*भारतीय मानक*

*Indian Standard*

**IS 18661 : 2024**

# पूर्व ढ़लित कंक्रीट जाली — विशिष्टि

# Precast Concrete Grating — Specification

ICS 91.100.30



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Cement Matrix Products Sectional Committee, CED 53

FOREWORD

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

Precast concrete grating is a popular building material generally preferred over metal grating due to their strength, durability and ability to withstand heavy loads and extreme weather conditions. They are also relatively easy to install and require minimal maintenance, making them a cost-effective option for a wide range of construction projects.

Precast concrete grating is commonly used for applications where strong, durable and slip resistant surface is required. They are widely used in the construction of buildings, bridges, car parking areas, and drainage systems among other applications. Gratings can be manufactured in a range of sizes and shapes to suit the specific needs of a project.

Grating is a type of structural element that consists of a grid of concrete bars or slabs that are reinforced with steel to provide strength and stability. The steel reinforcement is typically in the form of welded wire mesh or steel bars, which are embedded within the concrete during the casting process.

This standard contributes to the Sustainable Development Goal 9 'Industry innovation and infrastructure' — Build resilient infrastructure promote inclusive and sustainable industrialization and foster'.

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

This standard contains **4** which gives option to the purchaser to manufacture precast concrete gratings with shape and size other than that in Table 1.

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 : 2022 'Rules for rounding off numerical values (*second revision*)'. 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 GRATING — SPECIFICATION

## 1 SCOPE

This standard covers classification, dimensions, manufacture, physical requirements, sampling, criteria of conformity and marking of precast concrete grating. Precast concrete grating is used for covering gullies, manholes, drains and inspection chambers installed in areas subjected to pedestrian and/or vehicular traffic.

## 2 REFERENCES

The standards listed in Annex A contain provisions, which through references in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

## 3 TERMINOLOGY

For the purpose of this standard, the following definition shall apply.

**3.1 Grating** — Movable part(s) or opening within a manhole top or a gully top which permit(s) the passage of water through itself into the gully or manhole.

## 4 DIMENSIONS

### 4.1 Grating Shape and Size

The precast concrete gratings may be made in square, rectangular, circular or any other shapes as per agreement between manufacture and purchaser. The most commonly used shapes and size of precast concrete gratings are given in Table 1. The minimum thickness of precast concrete grating shall be 50 mm. Precast concrete gratings with shape and size other than those given in Table 1 may also be manufactured as per agreement between manufacture and purchaser, however the tolerance given in **8.2** shall be applicable to all sizes.

### 4.2 Slot Shape and Size

Shape, size and number of the slots in precast concrete grating are decided in view of the required hydraulic capacity. Total area of the slot shall be at latest 30 percent of the area of the grating. Slot in grating shall be provided, in any shape, like circular, rectangular or square. All slots in the grating shall be evenly distributed throughout the grating, however minimum 60 mm distance shall be maintained between outer edges of any two slots and outer edge of any slot to grating's edge (*see* Fig. 1).

## 5 CLASSIFICATION

On the basis of intended end use precast concrete grating are classified into 6 categories as given below:

| *Sl No.* | *Types* | *Remarks* |
|---|---|---|
| (1) | (2) | (3) |
| i) | LD | Areas which can only be used by pedestrians and pedal cyclists |
| ii) | MD | Pedestrian areas and comparable areas, car parks or car parking decks |
| iii) | HD | For gully tops, installed in the area of kerbside channels of roads which, when measured from the kerb edge, extends a maximum of 0.5 m into the carriageway and a maximum of 0.2 m into the pedestrian area |
| iv) | EHD1 | Carriageways of roads (including pedestrian streets), hard shoulders and parking areas, for all types of road vehicles |
| v) | EHD2 | Areas imposing high wheel loads, for example, docks, ports |
| vi) | EHD3 | Areas imposing particularly high wheel loads, for example, aircraft pavements |

## 6 MANUFACTURE AND DESIGN

### 6.1 Manufacture

The concrete used in the manufacturing of precast concrete gratings shall be compacted in moulds by hydraulic or vibratory press or hydraulic-cum-vibratory press with design mix concrete as specified in IS 456. The concrete used in the

manufacture of precast concrete manhole components shall not be of a grade designation lower than M 35. The production, batching, mixing, placing, compaction and curing of concrete shall be as per IS 456. The minimum nominal cover for reinforcement shall not be less than 30 mm. However, nominal cover may be increased depending on the severity of site conditions. The method of manufacture shall be such that the forms and dimensions of the finished product are accurate within the limits specified in this standard.

### 6.2 Design

The precast concrete gratings shall be designed in accordance with the provision of IS 456. Placing of reinforcement shall be done in such a way so that the criteria of minimum 30 mm clear cover shall be satisfied. Positioning of reinforcement shall be assisted by welding, tying or other suitable methods.

**Table 1 Dimension of Precast Concrete Gratings**

(*Foreword* and clause 4.1)

| Sl No. | Parameter | Dimensions<br>mm |
|---|---|---|
| (1) | (2) | (3) |
| i) | Length (L) | 250, 300, 400, 500, 600, 650, 700, 750, 800, 900, 1 000, 1 100, 1 200, 1 500 |
| ii) | Width (W) | 250, 300, 400, 450, 500, 550, 600, 650 |
| iii) | Thickness (T) | As per design |

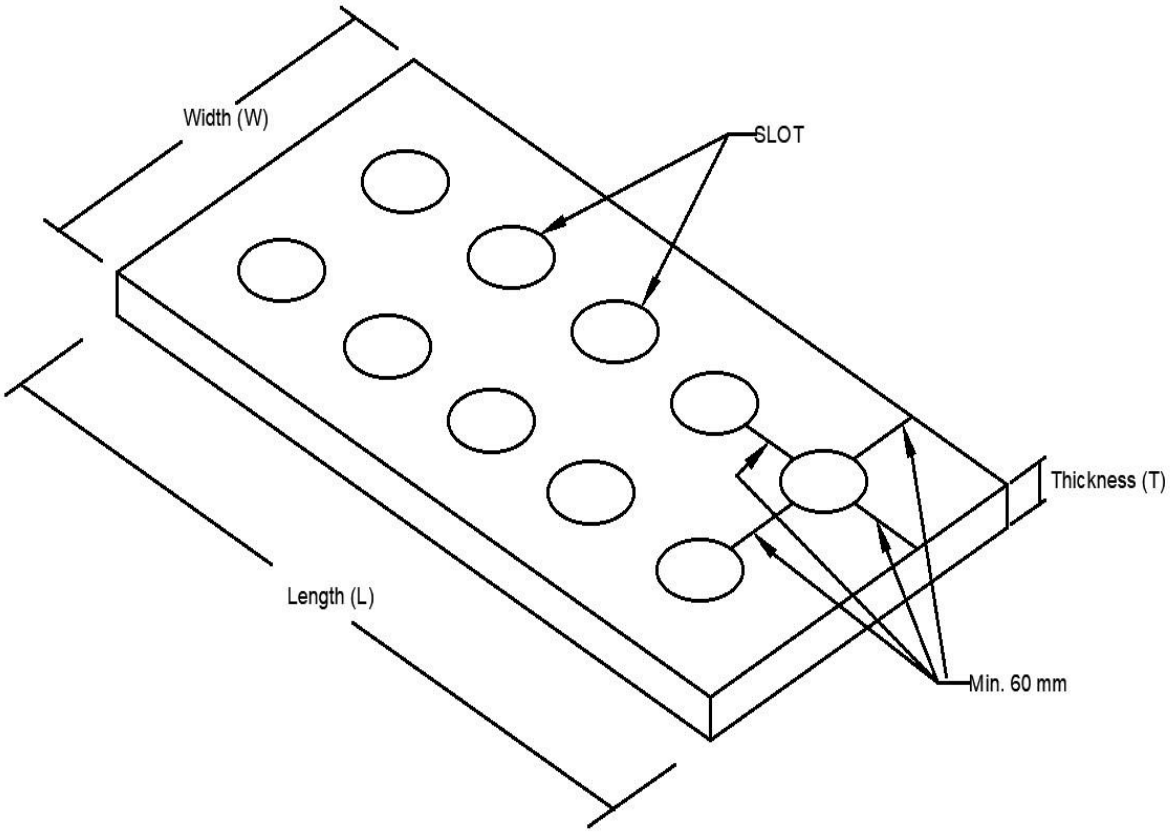


FIG. 1 TYPICAL ILLUSTRATION OF GRATING

## 7 MATERIALS

The materials used shall be as per 7.1 to 7.5.

### 7.1 Cement

Cement complying with any of the following Indian Standards may be used:

a) Ordinary Portland cement conforming to IS 269;

b) Portland slag cement conforming to IS 455;

c) Sulphate resisting Portland cement conforming to IS 12330;

d) Portland pozzolana cement fly ash based conforming to IS 1489 (Part 1);

e) Portland pozzolana cement, calcined clay based conforming to IS 1489 (Part 2);

f) Super sulphated cement conforming to IS 6909;

g) Rapid hardening Portland cement conforming to IS 8041;

h) White Portland cement conforming to IS 8042; and

j) Hydrophobic Portland cement conforming to IS 8043.

### 7.2 Aggregates

Fine and coarse aggregates used in the manufacture of gratings shall conform to IS 383.

### 7.3 Reinforcement

Steel for reinforcement of concrete complying with any of the following standards may be used:

a) Mild steel and medium tensile steel bars conforming to IS 432 (Part 1);

b) Hard-drawn steel wire conforming to IS 432 (Part 2);

c) High strength deformed steel bars and wires conforming to IS 1786; and

d) Hot rolled medium and high tensile structural steel conforming to IS 2062.

### 7.4 Pulverized Fuel Ash

Pulverized fuel ash shall conform to IS 3812 (Part 1).

### 7.5 Ground Granulated Blast Furnace Slag

Ground granulated blast furnace slag, if used, shall conform to IS 16714.

### 7.6 Admixtures

Admixtures, if used, shall conform to IS 9103.

### 7.7 Steel Fibres

The diameter/equivalent diameter of steel fibres if 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. In case of propriety fibres, manufacturer's recommendations shall be taken into account.

### 7.8 Water

Water shall be clean and free from injurious amounts of deleterious materials. Potable water is generally considered satisfactory for use in concrete. For further requirements regarding limits of deleterious materials permitted in water, reference may be made to IS 456.

## 8 REQUIREMENTS

### 8.1 General

All units shall be sound and free of cracks or other defects which interfere with the proper placing of the unit or which impair the strength or performance of the construction. Minor chipping resulting from the customary methods of handling during delivery, shall not be deemed grounds for rejection. All angles of the units shall be true right angles.

### 8.2 Dimensions and Tolerances

The values for the permissible deviation on the manufacturer’s declared work dimension is as given below:

a) Linear: ± 1 percent to the nearest millimetre with a minimum of 4 mm, not exceeding 10 mm.

### 8.3 Compressive Strength

The minimum average compressive strength of concrete cube shall not be less than 35 Mpa when tested as per IS 516 (Part 1/Sec 1).

### 8.4 Permanent Set

The permanent set of concrete gratings, when tested as per the procedure given in IS 12592, shall not be more than the value given in Table 2.

### 8.5 Load Test

The minimum load bearing capacity of grating when tested as per the procedure given in IS 12592, shall not be less than the values specified in Table 3.

### 8.6 Water Absorption

The average water absorption of three units, when determined in the manner prescribed in IS 12592 shall not be more than 6 percent by mass.

## 9 SAMPLING AND INSPECTION

### 9.1 Scale of Sampling

**9.1.1** *Lot*

In any consignment, precast concrete grating manufactured with same type of raw material and having same dimensions and type shall be grouped together to constitute a lot.

**9.1.2** The number of precast concrete grating to be selected from the lot shall depend on the size of the lot and shall be according to Table 4.

### 9.2 Number of Tests

**9.2.1** All the grating selected according to **9.1.2**, shall be inspected for visual defects (*see* **8.1**) and checked for dimensions (*see* **8.2**).

**9.2.2** The number of grating to be subject to load test shall be according to col (5) of Table 4.

## 10 CRITERIA FOR CONFORMITY

**10.1** The lot shall be considered as conforming to the requirements of the specification if the conditions mentioned in **10.2** and **10.3** are satisfied.

**10.2** The number of grating with dimensions outside the tolerance limit and/or with visual defects among those inspected shall be less than or equal to the corresponding acceptance number given in col (4) of Table 4.

**10.3** For load test, no value shall be less than the load specified in Table 3.

## 11 MANUFACTURER'S CERTIFICATE

The purchaser shall satisfy himself that the manhole grating conform to the requirements of this specification and if requested, the manufacturer shall supply a certificate to this effect to the purchaser or his representative. This certificate shall include information that a minimum 50 mm continuous support shall be provided for the end bearing for installation of grating.

## 12 MARKING

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

a) Identification of the source of manufacture;

b) Type and size of grating;

c) Date of production or batch number; and

d) Any identification mark as required by the purchaser.

### 12.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

**Table 2 Permanent Set**

(*Clause* 8.4)

| Sl No. | Types | Permanent Set mm, *Max* | Additional Requirement |
|---|---|---|---|
| (1) | (2) | (3) | (4) |
| i) | For LD, MD and HD | 1/100 time the diameter of the largest circle that can be inscribed in the clear area of the grating | The permanent set shall be measured to an accuracy of 0.1 mm. Further, no crack wider than 0.2 mm shall appear in the concrete after this test at bottom side of grating |
| ii) | For EHD1, EHD2 and EHD3 | 1/300 time the diameter of the largest circle that can be inscribed in the clear area of the grating | |

**Table 3 Load Test**

(*Clauses* 8.5 *and* 10.3)

| Sl No. | Types | Minimum Load Bearing Capacity kN |
|---|---|---|
| (1) | (2) | (3) |
| i) | LD | 25 |
| ii) | MD | 100 |
| iii) | HD | 200 |
| iv) | EHD | 350 |
| v) | EHD1 | 600 |
| vi) | EHD2 | 900 |

**Table 4 Scale of Sampling and Permissible Number of Defectives**

(*Foreword*, *clauses* 9.1.2 , 9.2.2 *and* 10.2)

| Sl No. | No. of Precast Concrete Grating in the Lot | Dimensional Requirements | | No. of Samples for Load Test |
|---|---|---|---|---|
| | | Sample Size | Acceptance Number | |
| (1) | (2) | (3) | (4) | (5) |
| i) | Up to 100 | 10 | 1 | 2 |
| ii) | 101 to 200 | 15 | 1 | 3 |
| iii) | 201 to 300 | 20 | 2 | 4 |
| iv) | 301 to 500 | 30 | 3 | 5 |

NOTE — If the number of grating in the lot is 20 or less. the number of samples for load test shall be decided by mutual agreement between the purchaser and the manufacturer.

## ANNEX A

(*Clause 2*)

## LIST OF REFERRED STANDARDS

| *IS No.* | *Title* |
|---|---|
| IS 269 : 2015 | Ordinary Portland cement — Specification (*sixth revision*) |
| IS 383 : 2016 | Coarse and fine aggregates for concrete — Specification (*third revision*) |
| IS 455 : 2015 | Portland slag cement — Specification (*fifth revision*) |
| IS 456 : 2000 | Plain and reinforced concrete — Code of practice (*fourth revision*) |
| IS 516 (Part 1/ Sec 1) : 2021 | Hardened concrete — Methods of test: Part 1 Testing of strength of hardened concrete, Section 1 Compressive, flexural and split tensile strength (*first revision*) |
| IS 1489 | Portland pozzolana cement — Specification: |
| (Part 1) : 2015 | Fly ash based (*fourth revision*) |
| (Part 2) : 2015 | Calcined clay based (*fourth revision*) |
| IS 3812 | Pulverized fuel ash — Specification: |
| (Part 1) : 2013 | For use as pozzolana in cement, cement mortar and concrete (*third revision*) |
| (Part 2) : 2013 | For use as admixture in cement mortar and concrete (*third revision*) |
| IS 6909 : 1990 | Supersulphated cement — Specification (*first revision*) |
| IS 8041 : 1990 | Rapid hardening Portland cement — Specification (*second revision*) |
| IS 8042 : 2015 | White Portland cement — Specification (*third revision*) |
| IS 8043 : 1991 | Hydrophobic Portland cement — Specification (*second revision*) |
| IS 9103 : 1999 | Concrete admixtures — Specification (*first revision*) |
| IS 12592 : 2002 | Precast concrete manhole cover and frame — Specification (*first revision*) |
| IS 16714 : 2018 | Ground granulated blast furnace slag for use in cement, mortar and concrete — Specification |

**ANNEX B**

(*Foreword*)

**COMMITTEE COMPOSITION**

Cement Matrix Products Sectional Committee, CED 53

| *Organization* | *Representative(s)* |
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| [*Former Joint Director and Head CDR National Council for Cement and Building Materials, Ballabgarh*] | **(*Chairperson*)** |
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| Brihan Mumbai Municpal Corporation, Mumbai | SHRI VISHAL THOMBARE |
| Central Designs Organization, Water Resources Deptt, Govt of Maharashtra, Nashik | REPRESENTATIVE |
| Central Pollution Control Board, New Delhi | SHRI J. S. KAMYOTRA<br>SHRI P. K. GUPTA (*Alternate*) |
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| Indian Institute of Technology Delhi, New Delhi | PROF R. AYOTHIRAMAN |
| JSW cement limited, Mumbai | SHRIMATI LOPAMUDRA SENGUPTA<br>SHRI HARI PRASAD RAO (*Alternate*) |

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## Amendments Issued Since Publication

| Amend No. | Date of Issue | Text Affected |
|---|---|---|
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