

British Standard Marine Series : Recommendations for

# The co-ordination of dimensions in shipbuilding: co-ordinating spaces for internal subdivision

Récommandations concernant la coordination dimensionnelle dans la construction navale: espaces coordonnés pour les sous-divisions internes

Empfehlungen für die Koordination von Abmessungen im Schiffsbau: Koordination von Räumen zur internen Unterteilung beziehungsweise Abtrennung

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## Foreword

This British Standard has been prepared under the authority of the Shipbuilding and Marine Standards Committee and is based on a proposal of the British Ship Research Association.

The changeover to the metric system within the shipbuilding industry has been taken as an opportunity to introduce a rationalized method of design for ships' accommodation that is applied to the components and to the structures within which they are used. Dimensional co-ordination, the method chosen, uses a range of related dimensions within a co-ordinated framework to achieve standardized components.

The aim in publishing the series of standards under the general title 'Recommendations for the co-ordination of dimensions in shipbuilding' is thus to establish for designers and manufacturers limited ranges of standard components that can be utilized to maximum effect within dimensionally co-ordinated accommodation space, giving the advantages of less need to manufacture non-standard units, avoidance of wastage of materials and labour in cutting components on site, and flexibility and interchangeability of components in use.

This standard is one of the series mentioned. It gives information on requirements for components used in the subdivision of accommodation and makes recommendations for a system to determine the optimum range of co-ordinating metric sizes which can be adopted to achieve improved flexibility in use, better compatibility, interchangeability, appearance etc. The standard traditional panel width of 1220 mm can, however, still be utilized, for example bulkheads and lining panels, with cutting of panel width only where essential. It also contains recommendations for ranges of co-ordinating sizes for other components used in internal subdivision.

Other standards in the series are:

- BS MA 13 Recommendations for the co-ordination of dimensions in shipbuilding: glossary of terms. (Definitions of terms used in modular and dimensional co-ordination, including terms peculiar to shipbuilding.)
- BS MA 14 Recommendations for the co-ordination of dimensions in shipbuilding: co-ordinating sizes for components and assemblies. (Recommendations on the first selection of sizes based on the use of standard modules or increments of size.)
- BS MA 44 Recommendations for the co-ordination of dimensions in shipbuilding: principles of dimensional co-ordination. (An introduction to the subject giving guidance on the use of the standards in the series.)
- BS MA 45 Recommendations for the co-ordination of dimensions in shipbuilding: controlling dimensions. (A framework of controlling dimensions for use in the design of ships' deckhouses and accommodation and to assist in the derivation of co-ordinating sizes of components.)
- BS MA 72 Recommendations for the co-ordination of dimensions in shipbuilding: co-ordinating spaces for furniture. (Information on dimensional requirements for furniture to assist in the derivation of co-ordinating sizes.)

BS MA 73 Recommendations for the co-ordination of dimensions in shipbuilding: co-ordinating sizes for fixtures, fittings and equipment. (Recommendations for co-ordinating sizes of these items in order to integrate them within dimensionally co-ordinated spaces.)

## Recommendations

NOTE. Users of this British Standard: Marine Series should note that while observing the requirements of the standard they should at the same time ensure compliance with such statutory requirements, rules and regulations as may be applicable to the individual ship concerned.

### 1. Scope

1.1 The intention of this standard is to assist in the derivation of limited ranges of co-ordinating sizes for key components used in the subdivision of accommodation spaces.

1.2 The standard gives information on dimensional requirements for components and makes recommendations for ranges of co-ordinating sizes for subdivision components.

### 2. References

This standard makes reference to the following standards 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 MA 44 Recommendations for the co-ordination of dimensions in shipbuilding: principles of dimensional co-ordination
- BS MA 45 Recommendations for the co-ordination of dimensions in shipbuilding: controlling dimensions
- BS 2900 Recommendations for the co-ordination of dimensions in building. Glossary of terms
- DD 22 Recommendations for the co-ordination of dimensions in building. Tolerances and fits for building. The calculation of work sizes and joint clearances for building components
- PD 6446 Recommendations for the co-ordination of dimensions in building. Combinations of sizes.

### 3. Definitions

For the purposes of these recommendations the definitions in BS MA 13 apply. These definitions are based on BS 2900, any variations being necessitated by the different terminology used in the shipbuilding industry.

### 4. Guidance for selection of co-ordinating sizes

4.1 To achieve variety reduction, some restrictions must be placed on the infinite number of possible sizes of components, and agreed constraints of both a general and particular nature need to be imposed. These constraints are the subject of two published standards which are summarized in 4.2 and 4.4 for convenience.

#### 4.2 Co-ordinating sizes

4.2.1 The first limitation on the choice of co-ordinating sizes is imposed by BS MA 14, which recommends increments of size or modules for the co-ordinating dimensions of components and assemblies. This restricts the total range

of possible sizes to multiples of the standard modules given in table 1.

**Table 1. BS MA 14 standard modules**

| Preference |           |          |
|------------|-----------|----------|
| 1st        | 2nd       | 3rd      |
| mm<br>300  | mm<br>100 | mm<br>50 |

4.2.2 Table 2 lists the co-ordinating sizes derived from these standard modules. Components which conform to BS MA 14 are termed 'modular components'.

**Table 2. BS MA 14 co-ordinating sizes**

| Preference |           |           |
|------------|-----------|-----------|
| 1st        | 2nd       | 3rd       |
| mm         | mm        | mm<br>50  |
|            | 100       | 150       |
|            | 200       | 250       |
| 300        |           | 350       |
|            | 400       | 450       |
|            | 500       | 550       |
| 600        |           |           |
| And so on  | And so on | And so on |

4.3 The possible permutations which are obtained from BS MA 14 recommendations are considerable and in order to achieve variety reduction beyond this general limitation, controls of a more particular nature are necessary. This led to the formulation of the second standard, which is for controlling dimensions.

#### 4.4 Controlling dimensions

4.4.1 A considerable degree of variety reduction, in relation to particular components, can be obtained by the standardization of those principal dimensions within an accommodation structure which delineate the usable spaces and zones. These dimensions, for deck-to-ceiling heights and widths of spaces and zones, are termed controlling dimensions and are the subject of the recommendations contained in BS MA 45.

4.4.2 The effect of BS MA 45 is to impose a framework of controlling lines representing planes between which the dimensions are taken; this framework of lines, planes and dimensions is described as the controlling reference system.

4.4.3 Within the controlling reference system, BS MA 45 provides further subdivision in relation to particular components by the establishment of intermediate controlling dimensions, which govern the height of the window-box head, the door-set head and the window-box sill.

4.5 Following the establishment of the constraints outlined, the process of co-ordinating dimensions continues with this standard which contains recommendations for co-ordinating sizes for components used in the internal subdivision of ships' accommodation.

### 5. Recommendations for co-ordinating sizes of components

5.1 Tables 3 to 9 contain proposals for a selected range of co-ordinating sizes for certain principal components and is intended to indicate the main range for manufacturers.

5.1.1 These sizes have been derived from consideration of the ranges of co-ordinating spaces, defined by the controlling reference system, which are described in 5.2 and the ranges of co-ordinating sizes for components in various locations, space types and forms of erection which are outlined in 5.3.

NOTE. Certain of these sizes may require amendment to incorporate boundary conditions for circumstances such as the presence of camber or sheer.

5.1.2 The co-ordinating sizes indicated for bulkhead panels, lining panels, ceiling panels and ceiling panels and ceiling tiles have been determined in accordance with the system outlined in 5.3.2 which is recommended as the method for obtaining the optimum range of sizes in terms of flexibility.

5.1.3 The sizes proposed in the tables are only one combination based on the combination of numbers technique selected from several possibilities. Other combinations which may be favoured by individual manufacturers or users to suit basic material sizes or other particular requirements may be employed provided that flexibility is maintained.

5.1.4 An example of the development of component sizes from the co-ordinating spaces, co-ordinating sizes, key components etc. is given in clause 6.

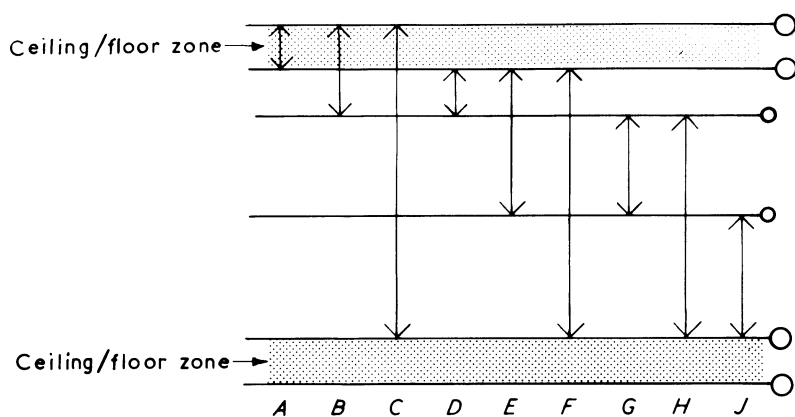
#### 5.2 Co-ordinating spaces

5.2.1 The spaces defined by reference planes or lines in the controlling reference system are termed co-ordinating spaces and may be occupied by a single component or an assembly of components.

5.2.2 Within the controlling reference system it is possible to identify different space types and to indicate which spaces are applicable to particular components, in both vertical and horizontal locations.

5.2.2.1 *Vertical location.* The total possible range of vertical co-ordinating spaces derived from the controlling and intermediate controlling lines is restricted, in the shipbuilding application, to those for internal subdivision, as shown in figure 1. The spaces shown are given a reference letter for ease of identification and are referred to as space types. All components and assemblies will not necessarily relate to all the space types and only those types commonly associated with particular components will be considered in the tables of co-ordinating spaces.

5.2.2.2 *Horizontal location.* The range of space types for horizontal co-ordinating spaces is limited to three, i.e. width of zone, width between zone faces and width between zone axes as indicated in figure 2.



NOTE. Ceiling/floor zone contains the deck structure, floor finish, services and ceiling.

Figure 1. Vertical space type reference letters

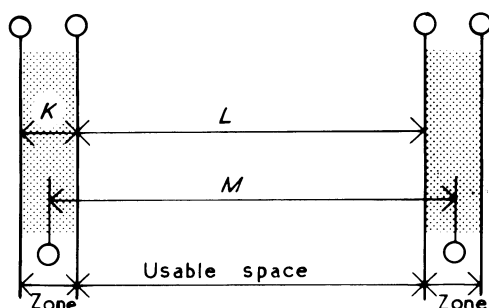


Figure 2. Horizontal space type reference letters

**5.2.3** The tables of co-ordinating spaces for components or assemblies related to each space type are given in appendix A in order to provide data on the range of sizes typically encountered; they are derived from the information obtained in a survey of vertical panel lengths and ceiling panel sizes in a selection of typical ships examined in detail.

NOTE. Where an assembly of components is used to fill a co-ordinating space, the overall size for the assembly must be a co-ordinating size.

### 5.3 Determination of ranges of co-ordinating sizes

**5.3.1** In selecting a range of sizes for modular components the objective is the development of a limited range of sizes which give the maximum flexibility of assembly for the component, flexibility being the measure of the number of co-ordinating spaces that a component range can fill, both singly and when assembled or grouped in combinations, without cutting or wastage.

**5.3.2** In considering the component sizes, use has been made of the mathematical technique 'combinations of numbers', which is the subject of PD 6446, in establishing groups of 'relatively prime numbers' to give maximum flexibility. By judicious choice of component sizes, combinations can be achieved which will exactly occupy any linear length above a critical value and, by reference to the information on panel runs obtained from the survey of typical ships, component sizes have been determined which give the widest application in the practical outfitting of ships' accommodation.

**5.3.3** The ranges of co-ordinating sizes for components in different locations and varying space types have been limited to those sizes which will appear in general shipboard applications and are included in appendix B in order to give guidance on the variation in sizes encountered in different applications for components. Certain of these sizes are indicated as possibly requiring amendment to incorporate boundary conditions for circumstances such as the presence of camber or sheer.

### 5.4 Key components and their preferred sizes

**5.4.1** Within the range of co-ordinating sizes for components given in appendix B, certain sizes to be known as key components can be identified in relation to specific forms of erection for accommodation subdivision. It is intended that these key component sizes should form the nucleus of any component range proposed for a particular form of erection, as they should satisfy most requirements.

**5.4.2** From consideration of these key component sizes, which are tabled in appendix C, the proposed component ranges have been derived to give the widest flexibility for the components.

### 5.5 Practical application of modular marine panel sizes.

A guide to the possible combinations and permutations with the proposed marine panel sizes and examples of the construction of some typical bulkheads are shown in appendix D.

## 6. Example of the derivation of component sizes

As an example of the derivation of one component size, consider a casing lining panel extending up to ceiling level which is at 2100 mm height above finished floor level, as shown in figure 3.

In table 4, it will be seen that the height of 2100 mm is included in the range of co-ordinating sizes and also in the proposed component range. This size was included in table 4 as a result of considering the information given in appendices A, B and C.

(a) Table 10 groups the components under space types, and the casing lining panels can be seen to include four space types, *F*, *C*, *D* and *B*.

(b) Reference to table 11 indicates that the component, which extends up to the ceiling level, is of space type *F* which is shown as extending from the top of the finished floor up to ceiling level. It is possible, therefore, in this particular example, to disregard the other space types *C*, *D* and *B*.

In table 11, under space type *F*, it will be seen that a range of heights are listed and that widths increase in multiples of 100 mm above 300 mm.

(c) This considerable range of sizes can be reduced by reference to appendix B. Table 13 lists the most common heights for general ship construction under the various space types; reference to type *F*, which is the type under consideration, shows that four heights are generally encountered. The widths of the *F* type panels

are now listed as 700 mm, 800 mm and 1200 mm, being the proposed sizes to give flexibility in assembling the panels, but other combinations of modular widths may be employed.

(d) This restricted range of sizes can now be further reduced by reference to appendix C. Consideration is given, in this appendix, to the sizing of components in relation to particular forms of erection and table 24 lists the panels which extend up to ceiling level at 2100 mm and therefore includes the particular component which is under consideration. The sizes for the casing lining panels are therefore 2100 mm height and 700 mm, 800 mm and 1200 mm widths, being one of the combinations of widths giving the required flexibility in assembly.

It can be seen therefore that for this particular form of erection, which is one of those commonly used in ship-building, the sizes proposed for inclusion in the component range are predetermined by the ceiling height and the required flexibility for width.

## 7. Component ranges

The ranges of co-ordinating sizes for principal components are shown in tables 3 to 9.

NOTE. The component range sizes listed in tables 3 to 9 are those considered to give maximum flexibility in meeting the requirements for different space types and are those recommended for manufacture.

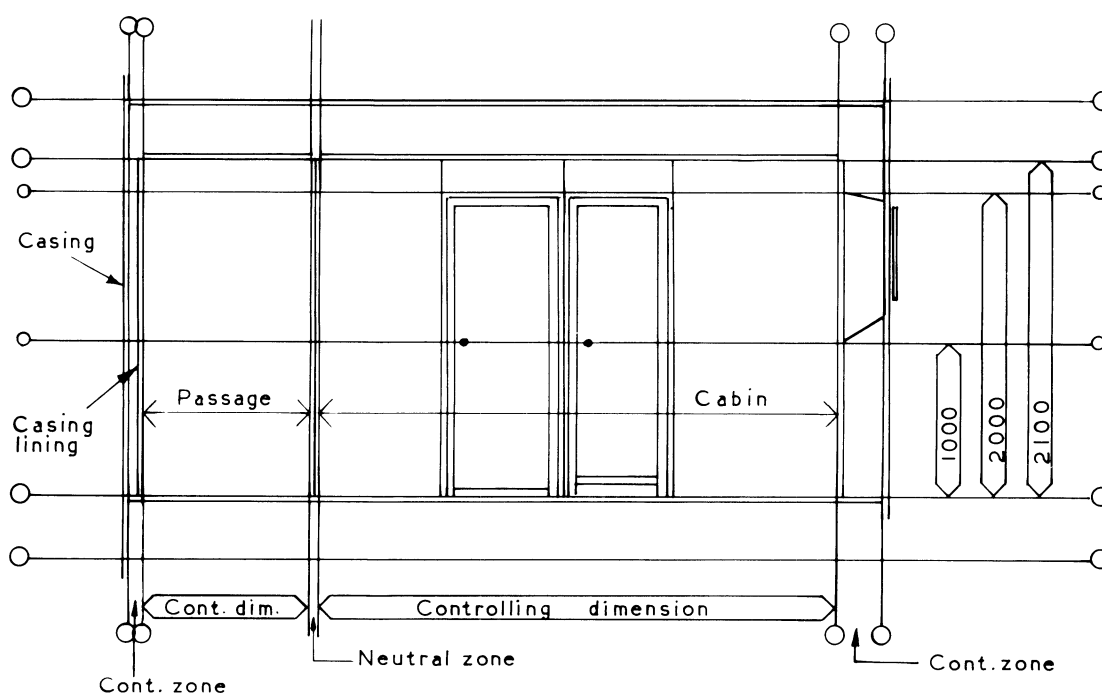


Figure 3. Typical accommodation section

**Table 3. Bulkhead panels***Component range*

| Co-ordinating sizes |       |
|---------------------|-------|
| Height              | Width |
| mm                  | mm    |
| 2100                | 700*  |
| 2200                | 800*  |
| 2400                | 1200* |
| 2600                |       |

NOTE. All combinations of height and width may be used.

*Range of co-ordinating sizes for varying space types*

| Height | Width | Space type (see 5.2) |
|--------|-------|----------------------|
| mm     | mm    |                      |
| 50     | 600   | D                    |
| 100    | 700   |                      |
| 150    | 800   |                      |
| 200    | 900   |                      |
| 300    | 700*  | A                    |
| 350    | 800*  |                      |
|        | 1200* |                      |
| 400    | 600   | A and B              |
| 450    | 700   |                      |
| 500    | 800   |                      |
|        | 900   |                      |
|        | 1200* |                      |
| 550    | 600   | A                    |
| 600    | 700   |                      |
|        | 800   |                      |
|        | 900   |                      |
| 2050   | 700*  | F                    |
| 2100   | 800*  |                      |
| 2150   | 1200* |                      |
| 2200   |       |                      |
| 2400   | 700*  | C                    |
| 2450   | 800*  |                      |
| 2500   | 1200* |                      |
| 2550   |       |                      |
| 2600   |       |                      |

NOTE. Boundary conditions may apply where camber or sheer is present and may also be dependent upon the form of erection at deckhead.

**Table 4. Lining panels for casing, shipside and bulkheads***Component range*

| Co-ordinating sizes |       |
|---------------------|-------|
| Height              | Width |
| mm                  | mm    |
| 2100                | 700*  |
| 2200                | 800*  |
| 2400                | 1200* |
| 2600                |       |

NOTE. All combinations of height and width may be used.

*Range of co-ordinating sizes for varying space types*

| Height | Width | Space type (see 5.2) |
|--------|-------|----------------------|
| mm     | mm    |                      |
| 50     | 600   | D                    |
| 100    | 700   |                      |
| 150    | 800   |                      |
| 200    | 900   |                      |
| 400    | 600   | B                    |
| 450    | 700   |                      |
| 500    | 800   |                      |
| 550    | 900   |                      |
| 600    |       |                      |
| 1000   | 600   | J                    |
| 1050   | 700   |                      |
| 1100   | 800   |                      |
| 1150   |       |                      |
| 1200   |       | F                    |
| 2050   | 700*  |                      |
| 2100   | 800*  |                      |
| 2150   | 1200* |                      |
| 2200   |       |                      |
| 2400   | 700*  | C                    |
| 2450   | 800*  |                      |
| 2500   | 1200* |                      |
| 2550   |       |                      |
| 2600   |       |                      |

NOTE. Boundary conditions may apply where camber or sheer is present and may also be dependent upon the form of erection at deckhead.

\*Other combinations of modular widths may be adopted provided the required flexibility is met.

**Table 5. Ceiling panels***Component range*

| Co-ordinating sizes |                             |
|---------------------|-----------------------------|
| Length              | Width                       |
| mm<br>2400          | mm<br>700*<br>800*<br>1200* |

NOTE. All combinations of length and width may be used.

*Range of co-ordinating sizes for space type L*

| Length                                          | Width                                           | Space type<br>(see 5.2) |
|-------------------------------------------------|-------------------------------------------------|-------------------------|
| mm<br>800<br>increasing by<br>increments of 100 | mm<br>500<br>increasing by<br>increments of 100 | L                       |

**Table 6. Ceiling tiles***Component range*

| Co-ordinating sizes      |                             |
|--------------------------|-----------------------------|
| Length                   | Width                       |
| mm<br>700<br>800<br>1200 | mm<br>700*<br>800*<br>1200* |

NOTE. All combinations of length and width may be used.

**Table 7. Floor tiles***Ceramic tiles: component range*

| Co-ordinating sizes |           |
|---------------------|-----------|
| Length              | Width     |
| mm<br>100<br>200    | mm<br>100 |

NOTE. All combinations of height and width may be used.

*Non-ceramic tiles: component range*

| Co-ordinating sizes             |                                 |
|---------------------------------|---------------------------------|
| Length                          | Width                           |
| mm<br>200<br><br>300<br><br>500 | mm<br>200<br><br>300<br><br>500 |

**Table 8. Internal door sets***Component range (BS MA 6)*

| Co-ordinating sizes |                         |
|---------------------|-------------------------|
| Height              | Width                   |
| mm<br>2000          | mm<br>700<br>800<br>900 |

NOTE. All combinations of height and width may be used.

*Range of co-ordinating sizes for varying space types*

| Height                                     | Width                       | Space type<br>(see 5.2) |
|--------------------------------------------|-----------------------------|-------------------------|
| mm<br>2000<br>2050<br>2100<br>2150<br>2200 | mm<br><br>700<br>800<br>900 | H<br>F<br>F<br>F<br>F   |

**Table 9. Window and sidelight boxes***Window component range*

| Co-ordinating sizes |                  |                  |
|---------------------|------------------|------------------|
| Height              | Width            | Depth            |
| mm<br>900<br>1000   | mm<br>700<br>800 | mm<br>150<br>200 |

NOTE. All combinations of height, width and depth may be used.

*Sidelight component range*

| Co-ordinating sizes |                         |                  |
|---------------------|-------------------------|------------------|
| Height              | Width                   | Depth            |
| mm<br>900<br>1000   | mm<br>600<br>700<br>800 | mm<br>200<br>250 |

NOTE. All combinations of height, width and depth may be used.

*Range of co-ordinating sizes for space type G*

| Height                                 | Width                   | Depth                                 | Space type<br>(see 5.2) |
|----------------------------------------|-------------------------|---------------------------------------|-------------------------|
| mm<br>800<br>850<br>900<br>950<br>1000 | mm<br>600<br>700<br>800 | mm<br>100<br>150<br>200<br>250<br>300 | G                       |

\*Other combinations of modular widths may be adopted provided the required flexibility is met.

## Appendix A

### Ranges of co-ordinating spaces

Tables 10, 11 and 12 give the space types commonly associated with the principal components in ships' accommodation and the range of co-ordinating sizes for these spaces that will occur in general ship construction.

**Table 10. Co-ordinating spaces for internal subdivision**

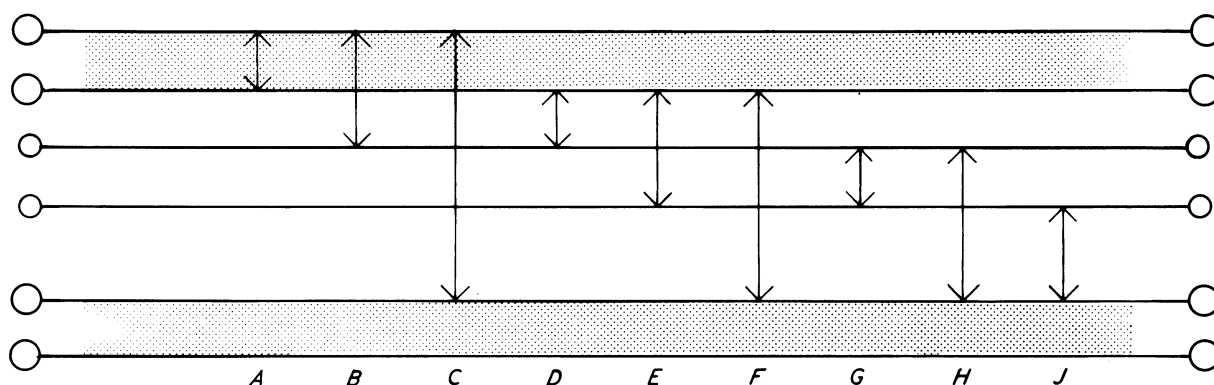
*Grouping of components and assemblies under space types*

| Location   | Assembly                          | Component                                     | Space type*                                         |
|------------|-----------------------------------|-----------------------------------------------|-----------------------------------------------------|
| Vertical   | Casing lining                     | Panels<br>Door sets                           | <i>F, C, D, B</i><br><i>H, F</i>                    |
|            | Shipside or deckhouse side lining | Panels<br>Sidelight/window boxes<br>Door sets | <i>F, C, D, B, J</i><br><br><i>G</i><br><i>H, F</i> |
|            | Bulkhead lining                   | Panels<br>Door sets                           | <i>F, C, D, B</i><br><i>H, F</i>                    |
|            | Bulkheads                         | Panels<br>Door sets                           | <i>F, C, D, B, A</i><br><i>H, F</i>                 |
| Horizontal | Floors                            | Tiles and flooring                            | <i>L</i>                                            |
|            | Ceilings                          | Panels                                        | <i>L</i>                                            |

\*The space types for given components are listed in a sequence related to the anticipated frequency of usage.

**Table 11. Vertical internal subdivision**

Dimensions in millimetres



| Space type                                                                | A                                                                                                                                                                                                                                                        | B   | C    | D   | E    | F    | G    | H    | J    |
|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|------|------|------|------|------|
| <b>Height</b>                                                             | 200                                                                                                                                                                                                                                                      | 100 | 2100 | 50  | 1000 | 2000 | 800  | 1900 | 1000 |
|                                                                           | 250                                                                                                                                                                                                                                                      | 150 | 2150 | 100 | 1050 | 2050 | 850  | 1950 | 1050 |
|                                                                           | 300                                                                                                                                                                                                                                                      | 200 | 2200 | 150 | 1100 | 2100 | 900  | 2000 | 1100 |
|                                                                           | 350                                                                                                                                                                                                                                                      | 250 | 2250 | 200 | 1150 | 2150 | 950  | 2050 | 1150 |
|                                                                           | 400                                                                                                                                                                                                                                                      | 300 | 2300 | 250 | 1200 | 2200 | 1000 | 2100 | 1200 |
|                                                                           | 450                                                                                                                                                                                                                                                      | 350 | 2350 | 300 | 1250 | 2250 | 1050 |      |      |
|                                                                           | 500                                                                                                                                                                                                                                                      | 400 | 2400 | 350 | 1300 | 2300 | 1100 |      |      |
|                                                                           |                                                                                                                                                                                                                                                          | 450 | 2450 | 400 | 1350 | 2350 |      |      |      |
|                                                                           |                                                                                                                                                                                                                                                          | 500 | 2500 |     | 1400 | 2400 |      |      |      |
|                                                                           |                                                                                                                                                                                                                                                          | 550 | 2550 |     |      |      |      |      |      |
|                                                                           |                                                                                                                                                                                                                                                          | 600 | 2600 |     |      |      |      |      |      |
|                                                                           |                                                                                                                                                                                                                                                          | 650 |      |     |      |      |      |      |      |
|                                                                           |                                                                                                                                                                                                                                                          | 700 |      |     |      |      |      |      |      |
| Other heights in multiples of 100 mm (preferred) or 50 mm may be selected |                                                                                                                                                                                                                                                          |     |      |     |      |      |      |      |      |
| <b>Width</b>                                                              | 300                                                                                                                                                                                                                                                      | 600 | 300  | 600 | 600  | 300  | 600  | 600  | 600  |
|                                                                           | *                                                                                                                                                                                                                                                        | 700 | *    | 700 | 700  | *    | 700  | 700  | 700  |
|                                                                           |                                                                                                                                                                                                                                                          | 800 |      | 800 | 800  |      | 800  | 800  | 800  |
|                                                                           |                                                                                                                                                                                                                                                          | 900 |      | 900 |      |      |      | 900  |      |
| *increasing by increments of 100                                          |                                                                                                                                                                                                                                                          |     |      |     |      |      |      |      |      |
| <b>Thickness</b>                                                          | The thickness of materials used for the components is governed by such statutory requirements, rules and regulations as may be applicable to the ship concerned, and the thickness of material, with all finishes, shall be treated as a 'neutral zone'. |     |      |     |      |      |      |      |      |

NOTE. In certain forms of erection, boundary conditions will arise and must be taken into consideration when co-ordinating sizes for components are derived, e.g. presence of camber and/or sheer.