

Spacers and chairs for steel reinforcement and their specification —

Part 1: Product performance requirements

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Committees responsible for this British Standard

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- Association of Consulting Engineers
- British Cement Association
- British Precast Concrete Federation Ltd.
- Building Research Establishment
- Concrete Society Ltd.
- Department of the Environment, Transport and the Regions (Construction Directorate)
- Department of the Environment, Transport and the Regions (Highways Agency)
- Institution of Civil Engineers
- Institution of Structural Engineers
- UK Steel Association

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Foreword

This British Standard has been prepared by Technical Committee B/525/2. It is the first edition of the standard.

Until now the inadequate manufacture and use of spacers and chairs and method of tying has been a major cause of misplaced steel reinforcement resulting in decreased durability of reinforced concrete. In November 1989 the Concrete Society published *Spacers for reinforced concrete* (CS101) [1] providing recommendations for achieving cover but until now no British Standard has existed.

All British Standards for reinforced concrete design and construction (e.g. BS 8110-1, BS 5400-7 and BS 8007) state that the nominal cover specified applies to all reinforcement including links.

This British Standard gives standardized performance requirements for and methods of testing spacers and chairs. It is based on Concrete Society Report CS 101 "Spacers" [1] published in November 1989 and was developed to be consistent with the Comité Euro-International du Béton Bulletin d'Information No. 201 *Spacers, chairs and tying of steel reinforcement* [2].

Performance and testing requirements are based on tests carried out on the capacity of spacers and chairs which have been available in the UK for many years and which have proved to be satisfactory in use.

It is imperative that chairs and spacers conforming to BS 7973-1 are applied in accordance with BS 7973-2.

Abnormal loads, such as those exerted by construction plant, storage of materials and heavy reinforcement cages, can overload spacers and chairs. Under abnormal load conditions adequate support is most suitably achieved using heavy (H) category line spacers at centres which depend on the exact size and nature of the load.

Annex A is normative.

A British Standard does not purport to include all necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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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.

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1 Scope

This part of this British Standard specifies product performance requirements for spacers and chairs sufficient to achieve and maintain cover to reinforcement in in situ reinforced concrete members subject to normal construction loads when used in accordance with BS 7973-2.

NOTE Where appropriate, the basic principles can be applied to precast concrete or proprietary systems.

Product requirements for spacers and chairs include their dimensions, identification, point load strength, permanent deflection after loading, stability and fixity.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 1881-108, *Testing concrete — Part 108: Method for making test cubes from fresh concrete*.

BS 1881-111, *Testing concrete — Part 111: Method of normal curing of test specimens (20 °C method)*.

BS 1881-116, *Testing concrete — Part 116: Method for determination of compressive strength of concrete cubes*.

BS 4482, *Specification for cold reduced steel wire for reinforcement of concrete*.

BS 4483, *Steel fabric for the reinforcement of concrete*.

BS 7973-2, *Spacers and chairs for steel reinforcement and their specification — Part 2: Fixing and application of spacers and chairs and tying of reinforcement*.

BS 8110-1:1997, *Structural use of concrete — Part 1: Code of practice for design and construction*.

3 Terms and definitions

For the purposes of this British Standard the following terms and definitions apply.

3.1

cover

distance between the steel reinforcement and the nearest face of the concrete

NOTE 1 Cover, or nominal cover, is the cover specified by the structural designer on the structural design drawings.

NOTE 2 As the term “minimum cover” can be confused with “nominal cover”, it should not be used.

3.2

spacer

component which is placed to maintain cover between the reinforcement and formwork or blinding and which provides cover or support for reinforcement at a single point on one or more faces of the formwork or blinding

NOTE As stated in BS 8110-1:1997, Table 3.4, 15 mm cover spacers may only be used where the nominal maximum size of aggregate does not exceed 15 mm.

3.3

end spacer

spacer designed to fit on the ends of reinforcement to provide end cover

3.4

line spacer

spacer normally made of either plastics or cementitious bars, normally of constant cross-section, used to support horizontal layers of reinforcement or horizontal continuous steel chairs

3.5

rib spacer

spacer used where there are no links within the ribs and which are designed to support one or more main bars in hollow pot, waffle, trough and ribbed slabs and to provide spacing between the sides of the hollow pot, waffle, trough and rib forms

3.6

wheel spacer

spacer having a circular section, perpendicular to the bar to which it is attached, used for maintaining cover in vertical members to the reinforcement nearest the surface of the concrete

3.7

clip-on spacer

spacer in which the clip action is an integral part of the design of the spacer

NOTE A clip-on spacer is usually made of plastics.

3.8

wire-on spacer

spacer that is attached to the bar by the use of tying wire

NOTE Wire-on spacers are usually cementitious.

3.9

chair

component in sizes of 50 mm to 300 mm normally manufactured from steel wire conforming to BS 4482 commonly used to support top horizontal reinforcement or to separate vertical reinforcement in walls

NOTE Chairs may be individual, continuous, or circular. Chair heights above 300 mm are normally scheduled using bent bar reinforcement.

3.10

individual chair

chair manufactured in standard heights of between 75 mm and 300 mm inclusive and used to support reinforcement at one point

3.11

continuous chair

chair manufactured to provide a straight line of support at a uniform height normally in the range of 45–300 mm

NOTE Continuous chairs are generally available in continuous lengths of up to 2 000 mm.

3.12

circular chair

steel chair delivered flat and formed into circles on site

3.13

welded fabric

cross-over arrangement of longitudinal wires and cross wires that are welded together at the cross-over points in a shear resistant manner, conforming to BS 4483

4 Designations and symbols

The following designations and symbols are used throughout this British Standard.

- c* Cover or nominal cover.
- d* The nominal size of the bar nearest the surface of the concrete including links, used to determine the frequency of spacers along the bar to which they are fixed. For the spacing of chairs, *d* is the nominal size of the bar or wire that the chair is supporting.
- D* The nominal size of the main bar.