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IS 1726 (1991): cast iron manhole covers and frames [CED 3: Sanitary Appliances and Water Fittings]



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IS 1726 : 1991

भारतीय मानक

ढलवां लोहे के मैनहोल ढक्कन एवं फ्रेम — विशिष्ट

(तीसरा पुनरीक्षण)

Indian Standard

CAST IRON MANHOLE COVERS AND FRAMES—
SPECIFICATION

(*Third Revision*)

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BUREAU OF INDIAN STANDARDS
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FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Sanitary Appliances and Water Fittings Sectional Committee had been approved by the Civil Engineering Division Council.

This standard, published in 1960, was first revised in 1967, followed by the second revision in 1974, covering the specific requirements for various types separately in seven parts. Part VIII of this standard for HD square type covers and frames was issued in 1985.

In this third revision, all the eight parts have been merged. Requirements for manhole covers and frames in respect of grades, types and shapes, clear opening depth and seating dimensions and test loads have been consolidated in one table. Similarly detailed dimensions for each of the grade, type and shape are given in another table.

The range between medium and heavy-duty with test loads of 5 to 35 tonnes specified earlier, has been revised and diversified to include an additional grades designated as Heavy-Duty HD-20; the earlier heavy-duty grade of 35 tonne has been redesignated as Extra-Heavy-Duty EHD-35. The light-duty test load has been increased to 2.5 tonnes and designated as LD-2.5. Also in the light-duty grade, additional square type with 400 mm clear opening, and circular types having 370 mm and 350 mm dia clear openings, with matching covers have been included. In the medium-duty grade the test load has been increased to 10 tonnes and designated as MD-10. Two additional sizes in circular shapes having 450 and 480 mm dia clear opening have been introduced in this grade. While introducing grade of 20 tonnes test load, designated as HD-20, two additional circular heavy-duty sizes with clear openings of 600 mm and 350 mm dia have been introduced to match manhole chambers of barrel as well as shaft designs. The 350 mm dia clear opening HD-20 grade would correspond to the lamp-hole manhole covers and frames which is commonly used by the Calcutta Municipal Corporation. The square type heavy-duty covers and frames would be restricted to HD-20 and EHD-35 grades, including clear opening of 560 square for both.

In this revision, rectangular manhole covers and frames for scrapper manholes have also been introduced, with clear opening of 900 × 450 mm in HD-20 and 900 × 600 mm in EHD-35 grade.

Heavy-duty triangular type covers have been withdrawn. The requirement of weights for cover and frames has also been withdrawn thus shifting the emphasis more to the performance requirements as stipulated in the standard.

While taking up the revision of this standard, the introduction of manhole covers and frame of materials other than that of cast-iron, both as replacement and for new sewerage projects have been kept in view. The Committee also noted the diversification in practice in the field in respect of sizes and shapes of cast-iron manhole covers and the frames, with an option open to the manufacturers for further diversification as per specified requirements. The technical opinion and comments of the users and the Research Institutes in respect of the revised test loads included herein have been taken care of.

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 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CAST IRON MANHOLE COVERS AND FRAMES — SPECIFICATION

(*Third Revision*)

1 SCOPE

1.1 The standard lays down basic and performance requirements for manhole covers and frames in cast-iron, intended for use in drainage and water works.

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this standard:

IS No.	Title
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210 : 1978	Specification for grey iron castings (<i>third revision</i>)
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4905 : 1968	Methods for random sampling
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3 GRADES AND TYPES

3.1 Manhole covers and frames covered by this standard shall be of the following four grades and types:

Grades	Grade Designation	Type/Shape of Cover
Light-Duty	LD-2.5	Rectangular Square Circular
Medium-Duty	MD-10	Circular Rectangular
Heavy-Duty	HD-20	Circular Lamphole Square Rectangular (Scrapper manhole)
Extra-Heavy-Duty	EHD-35	Circular Square Rectangular (Scrapper manhole)

3.2 Recommended locations for placement of different grade and types/shapes of manhole covers and frames are as under:

3.2.1 *LD-2.5 Rectangular, Square or Circular Solid Types*

Suitable for use within residential and institutional complexes/areas with pedestrian but occasional Light Motor Vehicle traffic. These covers are also used for 'Inspection Chambers'.

3.2.2 *MD-10 Circular or Rectangular Types*

Suitable for use in service lanes/roads, on pavements for use under medium-duty vehicular traffic including for car parking areas.

3.2.3 *HD-20 Circular, Square or Rectangular (Scrapper Manhole) Types*

Suitable for use in institutional/commercial areas/carriageways/city trunk roads/bus terminals, with heavy-duty vehicular traffic of wheel loads between 5 to 10 tonnes, like buses, trucks and parking areas and where the manhole chambers are located in-between the pavement and the middle of the road.

3.2.4 *EHD-35 Circular, Square or Rectangular (Scrapper Manhole) Types*

Suitable for use on carriageways in commercial/industrial/port areas/near warehouses/godowns where frequent loading and unloading of trucks/trailers are common, with slow to fast moving vehicular traffic of the types having wheel loads up to 11.5 tonnes irrespective of the location of the manhole chambers.

4 MATERIAL

4.1 Manhole covers and frames shall be manufactured from appropriate grade of grey cast-iron, not inferior than FG 150 Grade of IS 210 : 1978.

5 MANUFACTURE AND WORKMANSHIP

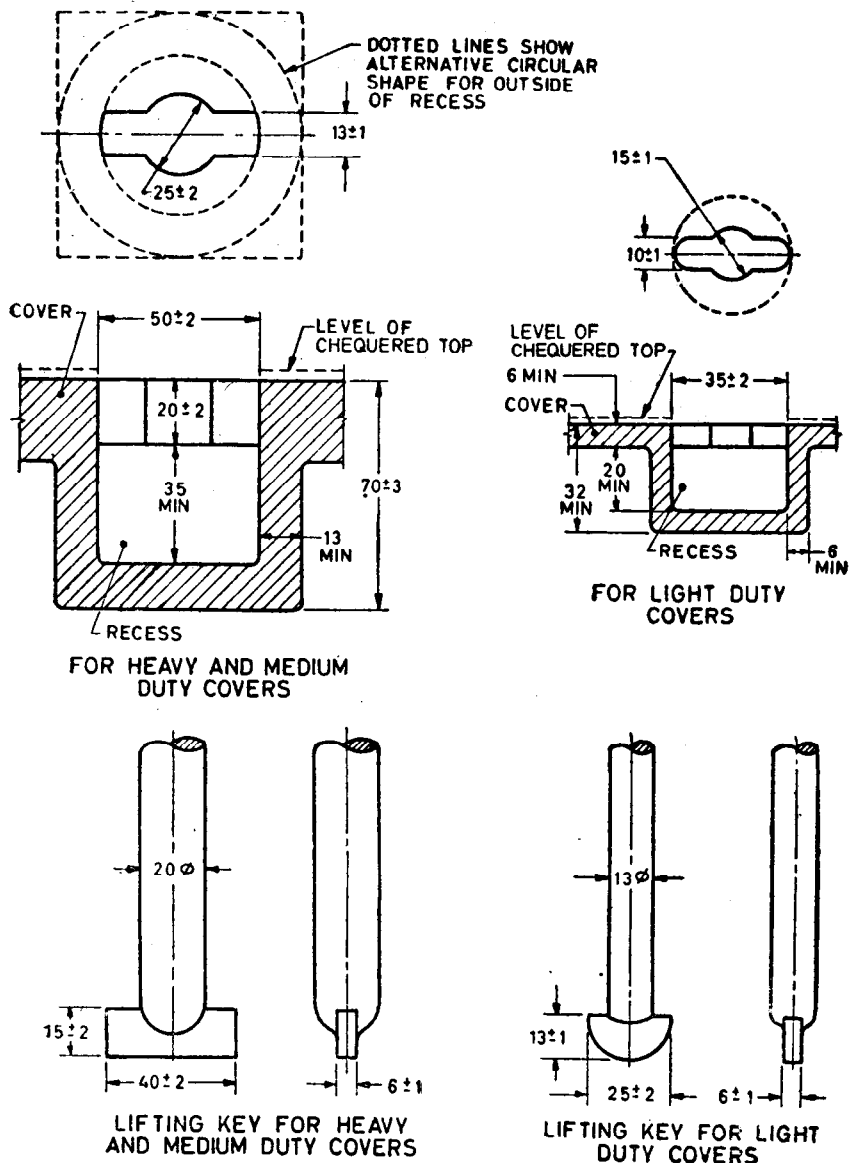
5.1 Covers and Frames

5.1.1 Covers and frames shall be cleanly cast and they shall be free from air and sand holes, cold shuts and warping which are likely to impair the utility of the castings.

5.1.2 Covers shall have on its operative top a raised chequered design to provide for an adequate no-slip grip. The rise of the chequer shall be not less than 4 mm.

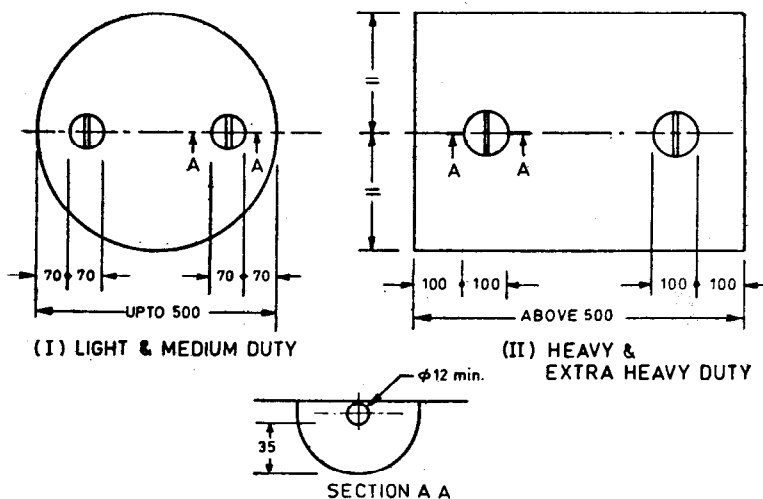
5.2 Key Holes and Keys

Key holes, keys and lifting devices shall be provided in the manhole covers to facilitate their placement in the frames, and their operative maintenance during use in the field. Typical designs are indicated in Figures 1 and 2.



All dimensions in millimetres.

FIG. 1 TYPICAL DETAILS OF KEY HOLES AND KEYS



All dimensions in millimetres.

FIG. 2 TYPICAL DETAILS OF ALTERNATE LIFTING ARRANGEMENTS

Table 1 Basic and Performance Requirements of Manhole Covers and Frames
(Clause 6.1)

Grade Designation	Type/Shape of Cover	Clear Opening of Frame O, O_1 mm	Frame		Test Load tonnes
			Depth f_d mm	Seating S mm	
(1)	(2)	(3)	(4)	(5)	(6)
LD-2.5	Rectangular	450 × 600	35	50	2.5
	Square	450 × 450	30	50	
		400 × 400	30	50	
	Circular	370 (dia)	45	40	
		350 (dia)	45	40	
MD-10	Circular	450 (dia)	60	40	10
		480 (dia)	70	40	
		500 (dia)	80	50	
	Rectangular	450 × 600	80	50	
HD-20	Circular	500 (dia)	100	50	20
		560 (dia)	110	60	
		600 (dia)	110	75	
	Lamphole cover	350 (dia)	130	25*	
	Square	560 × 560	110	75	
	Rectangular (scraper manhole)	450 × 900	100	60	
	EHD-35	Circular	560 (dia)	130	
600 (dia)			140	75	
Square		560 × 560	130	60	
Rectangular (scraper manhole)		600 × 900	120	70	

NOTE — The depth and seating in the frame for the respective test loads may vary depending upon the design of the frame (inside) and the corresponding matching cover.

*This seating of 25 mm is in case of tapered design of the frame (inside) as also the matching cover.

5.3 Locking Devices

Suitable locking devices including that with galvanized chain or a lock, or a combination of both shall be provided in the manhole cover system, if so desired by the purchaser.

6 PERFORMANCE REQUIREMENTS

6.1 Basic and performance requirements, as given in Table 1 in respect of the clear opening, depth and seating dimensions of frames and the test load, for various grades and types/shapes of manhole covers and frames shall be met with. However, the manufacturer shall have the option in respect of general design of the manhole cover and frame, provided the above requirements are adhered to in addition to the manufacture and workmanship as detailed in 5.

6.2 Respective weights of the manhole covers and frames shall depend upon their design, grade of cast iron, quality of manufacture and workmanship. Minimum weights supplied shall be agreed to between the manufacturer and the purchaser, if so desired, provided the requirements at 6.1 shall be strictly maintained, as basic acceptance criteria for the manhole cover system.

7 DIMENSIONS OF MANHOLE COVERS AND FRAMES

7.1 Dimensions of manhole covers and frames for the typical designs shown in Fig. 3 to 9 for the various grades, types and shapes shall be as given in Table 2. However, for designs other than those given in Fig. 3 to 9 the dimensions may be mutually agreed between the manufacturer and the purchaser.

7.1.1 Tolerances

Permissible tolerances on the dimensions of the covers and frames shall be as given below when read with Fig. 3 to 9.

Dimensions	Tolerances in mm
O, O_1	+ 5
f, f_1	+ 5
C, C_1	- 5
F, F_1	+ 5
F_d, f_d	+ 2

8 COATING

8.1 Manhole covers and frames shall be coated with a material having base with a black bituminous composition. The coating shall be smooth and tenacious. It shall not flow when exposed to a temperature of 63°C and shall not be so brittle as to chip off at a temperature of 0°C.

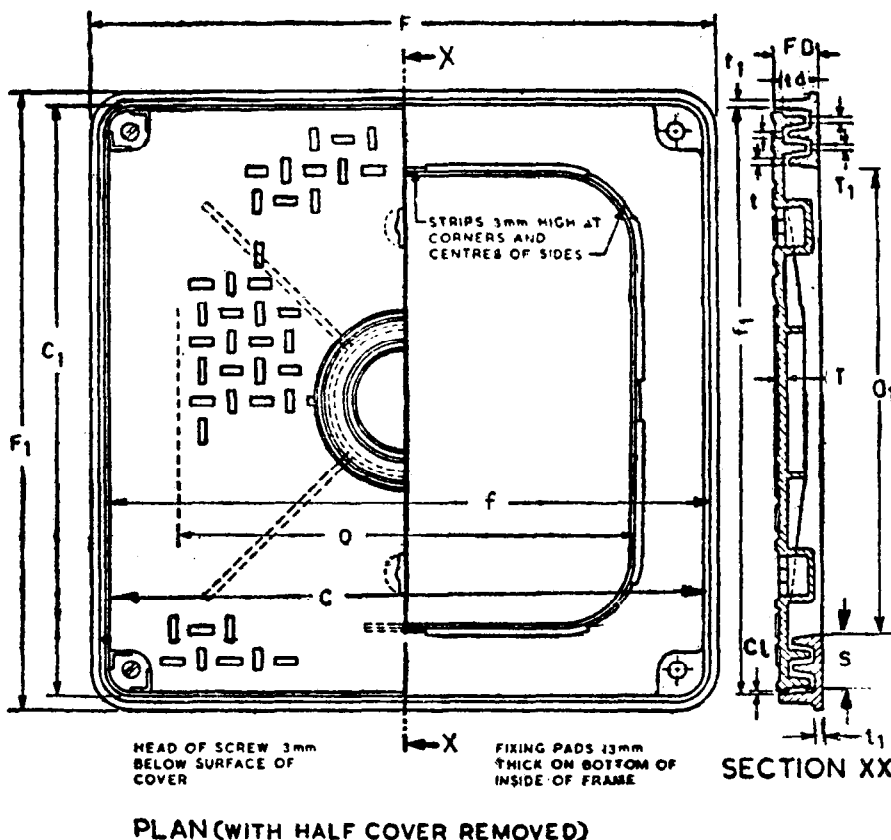
9 SAMPLING AND CRITERIA FOR CONFORMITY

9.1 The sampling procedure and criteria for conformity shall conform to the requirements given in Annex A; however, so far as load test is concerned the sampling and criteria for conformity shall conform to the requirements given in 10.1 and 10.1.1.

10 LOAD TEST

10.1 Samples for Load Test

The number of samples to be tested shall be one for every lot of 50 or part thereof for each grade, type/shape and size manufactured. In the event of any one of the articles tested failing to meet the requirements of this standard, the articles in the batch shall be deemed not to comply with the requirements of this standard unless individually tested. The manufacturer shall keep the records of all tests and shall make these available to the purchaser on request.



PLAN (WITH HALF COVER REMOVED)

NOTES

- 1 The 13 x 13 mm brass screws may be omitted and the 13 mm thick pads left undrilled at purchaser's option.
- 2 Covers are thickened up to 15 mm at corners above fixing pads.

FIG. 3 LIGHT-DUTY DOUBLE SEAL RECTANGULAR COVER AND FRAME

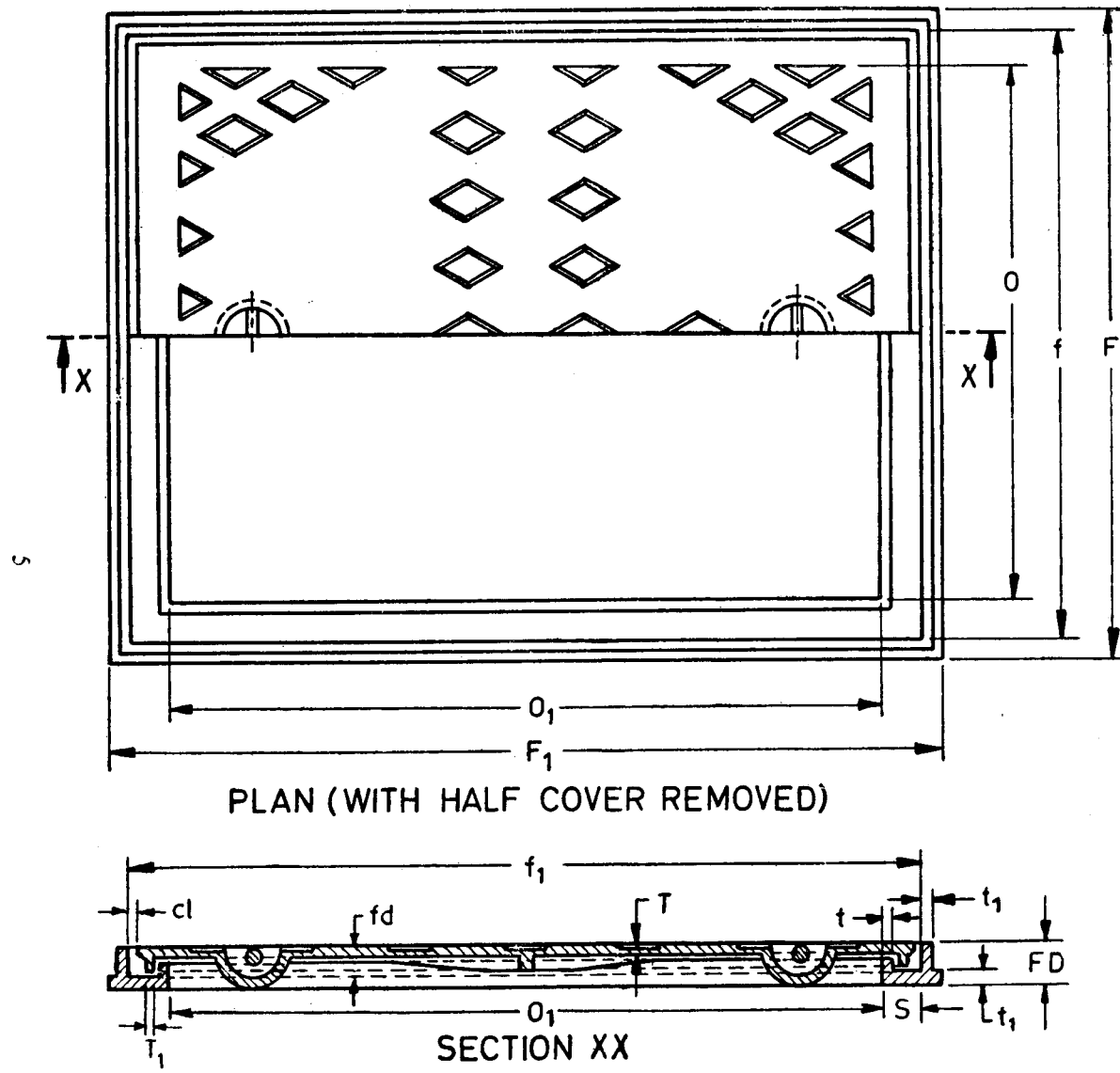


FIG. 4 TYPICAL LIGHT-DUTY SINGLE SEAL RECTANGULAR MANHOLE COVER AND FRAME

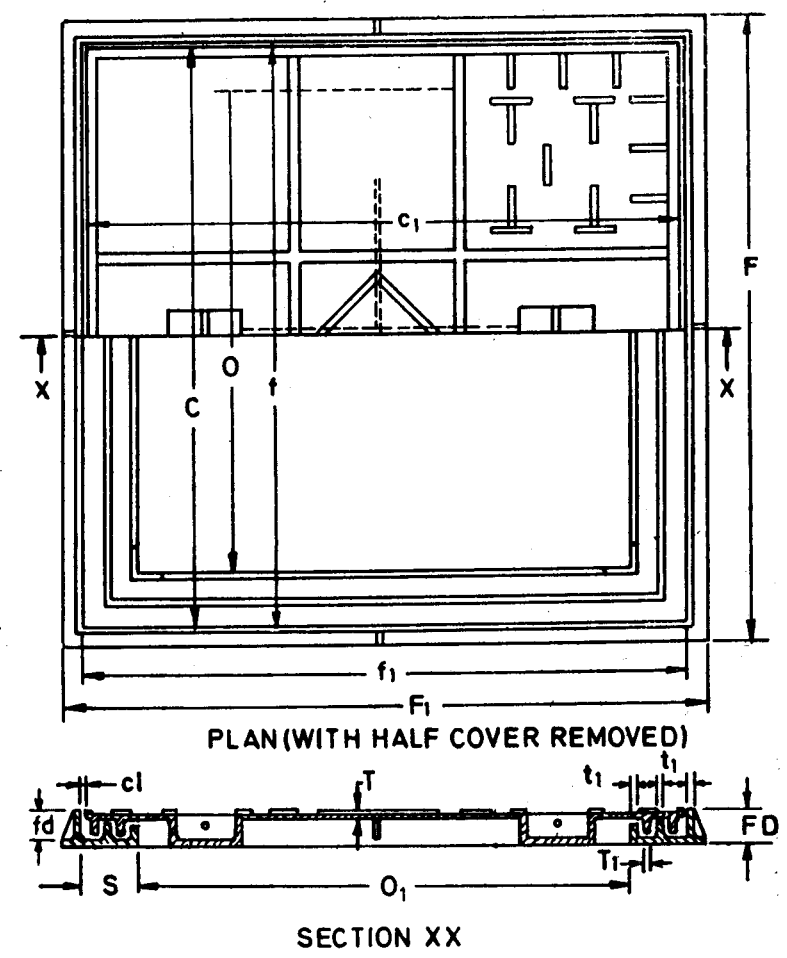


FIG. 5 LIGHT-DUTY DOUBLE SEAL COVER AND FRAME (SQUARE TYPE)

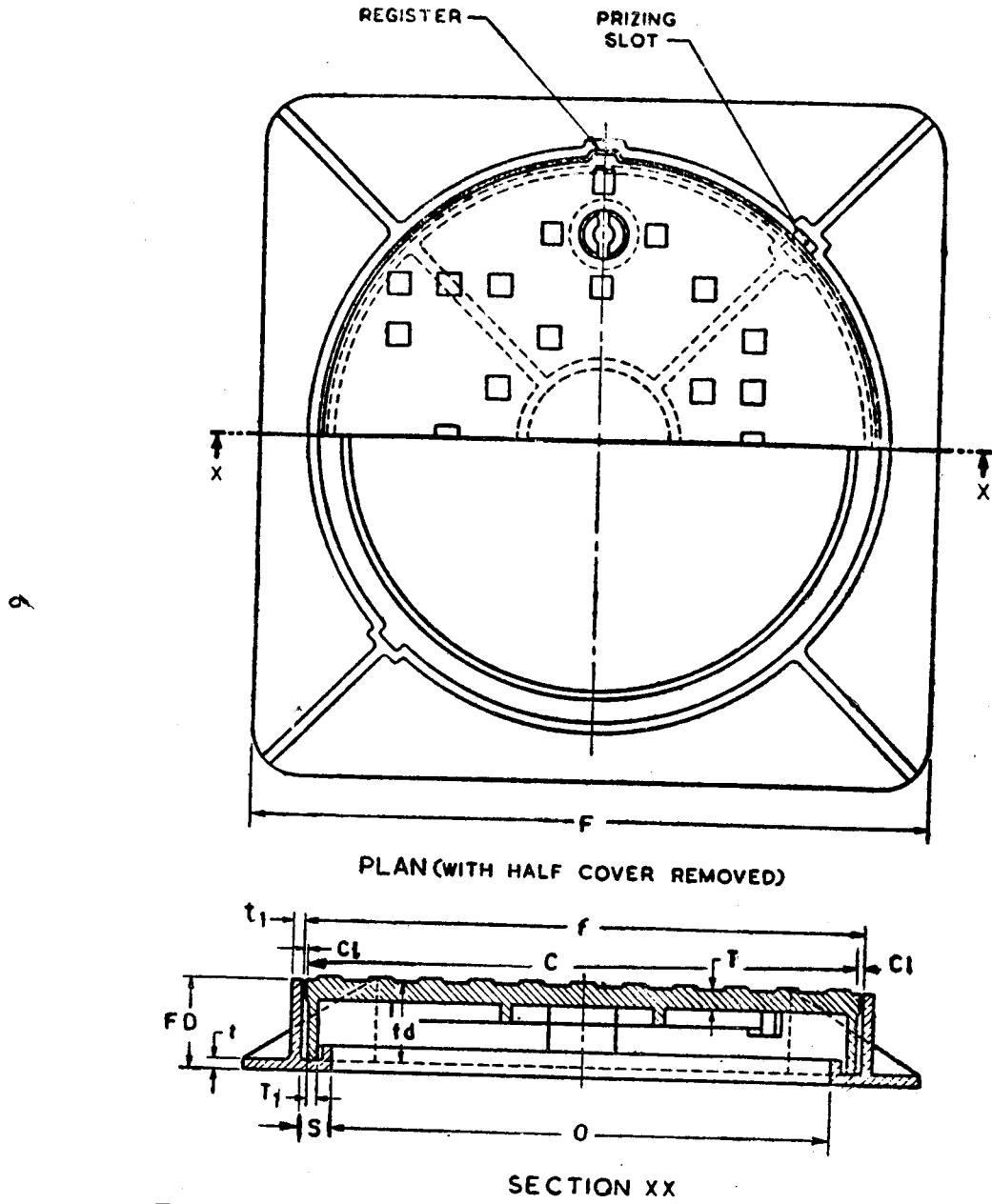


FIG. 6 HEAVY-DUTY AND MEDIUM-DUTY CIRCULAR COVER AND FRAME

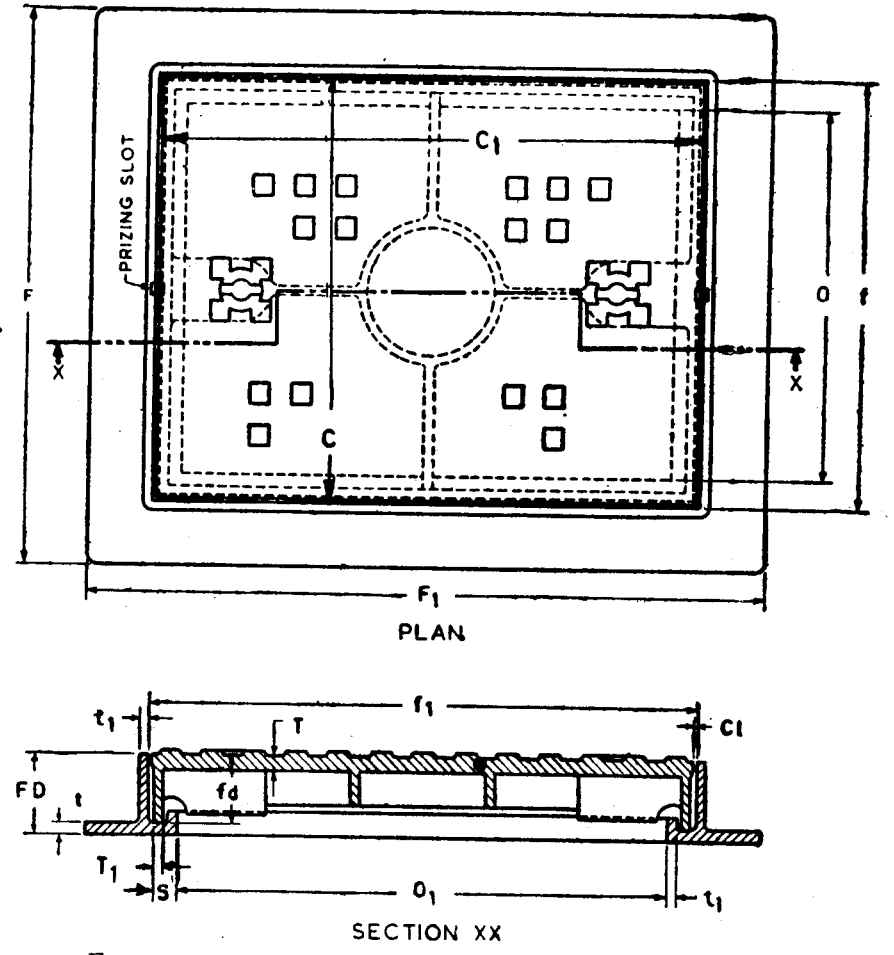


FIG. 7 TYPICAL MD/HD/EHD RECTANGULAR MANHOLE COVER AND FRAME

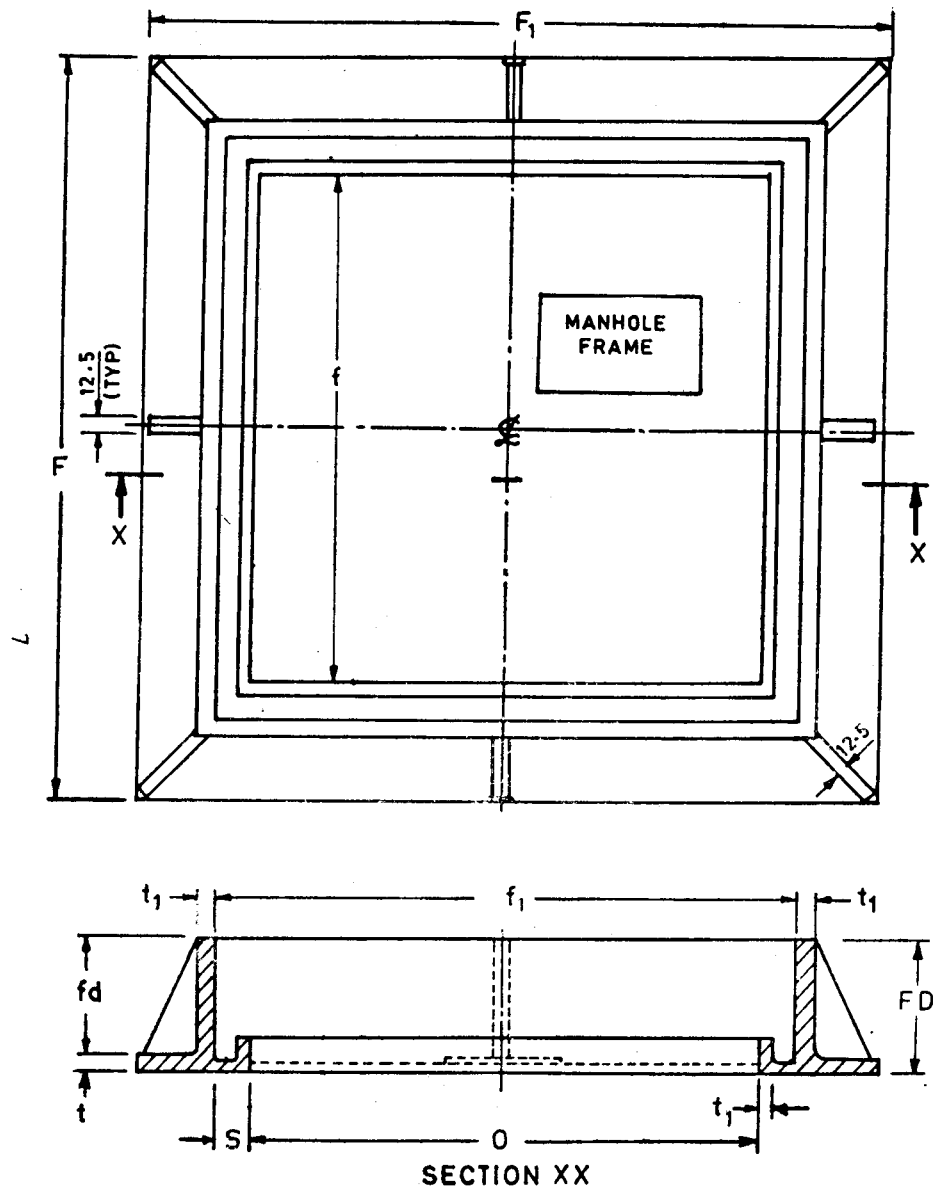


FIG. 8 TYPICAL HD/EHD SQUARE TYPE MANHOLE FRAME

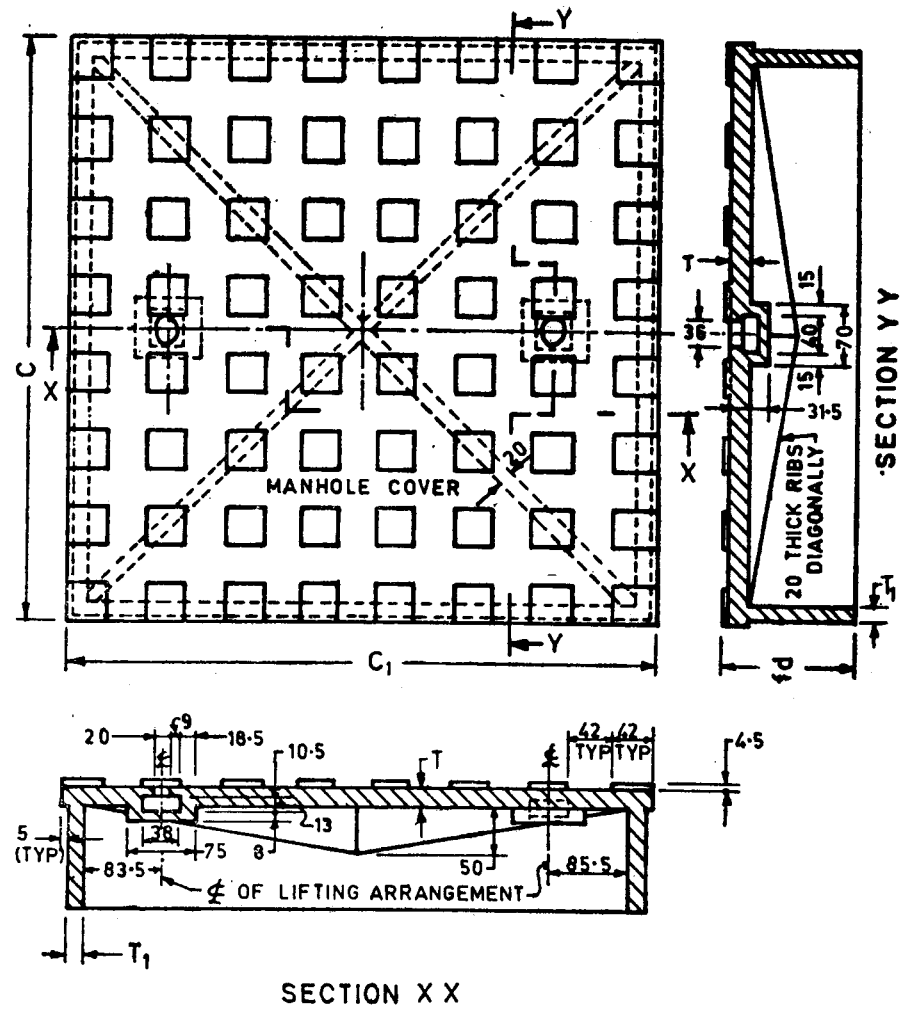


FIG. 9 TYPICAL HD/EHD SQUARE TYPE MANHOLE COVER

Table 2 Dimensions of Manhole Covers and Frames
(Clause 7.1 and Fig. 3 to 9)

All dimensions in millimetres.

Grade Designation	Type/Shape of Cover	Frame Dimensions											Cover Dimensions				Clearance C_1
		Clear Opening		Outer		Inner		Depth		Seating S	Thickness (Min)		Outer		Thickness		
		O	O_1	F	F_1	f	f_1	F_d	f_a		t	t_1	C	C_1	T	T_1	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
LD-2.5	Rectangular	450	600	650	800	550	700	45	35	50	10	10	540	690	10	5	5
	Square	400	400	600	600	500	500	40	30	50	10	10	490	490	10	5	5
		450	450	650	650	550	550	40	30	50	10	10	540	540	10	5	5
		370	—	550	550	450	450	55	45	40	10	10	440	—	10	5	5
	Circular	350	—	530	530	430	430	55	45	40	10	10	420	—	10	5	5
MD-10	Circular	450	—	620	620	530	530	70	60	40	10	10	520	—	10	5	5
		480	—	650	650	560	560	80	70	40	10	10	550	—	10	5	5
		500	—	750	750	600	600	90	80	50	15	15	590	—	20	12	5
	Rectangular	450	600	650	800	550	700	90	80	50	15	15	540	690	20	12	5
		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
HD-20	Circular	500	—	750	750	600	600	115	100	50	15	15	588	—	25	15	6
		560	—	820	820	680	680	125	110	60	15	15	668	—	25	15	6
		600	—	900	900	750	750	125	110	75	15	15	735	—	30	15	7.5
	Lamp-hole cover	350	—	575	575	450	450	145	130	25	15	20	440	—	30	15	5
	Rectangular (scraper man-hole)	450	900	670	1120	570	1020	115	100	60	15	20	560	1010	30	15	5
Square	560	560	800	800	660	660	125	110	60	15	15	648	648	25	15	6	
EHD-35	Circular	600	—	900	900	750	750	155	140	75	15	20	735	—	30	15	7.5
		560	—	830	830	680	680	145	130	60	15	20	668	—	30	15	6
	Square	560	560	830	830	680	680	145	130	60	15	20	668	668	30	15	6
	Rectangular (scraper man-hole)	600	900	850	1150	750	1050	135	120	70	15	20	740	1040	30	15	5

10.1.1 If the purchaser requires additional tests to be carried out, this shall be stated in the enquiry and order. The manufacturer shall provide every facility for the purchaser to select such samples as he may require from a consignment prior to delivery and the tests shall be carried out in the presence of the manufacturer and the purchaser, or his representative, if he so desired.

10.1.1.1 The cost of each additional test shall be borne:

- a) by the purchaser in the event of the result meeting the requirements of the standard, and

- b) by the manufacturer in the event of the result not meeting the requirements of this standard.

10.2 Testing Procedure and Requirements

Manhole covers shall withstand, without fracture, the loads specified in Table 1, for a minimum period of 30 seconds, when subjected to the loading test described in 10.3. A suitable testing arrangement is shown in Fig. 10.

10.3 The cover shall be supported in a frame which may be standard cover frame or a specially made testing appliance simulating normal conditions of use. The specified load as

given in Table 1 shall be applied without shock through the medium of a bearing block faced with hard rubber or other resilient material. The bearing block shall be the size specified in Table 3, and shall bear centrally on the cover. The block shall be sufficiently rigid to ensure that the load on the cover is uniformly distributed over the full area of the block.

11 INSPECTION

11.1 The purchaser or his authorized representative shall have free access to the works of the manufacturer at all reasonable times for carrying out inspection during the course of manufacture. Should the purchaser or his authorized representative desire to witness the test specified in 10.3, he shall inform the manufacturer who shall give reasonable notice of the date(s) on which the tests shall be carried out. The purchaser or his authorized representative shall, if he so desires, be enabled to carry out inspection of covers and frames prior to the application of coating.

12 MANUFACTURER'S GUARANTEE

12.1 When so required by the purchaser, the manufacturer shall supply, free of cost, a certificate stating that each lot or part thereof of manhole covers and frames has been subjected to the load test as specified in 10 and also conforms in all respects to this specification.

13 MARKING

13.1 Each manhole cover and frame shall have cast on them the following information:

- Manufacturer's name or trade-mark;
- Grade designation;
- Date of manufacture;
- The words 'SWD' or 'SEWER' to denote 'storm water drain' or 'sewer' respectively, if required by the purchaser; and
- An identification mark as required by the purchaser.

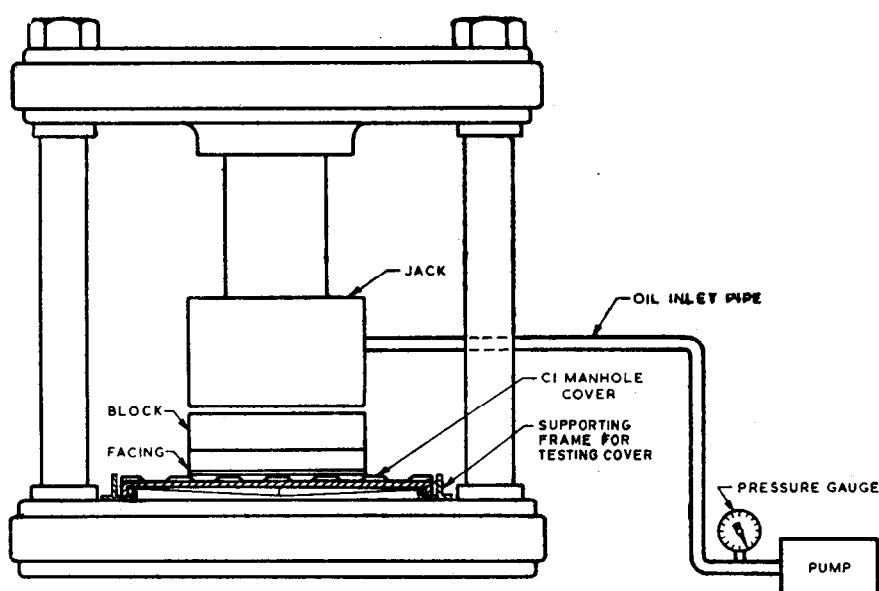


FIG. 10 ARRANGEMENT FOR TESTING MANHOLE COVERS

Table 3 Test Load and Diameter of Block

(Clause 10.3)

Grade of Cover	Type	Load in Tonnes	Diameter of Block in mm
(1)	(2)	(3)	(4)
LD-2.5	Rectangular, square or circular	2.5	300
MD-10	Circular/rectangular	10	300
HD-20	Circular/square/rectangular	20	300
EHD-35	Circular/square/rectangular	35	300

ANNEX A
(Clause 9.1)

SAMPLING OF CAST IRON MANHOLE COVERS AND FRAMES

A-1 LOT

A-1.1 In any consignment all the items of the same grade, type, shape and size, and manufactured from the same raw materials under relatively similar conditions of production shall be grouped together to form a lot for inspection. A lot shall contain a maximum of 300 items. In case a consignment has more than 300 items of the same grade, type/shape and size, and manufactured from the same raw material under relatively similar conditions of production, it should be divided into lots of 300 items or part thereof.

A-1.2 Samples shall be selected and inspected from each lot separately to ascertain its conformity or otherwise to the requirements of the specification.

A-2 SCALE OF SAMPLING

A-2.1 The number of items to be selected for the sample from a lot shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 4.

A-2.2 All the items in the sample shall be selected at random from the lot. In order to ensure randomness of selection, procedures given in IS 4905 : 1968 may be followed.

A-3 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

A-3.1 All the items selected under A-2.1 and in accordance with col 1 and 2 of Table 4 shall be inspected for material, workmanship, dimensions and tolerances. An item which fails to meet the requirements of any one or more of the characteristics mentioned above shall be

considered as defective. A lot shall be considered having met the requirements of the above characteristics if the number of defectives in the sample does not exceed the corresponding number given in col 3 of Table 4.

Table 4 Scale of Sampling and Permissible Number of Defectives
(Clause A-2.1)

Number of Items in the Lot	Number of Items to be Selected for the Samples	Permissible Number of Defective Items in the Sample for Visual and Dimensional Requirements	Sub-sample Size for Coating Test
(1)	(2)	(3)	(4)
Up to 15	3	0	3
16 to 25	5	0	3
26 to 50	8	0	3
51 to 100	13	0	4
101 to 150	20	1	5
151 to 300	32	2	7

A-3.2 A lot having found conforming to requirements of A-3.1 shall be inspected for coating test. For this purpose a sub-sample of size given in col 4 of Table 4 shall be selected at random from those which have been inspected and found conforming to A-3.1. Each of the items in the sub-sample shall be individually tested for coating requirements.

A-3.3 A lot shall be regarded as having met the requirements of the specification if the same is found conforming to requirements of A-3.1 and A-3.2.

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