

Identical adoption of ISO 15912:2006, *Dentistry – Casting investments and refractory die materials*.

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AMERICAN NATIONAL STANDARD/AMERICAN DENTAL ASSOCIATION SPECIFICATION NO. 126 FOR CASTING INVESTMENTS AND REFRACTORY DIE MATERIALS

The Council on Scientific Affairs of the American Dental Association has approved American Dental Association Specification No. 126 for Casting Investments and Refractory Die Materials. This and other specifications for dental materials, instruments and equipment are being formulated by working groups of the ADA Standards Committee on Dental Products (formerly Accredited Standards Committee MD156 for Dental Materials, Instruments and Equipment). The Committee has representation from all interests in the United States in the standardization of materials, instruments and equipment in dentistry. The Council has adopted the specifications, showing professional recognition of their usefulness in dentistry, and has forwarded them to the American National Standards Institute with a recommendation that the specifications be approved as American National Standards. The American National Standards Institute granted approval of ADA Specification No. 126 as an American National Standard on February 2, 2009.

The Council thanks the working group members and the organizations with which they were affiliated at the time the specification was developed:

Atul C. Sarma (chairman), Whip Mix Corporation, Louisville, KY;
Carlos Munoz (secretary), Loma Linda University, CA;
Waldemar De Rijk, University of Tennessee, Memphis, TN;
Frederick Eichmiller, Delta Dental of Wisconsin, Stevens Point, WI;
Daniel Menis, HarryJ. Bosworth Company, Skokie, IL;
Carl Panzera, American Thermocraft Corporation, Somerset, NJ; and
Nikhil Sarkar, Louisiana State University, New Orleans, LA.

AMERICAN NATIONAL STANDARD/AMERICAN DENTAL ASSOCIATION SPECIFICATION NO. 126 FOR CASTING INVESTMENTS AND REFRACTORY DIE MATERIALS

FOREWORD

(This Foreword does not form a part of ANSI/ADA Specification No. 126 for Casting Investments and Refractory Die Materials).

This specification is an identical adoption of ISO 15912:2006, Dentistry – Casting investments and refractory die materials. ADA SCDP Working Group No. 2.18 on Investments examined the international standard and found it acceptable for identical adoption as ANSI/ADA Specification No. 126.

Dental investment and other refractory materials are used for a variety of applications within the dental laboratory. Historically, standards were developed on the basis of the chemistry of the binding system used or specific type of application, resulting in five separate specifications.

This single specification gives the requirements and test methods for dental casting, brazing and refractory investments and refractory die materials, regardless of the nature of the binding system or the particular application. It consolidates and replaces these five specifications:

- ANSI/ADA Spec. No. 2 for Gypsum-Bonded Casting Investment for Dental Gold Alloy;
- ANSI/ADA Spec. No. 42 for Phosphate-Bonded Investments;
- ANSI/ADA Spec. No. 91 for Ethyl Silicate Investments;
- ANSI/ADA Spec. No. 92 for Refractory Die Materials;
- ANSI/ADA Spec. No. 93 for Soldering Investments.

This specification classifies investments into types according to their intended use and classes according to the recommended burn-out procedure.

A specific quantitative requirement for setting expansion is not included in this specification. However, if the setting expansion of a gypsum-bonded investment is measured, use of the procedure contained in ISO 6873:1998 should be considered. This procedure is not recommended for phosphate-bonded products.

AMERICAN NATIONAL STANDARD/AMERICAN DENTAL ASSOCIATION SPECIFICATION NO. 126 FOR CASTING INVESTMENTS AND REFRACTORY DIE MATERIALS

1 SCOPE

This specification is applicable to dental casting, brazing and refractory investments and refractory die materials, regardless of the nature of the binding system or the particular application.

This specification classifies investments into types according to their intended use and classes according to the burn-out procedure recommended by the manufacturer.

This specification specifies requirements for the essential physical and mechanical properties of the materials and the test methods used to determine them.

This specification also includes requirements for the information and instructions which accompany each package.

2 NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3696:1987, *Water for analytical laboratory use — specification and test methods*

ISO 1942, *Dentistry — Vocabulary*

ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*

(ISO standards for dentistry are available from the American Dental Association, Department of Standards, 211 E. Chicago Ave., Chicago, IL 60611 or www.adacatalog.org. Other ISO standards are available from the American National Standards Institute, 25 W. 43rd St., New York, NY 10036 or www.ansi.org).

3 TERMS AND DEFINITIONS

For the purposes of this document, the terms and definitions of ISO 1942 and the following apply.

- 3.1 Dental casting investment material** – refractory filler powder and binder system which, mixed with a specified liquid, hardens to form the mold for casting dental restorations.

NOTE: Generally, the refractory powder consists of oxides such as silica. Depending upon its chemistry, all the components of the binder can be in the liquid, or some can be dispersed (as a powder) in the refractory powder. The liquid can be pure water or a special liquid, as required by the chemistry of the binding system.

- 3.2 Refractory die material** – powder mixture of a refractory filler and binder system designed, specifically (when mixed with a particular liquid) to allow the formation of a hardened die suitable for the production of dental ceramic restorations using the sintering technique.

- 3.3 Brazing investment material** – powder mixture of a refractory filler and binder system, designed specifically (when mixed with a particular liquid) to allow the formation of a cast upon which components are held in place while they are being joined by brazing.

NOTE: The cast can be referred to as the model, even though this is a deprecated term.

- 3.4 Special liquid** – liquid, other than water, supplied by the manufacturer or distributor for mixing with the investment

powder.

- 3.5 Slow- or step-heating method** – heating method in which the burn-out furnace is initially at room temperature, then its temperature is increased to the end temperature at a programmed rate.

NOTE: After a time recommended by the manufacturer, the set investment is placed in the burn-out furnace, which is set at room temperature. The temperature of the furnace is then increased to the end temperature in a series of stages and at a rate recommended by the manufacturer.

- 3.6 Quick-heating method** – heating method in which the burn-out furnace is set initially at the recommended final burn-out temperature.

NOTE: At a time recommended by the manufacturer, the set investment is placed directly in the heated furnace. The furnace is maintained at this temperature.

4 CLASSIFICATION

For purposes of this specification, investments and refractory die materials are categorized by the following types.

Type 1: for the construction of inlays, crowns and other fixed restorations;

Type 2: for the construction of complete or partial dentures or other removable appliances;

Type 3: for the construction of casts used in brazing procedures;

Type 4: for the construction of refractory dies.

There are two classes of casting investment and refractory die material:

Class 1: recommended for burn-out by a slow- or step-heating method;

Class 2: recommended for burn-out by a quick-heating method.

5 REQUIREMENTS

5.1 General

If a manufacturer claims that a given product is suitable for both classes, the material must satisfy the requirements for both classes.

5.2 Material consistency

When examined in accordance with 7.1, the powder shall be uniform and free from lumps and foreign matter. If a special liquid is supplied, it shall be free of sediment.

5.3 Fluidity

When measured in accordance with 7.2, the fluidity shall not vary by more than 30 % from the value stated by the manufacturer.

This requirement shall not apply to silica bonded investments (i.e. products in which an alcoholic solution of ethyl silicate is used in the binding system).

5.4 Initial setting time

When measured in accordance with 7.3, the initial setting time shall not vary by more than 30 % from that stated by the manufacturer. If the manufacturer gives a range for the initial setting time, the measured initial setting time shall not vary by more than 30 % from the mid-point of this range.

5.5 Compressive strength

When measured in accordance with 7.4, the compressive strength shall not vary by more than 30 % from that stated by the manufacturer and in no case shall be lower than 2 MPa.

5.6 Linear thermal dimensional change

When measured in accordance with 7.5, the linear thermal expansion for all four types shall not vary by more than 20 % from the value stated by the manufacturer. If the manufacturer gives a range for the linear thermal expansion, the measured linear thermal expansion shall not vary by more than 20 % from the mid-point of this range.

When measured in accordance with 7.5, the linear firing shrinkage for Type 4 shall not vary by more than 15 % from the value stated by the manufacturer. If the manufacturer gives a range for the linear firing shrinkage, the measured linear firing shrinkage shall not vary by more than 15 % from the mid-point of this range.

5.7 Setting expansion

See the Introduction for guidance on setting expansion.

6 SAMPLING, TEST CONDITIONS AND MIXING

6.1 Sampling

Use material from a single lot. Use only sealed, undamaged packages that are within the “use before” date.

If a special liquid is recommended by the manufacturer, use liquid from a single lot that is within the “use before” date.

6.2 Test conditions

Carry out all testing under controlled conditions of temperature (23 ± 1) °C and relative humidity (50 ± 10) % in a room free from obvious drafts.

Hold all materials and test equipment under these controlled conditions for a minimum period of 16 hours prior to testing.

6.3 Mixing

Mix according to the manufacturer's instructions. If a range is given for the powder to liquid ratio, use the midpoint of this range. When a special liquid is supplied, use at the manufacturer's recommended dilution in accordance with 8.1 c). If a range of dilutions is given, use the mid-point of this range. If water is required, use water that complies with grade 3 in accordance with ISO 3696:1987.

6.3.1 Apparatus

The following items may be needed, depending on the manufacturer's instructions.

6.3.1.1 Clean, dry flexible **mixing bowl** and rigid **spatula** for hand mixing.

6.3.1.2 **Mechanical/vacuum mixer** with an appropriate clean and dry mixing bowl.

6.3.1.3 **Timer** capable of measuring time to an accuracy of 1 s.

6.3.2 Procedure

Measure the required mass of powder and the recommended volume of liquid to an accuracy of 1 %.

Pour the liquid into the mixing bowl (6.3.1.1) and add the powder. Commence timing when liquid and powder make first contact.