



Designation: B 495 – 01

Standard Specification for Zirconium and Zirconium Alloy Ingots¹

This standard is issued under the fixed designation B 495; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers four grades of zirconium ingots.

1.2 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

1.3 The following precautionary caveat pertains only to the test method portion, Section 10, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

E 114 Practice for Ultrasonic Pulse-Echo Straight-Beam Examination by the Contact Method²

3. Terminology

3.1 *Lot Definitions:*

3.1.1 *castings*—a lot shall consist of all castings produced from the same pour.

3.1.2 *ingot*—no definition required.

3.1.3 *rounds, flats, tubes, and wrought powder metallurgical products (single definition, common to nuclear and non-nuclear standards)*—a lot shall consist of a material of the same size, shape, condition, and finish produced from the same ingot or powder blend by the same reduction schedule and the same heat treatment parameters. Unless otherwise agreed between manufacturer and purchaser, a lot shall be limited to the product of an 8 h period for final continuous anneal, or to a single furnace load for final batch anneal.

3.1.4 *sponge*—a lot shall consist of a single blend produced at one time.

3.1.5 *weld fittings*—definition is to be mutually agreed upon between manufacturer and the purchaser.

4. Classification

4.1 The ingots are furnished in five grades as follows:

4.1.1 *Grade R60702*— Unalloyed zirconium.

4.1.2 *Grade R60703*— Unalloyed zirconium, metallurgical grade.

4.1.3 *Grade R60704*— Zirconium-tin alloy.

4.1.4 *Grade R60705*— Zirconium-niobium alloy.

4.1.5 *Grade R60706*— Zirconium-niobium alloy.

5. Ordering Information

5.1 Orders for materials under this specification shall include the following information:

5.1.1 Quantity (weight),

5.1.2 Name of material (zirconium ingot),

5.1.3 Grade number (Section 4),

5.1.4 ASTM designation and year of issue,

5.1.5 Finish (Section 8), and

5.1.6 Additions to the specification and supplementary requirements, if required.

NOTE 1—A typical ordering description is as follows: 10 000-lb zirconium ingot, machine conditioned, ASTM B 495, dated __, Grade R60702.

6. Materials and Manufacture

6.1 The ingots covered by this specification shall be manufactured by electron beam, vacuum, or inert atmosphere melting in furnaces conventionally used for reactive metals.

7. Chemical Composition

7.1 The material shall conform to the requirements as to chemical composition prescribed in Table 1.

7.2 When requested by the purchaser, a check analysis shall be performed for any elements listed in Table 1.

7.2.1 The manufacturer's analysis shall be considered as verified if the check analysis confirms the manufacturer's reported values within the tolerances prescribed in Table 2.

8. Workmanship, Finish, and Appearance

8.1 Ingots shall be conditioned by machining, grinding, or surface fusion to remove gross surface and subsurface defects detrimental to subsequent fabrication.

¹ This specification is under the jurisdiction of ASTM Committee B10 on Reactive and Refractory Metals and Alloys and is the direct responsibility of Subcommittee B10.02 on Zirconium and Hafnium.

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² *Annual Book of ASTM Standards*, Vol 03.03.