IS 2905 : 1989
(Reaffirmed 1997)

Indian Standard

CONCRETE POLES FOR OVERHEAD POWER AND TELECOMMUNICATION LINES — METHODS OF TEST

(First Revision)

भारतीय मानक

शिरोपी पावर तथा दूरसंचार लाइनों के लिए कंकरीट के खम्भें — परीक्षण पद्धति

(पहला पुनरीक्षण)

First Reprint JUNE 1993

UDC 621.315.668.3

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

July 1990

Price Group 3

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 21 December 1989, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

Apart from the requirements regarding design, materials, process of manufacture, dimensions, shape, workmanship, finish, etc, acceptability of a product is determined by the results of various tests to evaluate the properties stipulated in the relevant specifications. This standard lays down the procedure for testing of reinforced concrete as well as prestressed concrete poles for street lighting, overhead electric power transmission, traction and telecommunication lines.

In addition to the test specified in this standard, inspection of the process of manufacture and the quality of the finished poles and other tests for the quality control of materials during manufacture, shall be carried out in accordance with the requirements of relevant specifications.

This standard was first published in 1966. In this revision, the test for torsional strength has been deleted since this test is not considered necessary for poles. In addition, the length of straight rope required to apply the load on the pole has been modified and the provision regarding fixing of the pole in conformity with the type of foundation to be used has been deleted. The figure illustrating the testing arrangement has also been modified in this revision.

The composition of the committee responsible for the preparation of this standard is given in Annex A.

Indian Standard

CONCRETE POLES FOR OVERHEAD POWER AND TELECOMMUNICATION LINES — METHODS OF TEST

(First Revision)

1 SCOPE

1.1 This standard covers methods of test for concrete poles for street lighting, overhead electrical power transmission, traction, telephone and telegraph lines, to evaluate the properties stipulated in the relevant specifications.

2 INSPECTION

2.1 The materials to be used, processes of manufacture, and finished poles shall be open to inspection and approval by the purchaser.

3 TESTING FACILITIES

3.1 Unless otherwise specified in the relevant specification or agreed to between the manufacturer and the purchaser, the purchaser or his representative shall have, at all reasonable times, free access to the place of manufacture of the poles for the purpose of examining, sampling and testing the materials and for inspecting the process of manufacture.

4 GENERAL PRECAUTIONS

4.1 Unless otherwise specified in the relevant specification for the pole being tested, tests on poles shall not be carried out earlier than 28 days after the date of manufacture for poles manufactured from 33 grade ordinary Portland cement, Portland pozzolana cement or Portland slag cement and not earlier than 14 days after the date of manufacture for poles manufactured from rapid-hardening Portland cement and 43 grade and 53 grade ordinary Portland cement. The test specimens shall not have been exposed to a temperature below 4°C for 24 hours immediately preceding the test and shall be free from all visible moisture. The specimens shall be inspected and any specimen with visible flaws shall be discarded.

4.2 If any test specimen fails because of mechanical reasons, such as, failure of testing equipment or improper specimen preparation, it shall be discarded and other specimen taken.

5 SELECTION OF TEST SPECIMENS

5.1 In addition to the requirements specified in this standard, the number of test specimens and the methods of their selection shall be in accordance with specification for the type of pole being tested.

6 TRANSVERSE STRENGTH TEST

6.1 General

The pole may be tested in either horizontal or vertical position. If tested in the horizontal position, provision shall be made by suitable supports to compensate for the overhanging mass of the pole. For this purpose, the overhanging portion of the pole may be supported on a movable trolley or similar device. The frictional resistance of the supporting devices should be separately determined and deducted from the final load applied on the pole (*see* **6.2.5**).

6.2 Test Equipment

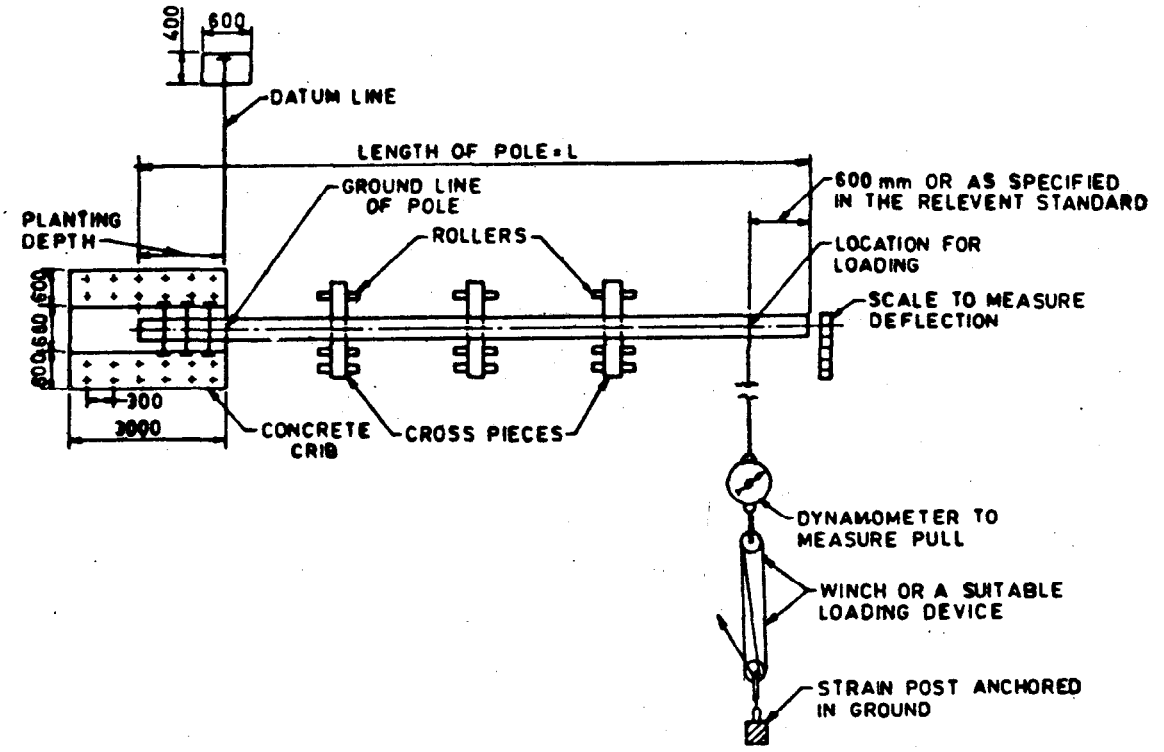
6.2.1 A schematic drawing of the test equipment and full layout for conducting tests is shown in Fig. 1. The butt of the pole shall be rigidly clamped by concrete cribs or similar rigid devices in such a manner that the clamped length of the pole shall be equal to the minimum depth of planting specified in the relevant standards. The crib shall check all longitudinal and rotational motions of the clamped portion of the pole.

6.2.1.1 The pole shall be fixed in the crib longitudinally from butt to its ground line and then it shall be secured firmly in place. Wooden saddles with concave surfaces and other packings shall be placed around the pole to prevent injury to the butt section.

6.2.2 To minimize vertical movement at the point of load application and to reduce the stresses due to dead mass of the pole, a suitable number of frictionless supports in the form of trollies shall be provided between the ground line and the point of application of the load. Support shall be such that any friction associated with the deflection of pole under load shall not be a significant portion of the measured load on the pole.

6.2.3 *Loading*

The load shall be applied at a point stipulated in the relevant Indian Sandard by means of a suitable device, such as, a wire rope and winch placed in a direction normal to the direction of the length of the pole so that the minimum length of the straight rope under pull is not less than the length of the pole. If the loading



All dimensions in millimetres.

FIG. 1 TYPICAL ARRANGEMENT FOR TESTING OF CONCRETE POLES

device is set sufficiently far away from the pole to make the angle between the initial and final positions of pulling line small, the error in assuming that the pull is always perpendicular to the original direction of the pole axis will be negligible. The pulling line shall be kept level between the pulling device position and the point where load is applied to the pole. The load shall be applied at a constant rate of 4 percent of the specified test load per minute and in accordance with **6.3.1**.

6.2.4 *Pulling Line*

The pulling line shall be secured around the pole at the load point. Load measuring device shall be placed in a way so as to accurately measure the tension in the pulling line, the other end of which is attached to the loading equipment.

6.2.5 *Load Measurement*

Dynamometer or any other satisfactory method of load measurement capable of measuring load to the accuracy of 50 N may be adopted. The dynamometer or other load measuring device shall be calibrated at regular intervals. The load measuring device shall be supported in such a way that it should record only the load applied to the pole and that no damage is caused to the instrument if the pole suddenly breaks under test. The frictional resistance of supporting devices and the rope line pulleys shall be separately determined and necessary corrections applied to the readings of the dynamometer or other load measuring devices.

6.2.6 *Deflection*

The deflection of the pole and the load applied shall be measured simultaneously at different stages of loading to provide at least five sets of readings. The measurement of deflection of the load point shall be made in a direction perpendicular to the unloaded position of the pole axis. The arrangement for measuring the deflections is shown in Fig. 1. The measurements shall be made correct to the nearest 5 mm by the use of a measuring scale.

A datum line shall be established from which the movement of the ground line, if any, shall be measured.

6.3 Procedure

6.3.1 Load shall be applied as mentioned in **6.2.3** and shall be steadily and gradually increased to the design value of the transverse load at first crack. The deflection at this load shall be measured.

Deflection at any other test load shall be measured according to the requirement of the relevant specification for the pole being tested.

The load shall then be reduced to zero and increased gradually to a load equal to the first crack load plus 10 percent of the minimum

ultimate transverse load and held up for 2 minutes. This procedure shall be repeated until the load reaches the value of 80 percent of the ultimate transverse load and thereafter increased by 5 percent of the ultimate transverse load until failure occurs. Each time the load is applied, it shall be held for 2 minutes. The load applied shall be measured to the nearest 50 N.

6.3.2 *Recording of Data and Measurement*

6.3.2.1 Any hair cracks appearing at a stage prior to the application of design transverse load at first crack shall be measured using feeler gauges and shall be recorded. It should also be recorded whether the hair cracks, if any, produced on application of 60 percent of the minimum ultimate transverse load close up on the removal or reduction of the test load. Recording of loads and deflections shall be made according to the requirements specified in relevant specification for the pole being tested.

6.3.2.2 The load applied to the pole at the time of failure shall be measured to the nearert 50 N (*see* **6.2.5**).

7 MEASUREMENT OF COVER

7.1 After completion of the transverse strength test, the sample pole shall be taken and checked for cover. The cover shall be measured to the nearest millimetre at three points, one within 1·0 m of the butt end of the pole, the second within 0·6 m from the top and the third at any intermediate point.

ANNEX A

(*Ref. Foreword*)

COMPOSITION OF THE TECHNICAL COMMITTEE

Cement and Concrete Sectional Committee, BDC 2

Chairman	*Representing*
••Dr H. C. Visvesvaraya	National Council for Cement and Building Materials, New Delhi
Members	
Shri K. P. Banerjee Shri Harish N. Malani (*Alternate*)	Larsen and Toubro Limited, Bombay
Shri S. K. Banerjee	National Test House, Calcutta
Chief Engineer (BD) Shri J.C. Basur (*Alternate*)	Bhakra Beas Management Board, Nangal Township
Chief Engineer (Designs) Superintending Engineer (S & S) (*Alternate*)	Central Public Works Department, New Delhi
Chief Engineer (Research-cum-Director) Research Officer (Concrete Technology) (*Alternate*)	Irrigation Department, Government of Punjab
Director Joint Director (*Alternate*)	A P Engineering Research Laboratories, Hyderabad
Director Chief Research Officer (*Alternate*)	Central Soil and Materials Research Station, New Delhi
Director (C&MDD-II) Deputy Director (C&MDD-II) (*Alternate*)	Central Water Commission, New Delhi
Shri V. K. Ghanekar	Structural Engineering Research Centre (CSIR), Ghaziabad
Shri S. Gopinath	The India Cement Limited, Madras
Shri A. K. Gupta	Hyderabad Industries Limited, Hyderabad
Shri J. Sen Gupta	National Buildings Organization, New Delhi
Shri P. J. Jagus Dr A. K. Chatterjee (*Alternate*)	The Associated Cement Companies Ltd, Bombay
Joint Director Standards (B&S)/CB-I Joint Director Standards (B&S)/CB-II (*Alternate*)	Research, Designs and Standards Organization (Ministry of Railways), Lucknow
Shri N. G. Joshi	Indian Hume Pipes Co Limited, Bombay
Shri R. L. Kapoor Shri R. K. Saxena (*Alternate*)	Roads Wing (Ministry of Transport), Department o Surface Transport, New Delhi

Members	*Representing*
Shri G. K. Majumdar	Hospital Services Consultancy Corporation (India) Ltd, New Delhi
Shri P. N. Mehta Shri S. K. Mathur (*Alternate*)	Geological Survey of India, Calcutta
Dr A. K. Mullick	National Council for Cement and Building Materials, New Delhi
Shri Nirmal Singh Shri S. S. Miglani (*Alternate*)	Development Commissioner for Cement Industry (Ministry of Industry)
Shri S. N. Pal Shri Biman Dasgupta (*Alternate*)	M. N. Dastur and Company Private Limited, Calcutta
Shri R. C. Parate Lt-Col R. K. Singh (*Alternate*)	Engineer-in-Chief's Branch, Army Headquarters
Shri H. S. Pasricha	Hindustan Prefab Limited, New Delhi
Shri Y. R. Phull Shri S. S. Seehra (*Alternate*)	Indian Roads Congress, New Delhi ; *and* Central Road Research Institute (CSIR), New Delhi
Dr Mohan Rai Dr S. S. Rehsi (*Alternate*)	Central Road Research Institute (CSIR), New Delhi
Shri A. V. Ramana Dr K. C. Narang (*Alternate*)	Central Building Research Institute (CSIR), Roorkee
Shri G. Ramdas	Dalmia Cement (Bharat) Limited, New Delhi
Dr M. Ramaiah Dr A. G. Madhava Rao (*Alternate*)	Directorate General of Supplies and Disposals, New Delhi
Shri A. U. Rijhsinghani Shri C. S. Sharma (*Alternate*)	Structural Engineering Research Centre (CSIR), Madras
Secretary Shri K. R. Saxena (*Alternate*)	Cement Corporation of India, New Delhi
Shri T. N. Subha Rao Shri S. A. Reddi (*Alternate*)	Central Board of Irrigation and Power, New Delhi
Superintending Engineer (Designs) Executive Engineer (SMD Division) (*Alternate*)	Gammon India Limited, Bombay
Shri L. Swaroop Shri H. Bhattacharyya (*Alternate*)	Public Works Department, Government of Tamil Nadu
Shri S. K. Guha Thakurta Shri S. P. Sankarnarayanan (*Alternate*)	Orissa Cement Limited, New Delhi
Dr H. C. Visvesvaraya Shri D. C. Chaturvedi (*Alternate*)	Gannon Dunkerley & Co Ltd, Bombay
Shri G. Raman, Director (Civ Engg)	The Institution of Engineers (India), Calcutta
	Director General, BIS (*Ex-officio Member*)

Secretary

Shri N. C. Bandyopadhyay
Joint Director (Civ Engg), BIS

Concrete Poles Subcommittee, CED 2 : 12

Convener	
Dr N. Raghavendra	National Council for Cement and Building Materials, New Delhi
Members	
Shri J. L. Bandyopadhyay Shri V. V. Surya Rao (*Alternate*)	Indian Posts and Telegraph Department, Jabalpur
Shri S. N. Basu Shri S. M. Munjal (*Alternate*)	Directorate General of Supplies and Disposals, New Delhi
Shri R. S. Bhatia Shri S. K. Sharma (*Alternate*)	Punjab State Electricity Board, Patiala
Shri P. C. Chatterjee Shri U. N. Rath (*Alternate*)	Orissa Cement Ltd, Rajgangpur

Members	*Representing*
Director (RE)	Central Electricity Authority, Rural Electrification Directorate, New Delhi
Deputy Director (RE) (*Alternate*)	
Shri G. L. Dua Shri P. D. Gaikwad (*Alternate*)	Rural Electrification Corporation Ltd, New Delhi
Joint Director Standards (B&S) CB-II	Research, Designs and Standards Organization, Lucknow
Deputy Director (Civil II) (*Alternate*)	
Shri N. G. Joshi	The Indian Hume Pipe Co Ltd, Bombay
Shri S. K. Naithani	Engineer-in-Chief's Branch, Army Headquarters, New Delhi
Shri Subhash Garg (*Alternate*)	
Shri H. S. Pasricha Shri A. K. Chadha (*Alternate*)	Hindustan Prefab Ltd, New Delhi
Dr C. Rajkumar	National Council for Cement and Building Materials, New Delhi
Shri R. Sampat Kumaram Shri Ramesh Chander (*Alternate*)	Delhi Electric Supply Undertaking, New Delhi
Shri A. V. Talati Shri H. C. Shah (*Alternate*)	The Steel Pipe & Fabrication Works, Vadodara
Shri T. G. Tepan Shri R. B. Joshi (*Alternate*)	Maharashtra State Electricity Board, Bombay
Shri S. Theagarajan Shri Lakshminarasimhan (*Alternate*)	Tamil Nadu Electricity Board, Madras
Prof P. C. Varghese	The Concrete Products and Construction Co, Poonamallee (TN)
Shri K. George (*Alternate*)	
Dr B. Venkateswarlu	Structural Engineering Research Centre (CSIR), Madras

Standard Mark

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 Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, 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 manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference :

Doc : No. CED 2 (4115)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	331 01 31 331 13 75
Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Maniktola, CALCUTTA 700054	37 86 62
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	2 18 43
Southern : C.I.T. Campus, IV Cross Road, MADRAS 600113	41 29 16
Western : Manakalaya, E9 MIDC, Marol, Andheri (East), BOMBAY 400093	6 32 92 95

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE, FARIDABAD, GHAZIABAD, GUWAHATI. HYDERABAD. JAIPUR. KANPUR. PATNA. TRIVANDRUM.

Reprography Unit, BIS, New Delhi, India