



Designation: **C515 – 95 (Reapproved 2007) C515 – 13**

Standard Specification for Chemical-Resistant Ceramic Tower Packings¹

This standard is issued under the fixed designation C515; 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 fired ceramic shapes formed from naturally occurring clays and from compounded bodies that are used as packing in tower installations. These ceramic units are designed primarily for use in process equipment for the chemical or allied industries.

1.2 The physical and chemical properties that affect quality of packing materials are covered in this specification. Properties that affect actual operational efficiency or characteristics of processing towers are not covered.

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

1.4 The following precautionary statement pertains to the test method portion only, Section 7, of this standard. *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*:²

C279 Specification for Chemical-Resistant Masonry Units

C373 Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products

E4 Practices for Force Verification of Testing Machines

3. Terminology

3.1 *Definitions*:

3.1.1 *tower packing*—a term covering variously shaped ceramic pieces such as spheres, cylindrical rings with either normal or angular ends, rings with included obstructions, perforated cylinders, and curved saddles. These shapes are used within columns or towers to provide inert surfaces for promotion of energy transfer or chemical reaction between liquids and liquids, gases and liquids, and gases and gases.

¹ This specification is under the jurisdiction of ASTM Committee D32 on Catalysts and is the direct responsibility of Subcommittee D32.02 on Physical-Mechanical Properties.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.1.1.1 *Discussion*—

Clay: An earthy or stony mineral aggregate consisting, essentially of hydrous silicates of alumina, plastic when sufficiently pulverized and wetted, rigid when dry, and vitreous when fired at a sufficiently high temperature.

3.1.2 *chemical stoneware tower packing*—pieces manufactured from specially compounded bodies consisting of clays and other minerals, of natural origin.

3.1.3 *chemical porcelain tower packing*—pieces manufactured from specially compounded bodies, consisting of refined clays and other naturally occurring minerals. These pieces are characteristically smooth-textured, vitreous, and white or light gray in color.

4. Shapes, Sizes, and Quantities

4.1 The number of dumped pieces of cylindrical-type packing per cubic foot shall conform to the requirements for each size of rings, packings, and saddles as specified in **Table 1**, **Table 2**, and **Table 3**; or as negotiated between customer and supplier.

5. Tolerances for Rings

5.1 *Dimensional Accuracy*—The average outside diameter and average length shall be within $\pm 5\%$ of specified size for 80 % of a lot, and within $\pm 10\%$ of specified size for 100 % of a lot.

5.2 Measurement of the ring shall be made with calipers, avoiding flashes, protrusions, and obviously defective areas. The average outside diameter shall be determined as one half the sum of the maximum and minimum outside diameters. The average length shall be determined as one half the sum of the maximum and minimum lengths.

5.3 *Ovalness*—The difference between maximum and minimum outside diameters of any ring in a lot shall not exceed 10 % of the specified size.

5.4 *Inspection*—The sample plan and procedure shall be as agreed upon by the supplier and purchaser at time of purchase.

NOTE 1—See **Table 2** for piece size counts of saddles which define size tolerances.

6. Chemical Composition

6.1 The appearance of iron or other leachable impurities on the surfaces may be cause for rejection if this is a matter of concern to the purchaser.

TABLE 1 Requirements For Shapes, Sizes, and Quantities of Rings

Raschig Rings			
Size, ^A in. (mm)	Nominal Wall Thickness, in. (mm)	Approximate Number per Cubic Foot ^B (0.03 m ³)	
1/4 (6.4)	1/32 to 1/16 (0.8 to 1.6)	79 200	
5/16 (7.9)	1/16 (1.6)	36 000	
3/8 (9.5)	3/32 to 1/16 ^C (2.4 to 1.6)	22 500	
1/2 (12.7)	3/32 (2.4)	9 960	
5/8 (15.9)	3/32 to 1/8 ^C (2.4 to 3.2)	5 360	
3/4 (19.1)	3/32 to 1/8 ^C (2.4 to 3.2)	2 890	
1 (25.4)	1/8 (3.2)	1 260	
1 1/4 (31.8)	3/16 (4.8)	640	
1 1/2 (38.1)	1/4 (6.4)	360	
2 (50.8)	3/16 to 1/4 ^C (4.8 to 6.4)	155	
3 (76.2)	3/8 (9.5)	64 to 74	
4 (101.6)	1/2 (12.7)	27 to 31	
6 (152.4)	5/8 (15.9)	8 to 9	
Lessing Rings			
Size, ^A in. (mm)	Nominal Wall Thickness, in. (mm)	Approximate Number per Cubic Foot ^B (0.03 m ³)	
1 (25.4)	1/8 (3.2)	1220	
1 1/4 (31.8)	3/16 (4.8)	620	
1 1/2 (38.1)	1/4 (6.4)	330	
2 (50.8)	1/4 (6.4) to (9.5) ^C	142	
3	5/16 (7.9) to 3/8 (9.5) ^C	44	
4	3/8 (9.5) to 1/2 (12.7) ^C	22	
Cross Partition Rings			
Size, ^A in. (mm)	Nominal Wall Thickness, in. (mm)	Number per Cubic Foot (0.03 m ³)	
		Square Set	Stagger Set
3 (76.2)	5/16 (7.9) to 3/8 (9.5)	64	74
4 (101.6)	3/8 (9.5) to 1/2 (12.7)	27	31
6 (152.4)	1/2 (12.7)	8	9

^A This dimension describes both the specified length and the specified outside diameter, and is intended as a guide rather than as an acceptance criterion.

^B Dumped, except for values assigned to 3 in. (76.2 mm) of larger rings, which are usually stacked in square or stagger set. These numbers are to be considered as guides rather than as acceptance criteria.

^C Representative of different manufacturers' practices.