

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1566

DENTAL ZINC PHOSPHATE CEMENT

1st EDITION

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BRIEF HISTORY

The ISO Recommendation R 1566, *Dental zinc phosphate cement*, was drawn up by Technical Committee ISO/TC 106, *Dentistry*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1566, which was circulated to all the ISO Member Bodies for enquiry in December 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	India	Spain
Belgium	Israel	Sweden
Brazil	Korea, Rep. of	U.A.R.
Canada	Netherlands	United Kingdom
Czechoslovakia	New Zealand	U.S.A.
Denmark	Peru	Yugoslavia
France	Poland	
Greece	South Africa, Rep. of	

The following Member Body opposed the approval of the Draft :

Switzerland

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

DENTAL ZINC PHOSPHATE CEMENT

INTRODUCTION

This ISO Recommendation is technically identical with F.D.I.* Specification No. 6, the only difference being in the wording and layout to bring the text into standard ISO form. Further studies are being undertaken to provide, if necessary, for a future revision of this ISO Recommendation in the light of technological advances supported by well-documented data.

NOTE. – Throughout this ISO Recommendation the figures for SI units are approximate conversions of the technical metric units using the conversion factors $1 \text{ N} = 0.102 \text{ kgf}$ and $1 \text{ MN/m}^2 = 10.2 \text{ kgf/cm}^2$.

1. SCOPE

This ISO Recommendation gives the classification of and requirements for dental zinc phosphate cement, together with the test methods to be used to determine compliance with these requirements.

2. FIELD OF APPLICATION

This ISO Recommendation is applicable to zinc phosphate cement, the primary uses of which are as follows :

- (a) to join or to seal dental appliances to oral structures or to other appliances;
- (b) to serve as a base or foundation for a tooth-filling material;
- (c) to serve as a temporary filling material.

3. CLASSIFICATION

Zinc phosphate cement covered by this ISO Recommendation should be of the following types :

- **Type I** : Fine grain (see Appendix)
- **Type II** : Medium grain (see Appendix)

4. REQUIREMENTS

4.1 Material

The cement should consist of a powder and a liquid which, when mixed according to the manufacturer's instructions, will set and harden.

4.2 Liquid

4.2.1 Condition. The liquid should be water-clear and no deposits or sediment should form when it is stored in a container.

4.2.2 Volume. The liquid should be supplied in an amount 20 % in excess of that necessary to combine with the total amount of powder in a container of full portion size ** when mixed to a standard testing consistency. (See clause 7.2.)

4.3 Powder

The powder should be free from extraneous material such as dirt and lint. The pigment should be uniformly dispersed throughout the powder.

* Fédération Dentaire Internationale.

** Usually about 14 g.

4.4 Unset cement

Cement when spatulated as directed in section 6 should not form lumps or granules, or evolve gases.

4.5 Set cement

The colour of each cement when set should match the relevant manufacturer's shade guide.

4.6 Arsenic content

The limitation on arsenic content should be as listed in Table 1 below.

4.7 Physical properties

The time of setting, compressive strength, film thickness, and solubility and disintegration, should be as listed in Table 1 below.

TABLE 1 — Requirements for physical and chemical properties

Time of setting at 37 °C		Compressive strength after 24 h	Film thickness Min.		Solubility and disintegration after 24 h	Arsenic content
Min.	Max.	Min.	Type I	Type II	Max.	Max.
5 minutes	9 minutes	70 MN/m ² (700 kgf/cm ²)	25 µm	40 µm	0.2 % (m/m)	0.0002 % (m/m) (1 part in 500 000)

4.8 Instructions

Instructions for proportioning and manipulation should include information regarding

- the temperature of the slab;
- the powder/liquid ratio;
- the rate of incorporation of the powder;
- the time of mixing;
- the maximum satisfactory working time after the end of the mixing.

5. SAMPLING

5.1 Sampling

The method of procurement and amount of the cement needed for testing should be the subject of agreement between the parties concerned.

5.2 Pooling of liquids

The contents of the sample containers of liquid should be emptied into a clean glass-stoppered bottle.

5.3 Pooling of powders

The contents of the sample containers of powder should be emptied into a square-sided jar having a capacity of 2 litres and a self-sealing cap.

The jar should be rotated on its minor axis for 2 hours at the rate of 25 revolutions per minute.

5.4 Test samples

All tests with the exception of those for the properties prescribed in clauses 4.2.1 and 4.3 should be conducted on specimens made from the composite samples of liquid and powder specified in clause 5.2 and 5.3 respectively.

6. PREPARATION OF TEST SPECIMENS

6.1 General

The preparation of all test specimens should be conducted at $23 \pm 2^\circ\text{C}$ and at a relative humidity between 55 and 75 %. The powder/liquid ratio should be determined by the test for standard testing consistency (see clause 7.2).

6.2 Mixing

The following mixing technique should be employed in the preparation of all test specimens.

A polished glass slab approximately 150 mm long by 75 mm wide and a spatula, which should be made from a material not corroded by the cement, should be used for mixing. The spatula, and the slab should be clean and free from hardened particles of cement. The mixing time should be $1\frac{1}{2}$ minutes.

The incorporation of the powder should be accomplished at the rate shown in Table 2.

TABLE 2 - Rate of incorporation of powder

Proportion of total amount of powder	Time of incorporation in seconds
$\frac{1}{16}$	10
$\frac{1}{16}$	10
$\frac{1}{8}$	10
$\frac{1}{4}$	15
$\frac{1}{4}$	15
$\frac{1}{4}$	30

At least one-half of the top surface of the slab should be used. No particles of powder or any unused liquid should remain on the slab when the mixing is completed.

A linear and not a rotary motion of the spatula should be used, with the edge of the spatula sweeping approximately half of the mixing area of the slab on each stroke.

7. TEST METHODS

7.1 Visual inspection

Visual inspection should be used in determining compliance with the requirements outlined in clauses 4.1, 4.2.1, 4.3, 4.4, 4.5 and 4.8, and section 8.

7.2 Determination of standard testing consistency

7.2.1 Apparatus. The type of apparatus for measuring consistency should be essentially that shown in Figure 1. This apparatus consists of two flat glass plates, a load, a gauge plug and a glass tube, of inside diameter approximately 6.5 mm, which will deliver 0.50 ± 0.02 ml of mixed cement. The combined mass of the top plate and the load should be 120 g.

7.2.2 Procedure. Trial amounts of powder should be mixed with 0.50 ml of liquid. Then 0.50 ± 0.02 ml of each mix should be delivered from the glass tube onto a flat glass plate. 3 minutes after the commencement of mixing, the top glass plate, of mass approximately 20 g, and the necessary additional load required to total 120 g should be carefully lowered onto the soft cement.

Trials should be made until the average of the greater and lesser diameters of the slumped mass of cement is 30 ± 1 mm 10 minutes after starting the mix.

7.2.3 Expression of results. The average mass of powder used in three such determinations rounded off to the nearest 0.05 g combined with 0.50 ml of liquid should be by definition the standard testing consistency or amount of powder necessary to produce a mix of standard consistency.