IS : 6884 - 1983
(Reaffirmed 1996)

Indian Standard

SPECIFICATION FOR DENTAL SILICATE CEMENT

(First Revision)

UDC 615·463 : 666·942·6 : 616·314-089·27-74

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

Gr 5

February 1984

Indian Standard

SPECIFICATION FOR DENTAL SILICATE CEMENT

(*First Revision*)

Dental Materials Sectional Committee, CDC 52

Chairman

DR N. K. AGRAWAL
Dental College & Hospital, Lucknow

Members	*Representing*
DR B. B. DUTTA	Dr R. Ahmed Dental College & Hospital, Calcutta
SHRI F. R. GULMOHAMED SHRI S. R. SETHNA (*Alternate*)	Dental Products of India Ltd, Bombay
DR S. N. IYER SHRI G. V. BHANDARI (*Alternate*)	Johnson &Johnson Ltd, Bombay
DR PRADIP JAYNA	Indian Dental Association, Madras
AIR CDRE P. C. KOCHHAR BRIG S. N. LUTHRA (*Alternate*)	Ministry of Defence (DGAFMS)
SHRI A. V. KOTHARI DR R. S. PAHMAR (*Alternate*)	Polymers Corporation of Gujarat Ltd, Vadodara
SHRI A. K. MANDAL	Directorate General of Technical Development, New Delhi
SHRI R. D. MATHUR SHRI A. B. MATHUR (*Alternate*)	Bharat Dental & Medical Supply Co, Lucknow
DR FALI S. MEHTA	Tata Institute of Fundamental Research, Bombay
SHRI R. G. NANDWANA SHRI S. A. SHEIKH (*Alternate*)	Kalabhai Karson & Sons, Bombay
SHRI B. M. RAWAL	Indo-Ceylon Dental & Surgical Co Ltd, Madras
DR J. L. SETHI SHRI ASHOK SETHY *(Alternate*)	Dr Jagdish Lal Sethi, Delhi
DR G.B. SHANKWALKAR	Government Dental College & Hospital, Bombay
DR V. K. SHOURIE DR (SHRIMATI) A. SHOURIE (Alternate)	Occulsion Products, Thane
DR (SHRIMATI) DAYA V. SINGHAL	Lady Hardinge Medical College & S. K. Hospital, New Delhi

(*Continued on page 2*)

(*Continued from page* 1)

Members	*Representing*
DR BALRAJ **SUR**	Dr Ram Manohar Lohia Hospital, New Delhi
DR S. T. **TALIM** DR D. R. SHAHANI (*Alternate*)	Nair Hospital Dental College, Bombay
DR P. P. **THUKRAL**	Ministry of Health & Family Welfare
SHRI S. K. MATXUR, Head (**Chem**)	Director General, **ISI** (*Ex-officio Member*)

Secretary

SHRI K. K. **TRIPATHI**
Deputy Director (Chem), **ISI**

Filling Materials and Allied Products Subcommittee, CDC 52 : 1

Convener	
DR P. P. **THUKRAL**	Maulana Azad Medical College, New Delhi
Members	
DR N. K. **AGRAWAL**	In personal capacity (*Dental College & Hospital, Lucknow*)
SHRI P. R. **GULMOHAMED** **SHRI** S. R. SETHNA (Alternate)	Dental Products of India Ltd, Bombay
DR B. GOVERDHAN **HEGDE**	Government Dental College, Bangalore
DR B. P. RAJAN	Madras Dental College, Madras
DR G. L. **SUBHARWAL**	Safdarjang Hospital, New Delhi
DR V. **SUBRAMANIAN**	Directorate of Medical Education and Research (Government of Maharashtra), Bombay

Indian Standard

SPECIFICATION FOR DENTAL SILICATE CEMENT

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 10 March 1983, after the draft finalized by the Dental Materials Sectional Committee had been approved by the Chemical Division Council.

0.2 This standard was first issued in 1973 with considerable assistance derived from ISO/R/1565-1970 'Dental silicate cement'. The IS0 document had been revised to IS0 1565-1978 (E) 'Dental silicate cement (hand-mixed). Consequently the committee decided to revise this standard to align it with the latest IS0 Document.

0.3 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*. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for manually mixed dental silicate cement based on the hardening reaction between a glass powder, the principal constituent of which is an alumina silicate, and aqueous solutions of ortho phosphoric acid which may contain metal ions, sampling and test for dental silicate cement.

2. REQUIREMENTS

2.1 Description — The cement shall consist of a powder and a liquid, which, when mixed according to the manufacturer's directions, shall set rapidly to a condition suitable for its intended use.

2.2 Liquid — The liquid shall be water-clear, and no deposit or sediment shall form on the inside of the container when it is stored.

*Rules for rounding off numerical values (*revised*).

2.3 Powder -The powder shall be free from extraneous material, if powder is coloured, the pigment shall be uniformly dispersed throughout the powder.

2.4 Unset Cement — The cement when mixed as directed in **A-l** shall be of uniform smooth consistency, completely mixed and shall not evolve gases.

2.5 **Set Cement -The colour** of the set cement shall match the relevant manufacturer's shade guide when viewed under water by natural light after immersion in water for 5 days.

2.6 **Arsenic Content** — The arsenic content of the material shall be not more than 2 parts per million, when tested in the manner prescribed in A-3.

2.7 **Toxicity** — The mixed cement when used in accordance with the direction of the manufacturer shall neither cause prolonged damage to oral tissues nor have any adverse system effect.

2.8 **Physical Properties** — The cement shall also comply with the requirements for physical properties given in Table 1 when tested according to methods prescribed in Appendix A.

TABLE 1 REQUIREMENTS FOR PHYSICAL PROPERTIES

TIME OF SETTING AT 37° C (MINUTES)		COMPRESSIVE STRENGTH AFTER 24 HOURS	OPACITY, Co. 70 AFTER 24 HOURS		SOLUBILITY AND DISINTEGRATION AFTER 24 HOURS
Min	Max	Min	*Min*	*Max*	*Max*
2	5	165 MN/m^2 (1 700 kgf/cm^2)	0·35	0.55	2 percent (m/m)

NOTE -Setting time is determined from the completion of mixing.

2.9 Instructions — Instructions for proportioning and manipulation shall include information regarding the following points:

a) Temperature, conditions and type of the slab and spatula;

b) Powder-liquid-ratio;

c) Rate of incorporation of the powder;

d) Time of mixing;

e) Maximum working time between the end of mixing and the application of the matrix; and

f) A statement that, when clinical conditions warrant, a liner should be placed between the cement and the dentine.

3. PACKING AND MARKING

3.1 Packing- The cement powder and liquid shall be supplied in properly sealed containers made of such materials which shall not contaminate or perm permit contamination of the contents.

3.2 **Instructions for Use** — Instructions for proportioning the powder and liquid, and for manipulation of the cement shall accompany each package.

3.3 Marking — Each container shall be marked with the following information :

a) Name of the material;

b) Colour of the cement when set;

c) Net mass in g of the powder and net volume in ml of the liquid;

d) Month and year of manufacture;

e) Name of the manufacturer and/or his recognized trade-mark;

f) Batch number; and

g) Storage conditions as agreed in between the manufacturer and the supplier shall be marked on the container.

3.3.1 The container may also be marked with the IS1 Certification Mark.

NOTE — **The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standardconveys 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 IS1 and operated by the producer. IS1 marked products are also continuously checked by IS1 for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the IS1 Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.**

4. SAMPLING

4.1 Themethod of preparing samples of the material and the criteria for conformity shall be as given in Appendix B or as agreed to between the purchaser and the supplier.

APPENDIX A

(Clauses 2.4, 2.6 and 2.8)

METHOD OF TEST FOR DENTAL SILICATE CEMENT

A-l. PREPARATION OF TEST SPECIMENS

A-l.1 Conduct the preparation of test specimens at 27 ± 2°C and a relative humidity between 65 and 75 percent.

A-l.2 The powder liquid ratio shall be determined by the test for standard testing consistency (see A-2).

A-l.3 Mixing — The following mixing technique shall be employed in the preparation of all test specimens. A glass slab, approximately 150-mm long and 75-mm wide, and 20 mm thick and a spatula which shall be made from a material not corroded by the cement, shall be used for mixing. The spatula and the slab shall be clean, dry and free from hardened particles of cement. The mixing time shall be 1 minute. Incorporate the powder at the following rate:

Proportion of the Total Amount of Powder	*Time of Incorporation in Seconds*
1/2	15
1/4	15
1/4	15

Spatulate the whole mass for the remaining 15 seconds, using approximately one-third of the top surface of the slab. Ensure that no particles of powder or any unused liquid remain on the slab when the mixing is completed,

A-2. DETERMINATION OF POWDER/LIQUID RATIO FOR STANDARD TESTING CONSISTENCY

A-2.1 Apparatus

A-2.1.1 ***Loading Device*** — It shall be of the type illustrated in Fig. 1 or an equivalent means whereby a force of 147 N (15 kgf) may be applied vertically on to the cement.

A-2.1.2 Two flat glass plates approximately 50 mm and 40 mm square and approximately 5 mm thick.

A-2.1.3 Measuring device to deliver 0·075 ml of mixed cement in the form of a cylinder 6·0 mm high and 4·0 mm in diameter. A suitable device may consist of a glass tube and a PTFE plunger.

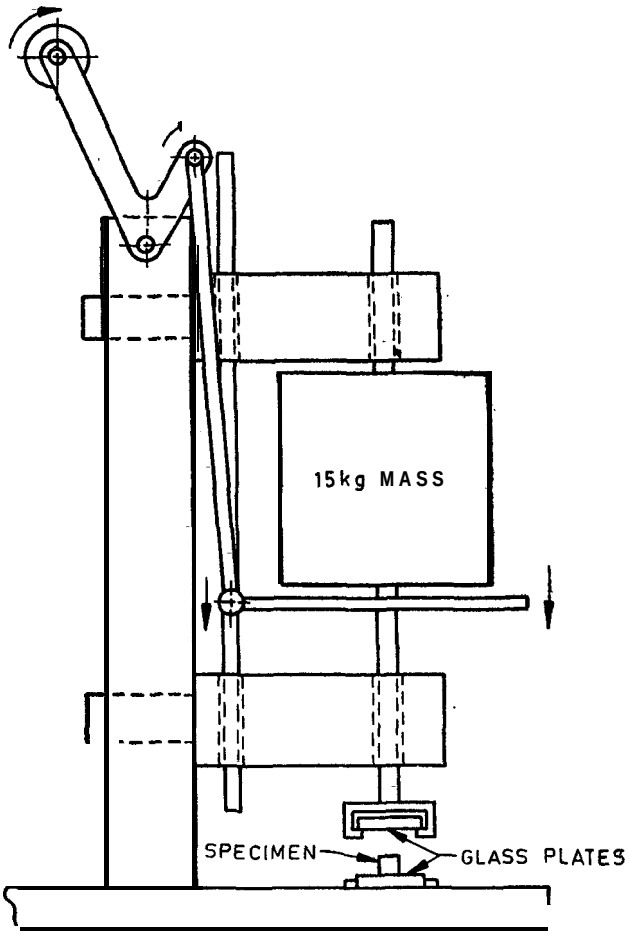


FIG. 1 LOADING DEVICE FOR MEASURING CONSISTENCY

A-2.1.4 Graduated syringe pipette having an accuracy of $\pm 0{\cdot}001$ ml.

A-2.2 Procedure — Carefully weigh out a trial amount of powder (300 to 450 mg) to an cc accuracy of 1 mg and transfer it to the glass mixing slab. Deliver 0·100 ml of liquid from the syringe pipette close to the powder. After mixing in accordance with A-l.3 collect and load the cement into the measuring device. Deliver 0·075 ml of the mixed cement, preferably as an upright cylinder, onto the centre of the lower glass plate, which is resting

on the lower anvil of the loading device. If it is not possible to deliver all the cement from the measuring device in a single operation, take the residue with the tip of a clean spatula and place on the centre of the other glass plate. Position both glass plates relative to each other, without pressure, in such a way that any cement on the second glass plate contacts centrally the bulk of the cement on the first glass plate. Sixty seconds after the end of mixing, gently press the cement out between the two glass plates with the force of 147 N (15 kgf) applied in a direction perpendicular to the lower glass plate. After the cement has set, measure the major and minor diameters of the cement disc with an accuracy of 0·5 mm and calculate the mean. If the two measurements differ by more than 1 mm discard the result and repeat the test. Make trial mixes of varying powder/liquid ratios until the mean diameter calculated from the major and minor diameter measured is 23 ± 1 mm. Check this result twice.

The powder/liquid ratios which gives the required mix consistency called the 'standard testing consistency', shall be used in the preparation of all test specimens for tests.

A-3, DETERMINATION OF ARSENIC CONTENT

A-3.1 **Preparation of Sample** — Powder the set cement and pass through a 75 micron IS sieve. Disperse 2 g of the sieved powder in 30 ml of water and add 10 ml of hydrochloric acid, 38 percent (m/m) relative density 1·1. Use this solution in the test for total arsenic content.

A-3.2 **Procedure** — The total arsenic content may be determined using any recognized analytical method of adequate sensitivity. If the result of such a determination shows the total arsenic content to be near the limit specified in the Table 1, then a further determination shall be carried out using the procedure described in IS : 2088-1971*. The result so obtained shall then be taken as the test result.

A-4. DETERMINATION OF NET SETTING TIME

A-4.0 The setting time determined by this test method is measured from the completion of mixing, and not the more usual total setting time, where the time is measured from the first contact between the cement components.

A-4.1 **-Apparatus**

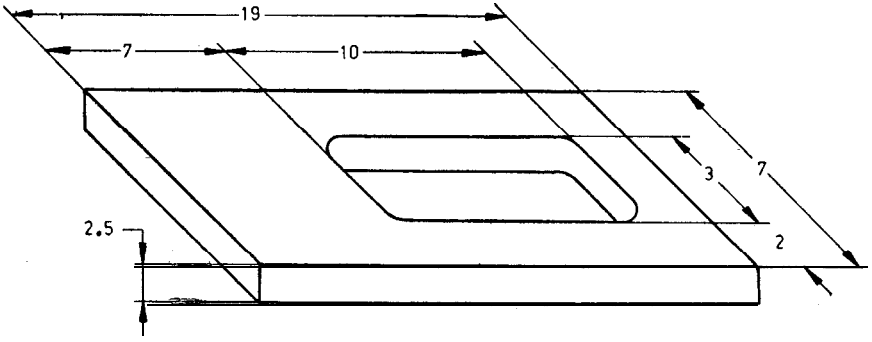
A-4.1.1 Oven or cabinet in which the specimen may be maintained at a temperature of 37 ± 1°C and a relative humidity of at least 30 percent.

A-4.1.2 Indentor of mass 400 ± 5 g and having a flat end of diameter 1·0 ± 0·1 mm. The needle tip shall be cylindrical for a distance of

*Methods for determination of arsenic (*first revision*).

approximately 5·0 mm. The needle end shall be plane and at right angles to the axis of the rod.

A-4.1.3 *Metal Mound* — Similar to that-illustrated in Fig. 2.



All dimensions in millimetres

FIG. 2 MOULD FOR USE IN DETERMINING SETTING TIME

A-4.1.4 Metal block of minimum dimensions 8 mm x 20 mm x 10 mm, either as part of A-4.1.1 or A-4.1.2 or as a separate item.

A-4.1.5 ***Aluminium*** Foil

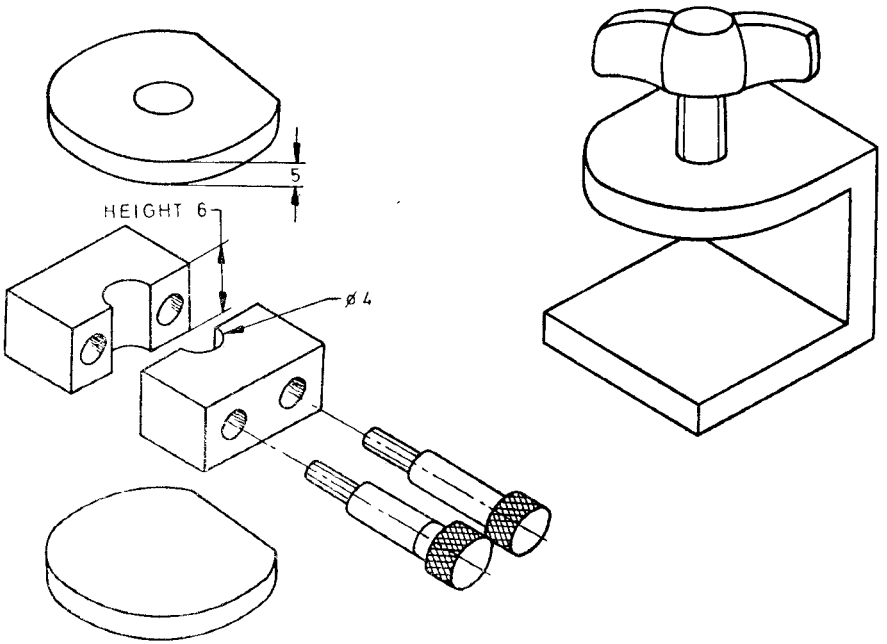
A-4.2 Procedure — Place the metal rectangular mould, conditioned to 27 ± 2°C, on a piece of aluminium foil of convenient size and fill to a level surface with cement of standard testing consistency. One minute after the completion of mixing, place the assembly containing a specimen on the metal block, which has been conditioned to 37 ± 1°C, and replace in the oven. Ensure good contact between the mould, foil and metal block. One and a half minutes after the completion of mixing, carefully lower the indentor vertically onto the surface of the cement and allow to remain there for 5 seconds. Repeat this at intervals until near the expected time of setting, at which stage reduce the intervals to 15 seconds. Maintain the needle in a clean condition by cleaning, if necessary, between indentations. Record the setting time as the period of time which elapses from the completion of mixing to the time when the needle fails to make a perceptible circular indentations on the surface of the cement, when viewed under a hand lens of low magnification. Take the mean of three such recorded values, rounded to the nearest 15 seconds, as the test result.

A-5. DETERMINATION OF COMPRESSIVE STRENGTH

A-5.1 Apparatus

A-5.1.1 Oven or cabinet maintained at a temperature of 37 ± 1°C and a relative humidity of at least 30 percent.

A-5.1.2 Split mould and plates, such as shown in Fig. 3, with internal dimensions 6 mm high and 4 mm diameter, made of stainless steel or other suitable material that will not be attacked or corroded by the cement.



All dimensions in millimetres.

FIG. 3 MOULD AND CLAMP FOR PREPARATION OF COMPRESSIVE STRENGTH TEST SPECIMENS

A-5.1.3 *Individual Screw Clamps*

A-5.1.4 Compressive strength testing apparatus with a cross-head speed of 0·75 ± 0·25 mm/min.

A-5.2 Preparation of Test Specimen — Bring the moulds top and bottom plates and the screw clamps to 27 ± 2°C. After mixing to the standard testing consistency, pack the cement, to a slight excess, into the split mould within 1 min of the completion of mixing.

NOTE — In order to consolidate the cement and avoid trapping air, it is advisable to convey the largest convenient portions of mixed cement to the mould and apply to one side with a suitable instrument. Fill the mould to excess in this manner and then place on the bottom plate with some pressure.

Remove any bulk extruded cement, place the top metal plate in position and manually squeeze together. Put the mould and plates in the clamp and screw tightly together. Not later than 2 min after the completion of mixing, transfer the whole assembly to the oven maintained at 37 ± 1°C. One hour after the completion of mixing, remove the plates, and surface the ends of the specimen plane, at right angles to its long axis. Grind the ends flat and remove any excess cement by drawing back and forth on a glass plate with a small amount of 350 mesh silicon carbide powder, maximum particle size 45 μm, mixed with water. Keep both ends of the specimen wet during the grinding and rotate about one quarter turn every few strokes. Remove the specimen from the mould immediately after surfacing and check for air-voids or chipped edges. Discard any such defective specimens.

NOTE -To facilitate the removal of the hardened cement specimen the internal surface of the mould may be evenly coated, prior to filling, with a 3 percent solution of micro-crystalline or paraffin wax in pure toluene. Alternatively a thin film of silicone grease or PTFE dry film lubricant may be used.

Immerse each acceptable specimen in distilled or deionized water and maintain at 37 ± 1°C for 23 h.

Five specimens shall be prepared and tested.

A-5.3 **Procedure** — Twenty-four hours after the completion of mixing, determine the compressive strength of the test specimens in the following manner, using a suitable apparatus with a cross-head speed of 0·75 ± 0·25 mm/min. Place each specimen with the flat ends between the platens of the testing apparatus so that the load is applied in the long axis of the specimen.

Record, the maximum load applied when the specimen fractures, and calculate the compressive strength C, in megapascals, using the formula :

$$C = \frac{4P}{d^2}$$

where

P = maximum applied load, in newtons ; and

d = diameter of the specimen, in millimetres.

If at least four of the fiveresults obtained are below the minimum strength specified in the table, the material shall be deemed to have failed the test. If at least four of the five results are above the minimum strength specified in the table, the material shall be deemed to have passed the test. In other cases prepare a further 10 specimens and obtain the median result for all 15 specimens. Round this value to two significant figures and record as the compressive strength.

A-6. DETERMINATION OF TRANSULCENCY/OPACITY

A-6.1 **Apparatus**

A-6.1.1 Oven or cabinet maintained at a temperature of 37 $\pm 1°C$, and a relative humidity of at least 30 percent.

A-6.1.2 Opal glass standards with $C_{0.70}$ 'values of 0·35 and 0·55 respectively.

A-6.1.3 A sheet of white waterproof material (approximately 110 mm x 40 mm) marked, along its entire length, with black stripes 2 mm wide and 3 mm apart.

A-6.1.4 Moulds consisting of a split brass or stainless steel ring contained in a former as illustrated in Fig. 4. The height of the ring shall be $1{\cdot}0 \pm 0{\cdot}03$ mm and the internal diameter 10 mm.

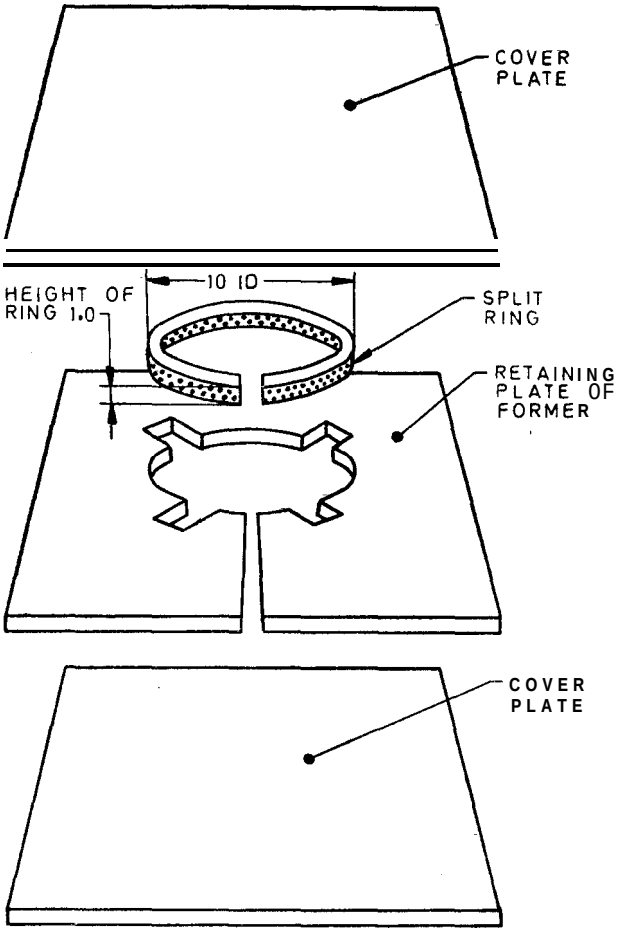
A-6.1.5 ***Individual Screw Clamps***

NOTE -**The constrast ratio $C_{0.70}$ used to represent the opacity is the ratio between the daylight apparent reflectance of the cement specimen when backed by a black backing, and the daylight apparent reflectance of the specimen when backed by a white backing having a daylight apparent reflection of 70 percent relative to magnesium oxide (MgO).**

A-6.2 Preparation of Test **Specimen** — Place the mould on a thin polyethylene or cellulose acetate sheet backed by a flat glass plate. Fill the split ring with cement mixed in accordance with A-I.3 using a light shade of powder. Cover With a further plate faced with a sheet of polyethylene or cellulose acetate, press firmly together and clamp. The specimen shall be $1{\cdot}00 \pm 0{\cdot}05$ mm thick. Two minutes after the completion of mixing, place the mould, plates and the screw clamp into the oven maintained at a temperature of 37 $\pm 1°C$, and at a relative humidity of at least 30 percent.

After 1 h, remove the plates and polyethylene or cellulose sheets from the clamp and carefully separate the cement specimen from the ring. Store the specimen for 23 h in distilled or deionized water maintained at 37 $\pm$ 1°C.

A-6.3 Procedure-Make a comparison of the translucency of the cement specimen and the two opal glass standards on the black and white striped background. Cover the cement specimen, the opal glass standards and the striped background with a thin film of distilled or deionized water while making the comparison. If the translucency of the cement specimen is between those of the two standards or equal to either of them, it shall be considered to comply with this requirement. Any photometric instrument may be used to make this comparison, provided that it can be proved to have an accuracy of within $\pm 0{\cdot}02\ C_{0.70}$.



All dimensions in millimetres.

FIG. 4 MOULD FOR PREPARATION OF TEST SPECIMEN USED IN SOLUBILITY DETERMINATION

A-7. DETERMINATION OF WATER LEACHABLE MATERIAL

A-7.1 Apparatus

A-7.1.1 Oven or cabinet maintained at a temperature of 37 ±1°C and a relative humidity of at least 30 percent.

A-7.1.2 Mould consisting of a split brass or stainless steel ring contained in a former or retaining plate similar to that illustrated in Fig. 4. The height of the ring shall be $1{\cdot}0 \pm 0{\cdot}03$ mm and the internal diameter 10 mm. The former or retaining plate shall ensure that excess cement does not expand the split ring beyond a diameter of 10 mm.

A-7.1.3 ***Individual Screw Clamps***

A-7.1.4 Platinum wire, dental floss or equivalent non-corrodible material.

A-7.1.5 Two wide-mouthed polyethylene bottles of approximately 50 ml capacity, as illustrated in Fig. 5.

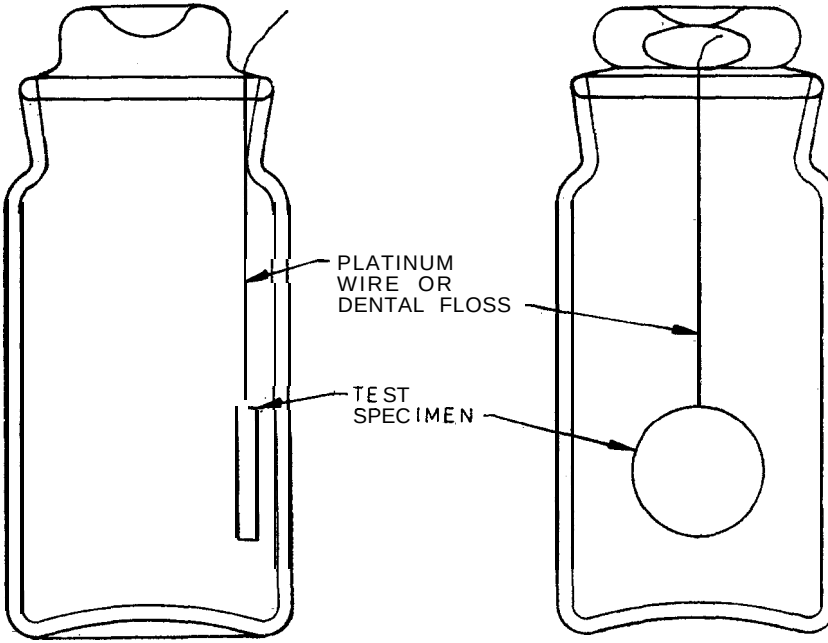


FIG. 5 WEIGHING BOTTLE CONTAINING SOLUBILITY SPECIMEN

A-7.1.6 Spectrophotometer having a range including 650 nm, with cells (optional); or a suitable comparator with Nessler tubes.

A-7.2 Reagents — All reagents shall be of analytical grade. Unless stated otherwise, distilled or deionized water shall be used.

A-7.2.1 Phosphate standard solution. Dissolve 200 sq of anhydrous disodium orthophosphate in one litre of water. This will have a solution containing the equivalent of 100 g/ml P_2O_5.

Prepare a working standard solution containing 10 sq/ml of P_2O_5 by diluting 10 ml of this standard solution to 100 ml.

A-7.2.2 ***Reagent I-*** A 10 percent solution of ammonium molybdate 1N ammonia solution (33 ml of concentrated ammonia solution, 15 N sp gr 0·88 in 500 ml of solution).

A-7.2.3 ***Reagent II*** — Sulphuric acid 20 N.

A-7.2.4 ***Reagent III*** — A 4 percent solution of ascorbic acid (it is essential that this solution be freshly prepared).

A-7.2.5 ***Reagent IV-*** Mix 40 ml of reagent I and 60 ml of reagent II; allow to cool, and add 100 ml of reagent III. It is essential that this solution be freshly prepared.

A-7.3 Preparation of Test Specimen — Place the mould on a thin polyethylene or cellulose acetate sheet backed by a flat plate. Insert a convenient tared length of wire or dental floss through the split ring so that at least 4 mm projects into the ring, Fill the split ring with cement mixed to the standard testing consistency. Cover with a further plate faced with a sheet or polyethylene or cellulose acetate, press firmly together and apply the screw clamp. Two minutes after the completion of mixing, place the mould, plates and the screw clamp into the oven maintained at 37 ±1°C, and a relative humidity of at least 30 percent. After 1 h, remove the plates and polyethylene or cellulose acetate sheets from the clamp and carefully separate the cement disc and attached wire or dental floss from the split ring. Remove any surplus cement from the edge of the disc and lightly brush the surface to remove any loose material.

A-7.4 Preparation of Test Solution — Weigh the specimen and immediately suspend it in 20 ml of water, contained in a polyethylene bottle, by means of the wire or dental floss. Ensure that the specimen does not touch the side of the bottle. Close&the lid as tightly as &possible and store for 23 h at 37 ±1°C.

A-7.5 Procedure — After 23 h, remove the specimen from the water and determine the amount of phosphate in solution by the following procedure. Carry out this determination in duplicate. Transfer the contents of each of the polyethylene bottles to a 200 ml flask and dilute to the calibration mark with water. Transfer 10 ml aliquot portions of these solutions to 50 ml volumetric flasks, and add 5 ml of reagent IV to each, the contents then being diluted to the calibration marks and thoroughly mixed. Treat 10 ml of standard phosphate solution similarly by adding 5 ml of reagent IV and making the volume up to 50 ml in a volumetric flask. At the same time also prepare a blank. Allow these flasks to stand for 24 h and then compare the solutions at 650 nm in a suitable spectrophotometer.

If no spectrophotometer is available, the sample solution may be compared against suitable standard; 9 ml of the working standard solution

(A-7.2.1) approximates to the specification limit if the cement disc is of 0·2 mm. Standard Nessler procedures should be adopted, but where any result is questionable, the spectrophotometer method shall be used.

A-7.6 **Expression of Results**

The amount of water-leachable material, expressed as P_2O_5 eluted in milligrams per gram of the specimen, is given by the formula :

$$\frac{A_1 - A_3}{A_2 - A_3} \times \frac{2}{m}$$

where

A_1 = the absorbance of the test solution;

A_2 = the absorbance of the standard phosphate solution;

A_3 = the absorbance of the blank solution;

m = the mass in grams, of the specimen.

NOTE — The absorbance, A_2 of the standard phosphate solution measured in a 1 cm cell at 650 nm is normally about 0·260.

APPENDIX B

(*Clause* 4.1)

SAMPLING OF DENTAL SILICATE CEMENT

B-l. GENERAL REQUIREMENTS OF SAMPLING

B-1.0 In drawing preparing, storing and handling test samples, the precautions and directions given in **B-l.1** to **B-l.7** shall be observed.

B-l.1 Samples shall not be taken in exposed place.

B-l.2 The sampling instrument shall be clean and dry.

B-1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

B-1.4 To draw a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by suitable means.

B-1.5 The samples shall be placed in clean, dry, air-tight glass or other suitable containers.

B-l.6 The sample containers shall be of such size that they are almost completely filled by the sample.

B-l.7 Each sample container shall be sealed air-tight with a suitable stopper after filling, and marked with full details of sampling, the date of sampling and the year of manufacture of the material.

B-2. SCALE OF SAMPLING

B-2.1 Lot -All the containers in a single consignment of the material drawn from a single batch of manufacture shall constitute a lot. If a consignment is declared or known to consist of different batches of manufacture, the containers belonging to the same batch shall be grouped together and each such group shall constitute a separate lot.

B-2.1.1 Samples shall be tested from each lot for ascertaining conformity of the material to the requirements of this specification.

B-2.2 The number of containers (n) to be selected from the lot shall depend on the size of the lot (N) and shall be as given in Table 2, subject to the provision that if n containers do not provide sufficient material for carrying out all the tests specified in 2 then at least as many containers as will provide sufficient material shall be taken out.

B-3. TEST SAMPLES AND REFEREE SAMPLE

B-3.1 Preparation of Test Samples

B-3.1.1 ***Liquid Component*** — Empty the contents of all the sample containers selected into a clean glass-stoppered bottle. Thoroughly mix the contents and divide the composite sample into three equal parts, one for the purchaser, another for the supplier and the third for the referee.

B-3.1.2 ***Solid Component*** — Empty the contents of all the samples containers selected into a square sided jar having a capacity of 2 litres and a self-sealing cap. Rotate the jar on its minor axis for two hours at the rate of 25 rev/min. Divide the composite samples into three equal parts, one for the purchaser, another for the supplier and the third for the referee.

B-3.2 Referee Sample — The referee sample shall consist of one composite sample each of the solid component and the liquid component, marked for this purpose and shall bear the seals of the purchaser and the supplier. These shall be kept at a place agreed to between the purchaser and the supplier and shall be used in case of dispute.

B-4. NUMBER OF TESTS

B-4.1 Tests for all the characteristics given in 2 shall be conducted on the composite sample.

B-5. CRITERIA FOR CONFORMITY

B-5.1 A lot shall be declared as conforming to this specification if the composite sample satisfies the requirements for each of the characteristics listed in 2. If the requirements for any of the characteristics are not met, the lot shall be declared to have not satisfied the requirements of this specification.

TABLE 2 NUMBER OF CONTAINER TO BE SELECTED FOR SAMPLING

(Ciauses B-Z.2)

LOT SIZE N	NUMBER OF CONTAINERS TO BE SELECTED n
(1)	(2)
3 to 50	3
51 to 200	4
201 to 400	5
401 to 650	6
651 to1 000	7

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

INDIAN STANDARDS INSTITUTION

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 26 60 21, 27 01 31 **Telegrams : Manaksanstha**

Regional Offices :

	Telephone
Western : Novelty Chambers, Grant Road	BOMBAY 400007 87 65 28
Eastern : 5 Chowringhee Approach	CALCUTTA 700072 27 50 90
Southern : C.I.T. Campus	MADRAS 600113 41 24 42
Northern : B69, Phase VII	S.A.S. NAGAR (MOHALI) 160051 5 78 20

Branch Offices :

'Pushpak', Nurmohamed Shaikh Marg, Khanpur	AHMADABAD 380001 2 03 91
'F' Block, Unity Bldg, Narasimharaja Square	BANGALORE 560002 22 48 05
Gangotri Complex, Bhadbhada Road, T.T. Nagar	BHOPAL 462003 6 27 16
22E Kalpana Area	BHUBANESHWAR 751014 5 36 27
5-8-56C L. N. Gupta Marg	HYDERABAD 500001 22 10 83
R 14 Yudhister Marg, C Scheme	JAIPUR 302005 6 98 32
117/418 B Sarvodaya Nagar	KANPUR 208005 4 72 92
Patliputra Industrial Estate	PATNA 800013 6 28 08
Hantex Bldg (2nd Floor), Rly Station Road	TRIVANDRUM 695001 32 27

Printed at Delhi Printers,, Delhi India