

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 14959-1 (2001): Method of Test determination of water soluble and acid soluble chlorides in mortar and concrete, Part 1: Fresh mortar and concrete [CED 2: Cement and Concrete]



“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”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



REAFFIRMED 2011

IS 14959 (Part 1) : 2001

भारतीय मानक

मोर्टार व कंक्रीट में जल एवं अम्ल में घुलनशील क्लोराइड
का निर्धारण — परीक्षण पद्धति

भाग 1 ताजा मोर्टार व कंक्रीट

Indian Standard

DETERMINATION OF WATER SOLUBLE AND
ACID SOLUBLE CHLORIDES IN MORTAR AND
CONCRETE — METHOD OF TEST

PART 1 FRESH MORTAR AND CONCRETE

ICS 91.100.10; 91.100.30

© BIS 2001

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

July 2001

Price Group 3

**AMENDMENT NO. 1 SEPTEMBER 2007
TO
IS 14959 (PART 1) : 2001 DETERMINATION OF WATER
SOLUBLE AND ACID SOLUBLE CHLORIDES IN
MORTAR AND CONCRETE — METHOD OF TEST**

PART 1 FRESH MORTAR AND CONCRETE

(Page 1, clause 4.1.6, line 1) — Insert 'dried at 160°C and cooled in a desiccator' after 'silver nitrate'.

(Page 1, clause 4.1.6, last line) — Insert 'and record the exact normality of the silver nitrate solution' at the end.

(Page 1, clause 4.1.7, first line) — Substitute '1.52 g' for '1.7 g'.

(Page 2, clause 4.1.7, last line) — Insert 'or record the exact normality' at the end.

(Page 2, clause 4.1.7) — Insert the following note at the end:

NOTE — Sometimes it is difficult to make exactly 0.02 N solution if the standard normality of the solution is less.

(Page 2, clause 4.3.1.2, line 3) — Insert 'or more' after '25 ml' and substitute '0.02 N' for '0.2 N'.

(Page 2, clause 4.3.2.2, line 2) — Delete the sentence 'Add 5 ml of 6 N nitric acid.'

(Page 2, clause 4.3.2.2, line 3) — Substitute 'or more of 0.02 N' for 'of standard'.

(Page 2, clause 4.4, lines 3 to 7) — Substitute in following for the existing formula:

$$\text{Chloride, percent} = \frac{0.709 (X-Y)}{m}$$

where

X = volume of 0.02 N silver nitrate added, in ml;

Y = volume of 0.02 N ammonium thiocyanate consumed; and

m = mass of concrete sample taken for test, in g.

(CED 2)

Reprography Unit, BIS, New Delhi, India

FOREWORD

This Indian Standard (Part 1) 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.

Chlorides in the concrete could be drawn from different sources like aggregates, mix water, admixtures and cement and could lead to durability problems namely, corrosion of reinforcing steel in concrete if present in sufficient quantity. Chlorides could be present in different degrees of binding in the concrete matrix and could be determined as water soluble and as acid soluble chlorides. In some cases of corrosion of carbonated concrete, the combined chlorides (water soluble and acid soluble) will be let free in pore water and these chlorides are harmful to concrete. To minimize the chances of deterioration of concrete due to harmful chlorides, the level of these chlorides has been limited in various design codes. Therefore, this standard has been formulated to provide necessary guidance for determination of water soluble and acid soluble chlorides in concrete. This Part 1 of the standard covers volumetric method of test for determination of chlorides in fresh mortar and concrete, and Part 2 of this standard covers the method of test for hardened mortar and concrete.

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

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

DETERMINATION OF WATER SOLUBLE AND ACID SOLUBLE CHLORIDES IN MORTAR AND CONCRETE — METHOD OF TEST

PART 1 FRESH MORTAR AND CONCRETE

1 SCOPE

This standard (Part 1) covers volumetric method of test for determination of water soluble and acid soluble chlorides in fresh mortar and concrete.

NOTE — The source of samples for test in accordance with this standard may be either the stationary samples obtained from project sites or ready-mixed concrete plants.

2 REFERENCES

The Indian Standards listed below contain provisions which through reference 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 editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
1070 : 1992	Reagent grade water — Specification (<i>third revision</i>)
3025 (Part 32) : 1988	Methods of sampling and test (physical and chemical) for water and wastewater: Part 32 Chloride (<i>first revision</i>)

3 SAMPLING

A sample of fresh concrete or mortar shall be collected within a period of two hours from the time of addition of water to the ingredients that is, cement, coarse and fine aggregates and admixtures, etc. However, every effort shall be made to collect the samples immediately after mixing. Samples shall be obtained by taking uniformly distributed increments (preferably without stopping the mixing operations, provided sampling can be safely carried out), and mixed thoroughly to form a combined bulk sample. The number of increments and size of bulk sample necessarily depends on the quantity of the material, its variability and the accuracy required of the test results.

At least three approximately equal sample increments totalling 0.02 m³ shall be taken in a clean and dry receptacle across the stream of mortar or concrete. This receptacle shall be constructed of non-absorbent material, preferably of metal and shall be such that

the sample retained is not segregated. A flat surface without retaining sides will not fulfill this purpose. Where three sample increments are taken they shall be taken at about the time when one quarter, one half and three quarters of the concrete have been discharged from the mixer, and if more than three are taken they shall be at correspondingly shorter, but of equal intervals.

4 METHOD OF TEST

4.1 Reagents

4.1.1 Quality of Reagent

Unless otherwise specified, pure chemicals of analytical reagent grade and distilled water (see IS 1070) shall be used in the test.

4.1.2 Nitric Acid (HNO₃) Concentrated (Specific Gravity 1.42)

Prepare the solution, 6N (approximately), by diluting 38 ml of concentrated nitric acid to 100 ml with distilled water.

4.1.3 Ferric Alum [FeNH₄(SO₄)₂ 12 H₂O]

Dissolve 10 g of ferric alum in 100 ml of distilled water and add 1 ml of nitric acid.

4.1.4 Potassium Chromate (K₂CrO₄), 5 Percent Solution

Dissolve 5 g of potassium chromate in 100 ml of distilled water.

4.1.5 Nitrobenzene ()

4.1.6 Silver Nitrate (AgNO₃) Solution, 0.02 N

Weigh 1.7 g, of silver nitrate, dissolve in distilled water and dilute to 500 ml in a volumetric flask. Standardize the silver nitrate solution against 0.02 N sodium chloride solution using potassium chromate solution as indicator (5 percent *m/v*) in accordance with the procedure given in IS 3025 (Part 32).

4.1.7 Ammonium Thiocyanate (NH₄SCN) Solution, 0.02N

Weigh 1.7 g of ammonium thiocyanate and dissolve

in one litre of distilled water in a volumetric flask. Shake well and standardize by titrating with 0.02 N silver nitrate solution using ferric alum solution as an indicator. Adjust the normality exactly to 0.02 N.

4.1.8 Sodium Chloride (NaCl), 0.02 N

Weigh 1.169 2 g of sodium chloride dried at $105 \pm 2^\circ\text{C}$, dissolve in distilled water and make up to 1 000 ml in a volumetric flask.

4.2 Use of Filter Paper

In the methods prescribed in this standard, relative numbers of Whatman filter paper only have been prescribed since these are commonly used. However, any other suitable brand of filter papers with equivalent porosity may be used.

4.3 Procedure

4.3.1 Water Soluble Chloride

4.3.1.1 Weigh $1\,000 \pm 5$ g of fresh mortar or concrete sample in a 2 litre capacity beaker and add 500 ml of distilled water (chloride free). Stir the mixture vigorously for 15 minutes. After allowing the mixture to stand for 10 to 15 minutes for settling, decant about 200 ml of the supernatant solution into a clean dry 250 ml capacity beaker. Immediately, filter the solution through Whatman filter paper No. 1 and collect the filtrate.

4.3.1.2 Pipette 50 ml of filtrate in a 250 ml capacity conical flask. Add 5 ml of 6 N nitric acid. Add a known volume (X), preferably 25 ml of 0.2 N silver nitrate solution. Add 1 ml ferric alum and 5 ml of nitrobenzene. Shake vigorously to coagulate the precipitate. Titrate the excess silver nitrate with 0.02 N ammonium thiocyanate solution until a permanent faint reddish brown colour appears. Note

down the volume (Y) of ammonium thiocyanate used.

4.3.2 Acid Soluble Chloride

4.3.2.1 Weigh about $1\,000 \pm 5$ g of the fresh mortar or concrete sample in a 2 litre capacity beaker and add 50 ml of 6 N nitric acid and 450 ml of distilled water (chloride free) after stirring for few minutes. Stir the mixture vigorously for 15 minutes. After allowing the mixture to stand for 10 to 15 minutes for settling, decant about 200 ml of the supernatant solution into a clean dry 250 ml capacity beaker. Immediately, filter the solution through Whatman filter paper No. 1 and collect the filtrate.

4.3.2.2 Pipette 50 ml of filtrate in a 250 ml capacity conical flask. Add 5 ml of 6 N nitric acid. Add a known volume (X), preferably 25 ml of standard silver nitrate solution. Add 1 ml ferric alum and 5 ml of nitrobenzene. Shake vigorously to coagulate the precipitate. Titrate the excess silver nitrate with 0.02 N ammonium thiocyanate solution until a permanent faint reddish brown colour appears. Note down the volume (Y) of ammonium thiocyanate used.

4.4 Calculation

Calculate the percentage of chloride (acid soluble/water soluble) by mass of mortar or concrete as follows:

$$\text{Chloride, percent} = 0.00071 (X - Y),$$

where

- X = volume of silver nitrate added, in ml; and
 Y = volume of 0.02 N ammonium thiocyanate consumed.

NOTE — Interference of silver chloride particles (which are generated *in-situ*) in titration by reacting with thiocyanate can be avoided by the addition of nitrobenzene which forms a film on silver chloride particles.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Cement and Concrete Sectional Committee, CED 2

Chairman

PADMASHRI DR H. C. VISVESVARAYA

'Chandrika', at 15th Cross 63-64 East Park Road, Malleswaram, Bangalore 560 003

Members

DR S. C. AHLUWALIA

DR S. S. AMETA

SHRI D. K. RAI (Alternate)

SHRI V. BALASUBRAMANIAN

SHRI R. P. SINGH (Alternate)

SHRI G. R. BHARITKAR

SHRI C. C. BHATTACHARYA

SHRI I. K. PANDEY (Alternate)

SHRI A. K. CHADHA

SHRI J. R. SIL (Alternate)

CHIEF ENGINEER (DESIGN)

SUPERINTENDING ENGINEER (S&S) (Alternate)

CHIEF ENGINEER (NAVAM DAM)

SUPERINTENDING ENGINEER (QCC) (Alternate)

CHIEF ENGINEER (RESEARCH)-CUM-DIRECTOR

RESEARCH OFFICER (CONCRETE TECHNOLOGY) (Alternate)

SHRI J. P. DESAI

SHRI B. K. JAGETIA (Alternate)

DIRECTOR

DIRECTOR

JOINT DIRECTOR (Alternate)

DIRECTOR

SHRI P. L. KASHYAP (Alternate)

DIRECTOR (CMDD) (N&W)

DEPUTY DIRECTOR (CMDD) (NW&S) (Alternate)

SHRI K. H. GANGWAL

SHRI V. PATTABHI (Alternate)

GENERAL MANAGER

SENIOR MANAGER (ENGINEERING) (Alternate)

DR ASHOK KUMAR GHOSH

SHRI S. GOPINATH

SHRI R. ARUNACHALAM (Alternate)

SHRI C. JAYARAMAN

SHRI A. K. JAIN (Alternate)

SHRI S. S. GOYALIYA

SHRI V. K. GOEL (Alternate)

JOINT DIRECTOR (STANDARDS) (B&S) (CB-I)

JOINT DIRECTOR (STANDARDS) (B&S) (CB-II) (Alternate)

SHRI D. K. KANUNGO

SHRI B. R. MEENA (Alternate)

MEMBER-SECRETARY

DIRECTOR (CIVIL) (Alternate)

SHRI P. R. C. NAIR

SHRI P. D. KELKAR (Alternate)

DR R. NARAYANAN

SHRI S. GOPALKRISHNAN (Alternate)

DR C. RAJKUMAR

DR K. MOHAN (Alternate)

SHRI S. A. REDDI

SHRI J. SARUP

SHRI P. K. JAIPURIAR (Alternate)

SECRETARY

Representing

OCL India Ltd, New Delhi

Geological Survey of India, Kolkata

Directorate General of Supplies and Disposals, New Delhi

B.G. Shirke Construction Technology Ltd, Pune

Ministry of Surface Transport, Department of Surface Transport (Roads Wing),
New Delhi

Hindustan Prefab Ltd, New Delhi

Central Public Works Department, New Delhi

Sardar Sarovar Narmada Nigam Ltd, Gandhinagar

Irrigation and Power Research Institute, Amritsar

Gujarat Ambuja Cements Ltd, Ahmedabad

Structural Engineering Research Centre (CSIR), Ghaziabad

A.P. Engineering Research Laboratories, Hyderabad

Central Soil and Materials Research Station, New Delhi

Central Water Commission, New Delhi

Hyderabad Industries Ltd, Hyderabad

Gannon Dunkerley and Co Ltd, Mumbai

Indian Institute of Technology, Kharagpur

The India Cements Ltd, Chennai

Grasim Industries Ltd, Mumbai

Cement Corporation of India Ltd, New Delhi

Research, Designs & Standards Organization (Ministry of Railways), Lucknow

National Test House, Kolkata

Central Board of Irrigation and Power, New Delhi

The Indian Hume Pipe Company Ltd, Mumbai

Structural Engineering Research Centre (CSIR), Chennai

National Council for Cement and Building Materials, Ballabgarh

Gammon India Ltd, Mumbai

Hospital Services Consultancy Corporation (India) Ltd, New Delhi

Builder's Association of India, Mumbai

(Continued on page 4)

IS 14959 (Part 1) : 2001

(Continued from page 3)

Members

SHRI S. S. SEEHRA
SHRI SATINDER KUMAR (Alternate)
SHRI S. S. SEEHRA
SHRI A. K. SHARMA (Alternate)
BRIG R. R. SINGH
SHRI MAHENDRA PRASAD (Alternate)
SUPERINTENDING ENGINEER (DESIGNS)
EXECUTIVE ENGINEER (Alternate)
SHRI C. R. V. SUBRAMANIAM
SHRI S. CHOWDHURY (Alternate)
SHRI V. SURESH
SHRI S. K. TANEJA (Alternate)
SHRI T. N. TIWARI
DR D. GHOSH (Alternate)
DR C. L. VERMA
DR B. K. RAO (Alternate)
SHRI VIMAL KUMAR
DR H. C. VISVESVARAYA
SHRI D. C. CHATURVEDI (Alternate)
DR C. S. VISWANATHA
SHRI D. SRINIVASAN (Alternate)
SHRI S. K. JAIN,
Director & Head (Civ Engg)

Representing

Central Road Research Institute (CSIR), New Delhi
Indian Roads Congress, New Delhi
Engineer-in-Chief's Branch, Army Headquarters, New Delhi
Public Works Department, Government of Tamil Nadu, Chennai
Larsen & Tubro Ltd, Mumbai
Housing and Urban Development Corporation Ltd, New Delhi
The Associated Cement Companies Ltd, Mumbai
Central Building Research Institute (CSIR), Roorkee
Fly Ash Mission, Department of Science and Technology, New Delhi
The Institution of Engineers (India), Kolkata
Indian Concrete Institute, Chennai
Director General, BIS (Ex-officio Member)

Member-Secretary

SHRI SANJAY PANT
Deputy Director (Civ Engg), BIS

Concrete Subcommittee, CED 2:2

Convener

DR A. K. MULLICK

Members

SHRI C. R. ALIMCHANDANI
SHRI T. B. BANERJEE
SHRI I. K. PANDEY (Alternate)
DR D. BHATTACHARJEE
CHIEF ENGINEER & JOINT SECRETARY
SUPERINTENDING ENGINEER (Alternate)
DR P. C. CHOWDHURY
DR C. S. VISWANATHA (Alternate)
SHRI KEN COWIE
SHRI M. SANJAY BAHADUR (Alternate)
SHRI J. P. DESAI
SHRI B. K. JAGTIA (Alternate)
DIRECTOR
SHRI N. CHANDRASEKARAN (Alternate)
DIRECTOR
JOINT DIRECTOR (Alternate)
DIRECTOR (C&MDD)
DEPUTY DIRECTOR (C&MDD) (Alternate)
GENERAL MANAGER
SENIOR MANAGER (ENGINEERING) (Alternate)
DR ASHOK KUMAR GHOSH
SHRI J. S. HINGORANI
PROF ASHOK KUMAR JAIN
SHRI L. K. JAIN
SHRI M. P. JAISINGH
DR B. K. RAO (Alternate)

Saurashtra Cements Ltd, Ahmedabad

STUP Consultants Ltd, Mumbai
Ministry of Surface Transport (Roads Wing), New Delhi

Indian Institute of Technology, New Delhi
Public Works Department, Government of Maharashtra, Mumbai

Tor Steel Research Foundation in India, Kolkata

Indian Ready-Mixed Concrete Association, Bangalore

Gujarat Ambuja Cements Ltd, Ahmedabad

Central Soil and Materials Research Station, New Delhi

A.P. Engineering Research Laboratories, Hyderabad

Central Water Commission, New Delhi

Gannon Dunkerley and Co Ltd, Mumbai

Indian Institute of Technology, Kharagpur
Associated Consulting Services, Mumbai
University of Roorkee, Roorkee
In personal capacity (36 Old Sneh Nagar, Wardha Road, Nagpur)
Central Building Research Institute (CSIR), Roorkee

(Continued on page 5)

(Continued from page 4)

<i>Members</i>	<i>Representing</i>
JOINT DIRECTOR STANDARDS (B&S)/CB-I	Research, Designs and Standards Organization (Ministry of Railways), Lucknow
JOINT DIRECTOR STANDARDS (B&S)/CB-II (<i>Alternate</i>)	
DR S. C. MAITI	National Council for Cement and Building Materials, Ballabgarh
DR SUDHIR MISHRA	Indian Institute of Technology, Kanpur
SHRI R. NARAYANAN	Structural Engineering Research Centre (CSIR), Chennai
SHRI K. MANI (<i>Alternate</i>)	
SHRI A. B. PHADKE	The Hindustan Construction Co Ltd, Mumbai
SHRI D. M. SAVUR (<i>Alternate</i>)	
SHRI RAM KUMAR	Structural Engineering Research Centre (CSIR), Ghaziabad
SHRI RAJEEV GOEL (<i>Alternate</i>)	
SHRI V. V. GOVINDA RAO	National Building and Construction Corporation Ltd, New Delhi
SHRI R. P. GOEL (<i>Alternate</i>)	
SHRI S. A. REDDI	Gammon India Ltd, Mumbai
DR N. K. NAYAK (<i>Alternate</i>)	
SHRI SUDDHODAN ROY	Hindustan Prefab Limited, New Delhi
SHRI M. KUNDU (<i>Alternate</i>)	
SHRI S. C. SAWHNEY	Engineers India Ltd, New Delhi
SHRI R. P. MEHROTRA (<i>Alternate</i>)	
SHRI S. S. SEEHRA	Central Road Research Institute (CSIR), New Delhi
SHRI SATINDER KUMAR (<i>Alternate</i>)	
PROF M. S. SHETTY	Indian Concrete Institute, Chennai
SHRI S. N. SINGH	Engineer-in-Chief's Branch, Army Headquarters, New Delhi
SHRI SURINDER MOHAN (<i>Alternate</i>)	
SHRI P. SRINIVASAN	The Associated Cement Companies Ltd, Mumbai
SHRI P. BANDOPADHYAY (<i>Alternate</i>)	
SUPERINTENDING ENGINEER (DESIGNS)	Central Public Works Department, New Delhi
EXECUTIVE ENGINEER (DESIGNS-III) (<i>Alternate</i>)	
SHRI B. T. UNWALLA	In personal capacity (15/9 Rustam Baug, Victoria Road, Mumbai)
SHRI U. S. P. VERMA	Nuclear Power Corporation of India Ltd, New Delhi
SHRI VIMAL KUMAR	Fly Ash Mission, Department of Science and Technology, New Delhi

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.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

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'.

This Indian Standard has been developed from Doc : No. CED 2 (5722).

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 110 002
Telephones : 323 01 31, 323 33 75, 323 94 02

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :

Telephone

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110 002

{ 323 76 17
323 38 41

Eastern : 1/14 C. I.T. Scheme VII M, V. I. P. Road, Kankurgachi
CALCUTTA 700 054

{ 337 84 99, 337 85 61
337 86 26, 337 91 20

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160 022

{ 60 38 43
60 20 25

Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600 113

{ 235 02 16, 235 04 42
235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
MUMBAI 400 093

{ 832 92 95, 832 78 58
832 78 91, 832 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE.
FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR.
LUCKNOW. NAGPUR. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM.