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SPECIFICATION FOR ASBESTOS CEMENT CABLE CONDUITS AND TROUGHS

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SPECIFICATION FOR ASBESTOS CEMENT CABLE CONDUITS AND TROUGHS

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Indian Standard

SPECIFICATION FOR ASBESTOS CEMENT CABLE CONDUITS AND TROUGHS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 18 July 1978, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Asbestos cement cable conduits and troughs are being used in this country for laying power and telecommunication cables. This standard has been prepared with a view to providing guidance to the manufacturers of asbestos cement cable conduits and troughs and also to users in obtaining asbestos cement cable conduits and troughs of satisfactory quality.

0.3 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 analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard covers asbestos cement cable conduits of 50 to 150 mm diameter together with plastic couplings, asbestos cement conical couplings and asbestos cement collars with rubber rings. These are intended to accommodate all types of plastic covered and/or sheathed paper insulated telecommunication and power cables.

1.2 This standard also covers asbestos cement cable troughs of 100 × 100 mm to 300 × 300 mm size together with bends and union clips for use at ground level and above ground level for carrying cables.

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*Rules for rounding off numerical values (*revised*).

2. COMPOSITION

2.1 Asbestos cement cable conduits and troughs, together with collars and couplings, shall be made from a close and homogeneous mixture of ordinary Portland cement conforming to IS : 269-1976*, asbestos fibre and water. Couplings and union clips may be made from plastics material.

3. DIMENSIONS AND TOLERANCES

3.1 The principal dimensions and permissible variations in dimensions of asbestos cement conduits and bends shall be as indicated in Table 1.

TABLE 1 DIMENSIONS AND PERMISSIBLE VARIATIONS OF ASBESTOS CEMENT CONDUITS AND BENDS

Nominal Diameter	Internal Diameter	Nominal Length		Wall Thickness	Permissible Variations	
		Conduits	Bends		Thickness	Length
(1)	(2)	(3)	(4)	(5)	(6)	(7)
mm	mm	m	m	mm	mm	mm
50	50	2, 3, 4	2	9·0	±1·5	$^{+50}_{-20}$
80	80	2, 3, 4	2	9·5	±1·5	$^{+50}_{-20}$
100	100	2, 3, 4	2	9·5	±1·5	$^{+50}_{-20}$
125	125	2, 3, 4	2	10·0	±1·5	$^{+50}_{-20}$
150	150	2, 3, 4	2	10·0	±1·5	$^{+50}_{-20}$

NOTE — Bends shall be in 90° and 135° angles.

3.2 The principal dimensions and permissible variations in dimensions of asbestos cement troughs shall be as indicated in Table 2.

*Specification for ordinary and low heat Portland cement (*third revision*).

TABLE 2 DIMENSIONS AND PERMISSIBLE VARIATIONS OF ASBESTOS CEMENT TROUGHS

(*Clause* 3.2)

Nominal Size	Nominal Length	Wall Thickness	Permissible Variation	
			Depth and Width	Length
(1)	(2)	(3)	(4)	(5)
mm	m	mm	mm	mm
100 × 100	1·75	12	±3	±6
150 × 100	1·75	12	±3	±6
180 × 150	1·75	12	±3	±6
300 × 200	1·75	12	±3	±6
300 × 300	1·75	12	±3	±6

3.3 The detailed dimensions for asbestos cement conduits, troughs and their fittings shall be in accordance with the following tables:

Conduits with plastic couplings and asbestos cement conical couplings	Table 3
Conduits with asbestos cement collars	Table 4
Cable troughs	Table 5
Union clips for cable troughs	Table 6
Cable trough bends	Table 7

3.4 Delivery Tolerances — At least 90 percent of the quantity of conduits or troughs supplied shall be of nominal lengths subject to the permissible variations given in Table 1 or Table 2 as applicable. Out of the balance 10 percent, the length of at least one-third of the quantity shall not be less than 1 m and lengths of the rest not less than 0·5 m. However, the total length of the quantity supplied shall not be less than the length ordered.

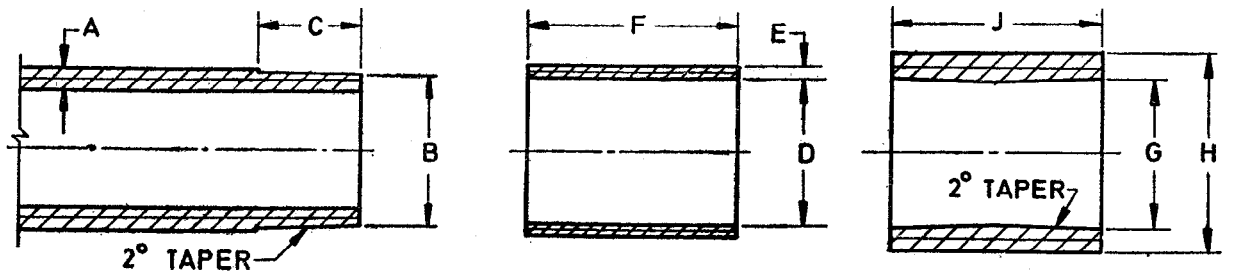
4. MANUFACTURE AND FINISH

4.1 The materials manufactured shall be sound and homogeneous with inner and outer surfaces clean, true, smooth and free from any imperfections that render them unsuitable for their purpose. Ends shall be finished square to the axis.

TABLE 3 DIMENSIONS OF CABLE CONDUITS WITH PLASTIC COUPLINGS AND ASBESTOS CEMENT CONICAL COUPLINGS

(*Clause* 3.3)

All dimensions in millimetres.



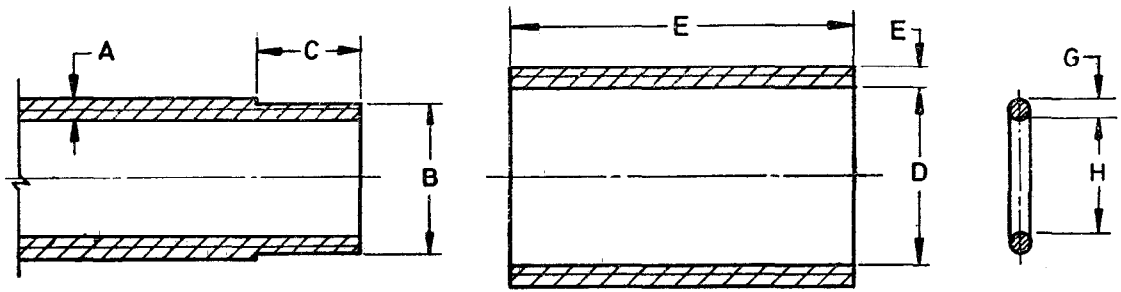
CABLE CONDUIT | PLASTIC COUPLING | CONICAL COUPLING

Nominal Diameter	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*J*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
50	9·0	67	45	66	2·50	93	67	85	93
80	9·5	97	45	96	2·50	93	97	117	93
100	9·5	117	50	116	2·50	103	117	137	103
125	10·0	143	50	142	2·75	103	143	165	103
150	10·0	168	50	167	2·75	103	168	190	103

TABLE 4 DIMENSIONS OF CABLE CONDUITS WITH ASBESTOS CEMENT COLLARS

(*Clause* 3.3)

All dimensions in millimetres.



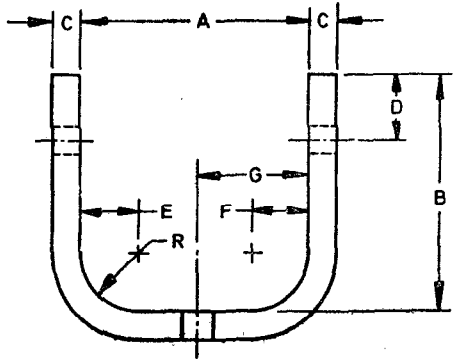
	CABLE CONDUIT			COLLAR			RUBBER RING	
NOMINAL DIAMETER	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
50	9·0	67	45	77·0	150	9·0	8	50
80	9·5	97	45	107·0	150	9·5	8	73
100	9·5	117	50	127·0	150	9·5	8	88
125	10·0	143	50	153·0	150	10·0	8	114
150	10·0	168	50	178·0	150	10·0	8	134

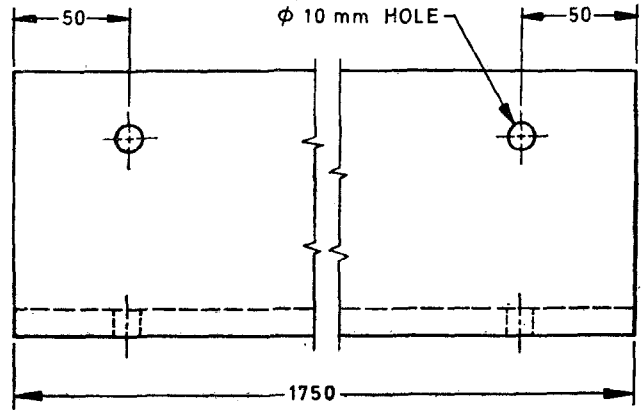
NOTE — Shore hardness of the rubber rings shall be 40 to 50 degrees.

TABLE 5 DIMENSIONS OF CABLE TROUGHS

(*Clause* 3.3)

All dimensions in millimetres.



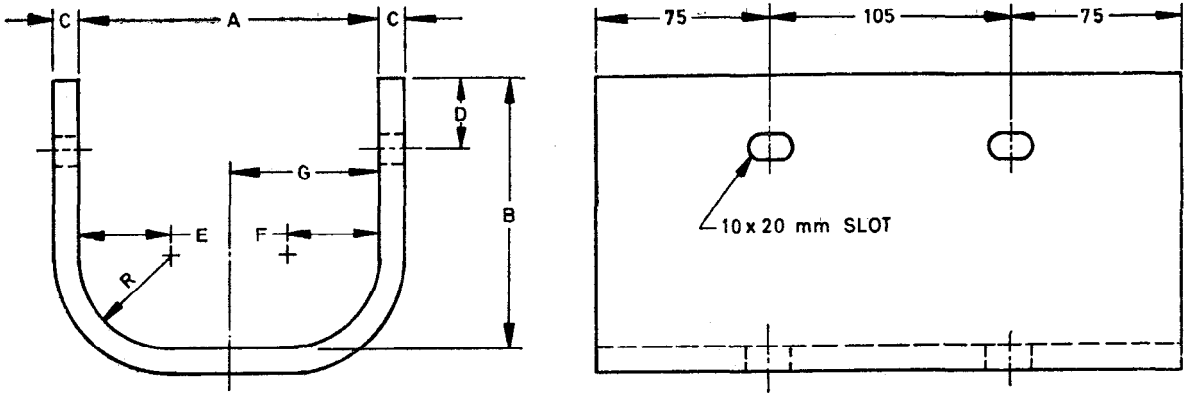


NOMINAL SIZE	*A*	*B*	*C*	*R*	*D*	*E*	*F*	*G*	NO. OF HOLES
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
100 × 100	100	100	12	25	30	—	—	50	3
150 × 100	150	100	12	25	30	—	—	75	3
180 × 150	180	150	12	25	30	—	—	90	3
300 × 200	300	200	12	25	50	40	40	—	4
300 × 300	300	300	12	25	50	40	40	—	4

TABLE 6 DIMENSIONS OF UNION CLIPS FOR CABLE TROUGHS

(*Clause* 3.3)

All dimensions in millimetres.

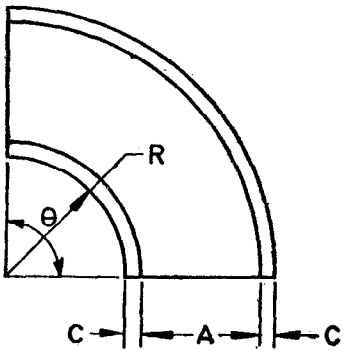


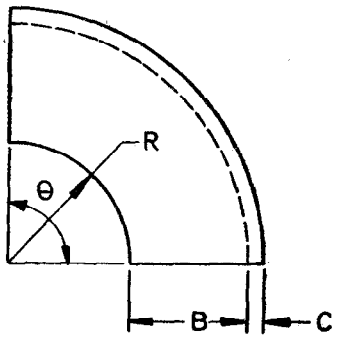
Nominal Size	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*R*	No. of Holes
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
100 × 100	130	115	12	30	—	—	65	40	3
150 × 100	180	115	12	30	—	—	90	40	3
180 × 150	210	165	12	30	—	—	105	40	3
300 × 200	330	215	12	50	65	65	—	40	4
300 × 300	330	315	12	50	65	65	—	40	4

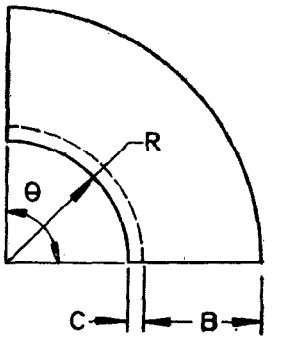
TABLE 7 DIMENSIONS OF CABLE TROUGH BENDS

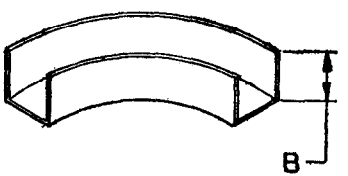
(*Clause* 3.3)

All dimensions in millimetres.

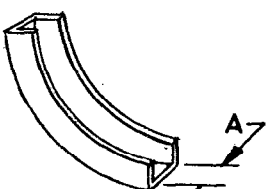




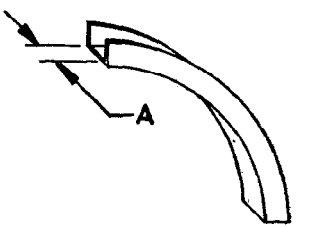




TROUGH BEND



VERTICAL TROUGH BEND (INTERNAL)



VERTICAL TROUGH BEND (EXTERNAL)

Nominal Size	*A*	*B*	*C*	Radius, *R*	*φ*
(1)	(2)	(3)	(4)	(5)	(6)
100 × 100	100	100	12	100	90°
150 × 100	150	100	12	100	90°
180 × 150	180	150	12	100	90°
300 × 200	300	200	12	100	90°
300 × 300	300	300	12	100	90°

5. TESTS

5.1 Conduits — Conduits shall be tested for straightness, regularity of thickness and diameter, flexural strength, crushing strength, water absorption, impact resistance and flattening resistance.

5.2 Troughs — Troughs shall be tested for straightness, regularity of thickness, flexural strength and water absorption.

6. TEST REQUIREMENTS

6.1 Conduits

6.1.1 *Straightness and Regularity of Thickness and Diameter* — The straightness and regularity of thickness and diameter shall be checked in accordance with IS : 5913-1970*. The deviation from straightness shall not exceed the following:

Nominal Diameter	*Maximum Deviation* mm
50 mm	$5{\cdot}5\,l$ } Where l is the length
Others	$4{\cdot}5\,l$ } in metres

6.1.2 *Flexural Strength* — Conduits shall be tested for flexural strength in the manner described in IS : 5913-1970* for longitudinal bending test of pipes, but the length of specimen shall be at least 150 mm more than the clear span of the specimen under test specified in Table 8 and the rate of loading shall be as specified in Table 8. The conduits when tested in the above manner shall have breaking load not less than the values given in Table 8.

TABLE 8 FLEXURAL STRENGTH REQUIREMENTS

Nominal Diameter	Clear Span	Rate of Loading	Breaking Load, *Min*
(1)	(2)	(3)	(4)
mm	mm	kN/min	kN
50	600	1·5	1·8
80	750	3·0	3·6
100	900	3·0	3·6
125	1 050	4·5	6·0
150	1 200	4·5	8·0

*Methods of test for asbestos cement products.

6.1.3 *Crushing Strength* — Conduits shall be tested in the manner described in IS : 5913-1970* for transverse crushing test for pipes, but the rate of loading shall be as given in Table 9. Conduits when tested in the above manner shall have crushing strengths not less than the values given in Table 9.

TABLE 9 CRUSHING STRENGTH REQUIREMENTS

Nominal Diameter	Rate of Loading	Breaking Load, *Min*
(1)	(2)	(3)
mm	kN/min	kN
50	4·00	6·00
80	4·00	4·50
100	3·00	3·75
125	2·25	3·00
150	2·25	2·75
200	2·25	3·50

6.1.4 *Water Absorption* — Conduits when tested in accordance with IS : 5913-1970* shall have an average water absorption not exceeding 28 percent of the dry mass of material.

6.1.5 *Impact Resistance* — Conduits when tested in accordance with Appendix A shall not be punctured by an impact less than the values given in Table 10.

TABLE 10 IMPACT RESISTANCE

Nominal Diameter	Height of Drop	Impact
(1)	(2)	(3)
mm	mm	N
50	250	20
80	350	30
100	450	35
125	500	40
150	525	45
200	650	50

*Methods of test for asbestos cement products.

6.1.6 *Flattening Resistance* — The resistance of conduits to flattening when tested in accordance with Appendix B is calculated according to the reduction of inside diameter when measured vertically and expressed as a percentage of the original diameter. This reduction shall not exceed 1 percent.

6.2 Troughs

6.2.1 *Straightness and Regularity of Thickness* — Troughs shall be tested for deviation from straightness and regularity of thickness by use of suitable straight edge and gauges which shall be provided and maintained by the manufacturer. The deviation from straightness shall not exceed 6 mm from an end.

6.2.2 *Flexural Strength* — Troughs when tested in accordance with Appendix C shall have a breaking strength not less than the values given in Table 11.

TABLE 11 FLEXURAL STRENGTH REQUIREMENTS

Nominal Size	Free Span	Rate of Load	Minimum Permissible Breaking Load
(1)	(2)	(3)	(4)
mm	m	kN/min	kN
100 × 100	1·5	4·5	2·5
150 × 100	1·5	4·5	5·0
180 × 150	1·5	4·5	8·0
300 × 200	1·5	4·5	10·0
300 × 300	1·5	4·5	10·0

6.2.3 *Water Absorption* — Troughs when tested for water absorption in accordance with IS : 5913-1970* shall have an average water absorption not exceeding 28 percent of the dry mass of the material.

7. SAMPLING, INSPECTION AND TESTING

7.1 Quality Control — A sufficient number of quality control tests, based on the total production shall be made at regular intervals by the manufacturer, to ensure that his products comply with the requirements of this standard and certified records of all such tests shall be kept for inspection by the purchaser.

7.2 Manufacturer's Certificate — The manufacturer shall, on request, furnish the purchaser or his representative with a certificate confirming

*Methods of test for asbestos cement products.

that all the products supplied to his order comply in all respects with the requirements of this standard.

7.3 Acceptance Tests — If the purchaser requires the manufacturer to carry out any of the tests specified in this standard in his or his representative's presence, the number and type of tests shall be stated in his enquiry and order. Such acceptance tests shall be carried out before delivery. Where a short length has to be cut in order to comply with the test requirements, such shortened products shall be accepted in that respect by the purchaser as standard lengths subject to the total length of the products supplied being not less than total length ordered.

7.3.1 Sampling for these tests shall be carried out in accordance with IS : 7639-1975*. Each inspection lot shall include only items of the same characteristics.

7.3.1.1 When the purchaser requires a greater number of items to be tested than is indicated in IS : 7639-1975*, the costs of such additional tests, unless otherwise specified, shall be borne:

a) by the manufacturer if the results show that the items do not comply with the requirements of the standard; and

b) by the purchaser if the results show that the items do comply with the requirements of the standard.

Independent tests may be carried out by arrangement between the manufacturer and the purchaser.

8. MARKING

8.1 Every conduit and trough shall be marked legibly with the following information:

a) Manufacturer's name or trade-mark,

b) Nominal size of conduit or trough, and

c) The relevant IS number.

8.1.1 Each conduit and trough may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

*Methods of sampling of asbestos cement products.

APPENDIX A

(*Clause* 6.1.5)

IMPACT RESISTANCE OF CONDUIT

A-1. The test sample shall be a section of the conduit at least 300 mm in length cut from the specimen conduit.

A-2. Weights with a cylindrical extension 12 mm long and 13·4 mm in diameter fixed to the bottom shall be dropped from a specified height specified in Table 10, on the crest of the sample lying in a V-notch of 120° on a firmly supported solid plate (*see* Fig. 1). Suitable guides shall be provided to ensure smooth and vertical drop of the weight. Weights chosen for the initial tests shall be less than the resistance prescribed in Table 10. Loads shall be gradually increased to find out the minimum impact force required to puncture the conduit.

A-2.1 The striking point shall be more than 75 mm from either end of the sample.

A-2.2 The impact force in Newtons required to puncture the sample is noted.

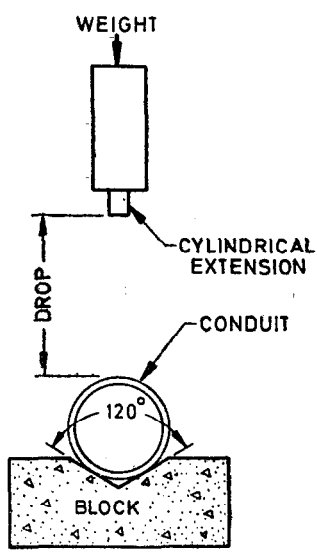


FIG. 1 LOADING ARRANGEMENT FOR IMPACT RESISTANCE TEST ON CONDUITS

APPENDIX B

(*Clause* 6.1.6)

FLATTENING RESISTANCE OF CONDUIT

B-1. Two samples each 75 mm (± 3 mm) in length shall be cut from the specimen length of conduit.

B-2. These two ring samples shall be placed on a common horizontal base aligned with their axes parallel and bridged with a weight of 250 N (*see* Fig. 2) and kept loaded at a temperature of 50°C for 48 hours.

The perpendicular inside diameter of each sample shall be measured to the nearest 0·25 mm before and after the test.

The decrease of this measured diameter in percentage of the original size is taken as the percentage flattening.

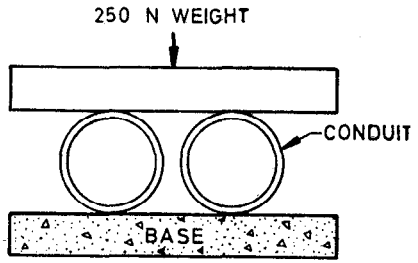


FIG. 2 LOADING ARRANGEMENT FOR FLATTENING RESISTANCE TEST ON CONDUITS

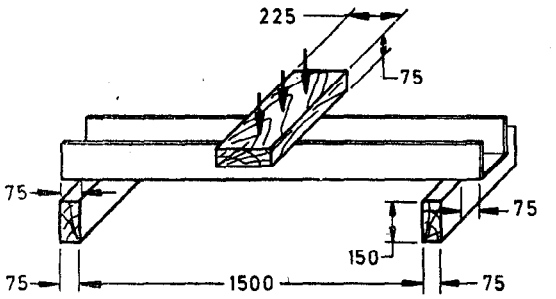
APPENDIX C

(*Clause* 6.2.2)

FLEXURAL STRENGTH OF TROUGH

C-1. The apparatus consists of two, 300 mm long parallel rigid hardwood bearers 75 mm wide and 150 mm deep securely positioned on a level base at a spacing of 1·5 m.

C-2. The trough shall be positioned at right angles across the bearers with the base of trough seated on each bearer and shall be of a length to project not less than 75 mm beyond each hardwood bearer (*see* Fig. 3).



All dimensions in millimetres.

FIG. 3 LOADING ARRANGEMENT FOR FLEXURAL STRENGTH TEST ON TROUGHS

C-2.1 The load is applied in midspan through a 225 × 75 mm hardwood bearer. Loading shall be increased at a rate specified in Table 11, up to breaking point. The average of the breaking loads for the samples tested is the flexural strength of trough.

(*Continued from page* 2)

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