

Recommendations for

The co-ordination of dimensions in shipbuilding: Principles of dimensional co-ordination

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Foreword

This British Standard has been prepared under the authority of the Shipbuilding and Marine Industry Standards Committee, based on a document drawn up by the British Ship Research Association.

Reference is made to the following publications.

BS MA 13, *Recommendations for the co-ordination of dimensions in shipbuilding. Glossary of terms.*

BS MA 14, *Recommendations for the co-ordination of dimensions in shipbuilding. Co-ordinating sizes for components and assemblies.*

BS 2045, *Preferred numbers.*

BS MA 45, *Recommendations for the co-ordination of dimensions in shipbuilding: Controlling dimensions*¹⁾.

PD 6446, *Combinations of sizes.*

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 21 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⁾ In course of preparation.

Introduction

The rationalization of traditional shipbuilding methods and the increasing use of prefabricated assemblies necessitates the utilization of standardized components wherever possible. In the outfitting of ships, in order to achieve the maximum benefit from the use of these components a systematic design method, applying both to the components and the spaces within which they are used, must be adopted which will give a common basis for layout, production and assembly.

Dimensional co-ordination is a system of applying a range of related dimensions to the sizing of components and assemblies and the structures incorporating them. This method of standardizing sizes or dimensions, which are not necessarily related to particular components, materials or manufacturing processes, permits its application to the widest possible range of components and assemblies, and will give the following advantages.

- 1) The maximum economy in the production of components by variety reduction.
- 2) The reduction in manufacture of non-standard units.
- 3) The avoidance of wastage in cutting components on site by achieving maximum flexibility in assembly.
- 4) The interchangeability of components giving more choice and flexibility for designers.

Modular co-ordination is a particular form of dimensional co-ordination in which the range of related dimensions is restricted by utilizing a standard step or module, the size of which is selected in order to satisfy the following requirements.

- a) It should be sufficiently small to give multiples which satisfy the sizes required for the various components in shipboard use and provide suitable increments to minimize alterations to existing sizes.
- b) It should be sufficiently large to achieve an effective measure of simplification of the existing number of sizes.
- c) For ease of application, it should be expressed as a whole number bearing a simple relationship to existing systems of measurement.
- d) It should be selected to give the widest possible agreement with national and International Standards for dimensional co-ordination in shipbuilding and with standards for related components.

The advantages of dimensional and modular co-ordination have been internationally recognized for many years and an International Standard has been agreed for the increments or modules to be used in the construction industry. These sizes have been adopted by the British Standards Institution in a series of standards on dimensional co-ordination for the building industry and the decision to adopt the metric system in the shipbuilding industry offers a unique opportunity to introduce a rationalized system for dimensional co-ordination in line with this established system.

The ultimate aim in publishing recommendations for dimensional co-ordination is to lay down standardized ranges of sizes for components and in order to achieve the maximum utilization of these components it is necessary to establish a comprehensive system which will form a framework for sizing, positioning and assembling co-ordinated components.

In shipbuilding the main advantage in utilizing co-ordinated components occurs in the accommodation areas where repetitive components are used which are common to other industries operating dimensional co-ordination.

0 Scope

This British Standard makes recommendations for the general principles of dimensional co-ordination, the need for a reference system and the importance of sizing, location, and assembly of components in relation to the system. Examples of the application of dimensional co-ordination are illustrated in Figure 1 to Figure 6.

NOTE The terms used in this British Standard are defined in BS MA 13.

1 The basis of dimensional co-ordination

The objective of the work on dimensional co-ordination is the establishment of standardized ranges of metric sizes for components. However, during the metric transition period differently based metric sizes of components will be in use including metric equivalents of imperial sizes, rounded metric sizes, preferred sizes and co-ordinated metric sizes.

1.1 Metric sizing of components

1.1.1 *Metric equivalents.* In the initial stages of the metric changeover, imperial sized products will be used and given a direct conversion to metric. This may sometimes result in complex decimal figures. e.g. 2 ft 0 in (609.6 mm)

1.1.2 *Rounded metric sizes.* Products which are altered from the existing imperial sizes may be given a metric size which is a sensible rounded number for convenience in terminology and to suit metric tools, gauges, etc. e.g. 610 mm (2 ft 0 in)

1.1.3 *Preferred sizes.* Preferred sizes, in accordance with BS 2045, may be used when a range of sizes is required following a geometrical progression, that is, where each size is a uniform percentage larger than its predecessor. e.g. 250
400
630
1 000 mm

1.1.4 *Co-ordinated metric sizes.* Co-ordinated metric sizes are multiples of the standard modules, or increments of size, given in BS MA 14. (See Table 1 and Table 2.) e.g. 600 mm

Table 1 — (BS MA 14) Standard modules

Preference	1st	2nd	3rd
	300	100	50

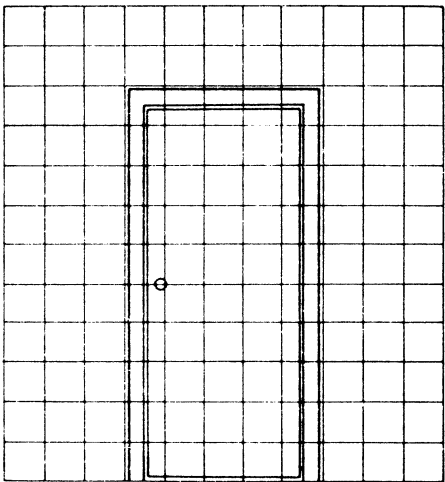
Table 2 — (BS MA 14) Co-ordinating sizes

Preference	1st	2nd	3rd
300	100	50	
	200	150	
		250	
	400	350	
	500	450	
600		550	
NOTE The sequence may be continued for further values.			

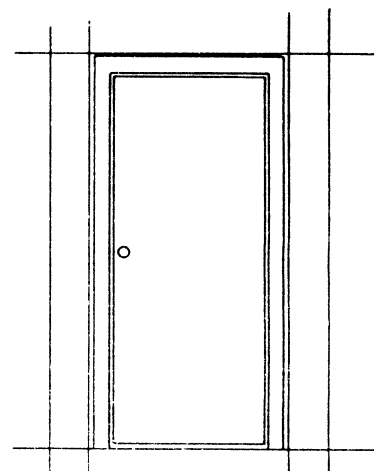
1.2 **Dimensional framework.** In order to ensure that dimensionally co-ordinated components or assemblies of components fit the spaces allocated to them, a dimensional framework, or reference system, is employed which is common to both.

1.2.1 *Modular grids.* The dimensional framework is represented by a grid, in which the grid lines are spaced in multiples of the standard modules, or increments of size, and the grid lines indicate the boundaries for the component and the space allocated to it.

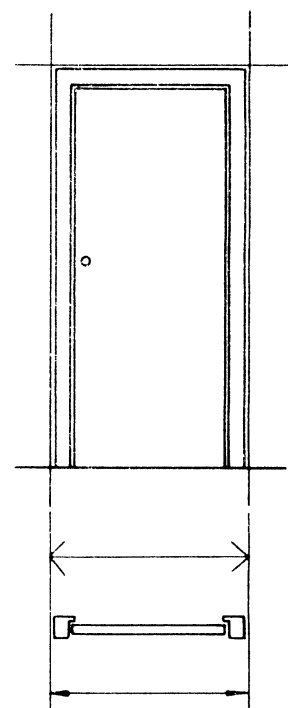
The use of a grid on drawings is an aid in locating components and in reading the drawings; as such it is a tool for communication.



1.3 Modular components. The size of components should be co-ordinated in accordance with the preferences given in BS MA 14. A component having a co-ordinating size derived from these preferences is a modular component.



The co-ordinating size of a component is equivalent to the size of the co-ordinating space allocated to it. Both include the work size of the component plus an allowance for its joints and tolerances.



NOTE In the accompanying sketches certain convention are used to identify different spaces and sizes. These conventions are:

Reference lines: Normally indicated as a continuous line.

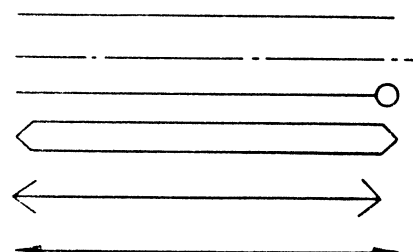
Centre and axial lines: Are normally also reference lines but are indicated as a thin chain line.

Controlling lines: Indicated by a circle at the end of a reference line.

Controlling dimension: Represented by an enclosed arrow.

Co-ordinating space and size: Represented by an open arrow head.

Work size: Indicated by a solid arrow head.



2 The controlling reference system

In establishing a dimensional framework, or reference system, which can be related to both dimensionally co-ordinated components and the structure incorporating them it is essential to establish certain controls over the principal dimensions of the reference system.

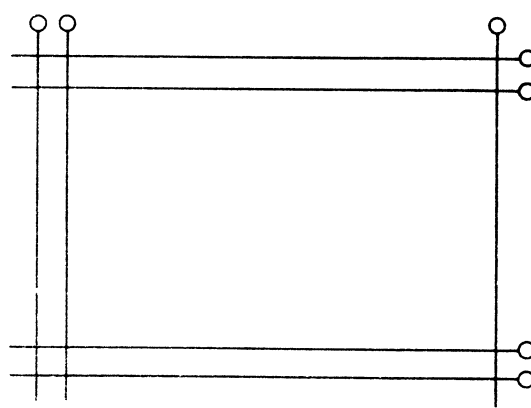
The initial control is based on the use of the standard modules given in BS MA 14 but in order to reduce the considerable number of permutations possible with these modules, further controls are necessary.

Certain known datum lines, which are related to user requirements, can be identified within the structure and the structure can be divided by these datum lines into a number of spaces. Some of these spaces are termed “usable spaces”, for example cabin interiors, and others termed “zones” are the spaces surrounding the usable space and are allocated to the structure or services. These terms are described later in this section. The principal dimensions of these zones and spaces can be standardized to give a limited range of sizes which are multiples of the standard modules, but achieve a considerable degree of variety reduction, in relation to particular components. These dimensions are therefore termed “controlling dimensions”. The identified datum lines which define the zones and usable spaces are termed “controlling lines” and in three dimensional considerations the planes, which these lines represent on plans, sections and elevations, are termed “Key reference planes”. The entire framework of planes, zones and dimensions is described as the “controlling reference system”.

2.1 Lines and planes

2.1.1 Controlling lines. “A line representing a key reference plane”.

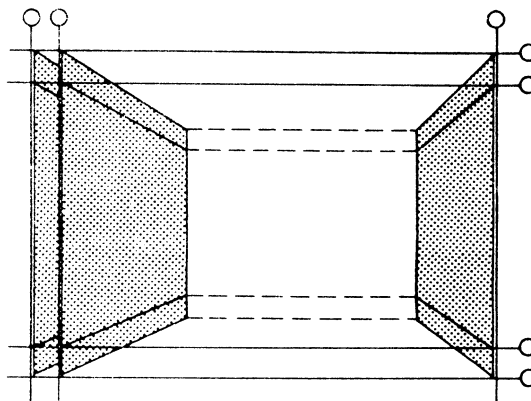
Controlling lines are the identifiable datum lines which indicate the main structural items such as deck levels, ceiling levels, bulkheads etc.



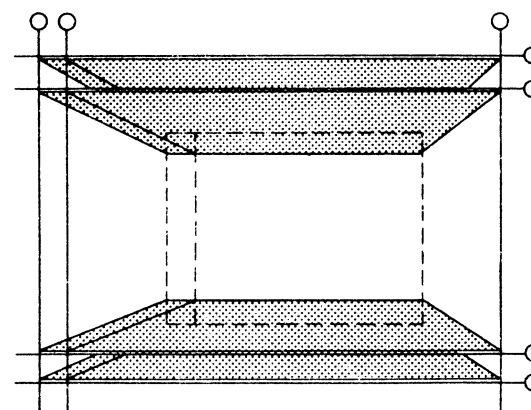
2.1.2 Key reference planes. “A reference plane which defines the boundary of a controlling zone or the axis of a bulkhead, etc.”

These are the three dimensional planes represented by the controlling lines on plans, elevations etc.

2.1.2.1 Vertical key reference planes. These are the planes relating to the finished surfaces of bulkheads, linings, casings etc.



2.1.2.2 Horizontal key reference planes. These are planes relating to finished horizontal surfaces such as floor, deck, ceiling etc.



2.2 Zones and spaces. The effect of delineating the key reference planes on the structure is to divide it into a number of zones and usable spaces. When the principal dimensions of these zones and spaces are standardized a controlling reference system is achieved which will accept modular components.