

BS 8541-2:2011

Incorporating Corrigendum No. 1



BSI Standards Publication

Library objects for architecture, engineering and construction –

**Part 2: Recommended 2D symbols of
building elements for use in
building information modelling**

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 38, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 8541 is published by BSI and came into effect on 30 September 2011. It was prepared by Technical Committee B/555, *Construction design, modelling and data exchange*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 8541 supersedes BS 1192-3:1987, which is withdrawn.

Relationship with other publications

BS 8541 comprises four parts as follows:

- *Part 1: Identification and [C1] classification [C1]* ¹⁾
- *Part 2 (this part): Recommended 2D symbols of building elements for use in building information modelling*
- *Part 3: Shape and measurement* ¹⁾
- *Part 4: Attributes for specification and assessment* ¹⁾

Information about this document

The start and finish of text introduced or altered by Corrigendum No. 1 is indicated in the text by tags [C1] and [C1].

This part of BS 8541 was written to bring the recommendations for construction drawing practice up-to-date and to conform to other national standards of the United Kingdom and with standards of the International Organization for Standardization (ISO) that have been accepted by the UK.

Use of this document

As a guide, this part of BS 8541 takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this part of BS 8541 is expected to be able to justify any course of action that deviates from its recommendations.

Presentational conventions

The provisions in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

The word “should” is used to express recommendations of this standard. The word “may” is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the clause. The word “can” is used to express possibility, e.g. a consequence of an action or an event.

Notes and commentaries are provided throughout the text of this standard. Notes give references and additional information that are important but do not form part of the recommendations. Commentaries give background information.

¹⁾ In preparation.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

0 Introduction

0.1 General

This part of BS 8541 is intended for those concerned with the application of symbols and other graphic conventions on drawings and 2D BIM models and for those concerned with the design, development and standardization of such conventions, for the construction industry.

0.2 Work within the International Organization for Standardization (ISO)

International agreement has not always been achieved in this field of work: acceptability of symbols internationally is dependent partly on precedent and partly on rationale. Precedent in this context can be determined only by an international survey which, although advocated by the United Kingdom, has not been undertaken. The development of a rationale for the design of new graphic conventions and for the selection of existing graphic conventions demands a major research programme. As yet such a programme has not been undertaken.

0.3 UK work

Although not the result of either an international survey or a major research programme, this part of BS 8541 is based on principles of rationale and also on precedent. Graphic conventions proposed by ISO or other authorities that do not conform either to the stated rationale or to national precedent are not included. This part of BS 8541 is the first step towards a theoretical and practical basis for symbols and other graphic conventions for an industry that is constantly progressing and changing. It will, therefore, be necessary for this work to be regularly monitored, adjusted and extended.

0.4 Core Maturity Model

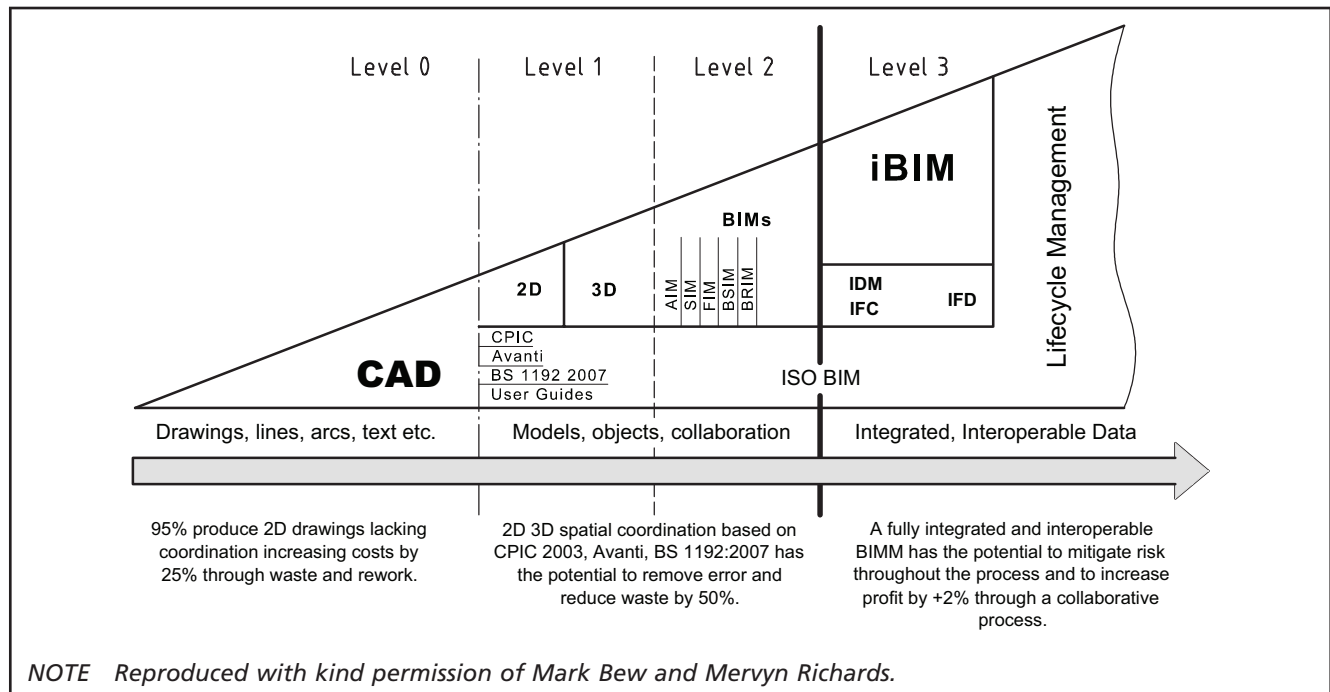
Figure 1 shows the Core Maturity Model against which this British Standard assists in the implementation of Building Information Modelling and Management BIM(M).

The purpose of the levels is to categorize types of technical and collaborative working to enable a concise description and understanding of the processes, tools and techniques to be used. The levels are as follows:

- 0 - Unmanaged CAD probably 2D, with paper (or electronic paper) as the most likely data exchange mechanism.
- 1 - Managed CAD in 2 or 3D format using BS 1192:2007 with a collaboration tool providing a common data environment, possibly some standard data structures and formats. Commercial data managed by standalone finance and cost management packages with no integration.
- 2 - Managed 3D environment held in separate discipline "BIM" tools with attached data. Commercial data managed by an ERP. Integration on the basis of proprietary interfaces or bespoke middleware could be regarded as "pBIM" (proprietary). The approach may utilise 4D programme data and 5D cost elements.
- 3 - Fully open process and data integration enabled by IFC/IFD. Managed by a collaborative model server. Could be regarded as iBIM or integrated BIM potentially employing concurrent engineering processes.

This standard for 2D symbology is the first of a number of symbology standards and has been developed to sit within Level 0 and Level 1 of the maturity model.

Figure 1 Core Maturity Model



The symbols have been developed to provide consistent 2D representation for drawing renditions and schematics with the basic metadata or attributes required for this level of definition.

Further 3D symbols are to be developed to enable use in 3D models and Building Information environments with the ability to be enhanced to allow for manufacturers' objects, information and data.

Section 1: General

1 Scope

This part of BS 8541 gives guidance and recommendations for symbols and other graphic conventions for use on drawings for the construction industry.

It is primarily intended for those preparing drawings.

The symbols covered by this British Standard is restricted to the architectural and land registry symbols as the base for architecture drawing, modelling and planning activities. The more specific symbols for mechanical, electrical and plumbing along with the structural steel sections and welding are deferred to those institutes that have a greater understanding of the needs of their members in a fast changing world.

NOTE For example, BSRIA has a large symbol library for the MEP and Building Services engineers and the Institution of Engineering and Technology (IET) covers both electronic and electrical symbols.

It also describes a rationale of symbolism (Clause 4) which establishes rules for the design of symbols and other graphic conventions, and gives recommendations for the application of those rules and the ways in which symbolism should be used (Clause 5).

It does not include the following:

- symbols applicable to signs for use on buildings or equipment;
- symbols for use on fire protection drawings (which are given in BS 1635).

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.

BS 3975-4, *Glossary for landscape work – Plant description*

BS EN ISO 9431, *Construction drawings – Spaces for drawing and for text, and title blocks on drawing sheets*

3 Terms and definitions

For the purposes of this part of BS 8541, the terms and definitions given in BS EN ISO 9431, BS 3975-4 and the following apply.

3.1 convention

accepted way of drawing an item which may have the nature of a representation, a simplified representation or a symbol

3.2 information device

convention indicating an abstract item

3.3 representation

scale view of an object

3.4 simplified representation

scale view incorporating only the essential shape, size or features of an object

3.5 symbol

graphic device without scale used:

- a) on a drawing to indicate the occurrence and/or location of an item;
- b) in an annotation to indicate one or more of the attributes of an item

3.6 symbol element (element)

graphic device without scale used only in combination with a symbol (or symbols) or with other elements, to form a symbol

4 Rationale

4.1 Indication of all features of an object

Although all the features of an object (subject to the limitations of the scale of the drawing) can be shown on a detailed pictorial view (a representation, see 3.3), there are usually other attributes of the object which need to be described, annotated or referred to in other documents.

4.2 Limited indication of the features of an object

To reduce drawing effort and time, a pictorial view such as that described in 4.1 can sometimes, as appropriate, be limited in detail (a simplified representation, see 3.4) but can still need a description, annotation or reference.

4.3 Non-realistic indication of objects

To reduce drawing effort and time still further for an object of which the size is not significant on a drawing, especially if many such objects occur, the object can be indicated non-realistically by using a symbol (see 3.5).

4.4 Symbols sharing common subsidiary features

Some symbols share common subsidiary features; this part of BS 8541 refers to these features as elements (see 3.6). These can be incorporated in new symbols, can be added to established symbols or can be combined with other elements as needed.

A symbol element should not be used in isolation.

4.5 Types of symbol

The simplest form of symbol is the basic symbol.

More complex types of symbol are derived from the basic symbol. There are three ways of deriving symbols:

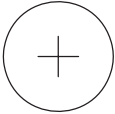
- a) by embellishment of a basic symbol;
- b) by a combination of basic symbols;
- c) by extension of a basic symbol.

Figure 2 gives examples of symbols/elements and constructed symbols.

4.6 Conventions showing abstract items

Conventions showing abstract items are referred to as information devices (see 3.2).

Figure 2 Examples of symbols/elements and constructed symbols

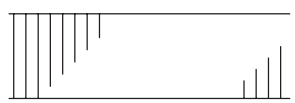
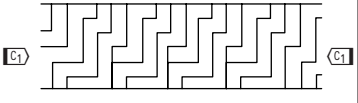
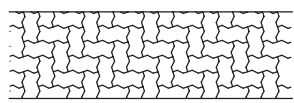
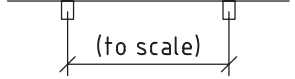
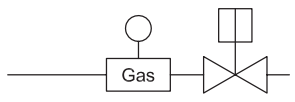
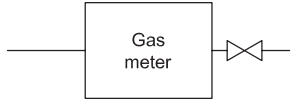
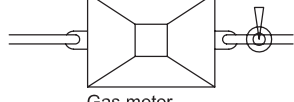
	1	2	3
Symbols/ elements	any new tree 	luminaire  pole  arm 	fall of ground 
	short standard 	luminaire on pole 	bank 
	half standard 	luminaire on pole-mounted arm 	
	light standard 		
	standard 		
	tall standard 		
	selected standard 		

NOTE The symbols given in columns 2 and 3 give examples of elements being combined to produce other  constructed  symbols.

4.7 Comparison between representations, simplified representations and symbols

Figure 3 shows a comparison between representations, simplified representations and symbols.

Figure 3 Comparison between representations, simplified representation and symbols

Item	Symbol	Simplified representation	Representation
Interlocking concrete block paving			
Fence			
Gas meter and shut-off valve			

5 Design and use of symbolism

5.1 Graphic simplicity

The amount of detail in a representation should be appropriate to the scale of the drawing.

The amount of detail in a simplified representation should be limited to the essential attributes of the object (see 3.4 and Figure 3).

NOTE Geometric shapes for information devices, elements and symbols are limited. Precedent (see the Introduction) can establish that one shape can have several meanings, the relevant meaning being determined normally by context and experience.

A geometric shape should not be used if its meaning is not determined by context and experience.

Over-complexity of information devices, elements and symbols should be avoided by one of the following methods:

- a) omitting unnecessary information (for example, if all the items in a project are of the same type);
- b) annotating differences between one item and another;
- c) referring differences to a schedule or other document.

5.2 Symbols (including elements of symbols)

The size of a symbol does not necessarily relate to the size of an object, or to the scale of a drawing.

The shape of a symbol does not necessarily relate to the shape of an object.

A symbol does not necessarily indicate graphically all the attributes of an item.

A symbol can be combined with an element or a symbol to form another symbol.

A symbol can be added to a convention, a representation, a simplified representation or another symbol. (See Figure 4.)

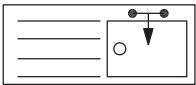
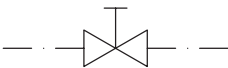
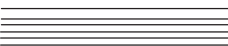
5.3 Graphics

5.3.1 Method of creation

The illustrations in Section 2: *Compendium*, indicate the size of symbolism that should typically be used on drawings. Account has been taken, in the light of evaluation tests, of producing symbolism by:

- a) manual draughting using a 0.35 mm pen, including the manufacture of suitable templates (stencils);
- b) computer draughting;
- c) using dry transfer.

Figure 4 Symbols and attributes

Item	Symbolism	Component parts of symbolism			
		Elements	Conventions	Symbols	Simp. Rep'ns
Sinktop (RH bowl) with mixer tap		7.4 E2	—	7.405	7.4R4
		7.4 E3	—	—	—
Wheel valve on exposed pipe at high level		—	1.302	7.101 7.313	—
Metal faced plywood		—	—	2.205	—
				2.207	—

5.3.2 Techniques

Graphic techniques should follow the recommendations in BS EN ISO 9431, and in particular:

- line thickness should be not less than 0.25 mm on drawings to be reproduced without reduction, or to be microfilmed;
- line thickness should be not less than 0.35 mm on drawings to be reduced by up to 50%;
- if different line thicknesses are used, each thickness should be at least twice the next thinner line;
- the space between lines should be not less than 0.7 mm;
- inclined lines should be at an angle of 15° or a multiple of 15°;
- solidly filled areas should be kept to a minimum (because they tend to disappear in successive reproductions): hatching is preferred;
- lettering (including numbers) should have a capital height of:
 - not less than 2.5 mm for drawings as in (a) above;
 - not less than 3.5 mm for drawings as in (b) above.

5.3.3 Orientation of symbolism excluding elements

The orientation of an element should always be as shown in Section 2: *Compendium*, but the orientation of other types of symbolism should not be regarded as affecting the meaning of the symbolism concerned.

5.4 Authority

5.4.1 Each drawing or set of drawings which uses symbolism drawn from this part of BS 8541 should include a statement to that effect in the information panel of the drawing concerned.

EXAMPLE

"The symbols represented on this drawing should be read in conjunction with BS 8541-2..."

5.4.2 Symbols derived from symbols in this standard should be illustrated and their meaning should be clearly explained on the drawings concerned. Care should be taken to ensure that derived symbols do not become over-complicated.

5.4.3 When a symbol is taken from other sources, e.g. from BS 1553-1, BS 1635 or BS EN 60617 parts 1 to 8 a statement to that effect should be included in the

information panel of the drawing concerned, the symbol should be illustrated and its meaning should be clearly explained on the drawing.

EXAMPLE

"The symbols represented on this drawing should be read in conjunction with  BS 1553-1 ..."

5.5 Level of detail for symbols

Levels of detail in symbology varies depending on the representative scale (see Figure 5):

- a) Low
- b) Medium
- c) High

If the detail is too complex it might not reproduce on the plotted facsimile.

Figure 5 Symbol and level of detail

