

Specification for

Lead bricks for radiation shielding

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- Institution of Chemical Engineers
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- Lloyd's Register of Shipping
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- Board of Trade
- British Institute of Radiology
- British Steel Industry
- Hospital Physicists Association
- Radiological Protection Service
- Society for Radiological Protection

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Foreword

This standard makes reference to the following British Standards:

BS 3908, *Methods for the sampling and analysis of lead and lead alloys*.

BS 3909, *Ingot lead for radiation shielding*.

This British Standard is based on a draft originally prepared by the Lead Development Association, and has been completed with the full co-operation of that Association.

Before the preparation of this standard there were in existence three main systems of lead shielding bricks. Two of these three systems overlapped to some extent. In changing over to metric dimensions the opportunity has been taken to introduce rationalization and two systems only are now considered sufficient to meet all existing and future requirements.

The two systems are designated as BS 4513 Type V, a chevron system, and BS 4513 Type R, a rounded mating surface system.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 General requirements

1.1 Scope

This British Standard specifies requirements for the design of the basic bricks of two systems of lead shielding bricks.

It does not give dimensional details of functional units such as window assemblies, aperture bricks, etc., although Figure 6 gives diagrammatic illustrations of the various functional units commonly in use.

The scope of this standard does not include advice on methods of constructing shielding barriers from the bricks, or on the shielding thickness required. Advice on the former may be obtained from the manufacturers of the bricks, and advice on the latter from the Radiological Protection Service.

1.2 Terminology

For the purposes of this British Standard the following terminology applies:

1.2.1

external surfaces

the generally front and rear surfaces of bricks which remain visible after the bricks have been built into a wall

1.2.2

mating surfaces

the boundary surfaces of the bricks which are adjacent to each other when the bricks are built into a wall

1.2.3

male mating surface

the projecting part of a brick in the form of one or more prisms (chevrons, or “vees”) or segments of cylinders

1.2.4

female mating surface

the incision in a brick in the form of one or more prisms (chevrons, or “vees”) or segments of cylinders

1.2.5

loadbearing surfaces

the upper and lower surfaces of a brick built into a wall, whether they be flat, rounded or chevron shaped

1.2.6

side surfaces

the surfaces which are at the side

1.2.7

front and rear surfaces

when it is necessary for any reason to differentiate between front (cold face) and rear (hot face) external surfaces, it shall be considered normal for male mating surfaces to be on the top and right-hand side of a brick when viewing the front external surface

until the bricks are built into a wall the answers to the questions “which is a front surface and which a rear surface” or “which are loadbearing surfaces and which side surfaces” cannot be established

1.3 Materials

Acceptable materials for the manufacture of the bricks to this standard are given in BS 3909¹⁾. This does not preclude the use of other lead alloys of superior properties.

1.4 Freedom from defects

All surfaces of all bricks shall be undamaged, flat (except rounded mating surfaces), and smooth, and all bricks shall be free from harmful inclusions, porosity or major segregation.

¹⁾ BS 3909, “Ingot lead for radiation shielding”.

1.5 Inspection

The method of inspection procedure shall be decided between the manufacturer and the purchaser. Where independent tests are agreed upon, sampling shall be in accordance with BS 3908²⁾.

NOTE The testing for porosity by direct weighing is unsatisfactory unless the individual brick dimensions and tolerances are taken into account.

Where it is thought to be necessary, the apparent density of a brick can be checked by weighing the brick in air and water; if the apparent density obtained is less than 11.0 g/cm³ gamma radiation testing (source and scintillation counter method) shall then be carried out.

1.6 Handling facilities

All bricks exceeding 25 kg (55 lb) are to be fitted in their upper loadbearing surface with a threaded hole with a wire thread insert for use with an eyebolt to facilitate lifting. This does not apply to those functional bricks in which a sling can obviously be engaged.

1.7 Tolerances

The dimensions of the bricks shall be subject to the following tolerances:

	Measurements	Tolerances
<i>On linear measurements:</i>	0–100 mm	+ 0.0 – 0.4 mm
	101 mm and over	+ 0.0 – 0.6 mm
<i>On squareness:</i>		± 4'
<i>On chevron angles:</i>		
(on female angles)		+ 0' – 15'
(on male angles)		+ 15' – 0'
<i>On radii of rounded mating surfaces:</i>		
(male and female radii)		+ 0.0 – 0.4 mm

1.8 Identification

To avoid confusion between existing inch-dimensioned bricks and the metric bricks specified in this standard, all bricks to this standard shall be marked indelibly on one face with the letter M, not less than 15 mm in height. The letter should not be stamped into the brick, but should be marked with some form of indelible ink, or with paint.

2 Specific designs

2.1 Chevron system (Designated Type V)

2.1.1 General description. The system comprises two basic thicknesses: 50 mm and 100 mm. Mating surfaces of all bricks have one chevron per 50 mm of thickness (Figure 1 shows a plan of the basic bricks involved in this system).

A list of types of plain wall bricks for both thicknesses, and the face dimensions of these bricks are given in Table 1.

A diagram of a wall showing all the bricks listed in Table 1 is given in Figure 2.

2.1.2 Description of functional units. There is a range of functional units to permit the performance of necessary operations and functions. These include plugs, ports, sphere units, and window bricks; the various functional units are shown diagrammatically in Figure 6.

The overall design of these bricks shall conform to the tolerances listed in 1.7 and the general dimensions of these bricks shall be either the same as, or multiples of the dimensions of, the plain bricks described in 2.1.1.

²⁾ BS 3908, "Methods for the sampling and analysis of lead and lead alloys".