

ICS 81.080

Q 44

JC

Building Materials Industry Standard of the People's
Republic of China

JC/T 495—2013

Replace JC/T 495-1992 (96)

Dense zircon brick for glass furnace 玻璃熔窑用致密锆英石砖

(English Translation)

Issue date: 2013 - 04 - 25

Implementation date: 2013 - 09 - 01

Issued by Ministry of Industry and Information Technology
of the People's Republic of China

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Foreword

China Building Materials Federation is in charge of this English translation. In case of any doubt about the contents of English translation, the Chinese original shall be considered authoritative.

This document was drafted in accordance with the rules given in GB/T 1.1—2020.

This document replaces the JC/T 495—1992 (96) (*Dense zircon brick for glass furnace*) in whole. In addition to a number of editorial changes, the following technical deviations have been made with respect to the JC/T 495—1992 (96) (*Dense zircon brick for glass furnace*) (the previous edition).

—Modify the original two brands to five brands (Refer to 4.1, 3.1 of 1992 (96) edition);

—Modify the requirements indexes corresponding ZrO_2 , SiO_2 , Fe_2O_3 , bulk density, apparent porosity, cold compressive strength and refractoriness under load (Refer to 5.1, 4.1 of 1992 (96) edition) ;

—Add the requirement index of TiO_2 (Refer to 5.1) ;

—Modify the dimension tolerance and the appearance quality of zircon brick (Refer to 5.2, 4.2 of 1992 (96) edition) ;

—Modify the marking, packaging, transport, storage and quality certification, simplify the content reasonably (Refer to chapter 8, chapter 7 of 1992 (96) edition) ;

This document was proposed and prepared by China Building Materials Federation.

The previous editions of JC/T 495—2013 (*Dense zircon brick for glass furnace*) are as follows,

—JC/T 495—1992 (96).

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Dense zircon brick for glass furnace

1 Scope

This document specifies the terminology and definition, classification, shape and dimension, technical requirements, test methods, inspection regulation, packaging, marking, transport, storage, and quality certification of dense zircon bricks for glass furnace (Hereinafter referred to as zircon brick).

This document is applicable to the zircon brick which are made of zircon sand fired at high temperature after isotactic pressing, mechanical pressing or other process.

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.

GB/T 2997 *Test method for bulk density, apparent porosity and true porosity of dense shaped refractory products*

GB/T 4984 *Chemical analysis of refractories containing zirconia*

GB/T 5072 *Refractories—Determination of cold compressive strength*

GB/T 7321 *Sample preparation for testing of shaped refractory products*

GB/T 10326 *Shaped refractory products inspections of dimension, appearance and section*

GB/T 16546 *Shaped refractory products—Packing, marking, transportation and storage*

GB/T 18930 *Terminology for refractories*

GB/T 21114 *Chemical analysis of refractory products by XRF—Fused cast bead method*

JC/T 806 *Test method of static corrosion resistance of refractories of glass furnace to molten glass*

YB/T 370 *Refractories—Determination of refractoriness under load (non-differential, with*

rising temperature)

3 Terms and definitions

For the purpose of this document, the terms and definitions given in GB/T 18930 and the following apply.

3.1 zircon brick

a refractory product produced with zircon ($ZrO_2 \cdot SiO_2$) as main constituent material.

4 Classification, shape and dimensions

4.1 Zircon brick is divided into ZS-G high-dense zircon brick, ZS-Z dense zircon brick, ZS-65A machine-pressed zircon brick, ZS-65B machine-pressed zircon brick, and ZS-63 machine-pressed zircon brick according to the production process, physical properties and chemical composition. Among them, ZS represents zircon brick, G represents high densification, and Z represents densification.

4.2 The shape and dimensions of zircon bricks shall be produced in accordance with the requirements of the drawings.

5 Technical requirements

5.1 The physical properties and chemical composition of zircon brick shall meet the requirements given in Table 1.

Table 1 The physical properties and chemical composition of zircon brick

Items		Requirements				
		ZS-G	ZS-Z	ZS-65A	ZS-65B	ZS-63
Bulk density / (g/cm ³)	≥	4.30	4.10	3.70	3.60	3.55
Apparent porosity /%	≤	1	11	17	19	20
Cold compressive strength /MPa	≥	300	200	100	80	60
Refractoriness under load T ₀ /°C	≥	1700	1700	1680	1650	1600
Corrosion resistance to molten glass under static condition / (mm/24h) (Alkali free glass, 1500°C×48h)		Provide the measured data				
Chemical composition/%	ZrO ₂	≥	65	68	65	63
	SiO ₂	≤	33	30	33	35
	Fe ₂ O ₃	≤	0.20	0.20	0.20	0.20
	TiO ₂	≤	1.2	1.2	1.2	—

5.2 The dimension tolerance and appearance quality of zircon bricks shall meet the requirements given in Table 2.

Table 2 The dimension tolerance and appearance quality of zircon bricks

Unit in millimeters

Items	Requirements	
Dimension tolerance	Size \leq 100	± 1.0
	100<Size \leq 250	± 1.5
	250<Size \leq 400	± 2.0
Distortion	\leq	0.5%
Crack length	Width \leq 0.25	Allowed
	0.26 <Width \leq 0.50	≤ 20 , no more than two places
	Width >0.50	Not allowed
Edge defect	Depth of edge defect	≤ 8
	Total length of edge defect ≤ 50	No more than one place
Corner defect	Number of corner defect	No more than one place
	Depth of corner defect	≤ 10
lamination		Not allowed

5.3 The dimension tolerance and appearance quality of the special-shaped and the large zircon bricks, and the dimension tolerance of the pre-assembled matching bricks are required to be agreed by the interested parties.

6 Test methods

6.1 Sample preparation

Sample preparation shall be carried out in accordance with the requirements specified in GB/T 7321.

6.2 Bulk density and apparent porosity

Bulk density and apparent porosity shall be carried out in accordance with the requirements specified in GB/T 2997.

6.3 Cold compressive strength

Cold compressive strength shall be carried out in accordance with the requirements specified in GB/T 5072.

6.4 Refractoriness under load

JC/T 495—2013

Refractoriness under load shall be carried out in accordance with the requirements specified in YB/T 370.

6.5 Corrosion resistance to molten glass

Corrosion resistance to molten glass shall be carried out in accordance with the requirements specified in JC/T 806.

6.6 Chemical composition

Chemical composition analysis shall be carried out in accordance with the requirements specified in GB/T 4984 or GB/T 21114, of which GB/T 4984 governs in arbitration.

6.7 The dimension tolerance and appearance quality

The dimension tolerance and appearance quality shall be carried out in accordance with specified in GB/T 10326. Distortion is expressed by the percentage of brick length.

7 Inspection rules

7.1 Inspection classification

The inspection is divided into delivery inspection and type test.

7.1.1 Delivery inspection

The delivery inspection shall be carried out before product delivery. The inspection items shall include appearance quality, dimension tolerance, chemical composition, bulk density and apparent porosity.

7.1.2 Type test items include all items specified in technical requirements given in Clause 5. In case of any of the following circumstances, type test shall be conducted,

- a) When the production process or raw material has changed greatly;
- b) At least two times a year during normal production;
- c) To resume the production which have been stopped for more than half a year;
- d) Major differences have been found between the results of delivery inspection and the last type test.

7.2 Grouping

Products with the same brand produced by the same process shall be grouped in lot, which shall be not over 200t each lot.

7.3 Sampling

7.3.1 Sampling for appearance and dimension inspection

The sampling and inspection scheme for appearance and dimension given in this document is determined according to acceptable quality limit (AQL), shown in Table 3. If there is no special provision, the appearance inspection shall be carried out according to the sampling scheme of AQL=4.0, and the dimension inspection shall be carried out according to the sampling scheme of AQL=6.5. If there are more stringent requirements, the sampling scheme of AQL = 1.5 and AQL = 4.0 may be used for appearance and dimension respectively, which shall be defined in the agreement between the two parties.

Sampling for appearance and dimension inspection shall be performed randomly at one time from the finished product to be delivered at the stock. In order to facilitate sampling, the products to be delivered shall be stocked in a good order according to the type and the production date of zircon brick. The sampling operation channel shall be reserved. Before sampling, the brick quantity (M) of each lot of the same brick type to be delivered shall be counted first, and then sampling shall be conducted according to the sample size (n) specified in Table 3. When the sample size specified for appearance and dimension are consistent, the total sample size equals to both appearance sample size n and dimension sample size n . The appearance and dimension of the samples shall be inspected separately, and the inspection quality of each item shall be judged according to the corresponding acceptance number AC . When the sample size n specified for appearance and dimension is different, the larger sample size shall be taken for the total sample size. The appearance and dimension of all the samples shall be tested, and then the inspection quality shall be judged according to the corresponding acceptance number AC .

Table 3 Sampling scheme for dimension and appearance inspection

Acceptance Quality Limit AQL%	Lot N (piece)	Sample size n (piece)	Acceptance number AC (pieces)
1.5	≤ 31	N	Elimination of unqualified samples
	32-1200	32	1
	1201-3200	50	2
	3201-10000	80	3
	>10000	125	5
4.0	≤ 12	N	Elimination of unqualified samples

	13-280	13	1
	281-500	20	2
	501-1200	32	3
	1201-3200	50	5
	3201-10000	80	7
	>10000	125	10
	≤7	N	Elimination of unqualified samples
6.5	8-150	8	1
	151-280	13	2
	281-500	20	3
	501-1200	32	5
	1201-3200	50	7
	3201-10000	80	10
	>10000	125	14

7.3.2 Sampling for physical properties and chemical composition

Samples shall be randomly selected from the finished product stock. In special cases, it may also be selected randomly in the production process (e. g. when the product is out of furnace) by mutual agreement. Any appearance defect affecting the physical properties and chemical composition shall not be allowed.

7.4 Rules of judgement

7.4.1 Rules of appearance quality and dimension tolerance

The "qualified" or "unqualified" judgments shall be made in terms of the appearance quality and dimension tolerance on each sampled product according to the requirements. After all samples have been tested, the cumulative number of unqualified samples (y) in appearance and dimension shall be counted respectively, and compared with the acceptance number A_c specified in Table 3. If $y \leq A_c$, the products of the lot are qualified; If $y > A_c$, the products of the lot are unqualified. If the appearance or dimension inspection of a lot is unqualified, and the unqualified products in the lot can be eliminated by sorting out, it is allowed the products be re-inspected after elimination of unqualified products. If the unqualified lot cannot be improved through the sorting-out, the products of the lot shall be rejected.

7.4.2 The judgement of physical properties and chemical composition

When the testing results of physical properties and chemical composition meet the requirements of Table 1, the products are regarded as qualified. If there is only one item unqualified, the duplicate samples shall be inspected for the unqualified item. If the re-inspection test

result meets the requirements of Table 1, the products are regarded as qualified. If more than two items are unqualified, the products shall be regarded as unqualified.

7.5 Comprehensive judgement

If all requirements acceptance are met in terms of physical properties, chemical composition, appearance and dimension tolerance, the products of the lot shall be qualified, Otherwise, they shall be unqualified.

8 Packaging, marking, transport, storage and quality certification

8.1 Packaging, marking, transport and storage shall be carried out in accordance with the requirements specified in GB/T 16546.

8.2 Quality certification

A quality certification shall be attached when the delivery of zircon brick. The quality certification shall include the name of provider, or trade mark of manufacturer, the name of demander, the production date, the contract number, the product name, the applicable standard number, the brand number, the brick number, the lot number and the corresponding inspection and test results.
