Designation: B 811 – 02

Standard Specification for Wrought Zirconium Alloy Seamless Tubes for Nuclear Reactor Fuel Cladding[1]

This standard is issued under the fixed designation B 811; 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 seamless wrought zirconium-alloy tubes for nuclear fuel cladding application, in the outside diameter (OD) size range of 0.200 in. (5.1 mm) to 0.650 in. (16.5 mm) and wall thickness range of 0.010 in. (0.25 mm) to 0.035 in. (0.89 mm).

1.2 Two grades of reactor grade zirconium alloys are described.

1.2.1 The present UNS numbers designated for the two grades are given in Table 1.

1.3 Unless a single unit is used, for example corrosion mass gain in mg/dm^2, the values stated in either inch-pound or SI units are to be regarded separately as standard. The values stated in each system are not exact equivalents; therefore each system must be used independently of the other. SI values cannot be mixed with inch-pound values.

1.4 The following precautionary caveat pertains only to the test method portions 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:*

B 350 Specification for Zirconium and Zirconium Alloy Ingots for Nuclear Application[2]

B 353 Specification for Wrought Zirconium and Zirconium Alloy Seamless and Welded Tubes for Nuclear Service Except Nuclear Fuel Cladding[2]

E 8 Test Methods for Tension Testing of Metallic Materials[3]

E 21 Test Methods for Elevated Temperature Tension Tests of Metallic Materials[3]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[4]

E 112 Test Methods for Determining the Average Grain Size[3]

G 2 Test Method for Corrosion Testing of Products of Zirconium, Hafnium and Their Alloys in Water at 680°F or in Steam at 750°F[5]

G 2M Test Method for Corrosion Testing of Products of Zirconium, Hafnium and Their Alloys in Water at 633°K or in Steam at 673°K (Metric)[5]

2.2 *Other Document:*

ANSI B46.1 Surface Texture (Surface Roughness)[6]

TABLE 1 ASTM and UNS Number Designation for Reactor Grade Zirconium Alloys

Grade	UNS Number
Zirconium-tin alloy	R60802
Zirconium-tin alloy	R60804

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *dimensions*—tube dimensions are outside diameter, inside diameter, and wall thickness. Only two of these parameters may be specified in addition to length, except minimum wall may be specified with outside and inside diameter. In each case, ovality and wall thickness variation (WTV) may be specified as additional requirements.

3.1.2 *hydride orientation fraction, Fn*—the ratio of hydride platelets oriented in the radial direction to the total hydride platelets in the field examined.

3.1.3 *lot size*—a lot shall consist of all tubes of the same size, shape, condition, and finish produced from the same ingot by the same reduction schedule and heat treatment. The final heat treatment shall be in a single furnace charge.

3.1.4 *mill finish tubes*—tubes that have received all finishing operations subsequent to final anneal, which potentially affects tube mechanical, dimensional, or surface condition. These operations include, but are not limited to, pickling, cleaning, outer and inner surface abrasive conditioning, and straightening.

[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 02.04.

[3] *Annual Book of ASTM Standards*, Vol 03.01.

[4] *Annual Book of ASTM Standards*, Vol 14.02.

[5] *Annual Book of ASTM Standards*, Vol 03.02.

[6] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

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