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SPECIFICATION FOR FUSE CARRIERS AND FUSE BASES USED IN REWIREABLE TYPE ELECTRIC FUSES UP TO 660V

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BUREAU OF CEYLON STANDARDS

SPECIFICATION FOR FUSE CARRIERS AND FUSE BASES USED IN REWIREABLE TYPE FUSES UP TO 660 V

SLS 352 : 1975

Gr. 9

Revised

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Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This Standard does not purport to include all the necessary provisions of a contract.

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STANDARD SPECIFICATION FOR FUSE-CARRIERS AND FUSE-BASES USED IN REWIREABLE TYPE ELECTRIC FUSES UP TO 660 V

FOREWORD

This Sri Lanka Standard has been prepared by the Drafting Committee on Fuse-carriers and Fuse-bases used in rewireable type Electric Fuses up to 660 V. It was approved by the Electrical Engineering Divisional Committee of the Bureau of Ceylon Standards and was authorised for adoption and publication by the Council of the Bureau on 1975-06-04.

Rewireable type electric fuses have been used extensively on systems where the voltage does not exceed 660 V. This standard is intended chiefly to cover the technical provisions relating to carriers and bases used in such rewireable type electric fuses having a current rating up to and including 200 A.

This standard, however does not cover all rewireable type electric fuses.

This standard has been drawn up to provide guidance to manufacturers as well as the users of the fuse-carriers and bases.

All standard values given in this specification are in SI units. Equivalent values in imperial units are given in brackets for guidance. These equivalents have been calculated in accordance with CS 116: 1971*.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or observation shall be rounded off in accordance with CS 102:1971**. The number of figures to be retained in the rounded off value shall be the same as that of the specified value in this standard.

*CS 116:1971 Principles pf Conversion.
**CS 102:1971 Presentation of Numerical Values.

In the preparation of this standard, valuable assistance derived from the publications of the Indian Standards Institution, British Standards Institute and South African Bureau of Standards is acknowledged.

1. SCOPE

This specification covers rewireable type fuse-bases and fuse-carriers having a current rating up to and including 200 A, and a voltage rating not exceeding 660 V between lines. These fuses shall be used only in installations where short circuit current does not exceed 4000 A.

This specification does not cover fuse-elements.

2. TERMINOLOGY

For the purpose of this standard, the following definitions shall apply:

2·1 **Crazing**—Hair-line cracks in the glaze of ceramic material.

2·2 **Dunt**—A hair line fracture extending through the body, or the body and the glaze, and caused by strains set up in the process of manufacture of the ceramic material.

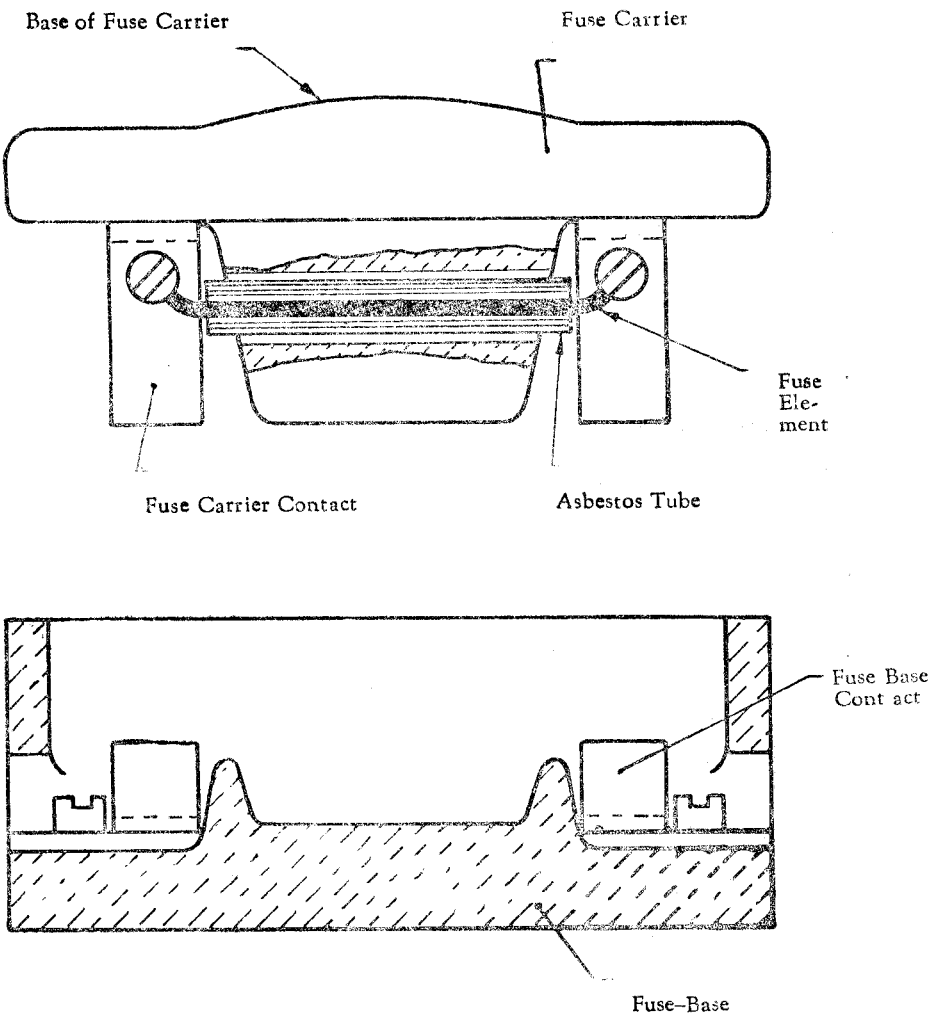
2·3 **Projection**—A raised portion, projecting more than 0·75 mm (0·030 in) above the surface of ceramic material.

2·4 **Exposed body**—An unglazed portion of ceramic material having a dimension larger than 1·588 mm (0·0625 in).

2·5 **Fuse**—A device for protecting a circuit against damage from current exceeding the rated current of the device, flowing in the circuit, by opening the circuit on the melting by such excess current, of a fuse element. The fuse comprises all the parts that form the complete device.

2·6 **Rewireable fuse**—A fuse in which the fuse-element consists of a wire which may be replaced when necessary. (Fig. 1).

2·7 **Fuse base**—The fixed part of the fuse provided with terminals for connection to the circuit and which is suitable for the reception of the fuse-carrier.



NOTE: The drawing is intended to illustrate the basic principle and does not purport to show actual constructional details.

Fig. **1 – Typical component parts of a rewireable fuse**

2·8 **Fuse-carrier**—A removable portion of the fuse which carries the fuse-element fitted with fuse contacts

2·9 **Fuse-carrier contacts**—The contacts which are fitted to the fuse-carrier for engaging with the fixed contacts in the fuse-base and capable of having a fuse-element attached to it.

2·10 **Fuse base contact**—A conducting part secured to the fuse-base and designed to engage with the fuse-carrier contacts, if any, or otherwise directly with the fuse-link contacts and connected to (or engaged with) the fixed terminals.

2·11 **Fuse-link**—That part of the fuse which comprises a fuse element enclosed in a cartridge or other container, and which can be attached to the fuse contacts or is fitted with fuse contacts.

2·12 **Fuse-element**—That part of the fuse which is designed to melt and thus open the circuit.

2·13 **Size**—The maximum rated current (expressed in amperes) that a fuse of a given dimension may be allocated.

2·14 **Rated current of a fuse-base or of a fuse carrier**—A current used in the designation of a fuse-base or fuse-carrier, namely, the current, the fuse can carry continuously without deterioration and without exceeding the specified temperature rise when fitted with a fuse element of the same rated current.

Note: A fuse of one rating (say 100 A) may be fitted with a fuse-element to give it some smaller current rating (say 80A). This matter is within the control of the user. Fuse-carrier contacts, fuse-carriers, fuse-base contacts and fuse-bases are usually described by stating the size of the fuse of which they are a part.

2·15 **Rated voltage**—A voltage used in the designation of the fuse and from which the test conditions and service voltage limits are determined.

2·16 **Recovery voltages**—The r.m.s. value of the normal frequency AC voltage or the DC voltage that exists across the terminals of the fuse after the opening of the circuit.

2·17 **Routine tests**—Tests carried out on each item to check requirements which are likely to vary during production.

2·18 **Type tests**—Tests carried out to prove conformity with the requirements of this specification. These are intended to prove the general qualities of a given type.

2·19 **Acceptance tests**—Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

2·20 **Prospective current**—The current (the r.m.s. value of the alternating component of an alternating current, or the direct current) that would flow, under any conditions, including test or fault conditions, on the making of the circuit when the circuit is equipped for the insertion of a fuse but the fuse is replaced by a link of negligible impedance.

2·21 **Breaking capacity rating**—A prospective current stated by the manufacturer to be the greatest prospective current to which a fuse may be subjected under prescribed conditions of voltage and of power factor or time constant.

3. RATINGS

3·1 **Rated voltages**—The preferred rated voltages for the fuse-carriers and fuse-bases shall be as follows:

For AC systems 250 and 440 V.
For DC systems 115, 250 and 500 V.

3·2 **Rated Currents**—The preferred rated currents of fuse-carriers and fuse-bases shall be 5,15,20,30,45,60,100 and 200 A.

4. CONSTRUCTIONAL REQUIREMENTS

4·1 **Materials**—The insulating materials used for construction of fuse-carriers and fuse-bases shall be of ceramic or other suitable material. They shall be non-ignitable under specified service conditions.

4·2 **Protection**—The fuse-carrier and fuse-base when installed in the intended manner shall have all live parts so protected as to prevent inadvertent contact with such live parts.

4·3 **Handle or grip**—The fuse-carriers shall be provided with a handle or shall be shaped in an acceptable manner so that it is practicable to withdraw the carrier without the use of tools and with no danger of the operator coming into inadvertent contact with live parts.

4·4 **Corrosion**—Metal parts shall, unless inherently resistant, be protected against corrosion. Suitable methods include enamelling, glavanising, painting, zinc impregnation, plating with copper, nickel, cadmium, silver, tin or zinc.

4·5 **Fuse-bases**

4·5·1 Every fuse-base shall, as far as possible, be provided in an acceptable manner with at least two holes for fixing, or alternatively with equivalent means of fixing. sufficient to ensure stability.

4·5·2 The fuse-base shall have contacts for suitably engaging with the contacts of the fuse-carrier. They shall have suitable means for connecting the contacts to terminals, when the fuse-base is mounted in the intended manner.

4·5·3 Live parts on the underside of fuse-bases designed for surface mounting shall be either covered by a shield or barrier of insulating material, or be countersunk not less than 3 mm (0·1 in) below the surface of the base and covered with a waterproof insulating sealing compound which will not deteriorate or flow at a temperature lower than 100°C or during any of the tests specified in Clause 6, and have a clearance of not less than 6·0 mm (0·24 in) for 5A, 15A, 20A, 30A, 45A and 9·0 mm (0·35 in) for 60A, 100A and 200A sizes from the mounting surface and be riveted, upset, or otherwise reliably prevented from loosening.

4·5·4 The mounting surface of the fuse-base shall enable secure mounting of the fuse on the intended surface.

4·6 **Fuse-carrier**

4·6·1 The fuse-carrier shall have contacts suitable for making contact with the contacts of the fuse-base. They shall be provided with suitable terminals for the connection of

the fuse-element. The fuse-carrier shall be so constructed that it is capable of being reversible for introduction into the fuse-base unless it is obviously designed to be inserted only in one way.

4·6·2 Live parts of fuse-carriers shall be covered either by a shield or barrier of insulating material, or be countersunk not less than 3 mm (0·1 in) below the surface of its base and covered with a waterproof insulating sealing compound which will not deteriorate or flow at a temperature lower than 100°C.

4·7 Screws

4·7·1 Screws upon which the general assembly of the fuse-base and fuse-carrier terminals and contacts depends shall be prevented from loosening or backing out by lock washers, staking or other reliable means.

4·7·2 If screws used in the assembly of a fuse should be loosened or removed in order to install the fuse element or to connect the fuse into a circuit, they shall thread in to metal and shall be provided with washers.

4·7·3 Screws or bolts used for the connection of current-carrying or earthing parts of fuses shall have at least two full threads or 0·6 of the diameter of the screw, which ever is greater, engaging.

4·8 Current carrying parts

4·8·1 Current carrying parts shall be of robust construction and capable of carrying their rated current without exceeding the temperature rise limits specified in Clause 5·4.

4·8·2 Iron and steel shall not be used for current carrying parts, except as clamping agents or pressure devices such as pinching screws, clamps or wire binding screws and nuts.

4·9 **Contacts**—The contacts of fuse-carrier and those of the fuse-base shall be so constructed, and be of such material that adequate contact between them is maintained even after repeated engagement and disengagement (see Clause 6·2).

4·10 Terminals

4·10·1 Fuse-carriers and fuse-bases shall be provided with terminals of adequate current carrying capacity.

4·10·2 Terminals, unless of a form which prevent the conductor wires from spreading, shall be fitted with special washers or other suitable means to prevent such spreading.

4·10·3 Wiring terminal screws shall thread into metal. Terminal screws shall have a smooth clean thread free from burrs, and the ends of the screws shall be of such a shape as to prevent damage to the conductor.

5. PHYSICAL AND ELECTRICAL REQUIREMENTS

5·1 **Mechanical endurance** —The fuse-base and fuse-carriers shall be mechanically robust and shall pass satisfactorily mechanical endurance test (see Clause 6·2). At the end of the mechanical endurance test, the fuse-base, and fuse-carrier shall be examined for the following:

(a) The contacts shall not work loose.

(b) No damage shall be caused to any part of the fuse-carrier or fuse-base.

(c) There shall be no displacement of the component parts, and

(d) The serviceability of the fuse shall not have been impaired.

5·2 **Mechanical strength** —When tested in accordance with Clause 6·3, the fuse-carrier and fuse-base shall show neither cracks nor permanent deformation such as will impair its compliance with this specification.

5·3 **Withdrawal force** —The withdrawal force of fuse-carrier from the fuse-base measured as described in Clause 6·4, shall be between the values given in Table 1.

TABLE 1-WITHDRAWAL FORCE

Nominal Current of the fuse A	Withdrawal Force	
	N	(lbf)
5 15 20	5 to 15	(1·1 to 3·4)
30	15 to 55	(3·4 to 12·4)
45 60 100	55 to 90	(12·4 to 20·2)
200	150 to 220	(33·7 to 49·5)

5·4 **Temperature rise**—When tested in accordance with Clause 6·5 in an ambient temperature not exceeding 40° C, the temperature rise of the fuse-carrier contacts shall not exceed 55° C and that of fuse-base contacts shall not exceed 40°C.

5·5 **Insulation resistance**-When measured in accordance with Clause 6·6, the insulation resistance shall be not less than 50 megaohms.

5·6 **Dielectric strength**—When tested in accordance with Clause 6·7 fuse-carrier and fuse-base shall withstand the application of an AC voltage of 2000 V r.m.s. for 1 minute without puncture of insulation or arcing over.

5·7 **Breaking capacity**—The fuse-carrier and fuse-base shall be deemed to have failed the test for breaking capacity if one or more of the following occur when tested in accordance with Clause 6·8.

(a) Any part of the fuse-carrier or fuse-base ignites,

(b) The fuse-carrier is ejected,

(c) Any part of the fuse except the fuse-element and its covering is damaged to such an extent as to render it unserviceable. and

(d) The insulation resistance reduces to below 100 kilo ohms when measured in accordance with Clause 6·6 within 3 minutes after the conclusion of the test.

Note: Selection and choice of the fuse-carriers and fuse-bases will be decided upon the basis of the circuit conditions and the short circuit level. Where necessary, back up protection should be provided.

5·8 **Absorption resistance (for non-ceramic materials)**—When tested in accordance with Clause 6·9 materials other than ceramics, required to be absorption resisting shall be incapable of taking up water in sufficient quantity to cause appreciable swelling, laminating, warping or changing of the material in a manner which will impair its compliance with this specification.

5·9 **Requirements of ceramic material**

5·9·1 The ceramic material shall be sound, thoroughly vitrefied, smoothly glazed and shall be free from defects such as dunts, projections and exposed bodies. The mounting surface may be left unglazed.

5·9·1·1 The glaze which shall show no signs of crazing, shall be leadless and shall cover at least those surfaces which are exposed when the fuse has been mounted in the intended manner.

5·9·2 **Temperature cycle**—When fuse-bases and fuse-carriers are subjected to the temperature cycle test specified in Clause 6·10·1 the ceramic material shall withstand the series of tests without breaking, cracking or crazing. In addition, the fuse-base and fuse-carrier shall comply with the requirements of Clause 5·6 when subjected to high voltage test (see Clause 6·7) at the end of the temperature cycle tests.

5·9·3 **Water absorption**—Ceramic material shall not absorb more than 2 per cent of its mass of water when broken and tested in accordance with Clause 6·10·2.

5·10 **Non-combustibility**—Materials required to be non-combustible shall be incapable of burning or giving off flammable vapours in sufficient quantity to ignite at a pilot flame when heated for 5 minutes in an oven at 300°C in the manner specified in Clause 6·11.

6. TESTS

General conditions for tests–Unless otherwise specified, each test shall be commenced with the fuse-base, fuse-carrier and all associated apparatus approximately at the prevailing ambient temperature.

6·1 Categories of tests

6·1·1 **Type tests**—The following shall constitute type tests:

(a) Test for mechanical endurance (see Clause 6·2).
(b) Test for mechanical strength (see Clause 6·3).
(c) Test for withdrawal force (see Clause 6·4).
(d) Test for temperature rise (see Clause 6·5),
(e) Insulation resistance test (see Clause 6·6).
(f) High voltage test (see Clause 6·7)
(g) Test for breaking capacity (see Clause 6·8).
(h) Test for water absorption (see Clause 6·9).
(j) Test on ceramic material (see Clause 6·10).
(k) Ignition test (see Clause 6·11).

6·1·1·1 **Number of samples**—Five samples of fuse-carrier and fuse-base (each sample consisting of a fuse-base and a fuse-carrier) shall be drawn at random and tests (a) to (k) specified in Clause 6·1·1 shall be carried out on each of these samples in the order mentioned.

6·1·1·2 **Criteria of compliance**—All these samples shall successfully pass all the tests specified in Clause 6·1·1 to prove conformity with this specification.

6·1·2 **Routine tests**—High voltage test (Clause 6·7) shall be the routine test.

6·1·3 **Acceptance tests**—The following shall constitute acceptance tests.

(a) Test for mechanical endurance (see Clause 6·2).
(b) Test for withdrawal force (see Clause 6·4).
(c) Test for temperature rise (see Clause 6·5).
(d) Insulation resistance test (see Clause 6·6).
(e) High voltage test (see Clause 6·7).
(f) Test for water absorption (see Clause 6·9).

These acceptance tests shall be conducted in the order specified above.

6·1·3·1 A recommended sampling plan for acceptance tests is given in Appendix C.

6·2 Tests for mechanical endurance

6·2·1 The fuse-base shall be fixed on a suitable support as for normal use, all fixing means being used. The fuse-carrier shall have the fusing element connected to the terminals as in normal use.

6·2·2 The fuse-carrier shall be introduced into the fuse-base and drawn out; the fuse-carrier shall then be turned by 180° around an axis perpendicular to the fuse-base in the case of the reversible type and its introduction and drawing out shall be repeated. This shall comprise one cycle.

6·2·3 The test cycle specified in Clause 6·2·2 shall be carried out 100 times for the reversible type and 200 times for the non-reversible type.

6·2·4 At the end of the test, the fuse- (fuse-base and fuse-carrier) shall be examined for conformity with the requirements specified in Clause 5·1.

6·3 **Test for mechanical strength**—The assembled fuse-carrier and fuse-base shall be firmly mounted on a hardwood block, its base forming any arbitrary angle with the horizontal plane. A mild steel

guiding rod of 6 mm (0·2 in) in diameter and 600 mm (23·6 in) long, fitted with a hard fibre base plate 25 mm (1·0 in) in diameter and 12·5 mm (0·5 in) thick, shall be rested vertically on the sample. A cylindrical metal weight of 250 g (8·8 on) having an outer diameter of 25 mm (1·0 in) and a bore permitting a loose fit over the rod shall be dropped freely from a height of 250 mm (9·8 in) on to the fibre base plate. The test shall be repeated three times for each of three different positions in which the sample is placed.

6·3·1 At the end of the test, the fuse-base and fuse-carrier shall be examined for conformity with the requirements specified in Clause 5·2.

6·4 Test for withdrawal force

6·4·1 The fuse-base shall be fixed on a suitable support as for normal use, all fixing means being used. The fuse-carrier shall be introduced into the fuse-base correctly and to the end. The fuse-carrier shall then be pulled with a force applied gradually perpendicular to the axis of the fuse until the fuse-carrier is drawn out. In the case of vertical sliding type of fuse, the force shall be applied in the direction of sliding.

6·4·2 The fuse-carrier shall be introduced anew into the fuse-base after being turned through 180° around an axis perpendicular to the fuse-base and withdrawn from the fuse-base as specified in Clause 6·4·1 unless the fuse-carrier is so constructed that it can be inserted only in one way.

6·4·3 The force needed for drawing out the fuse-carrier from the fuse-base shall be between the limits specified in Clause 5·3.

6·5 Test for temperature rise

6·5·1 The test shall be carried out in an ambient temperature not exceeding 40° C.

6·5·2 Fuse-base and fuse-carrier shall be tested for temperature rise at rated current in surroundings free from external draughts and in a containing case representative of that which may be used in service.

6·5·3 The fuse-carrier shall be fitted with the appropriate fuse-element (see Appendix A for characteristics of fuse-element) of the required size and rating and the fuse-base shall be connected to the circuit using not less than 1 m (3ft) for each terminal of the fuse-base of rubber insulated cable or PVC insulated cable, of sizes corresponding to the rated current of the fuse-base or fuse-carrier.

6·5·4 The fuse-base and fuse-carrier shall be mounted in the intended manner on a vertical surface of insulating material. If alternative positions are possible they shall be mounted with the fuse-elements vertically.

6·5·5 The temperature shall be measured by means of thermo-couples attached to:

(a) the upper fuse-carrier contact as close as possible to the fuse-element, and

(b) the upper fuse-base contact as close as possible to the connecting conductor.

6·5·6 A current equal to the current rating of the fuse-carrier or fuse-base shall be passed through the fuse. A low voltage source either AC or DC may be used for this test.

6·5·7 This current shall be maintained for such periods as may be required for the temperature to become constant.

6·5·8 The temparature rise thus measured shall comply with the requirements specified in Clause 5·4.

6·6 **Insulation resistance test** — This test shall be carried out with all parts in position except the fuse-element. The insulation resistance of the fuse-carrier and fuse-base shall be measured at a voltage of 500 V DC between the following parts:

(a) Between live terminals and any metal parts which would be exposed when the fuse is mounted in the intended manner. This test shall be made with all exposed metal parts electrically connected together and with all live terminals electrically connected together.

(b) Between incoming live terminals and outgoing live terminals.

6·6·1 The voltage shall be applied for sufficient time for the reading of the test indicator to become steady.

6·6·2 The insulation resistance shall comply with the requirement specified in Clause 5·5.

6·7 High voltage test

6·7·1 An AC voltage of 2000 V r.m.s. of approximately sinewave form at 50 Hz* shall be applied between the parts specified in Clause 6·6 and maintained for 1 minute. The test shall be commenced at a voltage, of about one third of the test votlage, and the voltage shall be increased to the full test voltage as rapidly as is consistent with its value being indicated by the measuring instruments. At the conclusion of this test the voltage shall be reduced to about one third of the test voltage, before switching off.

6·7·2 There shall be no puncture or arcing during the high voltage test. Immediately following the test, the insulation resistance shall be measured in accordance with Clause 6·6 and shall comply with the requirement specified in Clause 5·5.

6·8 Test for breaking capacity

6·8·1 Conditions for test

6·8·1·1 **Source of supply**—The test shall be such that when the fuse is replaced by a link of negligible resistance and the circuit closed, a current of 2000 A in the case of 5 A, 15A and 20A carriers

*1 Hz=1 C/s

and 4000 A in the case of other sizes, passes through the circuit. The source of supply for these tests shall be capable of producing initially a recovery voltage equal to the voltage rating of the fuse-base or fuse-carrier with a tolerance of plus or minus 5 per cent.

For AC circuits power factor of the circuit shall not exceed 0·4 (lag).

For DC circuits the time constant shall not be less than 0·0075 seconds.

The power factor of a polyphase circuit shall be deemed to be the average of the cosines of the angles of lag in all phases. The power factor of any phase shall not vary from the average by more than 25 per cent of the average.

6·8·1·2 **Fuse element**—Appropriate fuse-elements of required size and rating (see Appendix A for characteristics of fuse-element) shall be fitted to the fuse-carrier.

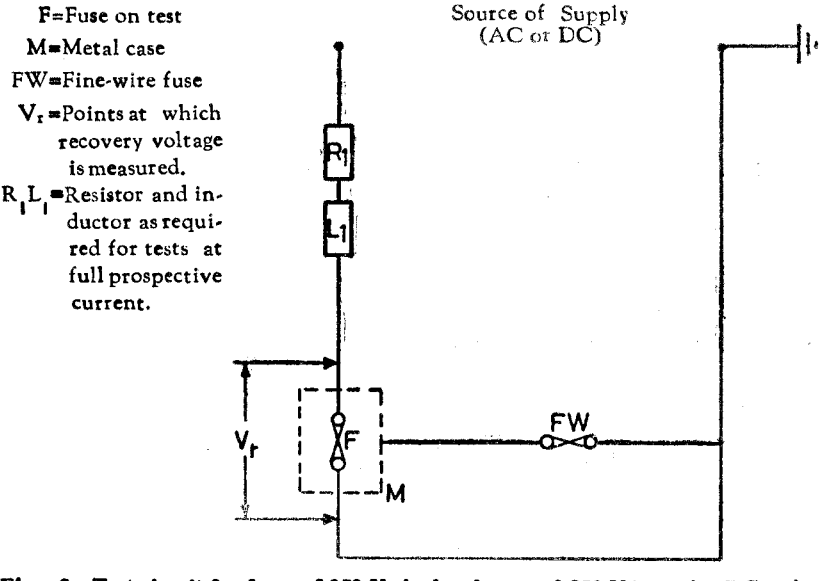
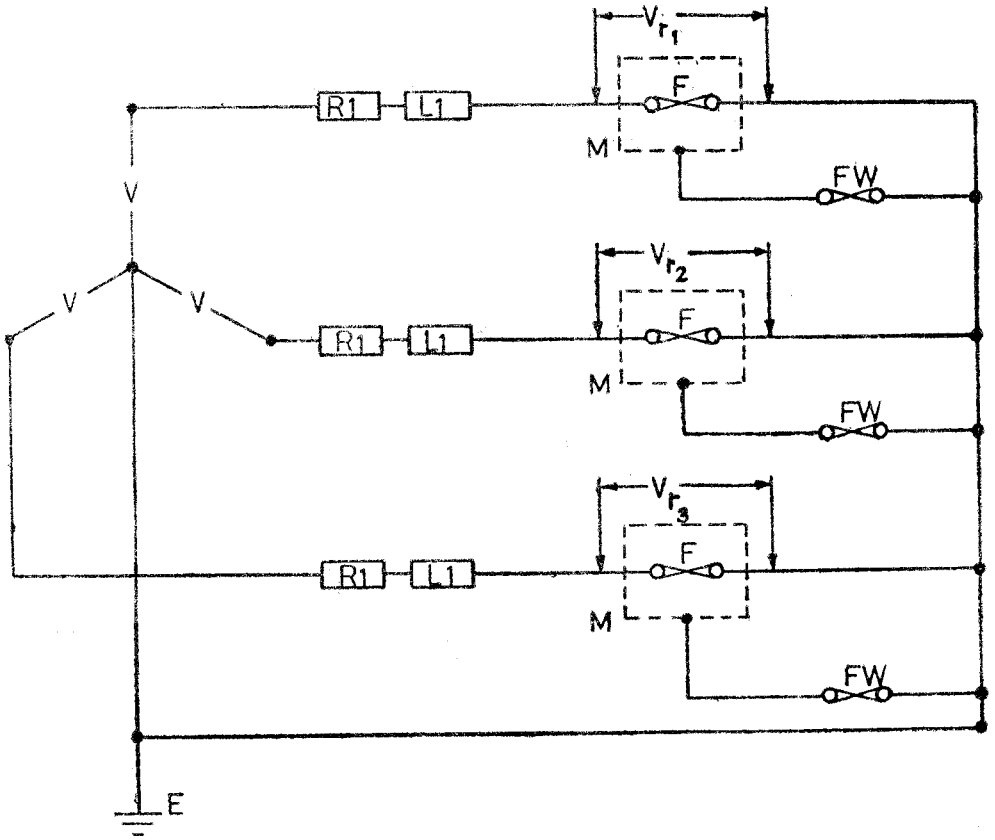


Fig. 2 – Test circuit for fuses of 250 V single phase and 250 V two-wire DC ratings



V=Three phase source of supply

F=Fuses on test

M=Metal Cases

FW=Fine wire fuses

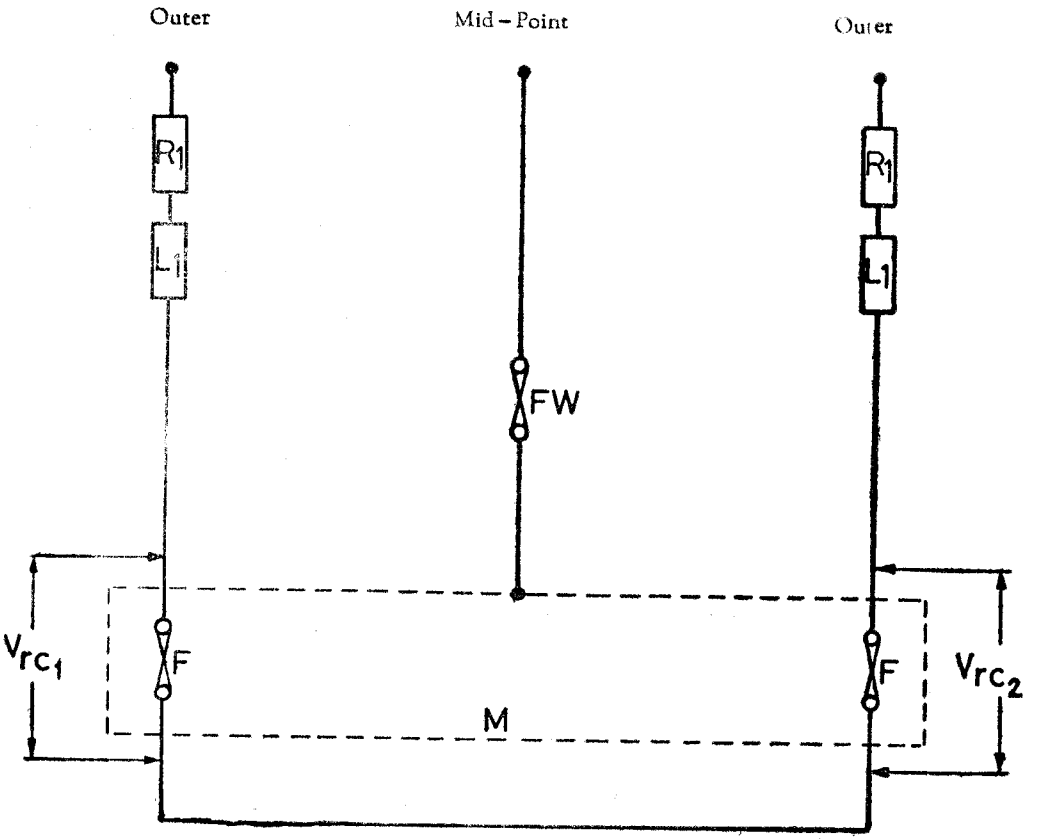
V_r=Points at which recovery voltage is measured.

E=Earth connection.

R_1 L_1=Resistors and inductors as required for tests at full prospective current.

Fig. 3 - Alternative test circuit for fuses of 250V single phase AC rating.

DC source of supply with earth mid-point



F=Fuses on test

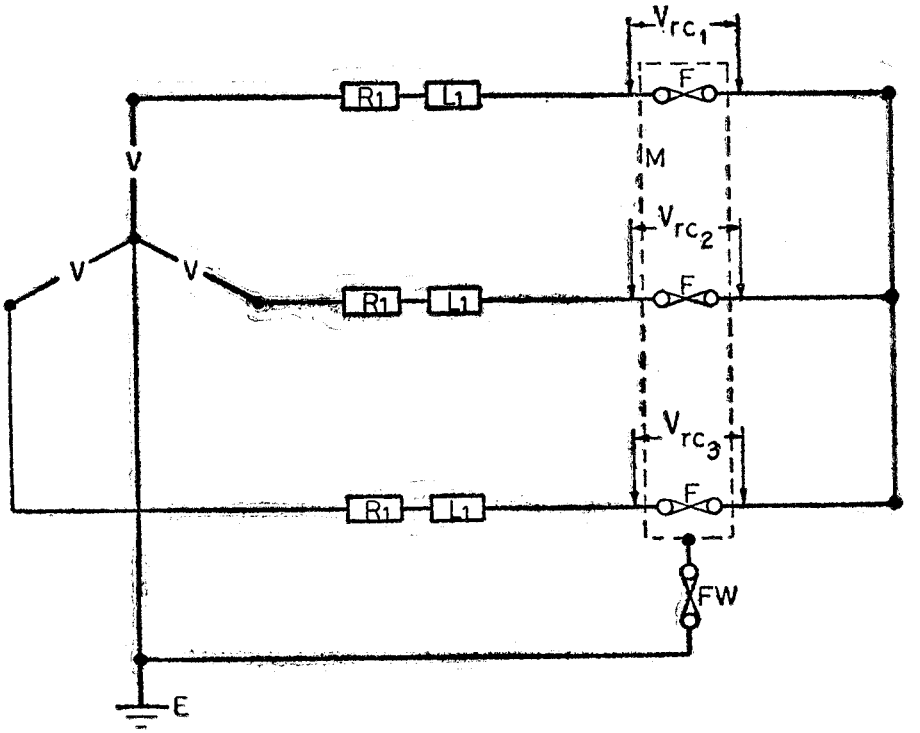
M=Metal case

FW=Fine wire fuse

V_r=Points at which recovery voltage is measured.

R_1L_1=Resistors and inductors for tests at full prospective current.

Fig. 4 – Test for circuit fuses of 500V three wire DC rating.



V=Three phase source of suppply

F=Fuses on test

M=Metal case

FW=Fine-wire fuse

V_{rc}=Points at which recovery voltage is measured.

E=Earth connections

R_1L_1=Resistors and inductors as required for tests at full prospective current.

Fig. 5—Test circuit for fuses of 660V three-phase AC rating.

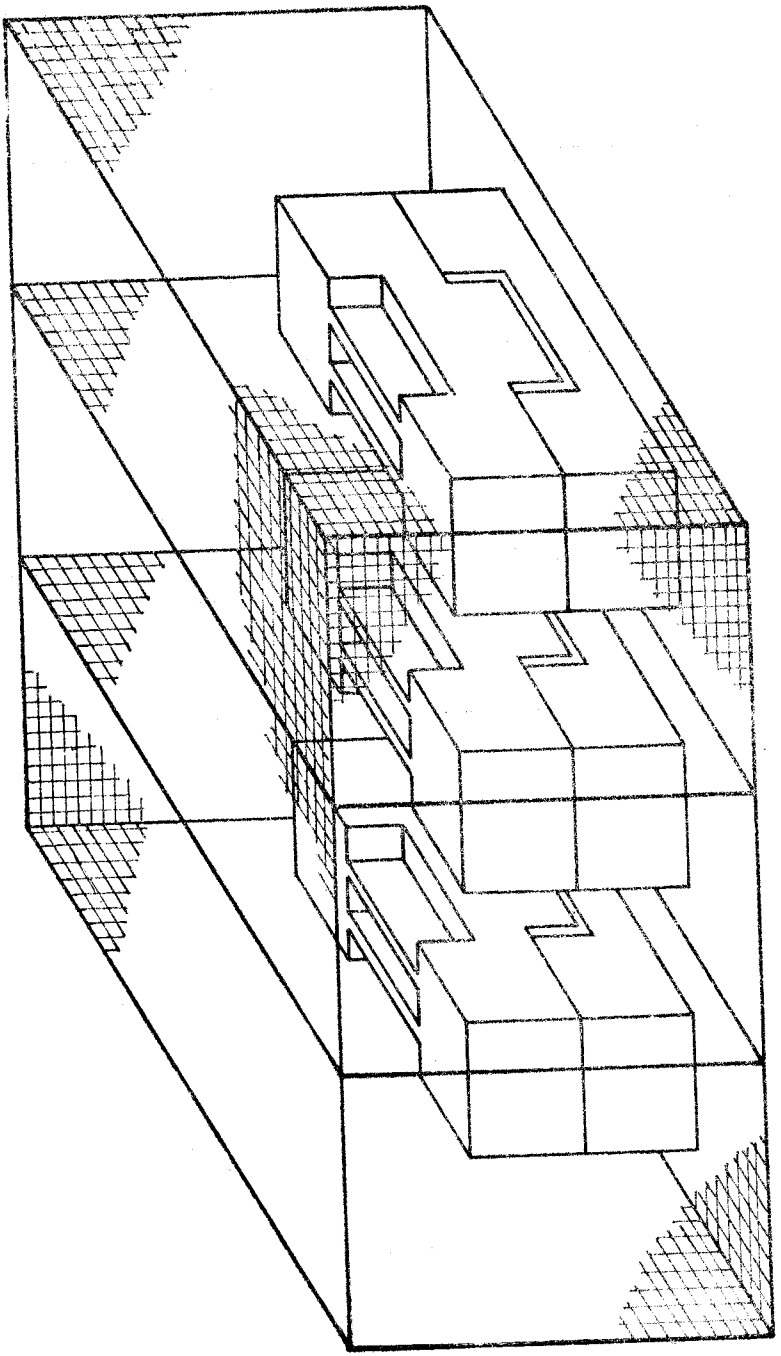


Fig. 6—Method of mounting fuses for test for breaking capacity

6·8·1·3 The arrangement of the circuit for test for breaking capacity shall be that given in one of the Figs. 2 to 5 according to the voltage rating of the fuse base or fuse-carrier.

6·8·1·4 The recovery voltage shall be maintained within the limits stated in Clause 6·8·1·1 for not less than 30 seconds after the extinction of the arc.

6·8·1·5 Throughout the test the fuse base and fuse carrier shall be mounted in the intended manner, on a metal plate and surrounded by a screen of woven wire cloth as shown in Fig. 6. The clearance between the screen and the external surfaces of the fuse shall not be less than 25 mm (1·0 in).

6·8·1·6 If the fuse is designed to hold three fuse elements in one fuse-base, the two centre screens should be centrally placed between the fuse-carriers.

6·8·1·7 The woven wire cloth shall be formed from 0·40 mm (0·016 in) diameter wire with approximately 16 meshes per centimetre (40 meshes per inch). The wire screens shall be connected electrically to the metal mounting plate which shall be insulated from earth potential but connected there to through a fine wire fuse, the fuse element of which shall be formed from copper wire with a diameter not greater than 0·12 mm (0·005 in) and not less than 75 mm (3·0 in) length. The fine wire fuse-element shall not melt during the test for breaking capacity.

6·8·2 **Procedure**—With the fuse element to be tested inserted in the circuit, the circuit shall be closed. The fuse element shall open the circuit at this test but the fine wire fuse connecting the mounting plate to earth shall not melt.

6·8·2·1 The test shall be repeated twice more, that is, in all it shall be carried out three times.

6·8·2·2 At the end of each test, the fuse-bases and fuse-carriers shall be examined for conformity with the requirements for performance specified in Clause 5·7.

6·9 **Test for water absorption (for non-ceramic material)**—The non-metallic portions of the fuse-carrier and fuse-base shall be immersed in distilled water at 29±2°C for 18 hours. At the end of this test the material shall conform to the requirements specified in Clause 5·8.

6·9·1 This test shall not apply to ceramic or asbestos material.

6·10 **Tests on ceramic material**

6·10·1 **Temperature cycle test**—The fuse-base and fuse-carrier from which any renewable covering has been removed, shall be passed through the following cycle three times in succession.

(a) Immersion in water maintained at a temperature of 70°C higher than that of the cold water bath to be used later in the test, and left submerged for 20 minutes, and

(b) Immediately thereafter immersion in a cold water bath for 20 minutes.

6·10·1·1 The mass of water in each bath shall be not less than four times that of the specimens immersed at one time and the water should cover the specimen completely.

6·10·1·2 At the conclusion of the series of immersions specified in Clause 6·10·1 the fuse base and fuse-carrier shall be dried and subjected to the high voltage test (see Clause 6·7). There shall be no arcing or puncture.

6·10·2 **Water absorption test (for ceramic material)**

6·10·2·1 The clean, dry fuse-bases and fuse-carriers from which any renewable covering and other metallic portion has been removed, shall be

broken into pieces having a size within the range of 12·5 mm(0·49 in) to 6 mm (0·2 in). A number of these pieces, not less than 40 g (1·4 oz) and not more than 50g (1·8 oz) totally in weight, shall be taken for testing. The test pieces shall be heated to 110±1°C in a dry atmosphere for at least 2 hours, and cooled in a desiccator.

6·10·2·2 The conditioned test pieces shall be weighed and then immersed in distilled water. The water shall be brought to the boiling point and kept boiling for not less than 30 minutes.

6·10·2·3 The test pieces still completely immersed in the water shall be allowed to cool to ambient temperature for a period of not less than 6 hours.

6·10·2·4 The test pieces shall be taken from the water after cooling, and the residual drops of water shall be removed by rolling them over a piece of filter paper. The test pieces shall then be transferred to a piece of wire gauze supported in still air at ambient temperature.

6·10·2·5 The test pieces shall be reweighed to the nearest milligramme, not less than 5 and not more than 10 minutes after removal from the water.

6·10·2·6 **Calculation**–The mass of water absorbed shall be calculated from these readings by the following formula:

$$\text{Mass of water absorbed, per cent} = \frac{A}{B} \times 100$$

where

A = mass of moisture absorbed, and
B = initial mass of test piece,

6·10·2·7 Water absorption shall be as specified in Clause 5·9·3.

6·11 Ignition test (for non ceramic materials)

6·11·1 Preparation of specimens

6·11·1·1 **Selection**—Three test specimens shall be prepared from the insulating materials of the fuse-carrier and fuse-base, The width of each specimen should be 12·5 mm (0·49 in), length being approximately 50 mm (2·0 in). The thickness shall be the same as that of the fuse, if it is less than 6·5 mm (0·26 in); should the thickness exceed 6·5 mm (0·26 in) it shall be reduced to this value by the removal of material.

If such specimens cannot be obtained, samples shall consist of broken pieces of materials to be tested which weigh not more than 10g (0·4 oz) and are not more than 10·0 mm (0·39 in) in thickness measured from an externally cured face.

6·11·1·2 **Conditioning**—The specimens shall be conditioned for a period of not less than 24 hours in a controlled atmosphere with a relative humidity of 75±5 per cent at a temperature 29±2°C before the test is carried out. (see Appendix B). Each specimen shall be tested within three minutes after its removal from the controlled atmosphere.

6·11·2 Apparatus

6·11·2·1 The specimen shall be tested in the heating chamber of an apparatus of the general type, shown in Fig. 7a pilot flame being located 22 mm (0·9 in) above the upper end of the specimen. A conical cover at the top shall limit the opening to approximately 650 mm^2 (1·01 sq. in) while the air intake at the bottom shall be approximately 65 mm^2 (0·10 sq. in). A light stirrup of wire may be used for supporting the specimen.

6·11·2·2 The support shall be so arranged that the specimen is placed centrally in the heating chamber with its longest dimension vertical. The apparatus shall be heated by passing a suitably regulated electric current through a heating element surrounding the heating chamber.

6·11·3 **Measurement of temperature of heating chamber**—The temperature of the heating chamber shall be taken as shown by a thermocouple situated at the level of the centre of the specimen and equidistant from the inner surface of the chamber and the specimen. The wires of which the thermocouple is made shall be not larger than 1·25 mm (0·49 in) and not smaller than 0·46 mm (0·018 in) in diameter and shall be bare for a length of 25 mm (1·0 in) from the junction.

6·11·4 **Procedure**—The temperature of the heating chamber shall be raised to 300°C and the specimen shall be inserted vertically in the chamber. The temperature shall then be re-adjusted to 300±3°C within 3 minutes and maintained for a period of 5 minutes. At the end of this period the specimen shall be removed from the chamber.

6·11·4·1 At any time during the test the specimen shall not flame or give off any flammable vapours in sufficient quantities to ignite at the pilot flame.

7. MARKING

7·1 Every fuse-carrier shall be clearly and indelibly marked with the following minimum information:

(a) Rated voltage (see Clause 3·1) (for example 250 V);

(b) Rated current (see Clause 3·2) (for example 15A);

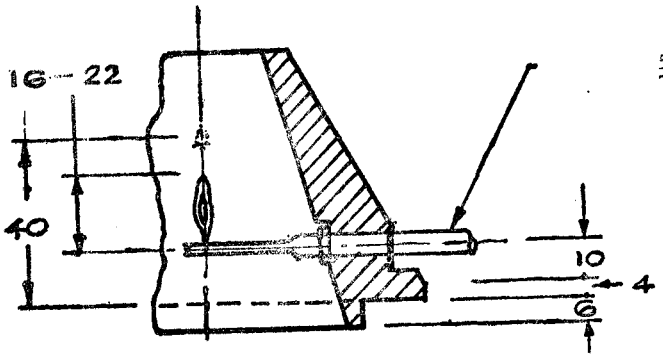
(c) The nature of supply, that is whether AC or DC (for example AC); and

(d) Maker's name or trade mark.

(e) Country of manufacture.

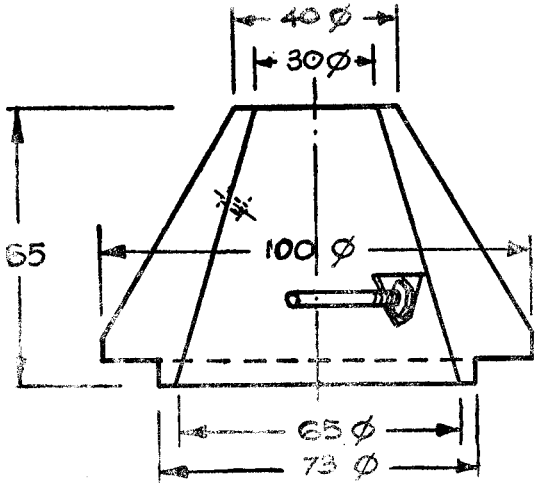
Note: The values shown in the above marking paranthesis would relate to a fuse with a maximum current rating of 15A suitable for 250 V single phase AC.

7·1·1 The marking given in Clause 7·1 shall be such that the voltage and current ratings shall be visible to the operator when the fuse is installed in the intended manner.



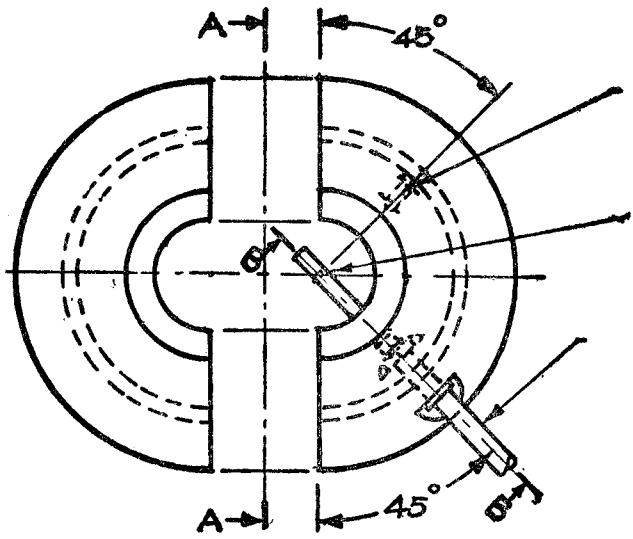
5 OD Metal Tubing

Elevation BB

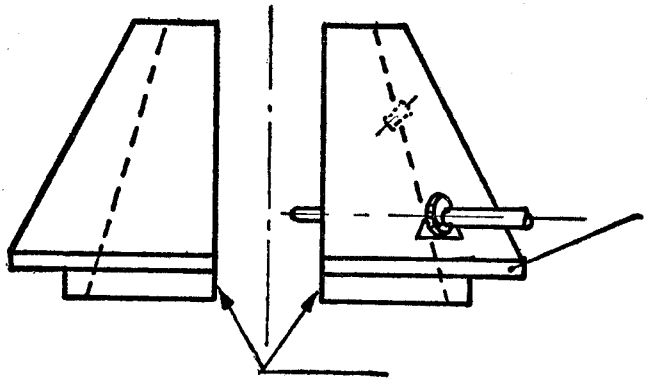


Elevation AA

7 A Details of C
To be of Refrac



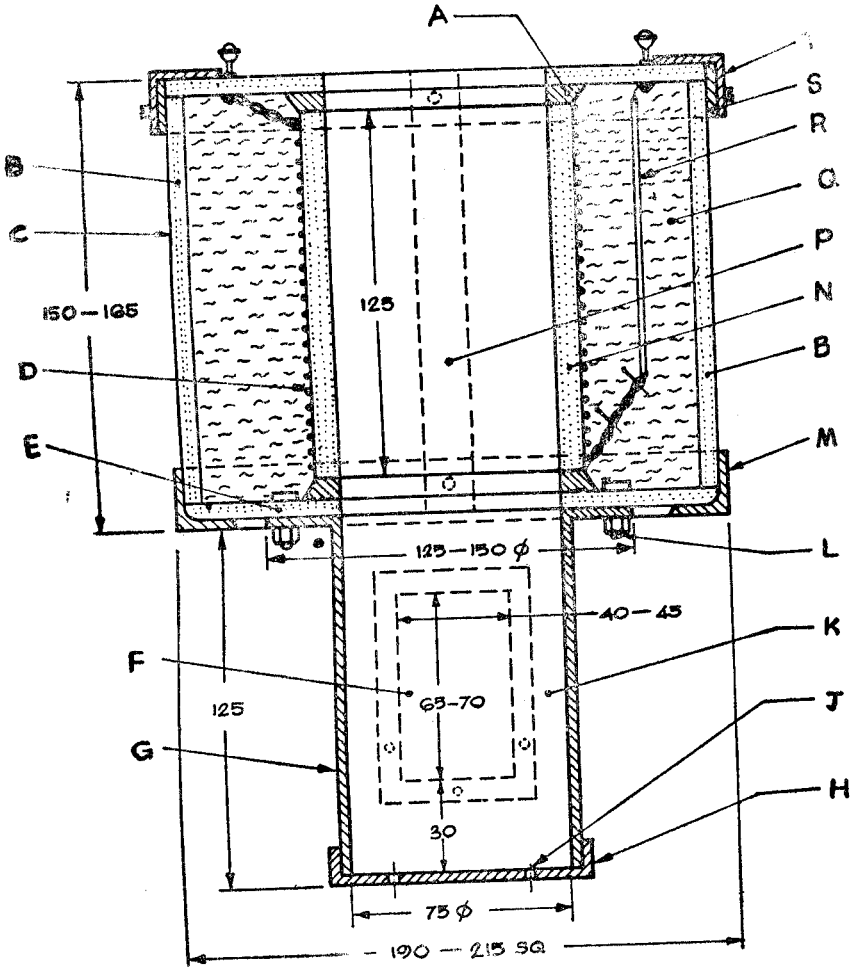
Plan



Elevation

Ground trully and square with base so as to prevent the escape of products of combustion

7 A Details of Conical Cover
To be of Refractory (Material)



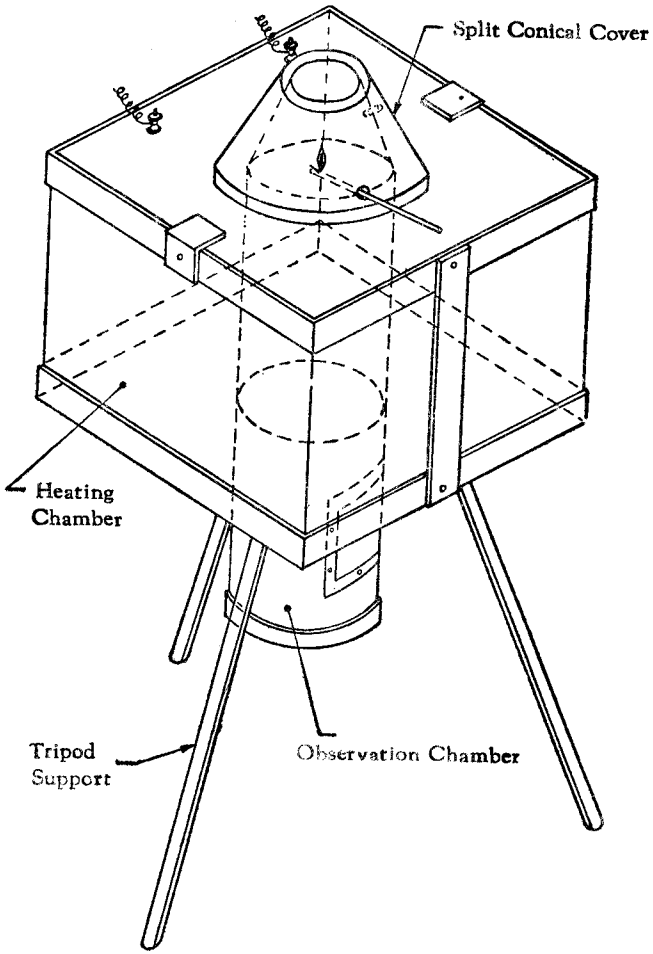
Section Oven

A – Refractory Cement
B – Asbestos Cement Sheeting
C – Heating Chamber
D – Nichrome Wire
E – Asbestos Board
F – Mica Window
G – Metal Cylinder
H – Screw on or Sliding Cap
J – 9 Holes, 3 ϕ Drilled in Cap
K – Observation Chamber
L – Brass Bolt
M – Angle Iron
N – Fire Clay or Silica Tube
P – Iron Stay
Q – Packing of Asbestos Wool or Magnesia Asbestos
R – Heat Resisting Insulation
S – Iron Band
T – Iron Clip

7 B Details of Test Oven

All dimensions in millimetrers

Fig. 7 Apparatu



7 C Sketch of Assembled Apparatus

APPENDIX-A

(Clause 6·5·3 and 6·8·1·2)

CHARACTERISTICS OF FUSE-ELEMENTS

General

The fuse-element employed for carrying out the tests for temperature rise and performance should comply with the requirements specified in a-1

A-1 Rquirements

A-1·1 Material-The fuse element may be of copper (tinned), lead, nickel silver or any other suitable material, smoothly drawn approximately circular in section and uniform in quality.

A-1·2 Fusing property-The fuse-element shall be capable of blowing off within 30 minutes when carrying a current of 1·9 time the current rating of the fuse element and be capable of carrying 1·6 times the current rating continuously without blowing for at least 30 minutes.

APPENDIX-B

(Clause 6·11·1·2)

METHOD OF CONTROLLING HUMIDITY OF ATMOSPHERE

The specified relative humidity of 75±5 per cent may be obtained by the use of pure sodium chloride (ordinary sodium chloride or common salt should not be used as it may contain an ingredient which alters the relative humidity obtained) inside a conditioning chamber such as that described below. The surface of the sodium chloride must be moist and should be sprinkled with water occasionally but care must be taken that it is not flooded with water.

To ensure that the relative humidity of the controlled atmosphere is maintained at the correct value, either the temperature must be kept constant or the air must be circulated inside the chamber. The surface of the sodium chloride per unit volume of air space should be large, otherwise the rate of attainment of equilibrium is very slow. The conditioning chamber described below has been found satisfactory for keeping the relative humidity of the controlled atmosphere constant.

The conditioning chamber consists of a 600 mm (23·6 in) cubical box. The floor of the box is nearly covered by a tray containing lumps of pure sodium chloride which are occasionally sprinkled with water as indicated above. The test samples to be conditioned are placed on a shelf halfway up the box. Air is circulated by means of a small fan over the tray, up through the holes cut at two corners of the shelf, over the samples and down through two holes cut at the opposite corners of the shelf.

Unless the prevailing conditions are extreme, the humidity of the air attains a constant value about 3 minutes after the box has been closed and the fan started.

APPENDIX C

(Clause 6·1·3·1)

SAMPLING PLAN FOR ACCEPTANCE OF LOTS

C-1 Lot

C-1-1 In any consignment, all the fuse carriers and fuse-bases of the same ratings and manufactured under similar conditions of production submitted for inspection and test at one time shall constitute a lot.

C-2 Scale of Sampling

C-2·1 The number of fuse carriers and fuse bases to be selected at random from the lot shall be in accordance with Columns 1 and 2 of Table C-1,

TABLE C-1-Sample size and criterion for conformity

Lot size	Sample Size	Permissible number of defectives
Up to 50	3	0
51 to 100	5	0
101 to 150	8	0
151 to 300	13	1
301 to 500	20	1
501 to 1000	32	2
1001 to 3000	50	3
3001 and above	80	5

C-2·2 The fuse-carriers and fuse-bases selected as in C-2·1 shall be subjected to the acceptance tests in the order specified in Clause 6·1·3. Any fuse-carrier and fuse-base which fails to satisfy the requirements of any one or more acceptance tests shall be considered as defective.

C-3 Criterion for Conformity

C-3·1 The lot shall be considered as conforming to the requirements of the standard if the number of defectives does not exceed the permissible number given in Column 3 of Table C-1.

SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLSI *which includes surveillance inspection of the factory, testing of both factory and market samples.*

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