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भाग 2 फ्रेम

Indian Standard

**PRECAST CONCRETE MANHOLE COVERS
AND FRAMES — SPECIFICATION**

PART 2 FRAMES

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**BUREAU OF INDIAN STANDARDS
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Price Group 4

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

The cost of cast iron is increasing day by day and cast iron manhole covers and frames are prone to pilferage and misuse since they possess a high resale value. This may result in financial loss due to the need for replacement of stolen covers and frames, accidents due to open manholes, and other environmental problems. Precast concrete manhole covers and frames are found to satisfy the general requirements of IS 1726 : 1990 Specification for cast iron manhole covers and frames (*third revision*). They have also been found to be economical substitute to cast iron manhole covers and frames and, as such, use of such covers and frames is increasing day by day.

This standard has been prepared with a view to encouraging the manufacture of precast reinforced cement concrete manhole covers and frames. This standard (Part 2) covers the requirements of precast reinforced concrete manhole cover frames. Part 1 of this standard covers precast reinforced concrete manhole covers.

Precast reinforced concrete manhole covers and frames can be produced in existing factories already producing precast concrete units. The manufacturing process is simple and requires only ordinary locally available machinery, such as concrete mixers, vibrators, steel moulds, etc.

The composition of the technical committee responsible for the formulation of this standard is given in Annex B.

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***PRECAST CONCRETE MANHOLE COVERS
AND FRAMES — SPECIFICATION****PART 2 FRAMES****1 SCOPE**

1.1 This standard (Part 2) covers the requirements for precast reinforced cement concrete manhole cover frames intended for use in sewerage and water works.

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 GRADES AND TYPES

3.1 Manhole cover frames shall be of the following four grades and types:

<i>Grades</i>	<i>Grade Designation</i>	<i>Type/Shape of Cover Frame</i>
Light Duty	LD—2.5	Rectangular, square and circular
Medium Duty	MD—10	Rectangular and circular
Heavy Duty	HD—20	Circular, lamphole, square, and rectangular (scraper manhole)
Extra Heavy Duty	EHD—35	Circular, square, and rectangular (scraper manhole)

4 MATERIALS**4.1 Cement**

The cement used shall conform to IS 269 : 1989 or IS 455 : 1989, or IS 1489 (Parts 1 and 2) : 1991 or IS 6909 : 1990 or IS 8041 : 1990 or IS 8043 : 1991 or IS 8112 : 1989.

4.2 Aggregates

The aggregates used shall be well graded. The nominal maximum size of coarse aggregate shall not exceed 20 mm. The aggregate shall be clean and free from deleterious matter and shall conform to the requirements of IS 383 : 1970.

4.3 Concrete

The mix proportion of concrete shall be determined by the manufacturer and shall be such as will produce a dense concrete without voids, honeycombs, etc (see IS 456 : 1978). The minimum cement content in the concrete shall be 360 kg/m³ with a maximum water cement ratio of 0.45. Concrete weaker than grade M 0 shall not be used. Compaction of concrete shall be done by machine vibration.

4.4 Reinforcement

The reinforcing steel shall conform to IS 226 : 1975 or IS 432 (Part 1) : 1982 or IS 432 (Part 2) : 1982 or IS 1786 : 1985 as appropriate.

4.4.1 Reinforcement shall be clean and free from loose mill scale, loose rust, mud, oil, grease or any other coating which may reduce or destroy the bond between concrete and steel. A slight film of rust may not be regarded as harmful but steel shall not be visibly pitted by rust.

4.5 Steel Fibre

The diameter/equivalent diameter of steel fibres, where used, shall not be greater than 0.75 mm. The aspect ratio of the fibres (ratio of the length of the fibre to its diameter/equivalent diameter) shall be in the range of 50 to 80. The minimum volume of fibres shall be 0.5 percent of the volume of concrete.

4.6 Admixtures

Where admixtures are employed, they shall be used in such proportions as to have no harmful effects on the setting, hardening and durability of the concrete. The admixtures, where used, shall conform to IS 2645 : 1975 or IS 9103 : 1979.

4.7 Water

The water used shall be free from matter harmful to concrete or reinforcement or matter likely to cause efflorescence in the units and shall conform to the requirements of IS 456 : 1978.

5 SHAPES AND DIMENSIONS**5.1 Shapes**

The shape of precast concrete manhole cover frames shall be square, rectangular or circular.

5.2 Dimensions and Tolerances

The dimensions and tolerances on dimensions of cover frames shall be as shown in Table 1 but inside dimensions at top shall match with the corresponding covers so that the maximum clearance at top between the frame and the cover is not more than 5 mm and the top surface of the frame and cover is in level within a tolerance of ± 5 mm.

6 DESIGN

6.1 Design of reinforced concrete manhole cover frame shall be done according to IS 456 : 1978.

7 MANUFACTURE

7.1 Mixing

Concrete shall be mixed in a mechanical mixer. Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency.

7.2 Placing and Compaction

The reinforcement shall be placed in proper position in steel moulds coated with a thin layer of mould oil. Concrete shall be filled to slightly overfill the moulds and compacted by vibration and struck off level with a trowel.

7.2.1 Use of needle vibrators for compacting the wet concrete mix containing fibres is not recommended since the holes left by the vibrator in the wet mix may not close after its removal owing to interlocking of the fibres with the mix. Compaction by means of shutter or form or table vibrators is recommended. In case of extra heavy duty and heavy duty cover frames, compaction by means of pressure cum-vibration technique may also be employed so as to achieve dense and strong concrete.

7.2.2 Clear cover to reinforcement shall be not less than 15 mm.

7.2.3 After demoulding, cover frames shall be protected until they are sufficiently hardened to permit handling without damage.

7.3 Curing

7.3.1 The hardened concrete manhole cover frame shall be placed in a curing water tank or taken to the curing yard where they shall be kept continuously moist for at least 28 days. Frames may be water cured by immersion in water, covering with water saturated material or by a system of perforated pipes, mechanical sprinklers or any other approved method that will keep to cover frames moist during the specified curing period.

7.3.2 Steam curing of manhole cover frames may be adopted instead of method specified in 7.3.1 provided the requirements of pressure or non-pressure steam curing are fulfilled and the manhole cover frames meet the requirements specified in this standard.

7.4 Edge Protection and Finishing

The top and inside surface of cover frames shall be smooth. To prevent the top outer edge from possible damages, it shall be protected by 25 mm \times 3 mm mild steel flat as part of the frame. Sufficient number of steel connectors shall be welded to the inner surface of the mild steel flat so as to connect it with the frame reinforcement and these shall be embedded in the concrete during casting. Exposed surface of mild steel flat shall be given suitable treatment with anticorrosive paint or coating.

7.4.1 Suitable arrangements may be made for fixing the manhole cover frames in position on the manholes by mutual agreement between the manufacturer and the purchaser.

8 PHYSICAL REQUIREMENTS

8.1 General

All the frames shall be sound and free from cracks and other defects which interferes with the proper placing of the units or impair the strength or performance of the units. Minor chippings resulting from the customary methods of handling and transportation shall not be deemed ground for rejection.

8.2 Dimensions

The overall dimensions of the cover frames shall be as specified in 5.

9 SAMPLING AND INSPECTION

9.1 Scale of Sampling

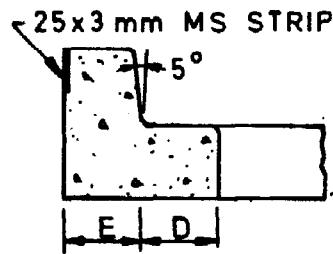
9.1.1 Lot

In a consignment 500 precast concrete manhole cover frames or a part thereof, of the same type and dimensions and belonging to the same batch of manufacturer, shall be grouped together to constitute a lot.

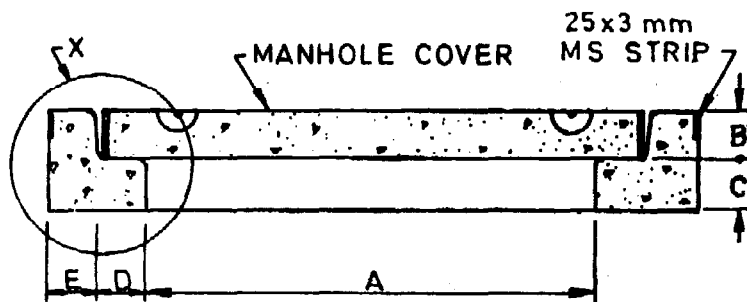
9.1.2 For ascertaining the conformity to the materials in the lot to the requirements of this specification, samples shall be tested from each lot separately.

9.1.3 The number of cover frames to be selected from the lot shall depend on the size of lot and shall be according to Table 2.

Table 1 Dimensions of Precast Concrete Manhole Cover Frames
(Clause 5.2)



DETAIL AT X



MANHOLE FRAME WITH COVER

Grade Designation	Description	Clear Opening of Frame, A	B	C	D	E
LD-2.5	Light Duty Rectangular	450 x 600	} According to thickness of cover	50	50	50
LD-2.5	Light Duty Square	450 x 450 400 x 400		50	50	50
LD-2.5	Light Duty Circular	370 350		50	50	50
MD-10	Medium Duty Circular	450 480 500		50	50	50
MD-10	Medium Duty Rectangular	450 x 600		50	50	50
HD-20	Heavy Duty Circular	500 560 600		75	75	75
HD-20	Heavy Duty Lamphole	350		75	75	75
HD-20	Heavy Duty Square	560 x 560		75	75	75
HD-20	Heavy Duty Rectangular (scraper manhole)	900 x 450		75	75	75
EHD-35	Extra Heavy Duty Circular	560 600		75	75	75
EHD-35	Extra Heavy Duty Square	560 x 560		75	75	75
EHD-35	Extra Heavy Duty Rectangular (scraper manhole)	900 x 600		75	75	75

NOTES

1 Tolerance on C shall be ± 5 mm and tolerance on D and E shall be $+5$ mm.
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2 For designs other than those given in the Table, the dimensions may be mutually agreed to between the manufacturer and the purchaser.

3 For facility of removing the manhole cover suitable upward tapering not more than 5° may be provided to the inner periphery of the frame.

4 Proper chamfering of corners as shown in Figure above Table 1 may be done by agreement between the manufacturer and the purchaser.

Table 2 Scale of Sampling and Permissible Number of Defectives

(Clauses 9.1.3 and 9.3.2)

No. of Cover Frames in the Lot	Dimensional Requirement	
	Sample Size	Acceptance Number
(1)	(2)	(3)
Up to 100	10	1
101 to 200	15	1
201 to 300	20	2
301 to 500	30	3

9.2 Number of Tests

All the cover frames selected according to 9.1.3 shall be checked for dimensions (see 8.2) and inspected for visual defects (see 8.1).

9.3 Criteria for Conformity

9.3.1 The lot shall be considered as conforming to the requirements of this specification if the conditions mentioned in 9.3.2 are satisfied.

9.3.2 The number of units with dimensions outside the tolerance limit and/or visual defects among those inspected shall be less than or equal to the corresponding acceptance number given in column 3 of Table 2.

10 MANUFACTURER'S CERTIFICATE

10.1 The manufacturer shall satisfy himself that the manhole cover frames conform to the requirements of this specification, and, if requested, shall supply a certificate to this effect to the purchaser or his representative.

11 MARKING

11.1 Following information shall be clearly and permanently marked on top of each manhole cover frame:

- Manufacturer's name or Trade Mark;
- Grade designation denoted by LD-2'5/MD-10/HD-20/EHD-35;
- Any identification mark as required by the purchaser.

11.1.1 Date of manufacture of the manhole cover frame shall be clearly and permanently marked at any appropriate location.

ANNEX A

(Item 2.1)

LIST OF REFERRED INDIAN STANDARDS

IS No.	Title	IS No.	Title
226 : 1975	Structural steel (standard quality) (fifth revision)	456 : 1978	Code of practice for plain and reinforced concrete (third revision)
269 : 1989	33 grade ordinary Portland cement (fourth revision)	1489 (Part 1) : 1991	Portland-pozzolana cement: Part 1 Flyash based (third revision)
383 : 1970	Coarse and fine aggregates from natural sources for concrete (second revision)	1489 (Part 2) : 1991	Portland-pozzolana cement: Part 2 Calcined clay based (third revision)
432 (Part 1) : 1982	Mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement: Part 1 Mild steel and medium tensile steel bars (third revision)	1786 : 1985	High strength deformed steel bars and wires for concrete reinforcement (third revision)
432 (Part 2) : 1982	Mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement: Part 2 Hard-drawn steel wire (third revision)	6909 : 1990	Supersulphated cement (first revision)
455 : 1989	Portland slag cement (fourth revision)	8041 : 1990	Rapid hardening Portland cement (second revision)
		8043 : 1991	Hydrophobic Portland cement (second revision)
		8112 : 1989	43 grade Ordinary Portland cement (first revision)

ANNEX B

(Foreword)

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