear axes in the following order: horizontal, lateral, and vertical.

7.5.2.5.2 *General extinguishers*

The vibration applied shall have the following parameters:

Frequency : 40 Hz

Amplitude : 0.25 ± 0.03 mm

Duration : 2 h (in each orientation specified in **7.5.2.5.1**)

7.5.2.5.3 *Vehicle extinguishers*

Subject the vehicle extinguishers to the following tests:

a) Subject the extinguisher to the variable frequency and amplitude specified below in each orientation specified in **7.5.2.5.1**.

Frequency, Hz	*Amplitude*, mm
10 to 19	0.75 ± 0.08
20 to 39	0.50 ± 0.05
40 to 60	0.25 ± 0.03

Vibrate the extinguisher for 5 min at each frequency and increase the frequency at discrete intervals of 2 Hz, and

b) Vibrate the extinguisher for 2 h at the frequency which produced the maximum resonance as determined in (a) above or if no resonance is observed subjected to the test specified in **7.5.2.5.2**.

Complete the tests specified in (a) and (b) above in one plane before making tests in the next plane.

7.6 Resistance to Corrosion (Type Test)

7.6.1 *External Corrosion Test*

Subject complete and fully charged extinguishers, including their mounting bracket and wall hook, to a salt spray test as defined in IS 6910 for a period of 240 h. Following a drying period of at least 24 h at room temperature, carefully wash the extinguisher to remove any salt deposits. Test two samples that is either two of the same size or one sample each of two different sizes from the same family.

At the conclusion of the test the following requirements shall be satisfied:

a) The mechanical operation of all working parts shall be unimpaired;

b) The minimum effective discharge time and method of operation shall comply with requirements specified;

c) The pressure gauge, if one is fitted, shall remain functional and watertight; and

d) There shall be no corrosion of the metal of the extinguisher body; discolouration/superficial corrosion of non-ferrous metals is acceptable, but galvanic corrosion between dissimilar metals shall not be permitted.

7.6.2 *Internal Corrosion Test for Extinguishers Using Water-Based Media (Type Test) and Gaseous Extinguishers*

Subject two extinguishers, charged in accordance with the manufacturer's filling instructions, eight times to the temperature cycle defined in Table 3.

On completion of the eight temperature cycles, cut each body into two sections in a manner sufficient to permit internal examination. Disregard detachment of any protective coating local to the plane of section. There shall be no visible signs of corrosion of the metal nor detachment, cracking or bubbling of any protective coating. There shall be no visible change in the colour of the extinguishing media other than that resulting from the thermal cycling in case of water based media only.

Table 3 Temperature Cycle
(*Clause* 7.6.2)

Stage	Duration h	Temperature, °C
(1)	(2)	(3)
1	27 ± 5	[1]
2	≥ 27	27 ± 5
3	27 ± 5	60 ± 2
4	≥ 27	27 ± 5

The temperature refers to the ambient temperature of the conditioning chamber. A liquid bath shall not be used. The duration of any one complete cycle shall not exceed 120 h.

[1] The lowest temperature marked on the extinguisher ± 2°C (*see* 7.1).

NOTE — Allowance should be made for a change of colour that occurs naturally due to the temperature changes. It is recommended that two samples of the agent be stored in closed glass containers and subjected to the same cycles as the extinguishers in order to establish a reference sample.

7.7 Tapping Test (Type Test)

7.7.1 *Requirements*

Portable extinguishers shall comply with the following requirements after being subjected to the conditioning specified in **7.7.3** :

a) Shall operate satisfactorily;

b) Commence discharge within 5 s of the opening of the control valve; and

c) Not retain more than the following percentage of initial charge within the extinguisher following complete discharge:

1) powder: 15 percent

2) all other media: 10 percent.

7.7.2 *Test Apparatus*

7.7.2.1 Compaction machine, designed to accept only one extinguisher at a time which shall be raised by rod and guided by castors.

The plate supporting the extinguisher shall be of steel 300 ± 5 mm square and 60 ± 1 mm thick. Figure 1 is an example of an acceptable test apparatus.

Observe the following points:

a) Ensure that the rod is adjustable as to adjust to the extinguisher base;

b) Ensure that the rod can move freely in the guide castors; and

c) Extinguisher shall also be guided without constraint.

7.7.3 *Test Method*

An extinguisher in a normally charged condition shall be held in the vertical position and dropped vertical 500 times from a height of 15 mm at a frequency of 1 Hz onto a rigid horizontal steel plate.

The extinguisher is to be removed from the test apparatus with a minimum amount of agitation, held in its normal working position, and operated.

NOTE — For cartridge extinguishers, the cartridge shall be pierced and the pressure allowed to build for 6 s before opening of the control valve.

7.8 Intermittent Discharge Test

7.8.1 An extinguisher conditioned at its minimum operating temperature ± 2°C and at 55 ± 5 °C shall operate in such a manner that no more than 1 s elapses from the time the control valve is opened until the extinguishing media starts to discharge. Additionally, at the end of discharge, the extinguisher shall not retain more than the following percentages of its original charge:

a) powder: 15 percent; and

b) all others: 10 percent.

7.8.2 Condition a correctly charged extinguisher at each of the specified temperatures for a min of 18 h. Operate the extinguisher intermittently by opening and closing the valve in cycles of 2 s 'open' and 2 s 'closed' until the end of discharge is reached.

7.8.3 For cartridge-operated extinguishers, pierce the cartridge and allow the pressure to build for 6 s before opening the control valve.

8 PERFORMANCE REQUIREMENTS FOR TEST FIRES

8.1 Rating Suitability for the Various Classes of Fire

8.1.1 *Class A*

The rating of extinguishers recommended as suitable for Class A fires shall be determined using the method described in **8.3**. The rating shall be based on the amount of extinguishing medium used to extinguish the fire of maximum size under the conditions of the test. This amount shall be no less than the appropriate minimum value given in Table 4.

8.1.2 *Class B*

The rating of extinguishers recommended as suitable for Class B fires shall be determined using the method give in **8.4**. The rating shall be based on the amount of extinguishing medium used to extinguish the fire of maximum size under the conditions of the test. This amount shall be no less than the appropriate minimum value given in Table 5.

8.1.3 *Class C*

There are no tests requirements for the performance of extinguishers against Class C fires included in this standard, suitability for use against Class C may be claimed for Class B or Class AB powder extinguishers only.

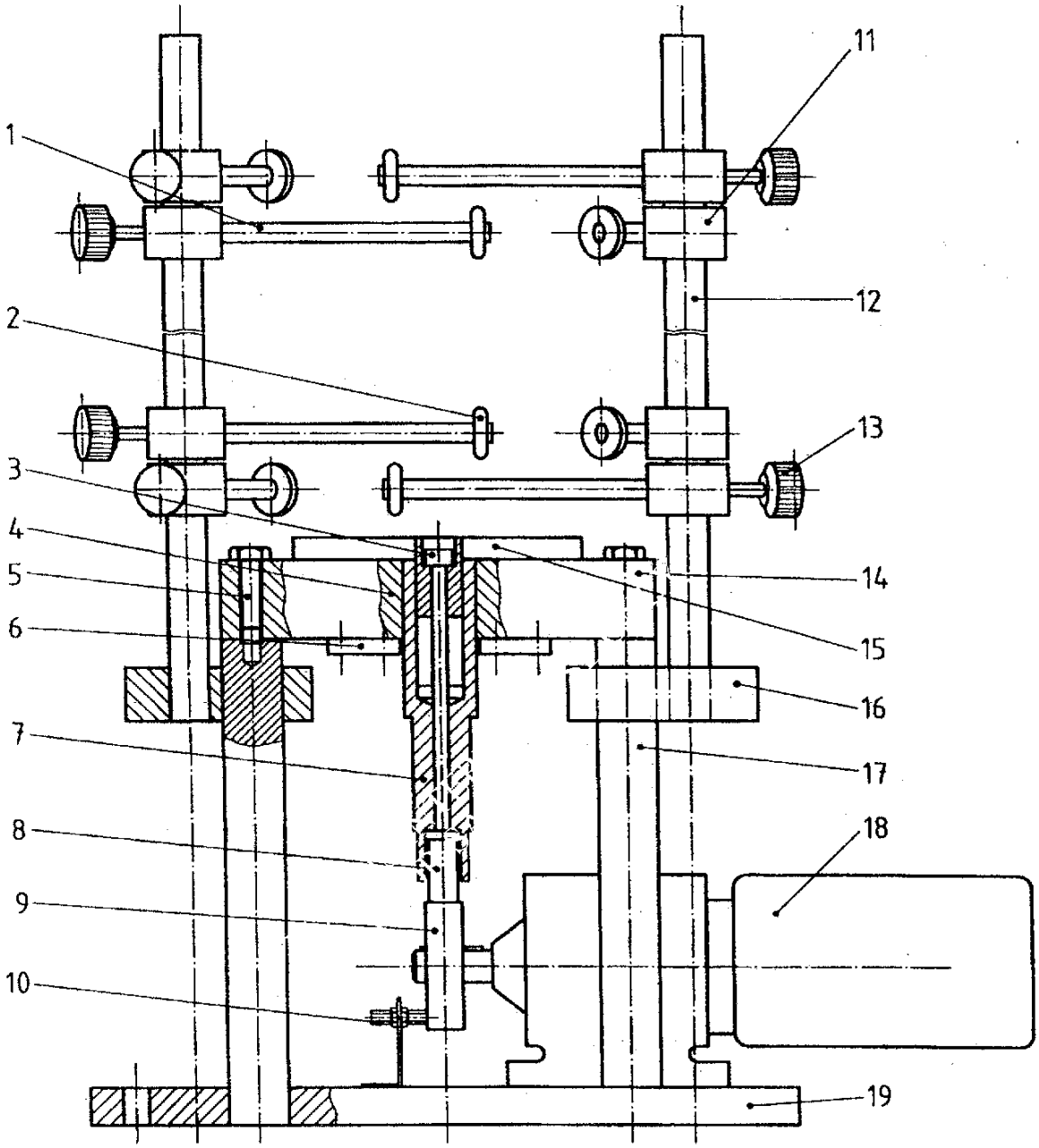
8.1.4 *Class D*

Extinguishers recommended as suitable for Class D fires shall extinguish the appropriate test fire or fires when tested as described in **8.5**.

NOTE — Extinguishers suitable for Class D fires are usually not suitable for use on fires of other classes. Specialized media and applicators are typically used.

Table 4 Amount of Extinguishing Medium Used to Obtain a Minimum Class A Rating of Extinguishers
(*Clause* 8.1.1)

Extinguishing Medium Content (Charge)			Minimum Class A Rating
Powder kg	Water/Foam Water with Additives	Clean Agent kg	
(1)	(2)	(3)	(4)
$l \leq 2$	$l \leq 6$	$l \leq 6$	1 A
$2 < l \leq 4$	$6 < l \leq 10$	$6 < l \leq 8$	2 A
$4 < l \leq 6$	$l > 10$	$l > 8$	3 A
$6 < l \leq 9$			4 A
$l > 9$			6 A

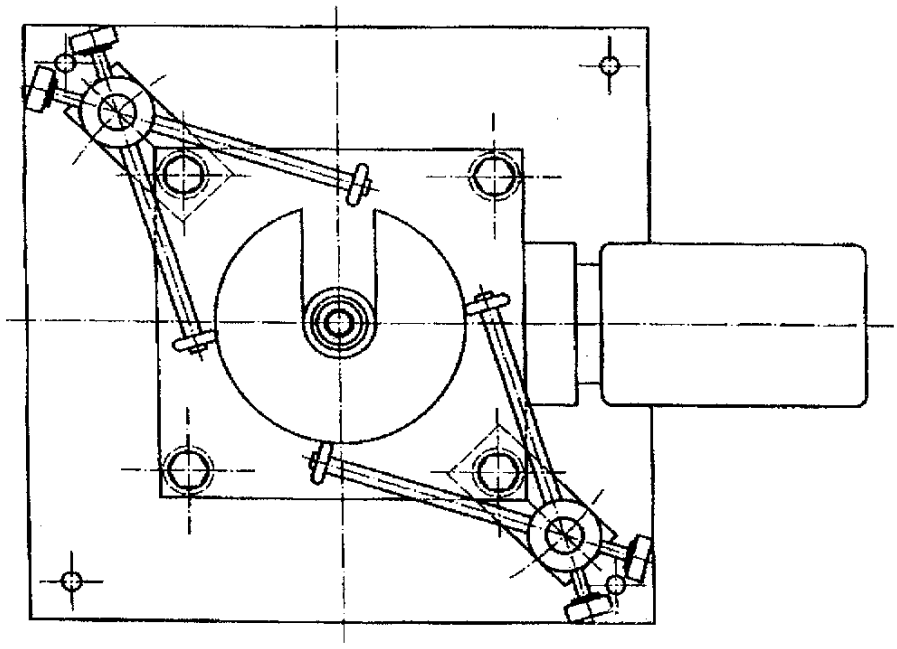


1A General Diagram

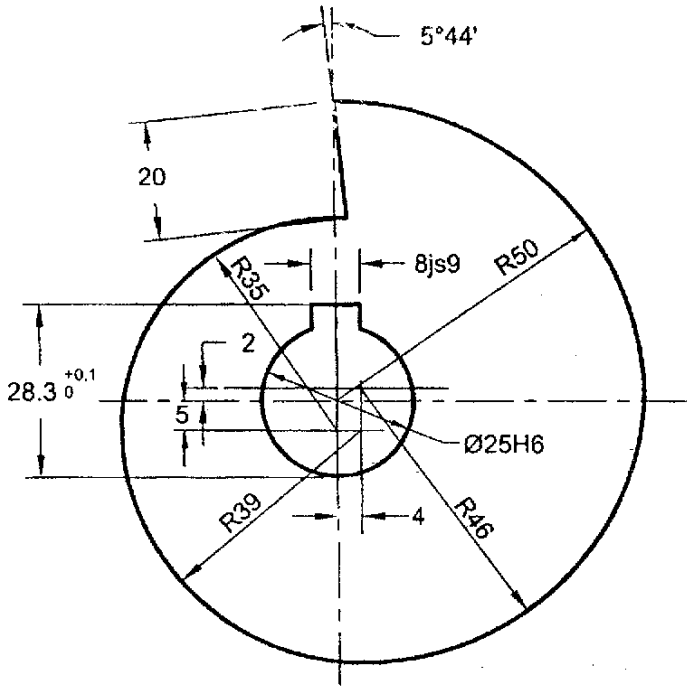
Key

1. Castor support axis
2. Castors
3. Cl + C, M12 – 190 screw
4. Push-nut extinguisher
5. H, M16-90 screw
6. Plates
7. Piston
8. Castor
9. Cam
10. Inductive pick-up
11. Rotation guidance
12. Axes
13. Castor nut
14. Support plate
15. Adjusting block
16. Support axes
17. Plate support axis
18. Flender-Himmel geared motor
19. System support plate

Fig. 1 Tapping Machine — *Continued*



1B View from Above



All dimensions in millimetres.

1C Side View

FIG. 1 TAPPING MACHINE

an extinguisher not fitted with a hose, by connection at the handle.

Measure any current flowing between the extinguisher and the earth when the plate is live and the extinguisher discharging.

9 CONSTRUCTION REQUIREMENTS

9.1 High-Pressure Extinguishers

Extinguishers with a service pressure greater than 19 bar (CO_2) shall have concave base. For carbon dioxide extinguishers, in case of steel body, it shall conform to IS 7285 and in case of aluminium body, it shall conform to IS 15660. Gas cartridge shall conform to IS 4947. The CO_2 gas cartridge shall be of minimum 60 g.

9.2 Low-Pressure Extinguishers

9.2.1 *General Requirements*

9.2.1.1 These requirements are applicable to extinguishers having a service pressure (P_s) not exceeding 19 bar.

9.2.1.2 A portable extinguisher with a charge exceeding 3 kg shall be constructed such that it can be stood vertically without extra support. Gas cartridge shall conform to IS 4947.

9.2.1.3 The manufacturer shall ensure that the welds show continuous penetration with no deviation in the weld. Welds and brazed joints shall be free from defects which are prejudicial to the safe use of the cylinder.

9.2.1.4 Parts attached to the body of the extinguisher shall be manufactured and fitted in a way that minimize concentrations of stress and corrosion risks. In the case of welded and brazed parts, the metal shall be compatible with the cylinder material.

9.2.1.5 The cylinder manufacturer shall obtain the certificate for the cast analysis of material supplied.

9.2.1.6 Where plastic components are threaded into metallic parts they shall be designed to minimize the possibility of cross-threading. This shall be accomplished by the use of coarse threads of less than 5 threads /cm or by the use of square-cut threads.

9.2.1.7 Extinguishers which are free standing shall either be fitted with a means to raise the pressure-retaining part of the body at least 5 mm above the floor, or the thickness of metal in the lowest pressure retaining part or parts of the body shall not be less than 1.5 times the minimum thickness of the cylindrical part of the body.

9.2.1.8 *Determination of maximum service pressure (P_{ms})*

9.2.1.8.1 Conduct the test on a minimum of three extinguishers conditioned at 55 °C for 18 h.

9.2.1.8.2 For stored-pressure type extinguishers, determine the pressure immediately after taking each extinguisher out of the oven. For cartridge-operated type extinguishers, remove each extinguisher from the oven and activate the cartridge immediately.

9.2.1.8.3 For each type of extinguisher the highest pressure observed during **9.2.1.8.2** is recorded as the maximum service pressure (P_{ms}).

9.2.2 *Burst Test*

9.2.2.1 Fill the extinguisher with a suitable liquid and increase the pressure at a rate not exceeding (20 ± 2) bar/min until the minimum burst pressure (P_b) is achieved. Maintain this pressure for 1 min without the cylinder rupturing. Increase the pressure until rupture occurs. The minimum burst pressure (P_b) shall be 2.7 × P_{ms} but in no case less than 55 bar.

9.2.2.2 The bursting test shall not cause the cylinder to fragment.

9.2.2.3 The break shall not show any sign of brittleness, that is the edges of the break shall not be radial but shall be slanting in respect of a diametrical plane and shall exhibit a reduction in area over their entire thickness.

9.2.2.4 The break shall not show any characterized defect in the metal.

9.2.2.5 The break shall not occur in the weld at a pressure less than 5.4 × P_{ms} or 8 MPa (80 bar), whichever is greater.

9.2.2.6 During the burst test, no parts shall be ejected from the extinguisher.

9.2.3 *Crushing Test (Type Test)*

9.2.3.1 Crush a minimum of three extinguishers perpendicularly to their longitudinal axis, and at their midpoint using two 25 mm thick mandrels with a radius at their apex of 12.5 mm and a width sufficient to extend beyond the sides of the extinguisher (*see* Fig. 4). Crush the cylinder over a period between 30 s and 60 s. In the case of extinguishers with a longitudinal weld place, the weld seam at 90° to the support lines. For extinguishers with central transverse welds, apply the mandrel at 45° to the weld seam.

9.2.3.2 After the crushing test, fill the extinguishers with water and increase the pressure to test pressure (P_t). The extinguishers shall not exhibit any cracks or leaks.

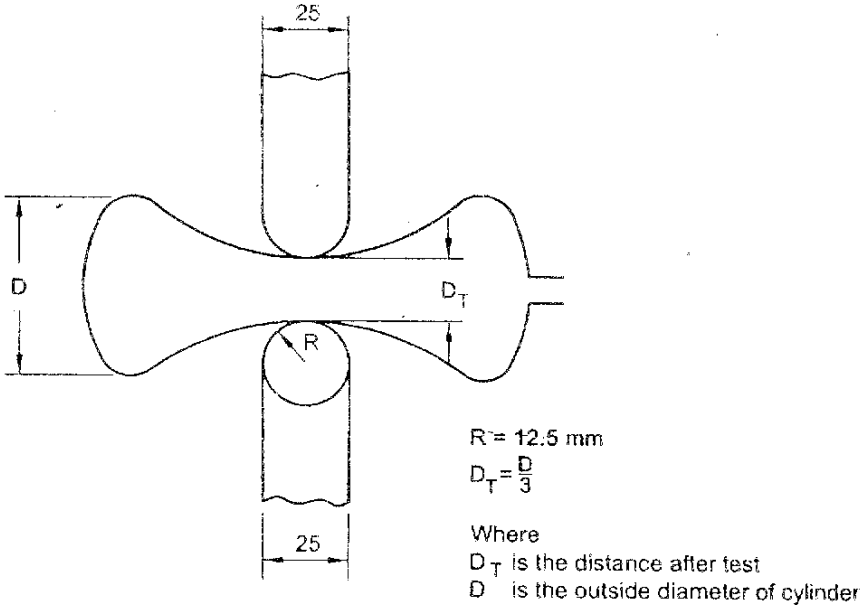


FIG. 4 CRUSHING TEST

9.2.4 *Permanent Volumetric Expansion Test (Type Test)*

It is only for high pressure cylinders. There shall be no permanent expansion in excess of 10 percent of the total expansion of the cylinder when subjected to the test pressure (P_t) for 30 s. For cylinders that have been proof-pressure tested prior to the deformation test, test pressure shall be increased by 10 percent.

NOTE — An acceptable test apparatus is the water jacket test however other methods are also acceptable

9.2.5 *Pressure Cycling Test (Type Test)*

A minimum of two cylinders shall be tested.

An extinguisher cylinder shall sustain, without rupture, 5 000 cycles from 0 to the test pressure (P_t) and back to 0 at the rate of 6 cycles/min. At the conclusion of testing, the cylinder shall be subjected to and comply with the burst test.

9.2.6 *Welded Low Carbon Steel Cylinder*

9.2.6.1 The cylinder material shall be capable of being welded and shall contain a maximum of 0.25 percent carbon, 0.05 percent of sulphur and 0.05 percent of phosphorous.

9.2.6.2 Filler material shall be compatible with the steel to give welds with properties equivalent to those specified for the base sheet.

9.2.6.3 The cylinder shall have a measured thickness greater than the minimum thickness given by the following formula but in no case less than 0.70 mm:

$$S = \frac{D}{300} + k$$

where

S = minimum thickness, expressed in mm;

D = outside diameter of the cylinder or, for non-cylindrical bodies, the greatest external diagonal of the extinguisher body, expressed in mm; and

k = coefficient equal to:

0.45 for $D \leq 80$;

0.50 for $80 < D \leq 100$; and

0.70 for $D > 100$.

9.2.7 *Stainless Steel Cylinders*

9.2.7.1 Stainless steel domes and bottoms shall be drawn from fully annealed stock.

9.2.7.2 Only austenitic stainless steel having a maximum carbon content of 0.03 percent shall be used.

9.2.7.3 The cylinder shall have a minimum measured wall thickness greater than the minimum wall thickness given by the following formula but in no case less than 0.64 mm:

$$S = \frac{D}{600} + k$$

9.6 Safety Devices

9.6.1 High pressure cylinders and cartridges shall be provided with a safety device in accordance with national regulations.

9.6.2 There are no compulsory safety systems required for low-pressure extinguishers. However, if such a system is used, it must be appropriately sized and positioned. The operating pressure of the device shall not exceed the test pressure (P_t) nor be less than the maximum service pressure (P_{ms}).

9.7 Manufacturing Tests

9.7.1 *Low-Pressure Cylinders*

9.7.1.1 At least one cylinder from each batch of 500 or less shall be subjected to the burst tests. If the test results are not acceptable, randomly select five additional cylinders from the same batch and repeat the tests. If one of the cylinders does not pass the test, the batch is rejected and made unserviceable. At the option of the manufacturer, the burst and crushing test may be conducted on the same cylinder.

9.7.1.2 Each cylinder shall be subjected to the test pressure (P_t) for 30 s, without leakage, failure or visible deformation.

9.7.2 *Leakage Test (Type Test)*

Each stored-pressure and carbon dioxide extinguisher and gas cartridge shall be subjected to a leakage test and comply with the following requirements:

a) Stored-pressure extinguishers fitted with a gauge as specified in **7.4.1.3**, the leakage rate shall not exceed a rate of loss of pressurizing content equivalent to 5 percent per annum of service pressure.

b) Gas cartridges and stored-pressure extinguishers without gauges as specified in **7.4.1.2**, the maximum loss of contents per annum shall not exceed the following:

   1) for extinguishers: 5 percent or 50 g, whichever is less, and

   2) for gas cartridges: 5 percent or 7 g, whichever is less.

c) Carbon dioxide extinguishers the maximum loss of contents shall not exceed 5 percent per annum.

NOTE — All stored-pressure extinguisher soap solution test be conducted to check leakage as a routine test.

9.8 Requirements for Plastics Components

9.8.1 *General Requirements*

9.8.1.1 Plastics components of portable fire extinguishers shall comply with the following requirements.

The test and conformity checks shall be carried out on components which correspond to the mass-produced components in respect of the material used, the form and the method of manufacture.

9.8.1.2 It is recommended that the plastic used, be identifiable at all times.

Any change in the material, the form, or the method of manufacture requires a new test.

9.8.1.3 It is necessary to have access to data supplied by the manufacturer relating both to the material itself and the manufacturing procedures.

9.8.1.4 To verify the attachment of plastic parts following the air-oven ageing, ultraviolet light exposure and impact-resistance tests, attach the plastic part(s) to an extinguisher and then subject the assembly to the appropriate pressure test.

9.8.2 *Requirements for Normally Pressurized Components*

9.8.2.1 *Burst strength*

9.8.2.1.1 Conduct burst tests at three temperatures as described below:

Subject at least three components to the burst test in accordance with **9.2.2** using an appropriate liquid at temperatures of 27±5°C, the minimum recommended operation temperature marked on the extinguisher (*see* **7.1**), and 55 ± 5°C. Increase the pressure at a rate of 2 ± 0.2 MPa/min.

9.8.2.1.2 The bursting pressure before and after the ageing and ultraviolet light exposure test shall be at least equal to the minimum burst pressure (P_b)

9.8.2.2 *Air-oven ageing*

9.8.2.2.1 Subject at least three components to accelerated ageing in an oven at 100 °C for 180 days. Fit the components with adapters to apply normal assembly stresses.

9.8.2.2.2 Following the exposure, condition the components for 5 h at 27 ± 5°C and subsequently inspect them for cracking. No cracking shall be permitted.

9.8.2.2.3 Subject the components to the burst test in accordance with **9.2.2** at 27 ± 5 °C using a suitable liquid at a rate of pressure increase of 2 ± 0.2 MPa/min. The bursting pressure (P_b) shall be at least equal to that specified for the cylinder.