

**Specification for non metallic conduit fittings for rigid non - Metallic
Conduits(Third Revision)**

Foreword

0.1 This Indian Standard (Third Revision) would be adopted by the Bureau of Indian Standards, after the draft finalized by the Electrical Wiring Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard covers the general requirements and methods of test of the fittings for rigid non - metallic conduits.

0.3 The non-metallic conduit fittings covered in this standard are intended to be suitable for use with rigid non-metallic conduits covered by IS 9537 (Part 3) :1983, using plain joints (with or without cement).

0.4 This standard was published in 1965 and was subsequently revised in 1976 and 1988. The present revision has been undertaken to include the properties and characteristics of following types of fittings:

- a) Short coupler
- b) Short bend
- c) Short elbow
- d) Short TEEs
- e) Circular Box H way, U way, Y way, Double back spout

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, shall be rounded off in accordance with IS 2: 2022. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies the requirements and methods of test for non metallic conduit fittings manufactured from insulating materials for use with circular, rigid, non flame propagating non threadable plain conduits of insulating materials.

1.1.1 This standard covers conduit fittings suitable for temperature between - 5°C and 60° C.

Note -Non-metallic conduit fitting complying with this standard will be suitable for use at temperature between -5°C and 60°Csubject to a reduction in mechanical strength.

1.1.2 Only plain type fittings are covered in this standard.

1.2 The fittings covered by this standard are:

- a) Slip type couplers
- b) Socketed type couplers
- c) Clamp type couplers
- d) Short couplers
- e) Normal type bends
- f) Slip type coupling bends
- g) Short bends
- h) Normal type elbows
- i) Short elbows
- j) Normal type tees
- k) Socketed type tees
- l) Short tees
- m) Spout type circular boxes
- n) Spout type circular box 'H'way
- o) Spout type circular box 'U'way
- p) Spout type circular box 'Y'way
- q) Double back spout junction boxes

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definition, in addition to those specified in IS 9537(Part 1) -1980 shall apply.

2.1 Components – Apart of a conduit fitting which may be common to several conduit fittings.

2.2 Fittings – Accessories used in conjunction with conduits for the purposes of uniting, changing direction, drawing-in and obtaining access to the insulated electrical conductors.

* Specification for conduits for electrical installations: Part I General requirements.

2.3 Type Tests- Tests carried out to prove conformity with the requirements of this standard. These are intended to prove the general qualities

2.4 Routine Tests – Tests carried out on each fitting to check the essential requirements which are likely to vary during production.

2.5 Acceptance Tests – Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

3. GENERAL REQUIREMENTS

3.1 The fittings shall be so designed and constructed that they ensure reliable mechanical protection to the conductors and / or cables therein and fit properly with the conduits with which these are used.

These shall withstand the stresses likely to occur during transport, storage, recommended installation and usage.

In general, compliance is checked by carrying out all the tests specified.

4. GENERAL NOTES ON TESTS

4.1 Tests specified in this specification are type tests. Type tests on fittings made of insulating materials shall not be commenced before 10 days after manufacture.

4.2 Unless otherwise specified, the tests are carried out at an ambient temperature of $27\pm 5^{\circ}\text{C}$.

4.3 Unless otherwise specified, each test is made on three new samples.

4.4 Unless otherwise specified, fittings are deemed not to comply with this specification if more than one sample fails in a test, that test and those preceding, which may have influenced the result of that test, are repeated on another set of samples of the number specified, all of which shall then comply with the repeated tests

5. CONSTRUCTION

5.1 General

5.1.1 The fittings shall be homogeneous and non-porous and shall be so designed and constructed as to have adequate mechanical strength and be able to withstand such rough usage as may be expected during and after installation.

5.1.2 The inside and outside surfaces of the fittings shall be smooth, clean and uniform, and free from projections, grooving and other defects .

5.1.3 The interior of the fittings shall be free from obstructions which might cause abrasion of the cables or which might interfere with the ready introduction or withdrawal of cables of the maximum size and number permitted to be enclosed by the conduit .

5.1.4 The inside edges of all openings through which cables are intended to pass, shall be smoothly rounded in order to prevent damage to the cable.

Note -Conformity to the dimensions specified in this standard ensures compliance with these requirements

5.1.5 The conduit entries of fittings and components shall be so designed that a reliable joint can be made between the appropriate conduits and the fitting or component.

5.2 Inspection Windows

5.2.1 Elbows – The area of the opening in the case of inspection elbow shall not be less than two- and a-half times the internal cross-sectional area of the corresponding conduits. The cover shall be of the same material as the accessory and shall have a minimum thickness of 1.5 mm. It shall be attached to the elbow by means of at least two M4 (*see IS: 4218*) fixing screws. The ends of the screws shall protrude into the cable way and at least 4 threads of engagements in the hole shall be provided.

NOTE - The cover of the inspection window shall overlap the opening

5.2.2 Tees- The area of the openings of inspection tees shall not be less three times the internal cross-sectional area of the corresponding cover. Details shall be same as for inspection elbows (*see 5.2.1*).

NOTE—The cover of the inspection windows shall overlap the opening

5.3 Covers

5.3.1 The cover of the circular box may be made of the same material as the box and shall have a minimum thickness of 1.6 mm. They shall be fixed to the box by means of M4 (*see IS: 4218**)fixing screws.

5.3.2 The covers shall be of the following two sizes :

- a) Diameter equal to the external diameter of the box, and
- b) Diameter not less than 12.5 mm larger than the external diameter of the box.

5.3.3 Holes for fixing screws for covers or accessories as specified shall be provided in pillars formed in the side of the fittings with or without metal inserts to provide a minimum threaded length of 10mm. The hole shall extend for the whole inside depth but openings in the back will not be permitted.

5.3.4 The means of attaching components or covers to conduit fittings shall not cause damage to cable institution.

* ISO metric screw threads.

6. DIMENSIONS

6.1 Nominal Size- The nominal size of the outlets of the fittings shall correspond to the nominal outside diameter of the conduits covered by IS 9537 (Part 3)-1983.

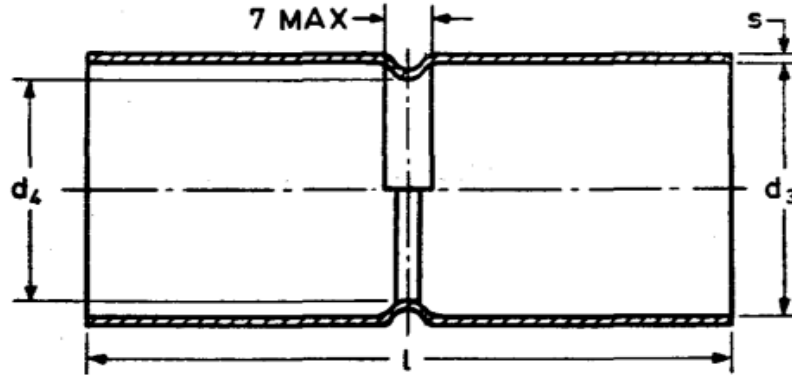
6.2 Fittings – The fittings shall comply with the appropriate tables as specified below:

a) Slip type couplers	Table 1
b) Socketed type couplers	Table 2
c) Clamp type couplers	Table 3
d) Short couplers	Table 4
e) Normal type bends	Table 5
f) Slip type coupling bends	Table 6
g) Short bends	Table 7
h) Normal type elbows	Table 8
i) Short elbows	Table 9
j) Normal type tees	Table 10
k) Socketed type tees	Table 11
l) Short tees	Table 12
m) Spout type circular boxes	Table 13
n) Spout type circular box ‘H’way	Table 14
o) Spout type circular box ‘U’way	Table 15
p) Spout type circular box ‘Y’way	Table 16
q) Double back spout junction boxes	Table 17

TABLE 1 SLIP TYPE COUPLERS

(Clause 6.2)

All dimensions in millimeters

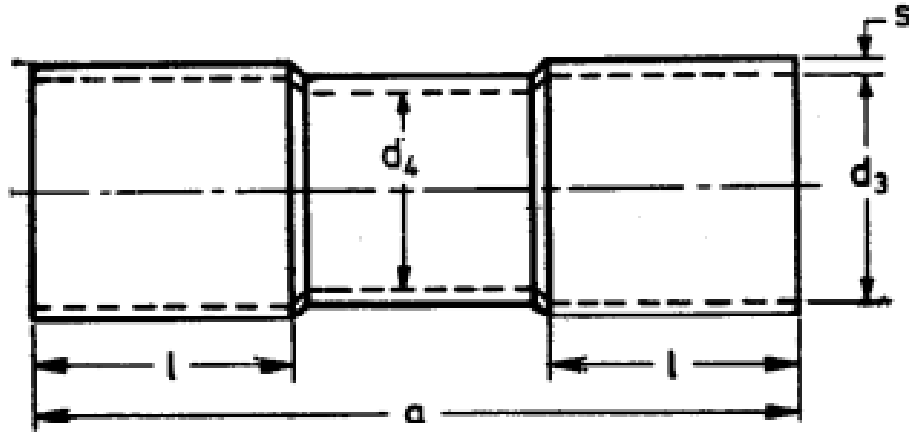


Sl. No.	Nominal Size	Inside Diameter of Collar d_3		Inside Diameter of Ridge d_4		Minimum Overall Length l	Minimum Wall Thickness s
(1)	(2)	(3)		(4)		(5)	(6)
i)	16	16.1	+ 0.2	13.5	+ 0.4	80	1.1
ii)	20	20.1	- 0	17.5	- 0	80	1.2
iii)	25	25.1	+ 0.3	22.0	+ 0.5	80	1.4
iv)	32	32.1	- 0	29.0	- 0	100	1.5
v)	40	40.1	+ 0.4	37.0	+ 0.6	100	1.5
vi)	50	50.1	- 0	46.4	- 0	120	1.7
vii)	63	Under consideration					

TABLE 2 SOCKETED TYPE COUPLERS

(Clause 6.2)

All dimensions in millimeters

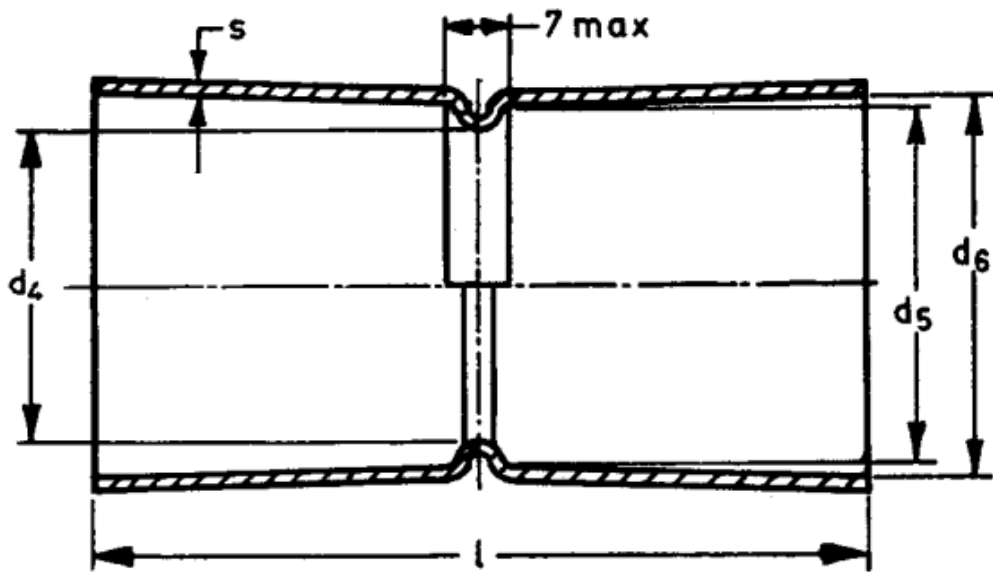


Sl. No.	Nominal Size	Inside Diameter of Collar d_3	Inside Diameter of Rigid d_4	Minimum Over All Length a	Minimum Wall Thickness s	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	16	16.1	13.5	100	35	1.1
ii)	20	20.1	17.5	100	35	1.2
iii)	25	25.1	22.0	110	35	1.4
iv)	32	32.1	29.0	120	45	1.5
v)	40	40.1	37.0	130	45	1.5
vi)	50	50.1	46.4	140	55	1.7
vii)	63	Under consideration				

TABLE 3 CLAMP TYPE COUPLERS

(Clause 6.2)

All dimensions in millimeters

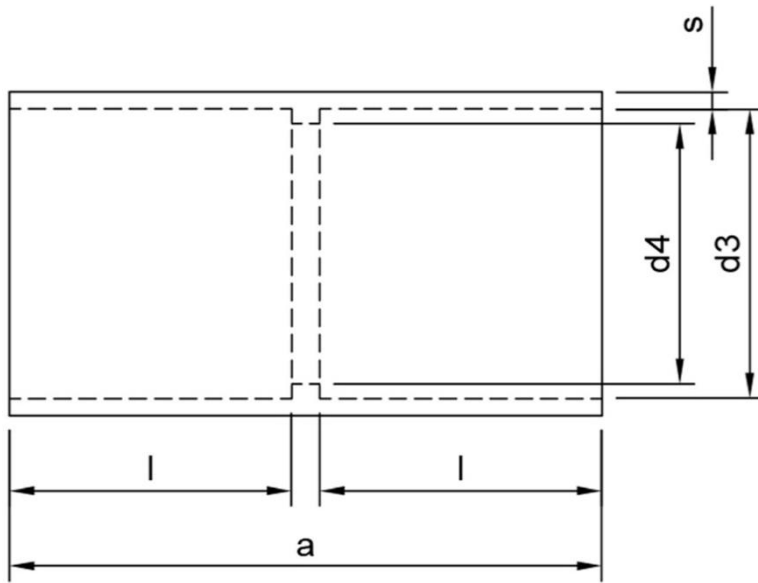


Sl. No.	Nominal Size	Inside Diameter of Collar		Inside Diameter of Rigid	Minimum Over Length	Minimum Wall Thickness			
		d_6	d_5	d_4					
(1)	(2)	(3)		(4)	(5)	(6)	(7)		
i)	16	16.1	+ 0.2	15.6	+ 0	13.5	+ 0.4	80	1.1
ii)	20	20.1	- 0	19.6	- 0.3	17.5	- 0	80	1.2
iii)	25	25.1	+ 0.3	24.6	+ 0	22.0	+ 0.5	80	1.4
iv)	32	32.1	- 0	31.6	- 0.4	29.0	- 0	100	1.5
v)	40	40.1	+ 0.4	39.6	+ 0	37.0	+ 0.6	100	1.5
vi)	50	50.1	- 0	49.6	- 0.5	46.4	- 0	120	1.7
vii)	63	Under consideration							

TABLE 4 SHORT COUPLERS

(Clause 6.2)

All dimensions in millimeters

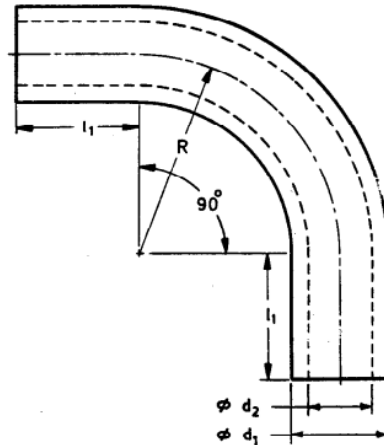


Sl no.	Nominal Size	l min	a min	s min	$d4$		$d3$	
1	16	20	45	1.1	13.5	+0.6 -0.6	16.1	+0.2 -0
2	20	20	47	1.2	18	+0.8 -0.8	20.1	+0.2 -0
3	25	23	50	1.4	23.5	+0.8 -0.8	25.1	+0.3 -0
4	32	25	60	1.5	29	+0.8 -0.8	32.1	+0.3 -0
5	40	30	62	1.5	37	+0.8 -0.8	40.1	+0.4 -0
6	50	34	68	1.7	46.4	+0.8 -0.8	50.1	+0.4 -0

TABLE 5 NORMAL TYPE BENDS

(Clause 6.2)

All dimensions in millimeters

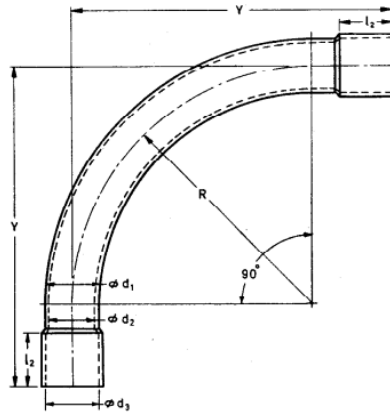


Sl. No.	Nominal Size	Outside Diameter d_1	Minimum Inside Diameter d_2	R	l_1
(1)	(2)	(3)	(4)	(5)	(6)
i)	16	+0.5	12	55	45
		-0.5			
ii)	20	+0.8	16	65	50
		-0.8			
iii)	25	+0.9	21	90	70
		-0.9			
iv)	32	+0.9	26	125	90
		-0.9			
v)	40	+0.9	35.5	160	100
		-0.9			
vi)	50	+0.9	44.7	210	110
		-0.9			
vii)	63	Under consideration			

TABLE 6 SLIP TYPE COUPLING BENDS

(Clause 6.2)

All dimensions in millimeters

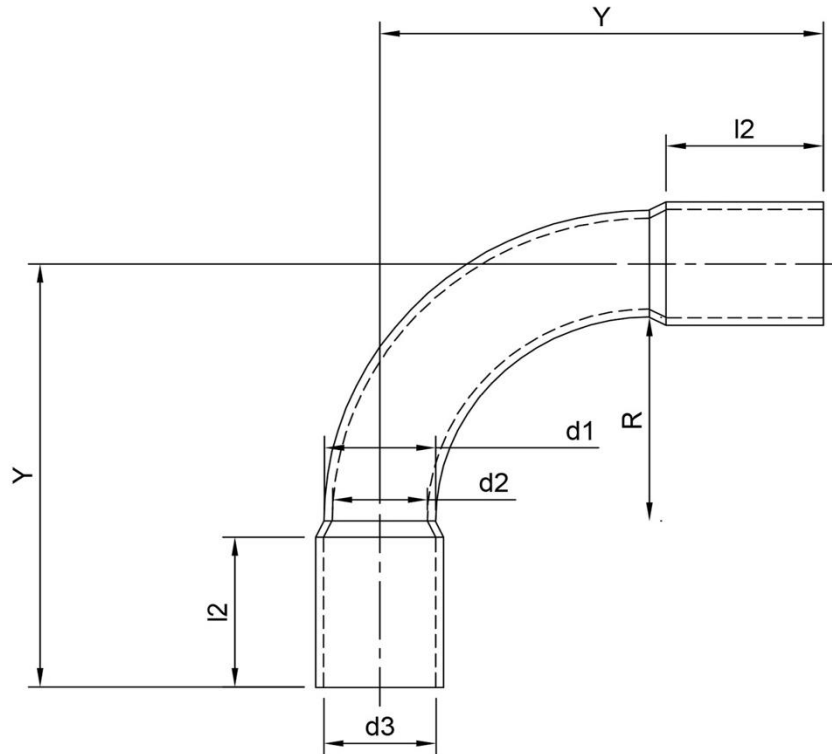


Sl. No.	Nominal Size	Outside Diameter of Bend d_1	Minimum Inside Diameter of Bend d_2	Inside Diameter of Collar d_3	R	Y	l_2	
(1)	(2)	(3)	(4)	(5)	(6)	(6)	(7)	
i)	16	+0.5	12	16.1	+ 0.2	55	100	35
		-0.5						
ii)	20	+0.8	16	20.1	- 0	65	115	35
		-0.8						
iii)	25	+0.9	21	25.1	+ 0.3	90	160	35
		-0.9						
iv)	32	+0.9	26	32.1	- 0	125	215	45
		-0.9						
v)	40	+0.9	35.5	40.1	+ 0.4	160	260	45
		-0.9						
vi)	50	+0.9	44.7	50.1	- 0	210	310	55
		-0.9						

TABLE 7 SHORT BENDS

(Clause 6.2)

All dimensions in millimeters



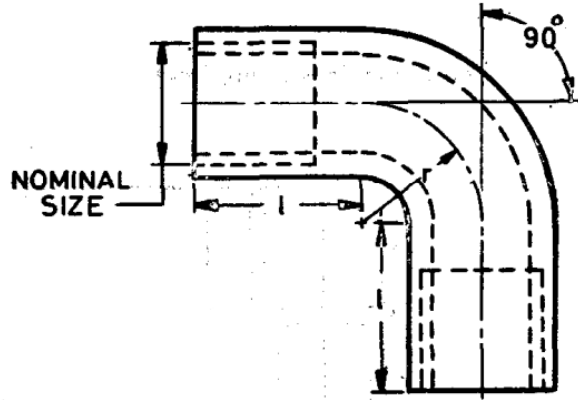
Nominal Size	Outside Diameter of Bend d_1	Minimum inside Diameter of Bend d_2 min	Inside Diameter of Collar d_3	R min	Y min	12 min
16	16 +0.5 -0.5	12	16.1 +0.2 -0	33	66	20

20	20 +0.8 -0.8	16	20.1 +0.2 -0	36	78	28
25	25 +0.9 -0.9	21	25.1 +0.3 -0	42	86	29
32	32 +0.9 -0.9	26	32.1 +0.3 -0	48	105	35
40	40 +0.9 -0.9	35.5	40.1 +0.4 -0	52	124	44
50	50 +0.9 -0.9	44.7	50.1 +0.4 -0	55	140	55

TABLE 8 NORMAL TYPE ELBOWS

(Clause 6.2)

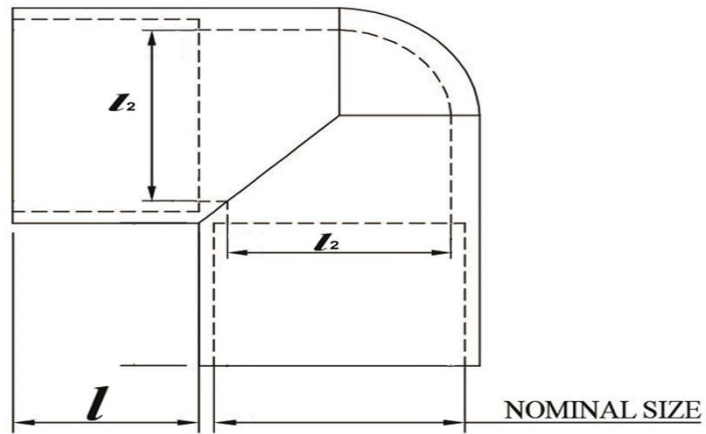
All dimensions in millimeters



Sl. No	Nominal Size	Inside Diameter of Collar		<i>l</i>	<i>r</i>	Minimum Wall Thickness
(1)	(2)	(3)		(4)	(5)	(6)
i)	16	16.1	+ 0.2	35	16	1.1
ii)	20	20.1	- 0	35	20	1.2
iii)	25	25.1	+ 0.3	35	25	1.4
iv)	32	32.1	- 0	45	32	1.5
v)	40	40.1	+ 0.4	45	40	1.5
vi)	50	50.1	- 0	55	50	1.7
vii)	63	Under consideration				

TABLE 9 SHORT ELBOWS
(Clause 6.2)

All dimensions in millimeters

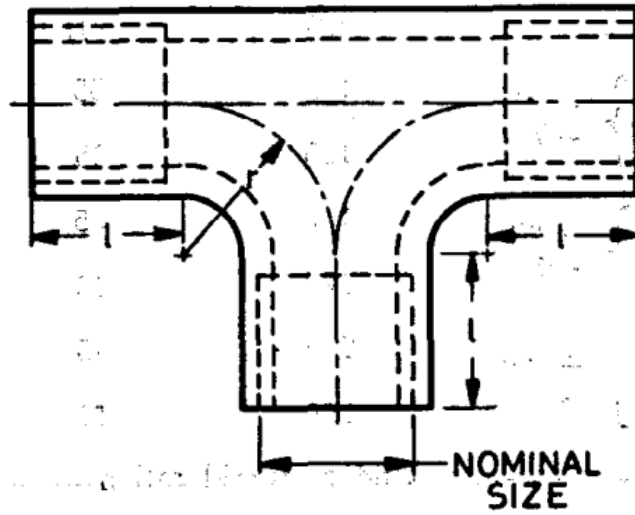


Sl no.	Nominal Size	Inside Diameter of Collar		$l(\text{Min})$	l_2		Min. Wall Thickness
1	16	16.1	+0.2 -0	12	13.5	+0.6 -0.6	1.1
2	20	20.1	+0.2 -0	13	18	+0.8 -0.8	1.2
3	25	25.1	+0.3 -0	18	23.5	+0.8 -0.8	1.4
4	32	32.1	+0.3 -0	25	29	+0.8 -0.8	1.5
5	40	40.1	+0.4 -0	30	37	+0.8 -0.8	1.5
6	50	50.1	+0.4 -0	35	46.4	+0.8 -0.8	1.7

TABLE 10 NORMAL TYPE TEES

(Clause 6.2)

All dimensions in millimeters

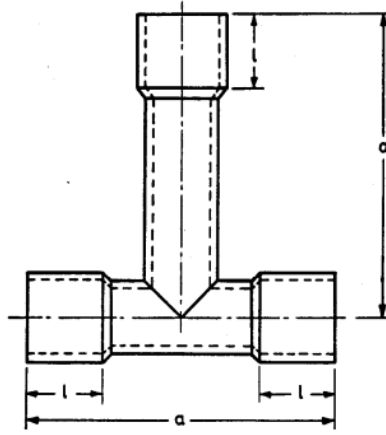


Sl. No	Nominal Size of The Tee	Inside Diameter of Collar		l	r	Minimum Wall Thickness
(1)	(2)	(3)		(4)	(5)	(6)
i)	16	16.1	+ 0.2	5	1	1.1
ii)	20	20.1	- 0	35	20	1.2
iii)	25	25.1	+ 0.3	35	25	1.4
iv)	32	32.1	- 0	45	32	1.5
v)	40	40.1	+ 0.4	45	40	1.5
vi)	50	50.1	- 0	55	50	1.7
vii)	63	Under consideration				

TABLE 11 SOCKETED TYPE TEES

(Clause 6.2)

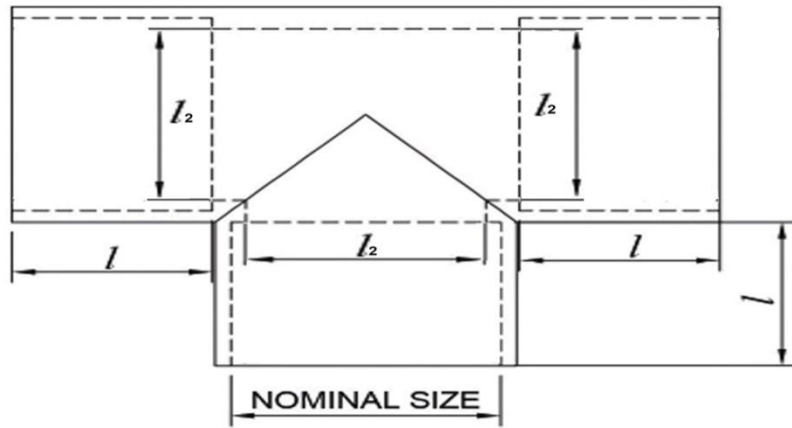
All dimensions in millimeters



Sl. No	Nominal Size of The Tee	Inside Diameter of Collar		a	l	Minimum Wall Thickness
i)	16	16.1	+ 0.2	125	35	1.1
ii)	20	20.1	- 0	125	35	1.2
iii)	25	25.1	+ 0.3	150	35	1.4
iv)	32	32.1	- 0	200	45	1.5
v)	40	40.1	+ 0.4	200	45	1.5
vi)	50	50.1	- 0	250	55	1.7
vii)	63	Under consideration				

TABLE 12 SHORT TEES
(Clause 6.2)

All dimensions in millimeters

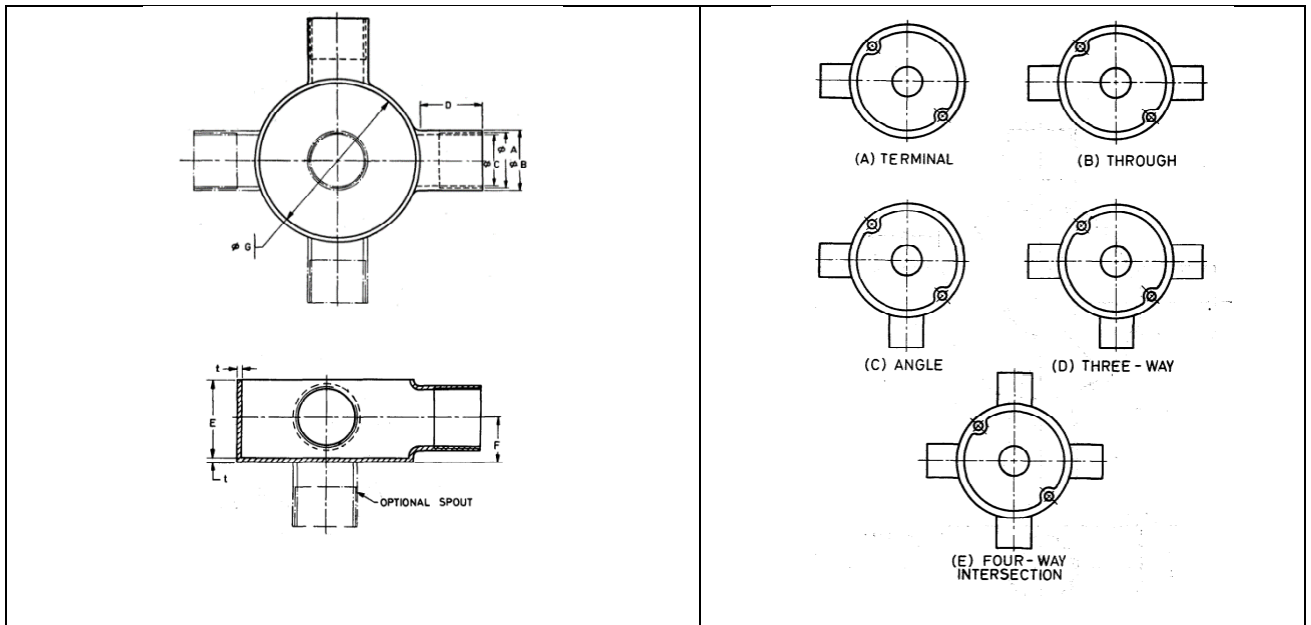


Sl no.	Nominal Size	Inside Diameter of Collar	$l(\text{Min})$	l_2	Min. Wall Thickness
1	16	16.1 +0.2 -0	12	13.5 +0.6 -0.6	1.1
2	20	20.1 +0.2 -0	13	18 +0.8 -0.8	1.2
3	25	25.1 +0.3 -0	18	23.5 +0.8 -0.8	1.4
4	32	32.1 +0.3 -0	25	29 +0.8 -0.8	1.5
5	40	40.1 +0.4 -0	30	37 +0.8 -0.8	1.5
6	50	50.1 +0.4 -0	35	46.4 +0.8 -0.8	1.7

TABLE 13 SPOUT TYPE CIRCULAR BOXES

(Clause 6.2)

All dimensions in millimeters

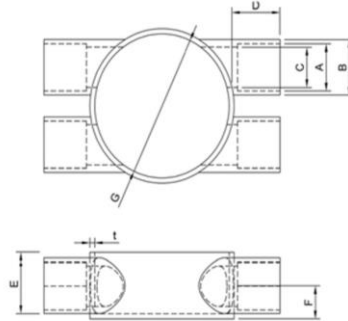


Sl. No.	Nominal Outside Diameter Of Conduit A	B, Min	C		D, Min	E, Min	F		G		t Min
			Max	Min			Max	Min			
(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	(9)		(10)
i)	16	19.2	13.75	+ 0.45	18.0	25	12.5	12.0	60	+ 1.5	1.6
				-0						-0	
ii)	20	23.0	17.00	+ 0.45	20.0	25	14.5	13.5	60	+ 1.5	1.6
				-0						-0	
iii)	25	28.2	22.75	+ 0.45	23.0	28	17.5	16.5	60	+ 1.5	1.6
				-0						-0	

TABLE 14 SPOUT TYPE CIRCULAR BOX 'H' WAY

(Clause 6.2)

All dimensions in millimeters

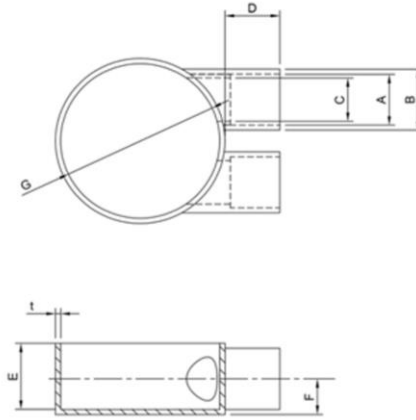


Sl. No.	Nominal Outside Diameter Of Conduit A	B, Min	C		D, Min	E, Min	F		G		t Min
							Max	Min			
(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	(9)		(10)
i)	16	19.2	13.75	+ 0.45	18.0	25	12.5	12.0	60	+ 1.5	1.6
				- 0						- 0	
ii)	20	23.0	17.00	+ 0.45	20.0	25	14.5	13.5	60	+ 1.5	1.6
				- 0						- 0	
iii)	25	28.2	22.75	+ 0.45	23.0	28	17.5	16.5	60	+ 1.5	1.6

TABLE 15 SPOUT TYPE CIRCULAR BOX 'U' WAY

(Clause 6.2)

All dimensions in millimeters

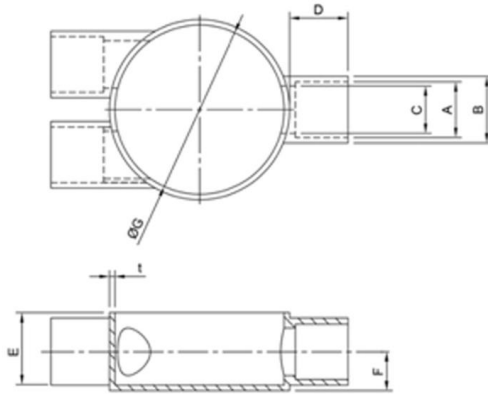


Sl. No.	Nominal Outside Diameter Of Conduit A	B, Min	C		D, Min	E, Min	F		G	t	
			Max	Min			Max	Min			
(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	(9)	(10)	
i)	16	19.2	13.75	+ 0.45	18.0	25	12.5	12.0	60	+ 1.5	1.6
				- 0						- 0	
ii)	20	23.0	17.00	+ 0.45	20.0	25	14.5	13.5	60	+ 1.5	1.6
				- 0						- 0	
iii)	25	28.2	22.75	+ 0.45	23.0	28	17.5	16.5	60	+ 1.5	1.6

TABLE 16 SPOUT TYPE CIRCULAR BOX 'Y' WAY

(Clause 6.2)

All dimensions in millimeters

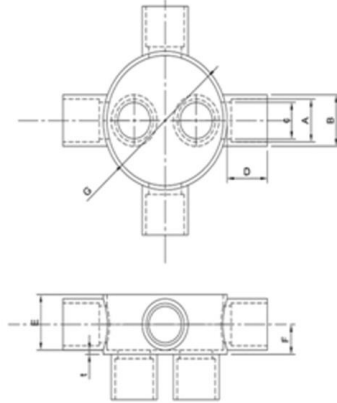


Sl. No.	Nominal Outside Diameter Of Conduit A	B, Min	C		D, Min	E, Min	F		G		t Min
							<div style="text-align: center;"> $\left. \vphantom{\begin{matrix} \text{Max} \\ \text{Min} \end{matrix}} \right\}$ Max Min </div>				
(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	(9)		(10)
i)	16	19.2	13.75	+ 0.45	18.0	25	12.5	12.0	60	+ 1.5	1.6
				- 0						- 0	
ii)	20	23.0	17.00	+ 0.45	20.0	25	14.5	13.5	60	+ 1.5	1.6
				- 0						- 0	
iii)	25	28.2	22.75	+ 0.45	23.0	28	17.5	16.5	60	+ 1.5	1.6

TABLE 17 DOUBLE BACK SPOUT JUNCTION BOXES

(Clause 6.2)

All dimensions in millimeters



Sl. No.	Nominal Outside Diameter Of Conduit A	B, Min	C		D, Min	E, Min	F		G	t	
			Max	Min			Max	Min			
(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	(9)	(10)	
i)	16	19.2	13.75	+ 0.45	18.0	25	12.5	12.0	60	+ 1.5	1.6
				- 0						- 0	
ii)	20	23.0	17.00	+ 0.45	20.0	25	14.5	13.5	60	+ 1.5	1.6
				- 0						- 0	

iii)	25	28.2	22.75	+ 0.45	23.0	28	17.5	16.5	60	+ 1.5	1.6
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7. MARKING

7.1 Each fitting shall be marked clearly and indelibly with the following information:

- a) Manufacture's name or trade-mark,
- b) Type reference including the diameter and
- c) Country of Manufacture

7.1.1 The conduit fitting may also be marked with the standard Mark .

Note – The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made there under there. The Indian Standard Mark on products covered by an Indian standard conveys the assurance that they have been produced to comply with the requirements of that produced to comply with the requirements of that testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that Standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards.

8. VISUAL EXAMINATION

8.1 Each conduit fitting shall be examined for conformity to the requirements specified in “relevant table”

9. CHECK OF DIMENSION

9.1 The selected samples shall be tested for correctness of dimensions, such as diameter, length and thickness.

10. RESISTANCE TO HEAT

10.1 Fittings and components shall be resistant to heat. Compliance is checked by the test specified in 10.2.

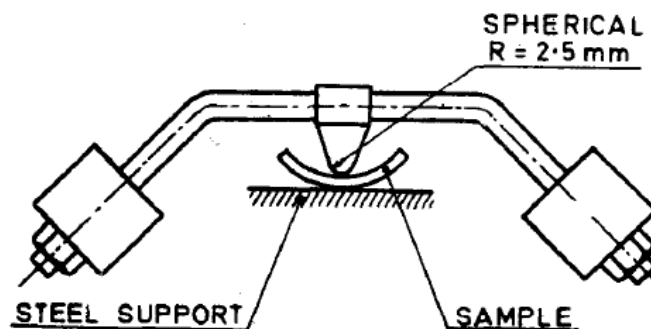


FIG. 1 BALL PRESSURE APPARTAUS

10.2 Cut a sample of suitable size from the fitting. Place it in a horizontal position on a steel support as shown in fig. 1, the support and the sample being placed in a heating cabinet, the temperature within which is maintained at $60 \pm 2^\circ\text{C}$. After 2 hours, a steel ball of 5 mm dia shall be pressed against the upper surface of the sample by a force of 20 N.

After 1 hour, the ball shall be removed and the sample taken out of the heating cabinet. After 2 hours, at room temperature, the diameter of the impression shall be measured which shall not exceed 2 mm

11. RESISTANCE TO BURNING

11.1 Fittings and components are tested in still air with a Bunsen Burner having a nozzle with an internal diameter of 9 mm.

11.2 The test shall be made in still in air with a Bunsen burner, having a nozzle with an internal diameter of 9 mm

While the burner is in the vertical position, the flame is adjusted so that the overall length is 100mm. The intensity of the flame shall meet the following requirements .

A bare copper wire 0.71 mm in diameter and at least 10 cm long, is held horizontally so that it passes through the middle of the frame, 5cm above the top of the burner, it is free and being vertically above the edge of the burner. The wire should melt within 6 seconds.

For testing the fittings, the burner is supported so that its axis is at an angle of 45° to the vertical.

The sample is held in such a position that the part above the flame is vertical and that the tip of the inner cone of the flame touches the surface of the sample at a distance of approximately 10mm from its lower end, as far as practicable.

11.3 The flame shall be held for 1 min. If the sample burns, it shall do so slowly that the burning shall not spread. Any flame shall die out in less than 30s after the removal of the burner.

12 MOISTURE ABSORPTION TEST

12.1 Fittings shall be resistant to moisture absorption. Compliance is checked by the test specified in **12.2**

12.2 Sample shall be dried by heating at a temperature of $60 \pm 2^\circ\text{C}$ for 24 hours and then cooled to the ambient temperature of the test room and the dry weight is taken. The sample shall then be immersed for 24 hours in water at a temperature of $27 \pm 2^\circ\text{C}$. After taking it out

of water and wiping off the excess moisture, the sample is left to dry for one hour at the ambient temperature of the test room and is then weighed again .

12.3 The increase in weight corresponding to the moisture absorbed shall not exceed 1.0 percent.

13. RESISTANCE TO CHEMICAL ACTION

13.1 **Test for resistance to chemical action**-Two samples are required for this test. The fittings shall not be affected by salt or moderate contamination of the atmosphere with acid or alkali.

13.2 The specimens shall be immersed, one each, in the following solutions:

- a) *Acid solution*-330ml of hydrochloric acid (sp gr 1.16) diluted in 1 litre of water, and
- b) *Alkaline Solution*-80g of sodium hydroxide dissolved in water and diluted to 1 litre of water.

The specimens shall remain in respective solutions for a period of one week.

13.3 During the specimens of immersion, there shall be no visible sign of deterioration of the specimens. Slight changes in colour of the specimens shall, however, be allowed .

14 COPPERTEST

14.1 A 25mm wide strip of annealed copper shall be wound on each sample centrally to form close helix of three complete turns. The sample shall then be maintained at $120 \pm 2^{\circ}\text{C}$ for 7 hours. the copper strip shall be carefully removed. There shall be visible evidence of formation of copper salts on the sample.

Note – Where three turns are not possible, the number of turns shall be maximum possible turns

15. RESISTANCE TO OIL

15.1 The external diameters of the sample (Sample dimensions in case of boxes) shall be measured. The Sample shall then be immersed in insulation oil conforming to IS 335-1983 for period of 48 hours, the temperature of the oil being maintained at $60 \pm 2^{\circ}\text{C}$ throughout this period.

15.2 At the completion of this period, the sample shall be carefully withdrawn from the oil and allowed to remain at a temperature of $27 \pm 2^{\circ}\text{C}$ throughout this period not less than 15 minutes.

15.3 The external diameter of the sample (the external dimensions neither the strip nor the sample shall show any sign of penetration of oil. Upon visual examination, the strip shall show no sign of cracking or splitting.

15.4 A strip, 12.5 mm wide, shall then be cut from the sample and on visual examination, neither the strip nor the sample shall show any sign of penetration of oil. Upon visual examination, the strip shall show no sign of cracking or splitting.

16. RESISTANCE TO IMPACT

16.1 Fittings and components shall be strong enough to withstand an impact during normal use.

Compliance is checked by the test method prescribed in Appendix A.

16.2 After the test, the samples shall show no damage or cracks visible to the naked eye.

17. ELECTRICAL CHARACTERISTICS

17.1 The fittings shall have adequate electric strength and insulation resistance.

Compliance is checked by tests specified in **17.2** and **17.3**.

17.2 Electric Strength - The fittings are fitted with covers in the manner prescribed by the manufacturer except that the fixing means may be of insulating material. All entries except one are closed with plugs of insulating material. One of the plugs shall allow two separate cables to 25 mm inside the sample, 12.5 mm of the cables within the sample being without insulation and the ends of the cables being spread so that there is a distance of 12.5 mm between them.

The inside of the sample is filled with spheroidal metal objects of a maximum size of 2.5 mm and remaining entry closed. This sample is placed in a container completely filled with similar spheroidal metal objects.

The conductivity of the metal objects inside the sample is checked by measuring the resistance between the two cables which have penetrated the sample. This resistance shall be not more than 10 Ω .

An electrode is immersed in the metal objects external to the sample. A voltage of 2 500 V of substantially sine-wave form and having a frequency of 50 Hz is applied for 15 minutes between the electrode and the cables.

No breakdown shall occur during the test.

17.3 INSULATION RESISTANCE -- The insulation resistance of each sample is measured at a temperature of $60\pm 2^{\circ}\text{C}$ by applying a dc voltage of approximately 500 V between the electrode and the cables. The insulation resistance is measured 1 min after the application of the voltage .

The insulation shall not be less than 100 MOhm

18. TESTS

18.0 CLASSIFICATION OF TESTS - The tests are classified as type tests, acceptance tests and routine tests

18.1 Type Tests - The tests given below shall constitute type tests and shall be carried out on fittings of a given type and size preferably selected at random from regular production). The sequence of type test shall be in accordance with Appendix B

- a) Visual examination (*see 8*)
- b) Checking of dimensions (*see9*)
- c) Test for resistance to heat (*see10*)
- d) Resistance to burning (*see11*)
- e) Moisture absorption test (*see 12*)
- f) Test for resistance to chemical action (*see13*)
- g) Copper test (*see14*)
- h) Test for resistance to oil (*see15*)
- j) Resistance to impact (*see16*)
- k) Test for electrical characteristics (*see17*)

18.1.1 Criteria of Acceptance – All samples shall successfully pass all the type tests for proving conformity with the requirements of this standard. If any of the samples fail in any of the type tests, a further set of samples shall be selected and that test shall be repeated. If the second set of samples also proves unsatisfactory, a lot shall be rejected.

18.2 Acceptance tests – The following sets constitute acceptance tests:

- a) Visual examination
- b) Checking of dimension
- c) Test of resistance to heat
- d) Test of electrical characteristics

18.2.1 A recommended sampling procedure for acceptance tests is given in Appendix C.

18.3 Routine test - The following shall constitute routine tests:

- a) Visual examination
- b) Checking of dimension

Appendix A

IMPACT TEST APPARATUS

DESCRIPTION OF THE APPARATUS

A.1.1 The typical test Apparatus is shown in Fig 2.

A.1.2 The striking element has a hemispherical face of radius made of hardwood, Polyamide or similar weighing 0.15 kg. It is rigidly fixed to the lower end of a steel tube with an external

diameter of 9 mm and thickness 0.5 mm which is provided at his upper end in such a way and that its swing only its vertical plane of the striking element *. The design of the

* The axis of pivot is 1 mm above the axis of the following

Apparatus in such a force between 1.0 and 2.0 N has to be applied to the face of the hammer to maintain the pendulum in a horizontal position.

A-1.3 The fitting under test is held against a solid wall of bricks concrete of the like and the test apparatus is so arranged that the pivot of the pendulum is vertically above the point of impact of the hammer. The hammer is then allowed to fall from a height so that the impact energy of each blow is 1 Nm. Three such blows are applied .

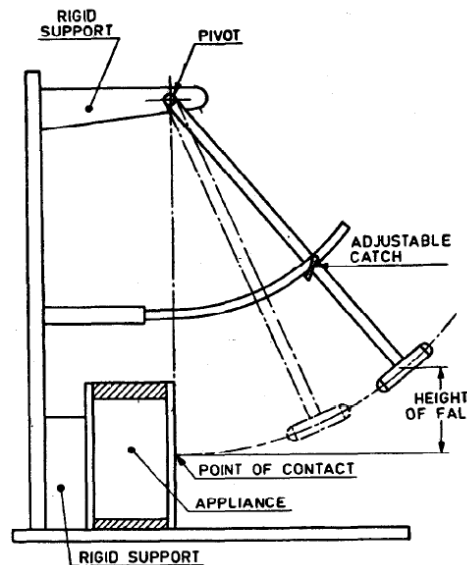


FIG. 2 APPARATUS FOR IMPACT TEST

APPENDIX B

(Clause 18.1)

SEQUENCE OF TYPE TESTS

All the 12 samples

Visual examination (see 8)

Checking of dimensions (see 9)

1 Sample Resistance to heat	1 Sample Resistance to burning	1 Sample Resistance to moisture absorption	1 Sample Resistance to chemical action	1 Sample Copper test	1 Sample Resistance to oil	3 Sample Resistance to impact	3 Samples Electrical characteristics
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APPENDIX C

SAMPLING PROCEDURE FOR ACCEPTANCE

C-1 LOT

C - 1.1 In any consignment, all the fittings of same make, model and type, and manufactured under similar conditions of production shall be grouped together to constitute a lot.

C-2 SELECTION OF SAMPLE

C - 2.1 From a each lot, a certain number of fittings as prescribed in Table 10 shall be selected at random and subjected to acceptance tests specified in 18.2

C - 2.2.1 if required for repeat test (s) (see C-3-2), additional fittings as given in col 3 of Table 10 shall also be selected at random.

TABLE 10 SAMPLING SCHEME						
<i>(Clause C – 2.1, C – 2.2, C – 2.2.1, C – 3.1, and C – 3.2)</i>						
Sl. No.	LOT SIZE	FIRST SAMPLE SIZE	SECOND SAMPLE SIZE	ACCEPTANCE NUMBER	FIRST REJECTION NUMBER	SECOND REJECTION NUMBER
		<i>n₁</i>	<i>n₂</i>	<i>a</i>	<i>r₁</i>	<i>r₂</i>
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Up to 100	5	5	0	2	2
ii)	101 to 300	8	8	0	2	2
iii)	301 to 500	13	13	0	3	4
iv)	501 to 1000	20	20	1	4	5
v)	1000 to 3000	32	32	2	5	7
vi)	3000 and above	50	50	3	7	9

C-3 CRITERION FOR CONFORMITY

C-3.1 The lot shall be considered as conforming to the requirements of acceptance tests if the number a , given in col 4 to table 10, the lot shall be considered as not conforming to the requirements of the acceptance tests

C - 3-2 If the number of failures is between a and r a second sample of same size (n_2) fittings shall be selected and subjected to the acceptance tests. If the number of failures in the two samples combined is less than the second rejection number r_3 as given in Table 10, the lot shall be considered as conforming to the requirements of the acceptance tests, otherwise not.