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

व्यापक परिचालन मसौदा

हमारा संदर्भः सीईडी 04/टी-52 **04 दिसंबर 2024**
तकनीकी समिति: इमारती चूना और जिप्सम उत्पाद विषय समिति, सीईडी 04

प्राप्तकर्ता :

क) सिविल इंजीनियरी विभाग परिषद्, सीईडीसी के सभी सदस्य
ख) सीईडी 04 के सभी सदस्य
ग) रूचि रखने वाले अन्य निकाय

प्रिय महोदय/महोदया,

निम्नलिखित भारतीय मानक का मसौदा संलग्न हैं:

प्रलेख संख्या	शीर्षक
सीईडी 04 (27015)WC	**बिल्डिंग लाइम्स के लिए परीक्षण के तरीके भाग 7 संपीड़ित और अनुप्रस्थ ताकत का निर्धारण का भारतीय मानक मसौदा** [IS 6932 (भाग 7) का *पहला पुनरीक्षण*] ICS 91.100.10

कृपया इस मानक के मसौदे का अवलोकन करें और अपनी सम्मतियॉ यह बताते हुए भेजे कि यदि यह मानक के रूप में प्रकाशित हो तो इस पर अमल करने में आपके व्यवसाय अथवा कारोबार में क्या कठिनाइयाँ आ सकती हैं ।

सम्मतियाँ भेजने की अंतिम तिथि : **04 जनवरी 2025**

सम्मति यदि कोई हो तो कृपया अधोहस्ताक्षरी को उपरिलिखित पते पर संलग्न फोर्मेट में भेजें या manoj@bis.gov.in पर ईमेल कर दें ।

यदि कोई सम्मति प्राप्त नही होती है अथवा सम्मति में केवल भाषा सम्बन्धी त्रुटि हुई तो उपरोक्त प्रलेख को यथावत अंतिम रूप दिया जाएगा। यदि सम्मित तकनीकी प्रकृति की हुई विषय समिति के अध्यक्ष के परामर्श से अथवा उनकी इच्छा पर आगे की कार्यवाही के लिए विषय समिति को भेजे जाने के बाद प्रलेख को अंतिम रूप दे दिया जाएगा ।

यह प्रलेख भारतीय मानक ब्यूरो की वैबसाइट www.bis.gov.in पर भी उपलब्ध हैं।

धन्यवाद ।

भवदीय,

(द्वैपायन भद्र)
प्रमुख (सिविल इंजीनियरी)

संलग्नक : उपरिलिखित

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

DRAFT IN WIDE CIRCULATION

Our Ref: CED 04/T-52 **04 December 2024**

TECHNICAL COMMITTEE: Building Limes and Gypsum Products Sectional Committee CED 04

ADDRESSED TO:

a) All Members of Civil Engineering Division Council, CEDC
b) All Members of CED 04
c) All others interests.

Dear Sir/Madam,

Please find enclosed the following document:

Doc No.	Title
CED 04 (27015)WC	**Draft Indian Standard** **Methods of Tests for Building Limes** **Part 7 Determination of Compressive and Transverse Strengths** [*First Revision* of IS 6932 (Part 7)] ICS 91.100.10

Kindly examine the draft standard and forward your views stating any difficulties which you are likely to experience in your business or profession if this is finally adopted as National Standard.

Last Date for Comments: **04 January 2025**

Comments if any, may please be made in the attached format and mailed to the undersigned at the above address or preferably through e-mail to manoj@bis.gov.in.

In case no comments are received or comment received are of editorial nature, you may kindly permit us to presume your approval for the above document as finalized. However, in case of comments of technical in nature are received then it may be finalized either in consultation with the Chairman, Sectional Committee or referred to the Sectional Committee for further necessary action if so desired by the Chairman, Sectional Committee.

The document is also hosted on BIS website www.bis.gov.in**.**

Thanking you,

Yours faithfully,

(**Dwaipayan Bhadra**)
Head (Civil Engineering)

Encl: As above

FORMAT FOR SENDING COMMENTS ON BIS DOCUMENTS

(Please use A-4 size sheet of paper only and type within fields indicated. Comments on each clause/sub-clause/table/fig etc. be started on a fresh box. Information in column 3 should include reasons for the comments and suggestions for modified working of the clauses when the existing text is found not acceptable. Adherence to this format facilitates Secretariat's work) (Please e-mail your comments to manoj@bis.gov.in)

Doc. No.: **CED 04 (27015)WC**

Title: **Draft Indian Standard Methods of Tests for Building Limes**
Part 7 Determination of Compressive and Transverse Strengths
[*First Revision* of IS 6932 (Part 7)] ICS 91.100.10

LAST DATE OF COMMENT: **04/01/2025**

NAME OF THE COMMENTATOR/ORGANIZATION: _____

Sl. No.	Clause/Para/Table/ Figure No. Commented	Comments/Modified Wordings	Justification of the Proposed Change

BUREAU OF INDIAN STANDARDS

DRAFT FOR COMMENTS ONLY
(*Not to be reproduced without the permission of BIS or used as an Indian Standard*)

Draft Indian Standard

STANDARD METHODS OF TESTS FOR BUILDING LIMES PART 7 DETERMINATION OF COMPRESSIVE AND TRANSVERSE STRENGTHS

[*First Revision* of IS 6932 (Part 7)]
ICS 91.100.10

Building Lime and Gypsum Products Sectional Committee, CED 04	Last date of Comments: **04 January 2025**

FOREWORD

(*Formal clauses will be added later*)

The role of building limes in construction has been recognized and valued for centuries, from the ancient structures to modern structures. The use of lime as building materials, is not only a testament to its versatility and durability but also to its sustainability and environmental benefits. As we continue to seek eco-friendly alternatives in construction, the relevance of lime-based products has become increasingly significant.

Building lime is used in construction for a variety of purposes such as lime washing, lime mortar, lime Plastering, lime Concrete, Rendering and Pointing, soil Stabilization, Restoration of Historic Buildings, Waterproofing and Decoration. Each of these forms of lime serves specific purposes in construction, from creating strong, durable mortar joints to providing breathable, flexible finishes that protect and preserve structures.

A number of Indian Standards on lime building materials covering specifications, code of practices, etc. have been prepared with a view to assisting the lime industry in its development. In line with that, methods of test for building lime, IS 6932 was prepared in eleven parts in the year 1973. In this revision it was decided to review and update the various existing test methods of building lime, taking into consideration the latest international practices and developments in this field and the current practices in the country. In this revision all the amendments are incorporated and reference of all Indian standards has been updated. Ambiguity in the procedure or reporting has been also removed.

This standard (Part 7) covers the methods of test for Standard methods of tests for building limes for determination of compressive and transverse strengths. The others standards in the series are:

Part 1	Determination of Insoluble Residue in Dilute Acid and Alkali, Loss on Ignition, Insoluble Residue in Hydrochloric Acid, Silicon Dioxide, Ferric and Aluminium Oxide, Calcium Oxide and Magnesium Oxide
Part 2	Determination of carbon dioxide content
Part 3	Determination of residue on slaking of quicklime
Part 4	Determination of fineness of hydrated lime
Part 5	Determination of unhydrated oxide
Part 6	Determination of volume yield of quicklime

Part 8 Determination of workability
Part 9 Determination of soundness
Part 10 Determination of popping and pitting of hydrated lime
Part 11 Determination of setting time of hydrated lime

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.

Draft Indian Standard

METHODS OF TESTS FOR BUILDING LIMES PART 7 DETERMINATION OF COMPRESSIVE AND TRANSVERSE STRENGTHS

(First Revision)

1 SCOPE

This standard (Part 7) covers the methods of tests for determination of compressive and transverse strengths of building limes.

2 REFERENCES

The standards given 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 agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standard indicated below:

IS No.	*Title*
IS 460 (Part 1) : 2020	Test sieves – Specification: Part 1 Wire cloth test sieves (*fourth revision*)
IS 650 : 1991	Standard sand for testing cement – Specification (*second revision*)
IS 1070 : 2023	Reagent grade water – Specification (*fourth revision*)
IS 2250 : 1981	Code of practice for preparation and use of masonry mortars (*first revision*)
IS 6932	Method of test for building limes:
(Part 3) : 1973	Determination of residue on slaking of quicklime
(Part 6) : 1973	Determination of volume yield of quicklime

3 OBJECTIVE

The objective of the tests is to determine the compressive and transverse strengths of building limes. These parameters are critical in assessing the load carrying capacity of the structure constructed by using building lime.

4 PRINCIPLE

Compressive Strength Test is based on the principle of applying a progressively increasing axial load to a cubic specimen until it fails. The maximum load sustained by the specimen is divided by its cross-sectional area to calculate the compressive strength. Transverse Strength Test is determined by applying transverse load on the beam placed on two supports. The modulus of rupture is calculated using the applied load, specimen dimensions, and the testing configuration.

5 SAMPLE PREPARATION

5.1 General

5.1.1 Sampling shall be carried out as quickly as possible so that the material does not deteriorate. The total time occupied in mixing and preparation of the sample for the test should not exceed two hours.

The samples shall be placed immediately in clean, dry, airtight containers. When testing is not to be carried out at once, the samples shall be kept in the airtight containers. Tools such as Shovel, auger, metal or plastic containers shall be of material free from rust and shall be alkali resistant.

5.1.2 If the sample contains lumps, crush the lime using a mortar and pestle or mechanical grinder to achieve a fine powder. Sieving is used to achieve a uniform particle size for accurate test results. Pass the dried and pulverized lime through a 2.36 mm sieve [*see* IS 460 (Part 1)]. This is a standard procedure for many tests, although specific tests may require different sieve sizes (e.g., 300-micron sieve). Use a precision balance to weigh the required quantity of lime for each test. The amount of lime needed will vary depending on the test being conducted. Typically, chemical tests may require 0.5 g to 5.0 g of sieved lime and physical test require 100 g to 5 000 g. Use distilled (*see* IS 1070) or deionized water to avoid contamination. Follow the specific water-to-lime ratio as required by the test method. The mixing can be done manually using a spatula or mechanically using a mixer. Ensure that the mixture is homogeneous and free of lumps. For some tests, a paste-like consistency may be required.

5.2 Preparation of Lime-Sand Mortar (1:3)

5.2.1 The sand employed for the preparation of mortar shall conform to IS 650.

5.2.2 The lime used for the preparation of the mortar shall be either hydrated lime or quicklime.

5.3 Adjusted Lime Putty

5.3.1 In case of hydrated lime.

5.3.1.1 When hydrated lime is used, 500 g or the sample shall be thoroughly mixed with 60 percent to 65 percent of water for 5 min, and the resulting putty shall be passed twice through a mixer of the type given in IS 2250 and used immediately for preparing the standard mortar. Used 350 g of the putty, which contain approximately 212 g to 219 g of dry hydrate lime. Mix it with sand equal to 3 times the mass of the dry hydrate lime (approximately weight of sand is 636 g to 656 g). The lime putty and sand shall be thoroughly mixed for 10 min continuously, so as to form a uniform plastic mortar.

5.3.2 In Case of quicklime.

5.3.2.1 When quicklime is used about 1 kg of the sample shall be crushed to pass through 2.36 mm IS Sieve (conforming to IS 460 (Part 1) and slaked isothermally for 1 h as described in IS 6932 (Part 3). The resulting putty shall be stirred with a wooden rod and sieved through 850 micron IS Sieve and collected over a filter cloth as described in IS 6932 (Part 6). The excess water shall be removed by folding the filter cloth in the form of a gag and pressing moderately by hand. The consistency of the putty shall be adjusted by trial to a water content of 60 to 65 percent by mass of water of the mass of dry hydrated lime. The adjustment shall be carried out by subtracting any excess water from the putty by placing it, after removal from the filter cloth, for a short time on a clean absorbent surface, or alternatively, if oven dry, by adding a small quantity of water and mixing and knocking up thoroughly.

5.3.2.2 The proportion of water present can be determined by drying a weighed portion rapidly in a drying oven at 100 °C ± 10 °C so that no significant amount of carbon dioxide is absorbed in the process, and weighing the dry residue when the loss in mass should be 60 percent to 65 percent of the mass of the dry residue, or by any convenient alternative method.

5.3.2.3 The adjusted lime putty shall be thoroughly mixed and knocked up and passed twice through a mixer of the type given in IS 2250 and used immediately for preparing the mortar.

5.3.2.4 Thoroughly mix 350 g of the putty with all amount of standard sand conforming to IS 650 equal to 3 times the mass of the dry hydrate contained in it, that is, 636 g to 656 g. The balance of the putty shall be discarded. The lime putty and sand shall be thoroughly mixed and knocked up for 10 min continuously, so as to form a uniform plastic mortar.

5.4 The mortar prepared shall be used immediately for filling the moulds for strength tests.

5.5 The whole operation starting from the slaking of the quicklime up to the filling of the moulds shall be carried out as expeditiously as possible.

6 TRANSVERSE STRENGTH

6.1 Preparation of Test Specimen

6.1.1 Six test specimens each 2.5 cm square in cross-section and 10.0 cm in length shall be prepared using the standard lime and mortar specified under **5.2.** The mould used shall be an individual or gang mould of bronze or other suitable non-corrodible metal, and of internal dimensions 2.5 cm square and 10.0 cm long, the inner surface of the mould shall be carefully machined to a tolerance of ± 0.002 cm and the mould shall be so constructed that the specimens can be removed without the mould being tapped. The mould shall be well greased with petroleum jelly before use) and shall rest on a well-greased non-corrodible plate during the filling operations. The mould shall be filled by hand, the mortar being pressed in with the thumb, lightly tamped, and then smoothed off with two or three strokes of palette knife.

6.1.2 The filled mould together with its base plate and covered on the top with a similar plate shall be stored for a period of 28 days undisturbed in a suitable container in an atmosphere of at least 90 percent RH and at a temperature of 27 °C ± 2 °C. A record shall be made of the temperature of storage on at least 24 days of the 28 days period. The maximum and minimum temperatures shall be read from time to time, in order to check any possible wide variations of temperature that may have occurred whilst the apparatus was not under direct observation.

6.2 Procedure

After the expiry of the period of storage specified under **6.1.2** the specimens shall be removed from the mould, care being taken not to injure them in any way during this process, and immersed in water for a period of half an hour. They shall be then removed and tested immediately for transverse strength. The specimens to be tested shall rest symmetrically on their sides on two parallel metal rollers 4 cm in diameter and spaced at 8.0 cm centres. The load shall be applied through a third parallel roller of the same size at a point midway between the other two. No packing shall be used between the rollers and the specimen. The load shall be applied steadily and uniformly, starting from zero, and increased at a rate of 15 kg/min ± 10 percent.

6.3 Evaluation and Report of Test Results

6.3.1 The modulus of rupture of the specimen is obtained by the formula:

$$t = kP$$

where

t = modulus of rupture,
P = total load, and
k = factor.

The value of k is equal to 0.768 when the modulus of rupture is expressed in kg/cm^2, P in kg and the dimensions of the specimen in cm.

6.3.2 The average of the 6 test specimens shall be taken as the modulus of rupture of the mortar and the result shall be expressed in kg/cm^2.

7 COMPRESSIVE STRENGTH

7.1 Preparation of Test Specimens

Twelve cubes with side 5.0 cm shall be prepared from standard lime-sand mortar specified under **5.2** using bronze or other non-corrodible metallic moulds which shall be so designed as to prevent spreading during moulding. The inner surface of the moulds shall be carefully machined to a tolerance of ± 0.002 cm and the moulds shell be 10 constructed that the specimens can be removed without tapping them. The moulds shall be filled by hand, the mortar being pressed in with the thumb, lightly tamped, smoothed off with two or three strokes of the trowel or palette knife stored undisturbed in a suitable container for a period of 72 h in an atmosphere of at least 90 percent RH and at a temperature of 27 °C ± 2 °C. After the expiry of this period, the specimens shall be taken out of the moulds and placed in the air in the laboratory for 4 days. When 7 days old, the specimens shall be immersed in clean water and left there until just prior to testing for its strength in the testing machine. The water shall be renewed every 3 days and maintained at a temperature of 27 °C ± 2 °C.

7.2 Procedure

After 7 days of storage in water (and in the case of Class *B* limes, under moist sand) 6 of the cubes shall be taken out of water, wiped surface-dry and tested for compressive strength in a compression testing machine. This gives the strength at 14 days. Those faces of the cube specimens, which when moulded were in contact with the sides of the mould shall be placed in contact with the surface through which load is applied. There shall be no packing between the cube and steel platens of the testing machine. One of the platens shall be carried on the ball and shall be self-adjusting. The load shall be steadily and uniformly applied, starting from zero increasing at the rate of 15 kg/min.

7.2.1 The remaining 6 test specimens shall be taken out after 21 days and similarly tested thus determining the compressive strength at 28 days.

7.3 Evaluation and Report of Test Results

7.3.1 The crushing load divided by the area over which the load is applied denotes the compressive strength of the mortar.

7.3.2 The average strength of the six specimens shall be taken as the compressive strength of the mortar and the result expressed in kg/cm^2.