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"पुराने को छोड नये के तरफ"
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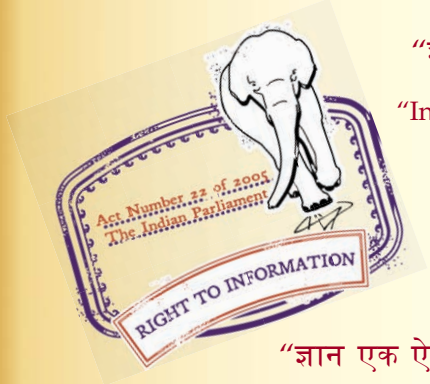
IS 785 (1998): Reinforced Concrete Poles for Overhead Power and Telecommunication Lines - [CED 53: Cement Matrix Products]



"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS 785 : 1998
(Reaffirmed 2004)

भारतीय मानक

शिरोपरि पावर और दूर संचार लाईनों के लिए प्रबलित काँक्रीट के खम्बे — विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

REINFORCED CONCRETE POLES FOR OVERHEAD POWER AND TELECOMMUNICATION LINES — SPECIFICATION

(Second Revision)

ICS 91.100.30

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

March 1998

Price Group 4

FOREWORD

This Indian Standard (Second Revision) 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.

This specification has been prepared with a view to clarifying and defining design requirements for different types of reinforced cement concrete poles used in overhead electric power transmission, telephone and telegraphs circuits. The specification relates to concrete poles in the manufacture of which mechanical compacting methods, such as vibration, shocking, spinning, etc, have been adopted, and does not relate to hand compacted poles.

This standard was first published in 1957 and subsequently revised in 1964. The present revision has been taken up with a view to incorporating the modification found necessary in the light of experience gained with the use of this standard and due to revision of various referred standards. This revision incorporates significant modifications in respect of materials, design, depth of planting, testing, sampling and inspection.

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

REINFORCED CONCRETE POLES FOR OVERHEAD POWER AND TELECOMMUNICATION LINES — SPECIFICATION

(Second Revision)

1 SCOPE

This standard covers reinforced concrete poles suitable for use in overhead power, traction and telecommunication lines. This standard does not cover prestressed concrete poles or prestressed concrete poles using untensioned reinforcement.

2 REFERENCES

The Indian Standards listed in Annex A contain provisions which, through reference in this text, constitute provision 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 editions of the standards listed in Annex A.

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions shall apply.

3.1 Ultimate Failure

The conditions existing when the pole ceases to sustain a load increment owing to either crushing of concrete, snapping or permanent stretching of the reinforcing steel in any part of the pole.

3.2 Load Factor

The ratio of ultimate transverse load to the transverse load at first crack. For design, the transverse load at first crack shall be taken as not less than the value of the working load.

3.3 Transverse

The direction of the line bisecting the angle contained by the conductor at the pole. In the case of straight run, this will be normal to the run of the pole.

3.4 Ultimate Transverse Load

The load at which failure occurs, when it is applied at a point 600 mm below the top and perpendicular to the axis of the pole along the transverse direction with the butt end of the pole planted to the required depth as intended in the design.

3.5 Working Load

The maximum load in the transverse direction, that is, ever likely to occur, including the wind pressure on the pole. This load is assumed to get at a point 600 mm below the top with the butt end of the pole planted to the required depth as intended in the design.

4 OVERALL LENGTH OF POLES

4.1 The minimum overall length of poles shall be 6 m and the maximum overall length shall not exceed 9 m. Further, the lengths shall be in steps of 0.5 m.

4.2 Tolerances

The tolerances for reinforced concrete poles shall be as under:

a)	Overall length of poles	± 15 mm
b)	Cross-sectional dimension	+ 5 mm − 3 mm
c)	Uprightness or straightness	0.5 percent

5 MATERIALS

5.1 Cement

The cement used in the manufacture of reinforced concrete poles shall be any of the following:

a) 33 grade ordinary Portland cement conforming to IS 269,

b) 43 grade ordinary Portland cement conformning to IS 8112,

c) 53 grade ordinary Portland cement conforming to IS 12269,

d) Portland slag cement conforming to IS 455,

e) Portland pozzolana cement : Part 1 Fly ash based conforming to IS 1489 (Part 1),

f) Portland pozzolana cement : Part 2 Calcined clay based conforming to IS 1489 (Part 2), and

g) Rapid hardening Portland cement conforming to IS 8041.

5.2 Aggregates

Aggregates used for the manufacture of reinforced concrete poles shall conform to IS 383. Where specified, a sample of the aggregate shall be submitted by the manufacturer to the purchaser for approval.

5.3 Reinforcement

Reinforcing bars and wires used for the manufacture of reinforced concrete poles shall conform to the following:

a) Mild steel and medium tensile steel bars and hard-drawn steel wires conforming to IS 432 (Part 1) and IS 432 (Part 2), and

b) High strength deformed bars and wires conforming to IS 1786.

5.3.1 The surface of all reinforcement shall be free from loose scale, loose rust, oil, grease, clay or other material that may have deteriorating effect on the bond between the reinforcement and the concrete.

5.4 Admixture

Admixtures if used shall conform to IS 9103.

5.5 Concrete

Minimum grade of concrete used for the manufacture of reinforced concrete poles shall be M 25.

5.6 Water

The requirement of water used for mixing and curing shall conform to the requirements given in IS 456. Sea water shall not be used.

6 DESIGN

6.1 The poles shall be so designed that they do not fail owing to failure initiated by compression in concrete.

6.2 Loading

The maximum wind pressure to be assumed for computing the design working load shall be as specified by the State Governments, who are empowered in this behalf under the *Indian Electricity Rules,* 1956. Wind pressure may also be determined as specified in IS 875 (Part 3).

6.3 Depth of Planting

The minimum depth of planting of a pole below ground level shall be in accordance with Table 1, the actual depth being determined on the basis of ground conditions.

Table 1 Minimum Depth of Planting of Reinforced Concrete Poles in the Ground
(*Clause* 6.3)

Length of Pole	Minimum Depth of Planting in Ground
m	m
(1)	(2)
6.0 to 7.0	1.20
7.5 to 9.0	1.50

6.4 Transverse Strength at Failure

The poles shall be so designed that its strength in transverse direction shall be sufficient to take the load due to wind on wires and poles, multiplied by load factor. Where specifically stated, snow load shall also be taken into consideration. The design shall also ensure that, at design working load, the stresses and strains are such as not to cause any harmful cracking in the pole.

6.4.1 The strength of the pole in the direction of the line shall not be less than one-quarter of the strength required in the transverse direction.

6.4.2 The load factor on transverse strength for reinforced concrete poles shall not be less than 2.

6.4.3 Poles intended to be fitted with stays or struts shall be designed accordingly, and if required by the purchaser, they shall be appropriately tested.

6.5 Method of selection of reinforced concrete pole in any given situation shall be as specified in IS 7321.

7 MANUFACTURE

7.1 All reinforcement shall be accurately placed and maintained in position during manufacture. All buttons or chairs or other devices used to obtain the necessary cover shall be of corrosion-resistant material.

7.2 Cover

The cover of concrete overall reinforcement shall be atleast equal to the maximum size of aggregate plus 2 mm but in no case less than 20 mm.

7.3 Welding and Lapping of Reinforcement

Welding and lapping of reinforcement shall be as given in IS 456.

7.4 Forms

7.4.1 Forms shall be of the shape required and shall be so constructed as to maintain their shape during the placing and compaction of the concrete. They shall be sufficiently tight to prevent loss of liquid from the concrete.

7.4.2 *Removal of Forms*

Forms shall not be removed until the concrete has hardened sufficiently so that the surface is not marred by the removal of the forms. Poles shall not be moved until the concrete has attained sufficient strength to withstand the stresses introduced during demoulding.

7.5 Placing, Compaction and Curing of Concrete

7.5.1 The concrete shall be used as soon as possible after being mixed and no material which has developed an initial set shall be used in the work. After the concrete has been placed in the moulds and compacted, it shall not be disturbed during the period of setting. For depositing concrete in hot weather, IS 7861 (Part 1) may be referred.

7.5.2 *Compacting*

Concrete shall be compacted by spinning, vibrating, shocking or other suitable mechanical means. Hand compaction shall not be permitted.

7.5.3 *Curing*

After placing, the concrete shall be adequately protected, during setting and in the first stages of hardening, from shocks, running or surface water and the harmful effects of sunshine, drying winds and cold. The concrete shall be cured for at least 28 days unless special curing methods are adopted, in such cases it shall be cured till the required strength is achieved. Steam curing of concrete may be adopted if so desired by the manufacturer provided the requirements of pressure or non-pressure steam curing are fulfilled.

7.6 Finish

The concrete when removed from the mould shall be of good finish and free from honeycombing. All arrises shall be clean and true and shall present a neat appearance.

7.7 Tests on Concrete

During manufacture, test on concrete shall be carried out as specified in IS 456. The manufacturer shall supply when required by the purchaser of his representative, results of compressive test on concrete cylinders or cubes made from the concrete used for the poles. If the purchaser so desires, the manufacturer shall supply cylinders or cubes for test purposes and such cylinders or cubes shall be tested in accordance with IS 516 .

7.8 Earthing

7.8.1 Earthing shall be provided by one of the following means:

a) By having a length of 25 mm × 3 mm copper strip or equivalent bare copper cable or 4 mm dia galvanized iron wire embedded in concrete during manufacture and the ends of the strip or cable left projecting from the pole to a length of 50 mm at 215 mm from top and 150 mm below ground level (*see* Fig. 1).

b) By providing two holes of suitable dimensions 215 mm from top and 150 mm below ground level (*see* Fig. 1) to enable 25 mm × 3 mm copper strip or equivalent bare copper cable to be taken from the top hole to the bottom through the central hole.

7.8.2 The purchaser shall specify the type of earthing to be provided.

7.9 Holes

During manufacture, sufficient holes shall be provided in the poles for the attachment of cross arms and other equipment. A typical arrangement of holes shown in Fig. 1 permits the use of reinforced concrete poles in conjunction with wood or steel cross arms, but other arrangements may be specified by the user. Holes for kicking block may be provided, if necessary.

7.10 Eye Hook

To facilitate handling of poles during transport and erection, an eyehook may be provided suitably in every pole below ground level on the face of the poles so as to utilize the maximum flexural strength of the section during handling.

8 TESTS

8.1 Transverse Strength Test

The transverse strength test of reinforced concrete poles shall be conducted in accordance with IS 2905. A reinforced concrete pole shall be deemed not to have passed the test if the observed ultimate transverse load is less than the design ultimate transverse load.

9 SAMPLING AND INSPECTION

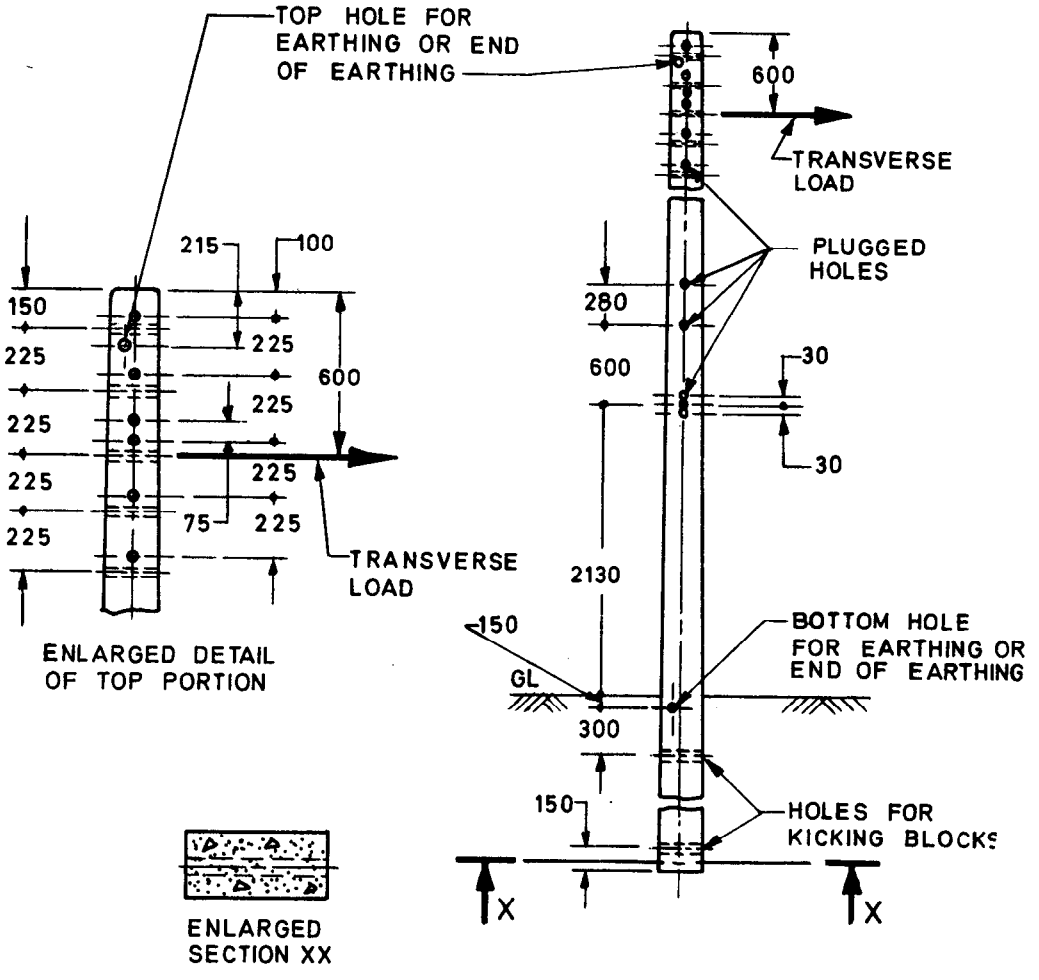
9.1 Scale of Sampling

9.1.1 *Lot*

In a consignment of 500 poles or a part thereof the same mounting height, same dimensions and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

9.1.2 For ascertaining the conformity of 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 poles to be selected from the lot shall depend on the size of the lot and shall be according to Table 2.



NOTES

1 All holes except where otherwise specified shall be of 20 mm dia.

2 This figure gives information on holes and marking only and should not be used as a basis for design.

All dimensions in millimetres.

FIG. 1 TYPICAL DETAILS OF POLE IN DIRECTION OF LINE

9.2 Number of Tests and Criteria for Conformity

9.2.1 All the poles selected according to **9.1.3** shall be tested for overall length, cross-section and uprightness (*see* **4.2**). A pole failing to satisfy one or more of these requirements shall be considered defective. All the poles in the lot shall be considered as conforming to these requirements if the number of defective poles found in the sample is less than or equal to the corresponding acceptance number given in col 3 of Table 2.

9.2.2 The lot having been found satisfactory according to **9.2.1** shall be further tested for transverse strength (*see* **8.1**) of the poles. For this purpose, the number of poles given in col 4 of Table 2 shall be tested, these poles may be selected from those already tested.

Table 2 Scale of Sampling and Permissible Number of Defectives

(*Clauses* 9.1.3, 9.2.1 *and* 9.2.2)

No. of Poles in the Lot	Sample Size	Dimensional Requirements Acceptance Number	Transverse Strength Test
(1)	(2)	(3)	(4)
Up to 100	10	1	2
101 " 200	15	1	3
201 " 300	20	2	4
301 " 500	30	3	5

NOTE — The number of poles to be tested shall be subject to agreement between the purchaser and the supplier.

according to **9.2.1** and found satisfactory. All these poles tested for transverse strength shall satisfy the corresponding specification requirements. If one or more poles fail, twice the number of poles orginally tested shall be selected from those already selected and subjected to this test. If there is no failure among poles, the lot shall be considered to have satisfied the requirements of this test.

10 MARKING

10.1 The poles shall be clearly and indelibly marked with the following particulars either curing or after the manufacture, but before testing, at a position so as to be clearly read after erection in position:

a) Indication of the source of manufacture,

b) Month and year of manufacture,

c) Serial number of the poles, and

d) Position of centre of gravity of the poles with the words 'C.G'.

10.2 BIS Certification Marking

The poles may also be marked with the Standard Mark.

10.2.1 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 thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
269 : 1989	Specification for 33 grade ordinary Portland cement (*fourth revision*)
383 : 1970	Specification for coarse and fine aggregates from natural sources for concrete (*second revision*)
432	Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement
(Part 1) : 1982	Mild steel and medium tensile steel bars (*third revision*)
(Part 2) : 1982	Hard drawn steel wire (*third revision*)
455 : 1989	Specification for Portland slag cement (*fourth revision*)
456 : 1978	Code of practice for plain and reinforced concrete (*third revision*)
516 : 1959	Method of test for strength of concrete
875 (Part 3) : 1987	Code of practice for design loads (other than earthquake) for buildings and structures : Part 3 Wind loads (*second revision*)
1489	Specification for Portland pozzolana cement:
(Part 1) : 1991	Flyash based (*third revision*)
(Part 2) : 1991	Calcined clay based (*third revision*)
1786 : 1985	Specification for high strength deformed steel bars wires for concrete reinforcement (*third revision*)
2905 : 1989	Method of test for concrete poles for overhead power and telecommunication lines (*first revision*)
7321 : 1974	Code of practice for selection, handling and erection of concrete poles for overhead power and telecommunication lines
7861 (Part 1) : 1975	Code of practice for extreme weather concreting : Part 1 Recommended practice for hot weather concreting
8041 : 1990	Specification for rapid hardening Portland cement (*first revision*)
8112 : 1989	Specification for 43 grade ordinary Portland cement (*first revision*)
9103 : 1979	Specification for admixture for concrete
12269 : 1987	Specification for 53 grade ordinary Portland cement

ANNEX B

(Foreword)

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Member-Secretary

SHRI J. K. PRASAD
Additional Director (Civ Engg), BIS

(*Continued on page 7*)

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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