MARS2000 User's guide Booklet 4
DEFINITION OF A BULKHEAD ARRANGEMENT舱壁布置定义

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Chapter 1 : GENERAL COMMENTS 综述

1.1   INTRODUCTION

BhaIn allows the input of any bulkhead arrangement along the ship length. A bulkhead arrangement is a set of bulkheads located at the same longitudinal position.沿船长输入任意舱壁

The bulkhead is described by:

- Its geometry and scantling.说明几何形状和规格
- Primary and ordinary stiffeners.主要和普通型材
- Forward and aftward compartments.首尾分舱

1.2   A GOOD WAY TO CREATE A BULKHEAD ARRANGEMENT创建舱壁布置

When creating a new bulkhead arrangement, the following window appears:

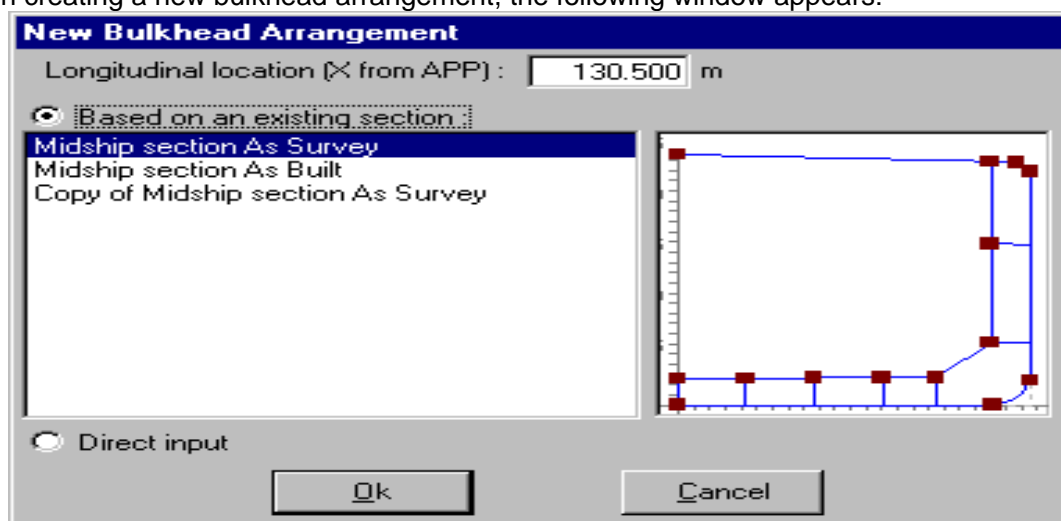**Figure 1 : BULKHEAD ARRANGEMENT CREATION**

There are two ways to modelise a bulkhead arrangement:两种方法

- Direct input直接输入
- From a section来自剖面

The second way (from a section) is the fastest: it automatically detects the bulkhead geometry based on the compartments. It also initializes the compartment data.

1.3   BHAIN INTERFACE界面

The module allowing to input the data of a bulkhead is organized around the following application:
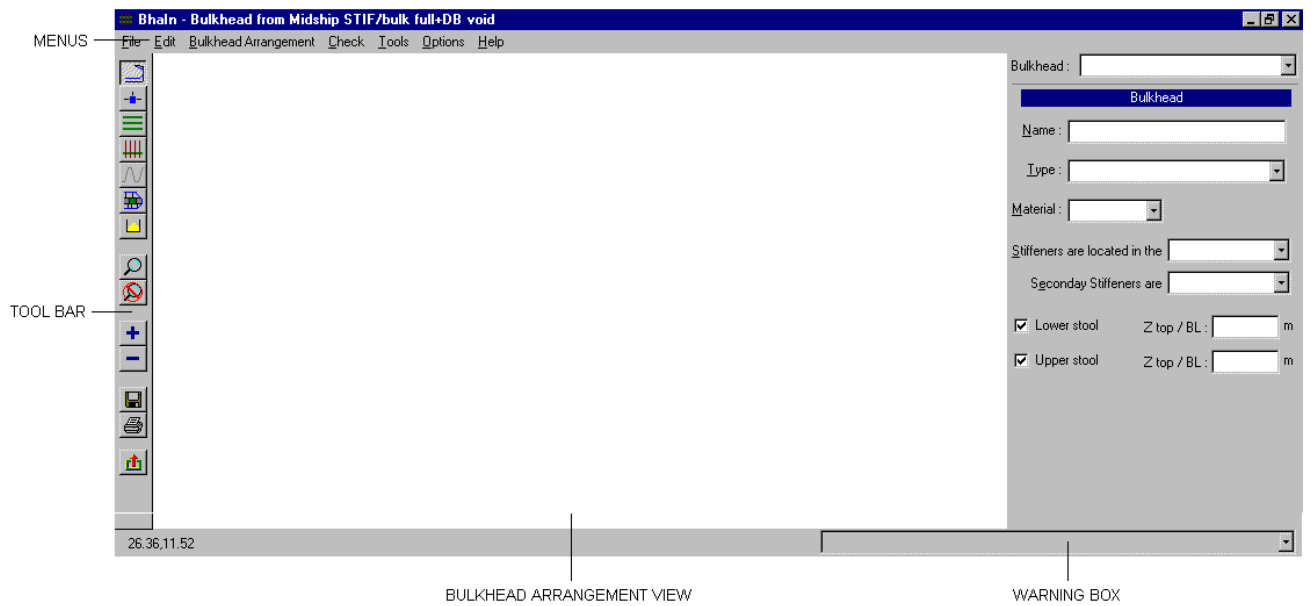
Figure 2 :BHAIN

Warning Box : displays warning message when BHAIN detects incoherence in the bulkhead definition.

Bulkhead arrangement view : displays a view of the bulkhead arangement.

Chapter 2 : MAIN SECTION DATA 主要剖面数据

On the Bulkhead Arrangement menu, click on Main Data (Figure 24) to display the Main Bulkhead Arrangement

Data Window.

2.1   MAIN DATA主数据

The first tab of the main bulkhead arrangement data window allows to define a identification of bulkhead, the X

longitudinal location of the bulkhead and also the type of section used to define the bulkhead.

Figure 3 : MAIN DATA WINDOW

2.2   HOLD DATA货舱数据（散货计算压力）

The second tab of the main bulkhead arrangement data window allows defining the hold data. These values have to be filled to calculate bulk pressure.

Figure 4 : HOLD DATA WINDOW

2.3   SHIP STATE船舶数据

Figure 5 : SHIP STATE WINDOW

Chapter 3 : BULKHEAD GEOMETRY 舱壁几何

3.1 INPUT SEQUENCE输入顺序

There are six main sequences to define the geometry of a bulkhead:

- Nodes节点
- Primary stiffeners主要扶强材
- Secondary stiffeners次要扶强材
- Corrugation波形壁
- Strakes船底板

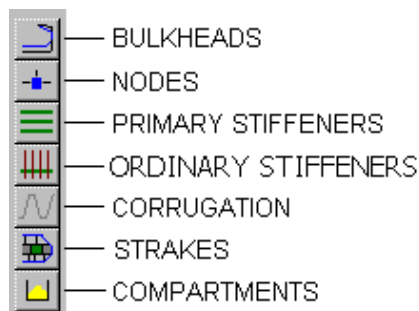These different sequences of the geometry description may be accessed by the following toolbar as follows:

Figure 6 : BHAIN TOOLBAR

Bulkheads: allows defining the bulkhead name and characteristics.

Nodes: allows defining the geometry of the bulkhead by a succession of segments.

Primary Stiffeners: allows locating all the primary stiffeners.

Ordinary Stiffeners: allows locating all the ordinary stiffeners and to define their scantlings in case of a single or double skin bulkhead.

Corrugation: allows defining geometry of a corrugated bulkhead. Strakes: allows locating strake bands and characteristics. Compartments: allows defining forward and aftward compartments.

All these input sequences are bulkhead-oriented. It means that, inside an input sequence, the data are available bulkhead by bulkhead.

When an input sequence is selected in the toolbar, the program displays generally the data corresponding to the current bulkhead. The current bulkhead is the last selected bulkhead.

They are four ways to move from one bulkhead to another:

- a direct click on the desired bulkhead in the bulkhead arrangement view,
- the Next Bulkhead and Previous Bulkhead items on the Tools menu (Figure 24),
- the F6 key to jump to the next bulkhead or the F5 key to jump to the previous bulkhead,
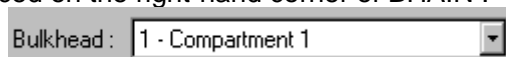- using the bulkhead list placed on the right-hand corner of BHAIN :

Figure 7 : BULKHEAD LIST

3.2 CREATION AND DELETION OF DATA数据的创建和删除

In each input sequence, you can create or delete data:

- Bulkheads : creation or deletion of a bulkhead
- Nodes : creation or deletion of a segment
- Primary stiffeners : creation or deletion of a primary stiffener
- Ordinary stiffeners : creation or deletion of a secondary stiffener
- Strakes : creation or deletion of a strake band

Each object has to be created or deleted using the following toolbar:

Figure 8 : CREATION-DELETION TOOLBAR

For example, if you want to create a new bulkhead

- click on the bulkhead button (Figure 6),

the Bulkhead management window (Figure 9) is displayed,

- click on the creation button (Figure 8). Inversely, if you want to delete an existing panel,
- click on the bulkhead button (Figure 6),
- select the bulkhead you want to delete,
- click on the deletion button (Figure 8).

To create data, it is also possible to hit the F12 key instead of clicking the creation button.

Another way to create or delete objects is to use Create object or Delete object on the Tools menu (Figure 24)

3.3 BULKHEAD DATA舱壁数据

Clicking on the bulkhead button [icon] or on Bulkhead on the Bulkhead arrangement menu (Figure 24), you enter the Bulkhead management window:
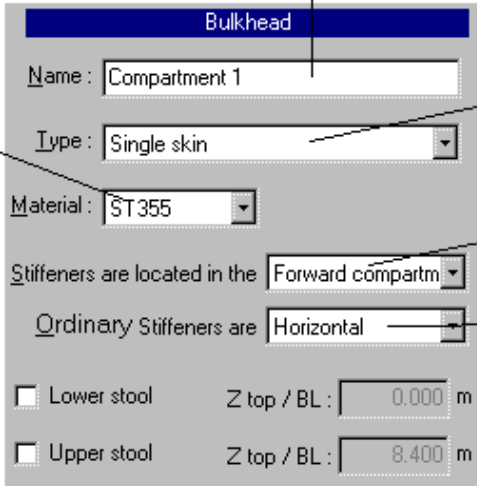

Figure 9 : BULKHEAD MANAGEMENT WINDOW

In this window, you can create or delete bulkheads using the creation or the deletion buttons (Figure 8). Identification, a type and material define each bulkhead. Moreover you can enter the stiffeners location as regards compartments near to bulkhead and the secondary stiffeners direction.

Bulkhead Identification: up to 40 characters.

The bulkhead has to be clearly identified. This identification will appear in input sequences and in output of data and results.

Type: single skin, double skin or corrugated.

Material: material of bulkhead.

Stiffeners are located in the: stiffeners location as regards compartments near to bulkhead.

Ordinary Stiffeners are: ordinary stiffeners direction.

3.4 NODE BUTTON : GEOMETRY OF THE BULKHEAD节点定义舱壁几何形状

3.4.1 Nodes and segments节点和线段

A bulkhead contour is made of contiguous segments of different geometry (straight or circular line). Each segment is described by:

- its ending node
- its type of curve.

First node of a bulkhead舱壁的第一个节点

Clicking on the node button [icon] or on Nodes on the Bulkhead arrangement menu (Figure 24), you enter the

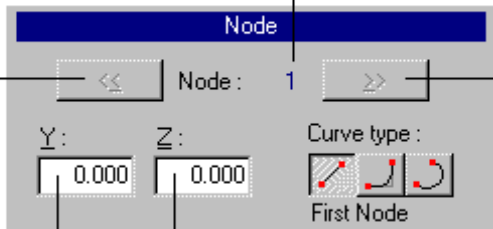Node management window where these inputs are performed:

Figure 10 : NODE MANAGEMENT WINDOW Node

Creation创建

The creation button   allows you to create a node extending the bulkhead contour. The deletion button   is used to delete nodes.

It is also possible to insert a node between two existing nodes by clicking on the Tools… menu and

selecting

Insert node (Figure 24).

Next node - Previous node: Those two buttons allow to navigate node by node within a bulkhead. A direct click on the desired node in the bulkhead arrangement view is also possible.

Node characteristics

Coordinates of the node (in m): The Y and Z coordinates of the current node.

Segment characteristics线段特性

The characteristics of the segment between the current node and the previous one consist in:

Curve Type: it specifies the type of the segment.

 : straight line

 : tangent arc (see 3.4.2.1) : arc (see 3.4.2.2)

3.4.2   Circles圆

There is two ways to define circle:

- tangent arc button
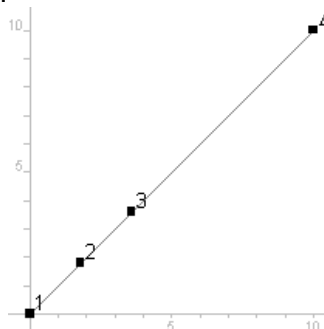- arc button

3.4.2.1   Tangent arc相切

The Tangent Arc button is a way of defining circular segment tangent to both segments enclosing it. Therefore you have to create the nodes for the three segments (the circular one end its adjacent).

Example of input of bilge with a flat bottom平底输入示例

For a rise of keel, you enter:

Node	Y Coordinate	Z Coordinate	Click On
1	0.	0.	to create a node.
2	-	-	to create a node.
3	-	-	to create a node.
4	10.	10.	

You should obtained this kind of bulkhead:

Click on segment 2 (node 3) and hit on the *Arc Tangent* button (Figure 10).The window here after is displayed on screen :
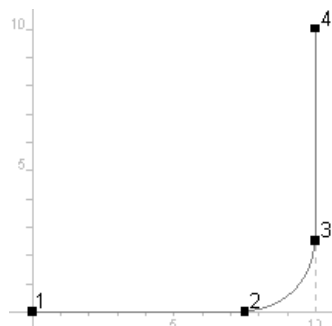

R (in m): Radius of the circle

Figure 11 : TANGENT ARC DATA

YTan and *ZTan* (in m) : Y and Z coordinates of the tangent intersection of the enclosing segments.
The coordinates of the first and the last nodes on this segment are automatically calculated and cannot be changed. The result is:
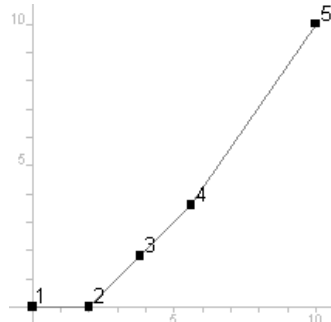

Example of input of bilge with rise of keel斜底输入示例

For example, for a rise of keel, you enter:

Node	Y Coordinate	Z Coordinate	Click On
1	0.	0.	to create a node.
2	2.	0.	to create a node.
3	-	-	to create a node.
4	-	-	to create a node.
5	10.	10.	

You should obtained this kind of section:
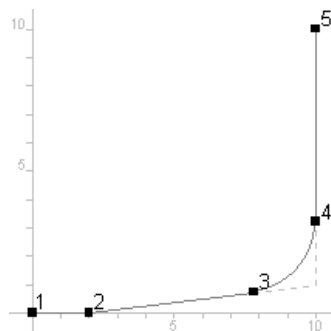

Click on segment 3 (node 4) and hit on the *Arc Tangent* button (Figure 10). The window here after is displayed on screen:

The result is:

3.4.2.2   Arc弧

The *Arc* button can be used to define any circular segment.

The coordinates of the first and the last nodes on this segment have to be input.

The definition of an arc is completed by means of the window here after. It is displayed on screen, hitting arc button when the current node is the last node of the circle
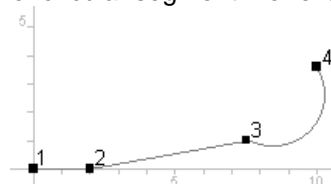

R (in m) : Radius of the circle.
   Figure 19 : ARC DATA

With this method, you can define any kind of circular segment. For example:

3.5   PRIMARY STIFFENER主要扶强材

All the primary stiffeners existing on the bulkhead have to be defined by their position and their coordinate. They are automatically numbered, starting at number 1 for each bulkhead.

Clicking on the *Primary stiffeners* button (Figure 6) or on *Primary stiffeners* on the *Bulkhead Arrangement* menu

(Figure 24), you enter the *Primary stiffener management window* where these inputs are performed:
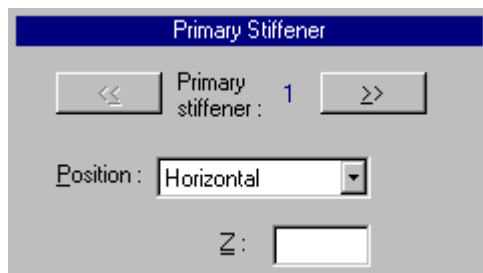
Figure 12 : PRIMARY STIFFENER MANAGEMENT WINDOW

The creation and the deletion buttons (Figure 8) allow you to create or delete primary stiffeners. Position: horizontal or vertical.

To select a primary stiffener, click on a primary stiffener in the bulkhead arrangement view or in the previous/next button.

Z/Y (in m): coordinate of primary stiffener.

3.6 SECONDARY STIFFENER次要扶强材

3.6.1 Location位置

Clicking on the Secondary Stiffener button (Figure 6) or on Secondary Stiffeners on the Bulkhead Arrangement menu (Figure 24), you enter the Secondary Stiffener management window where these inputs are performed:
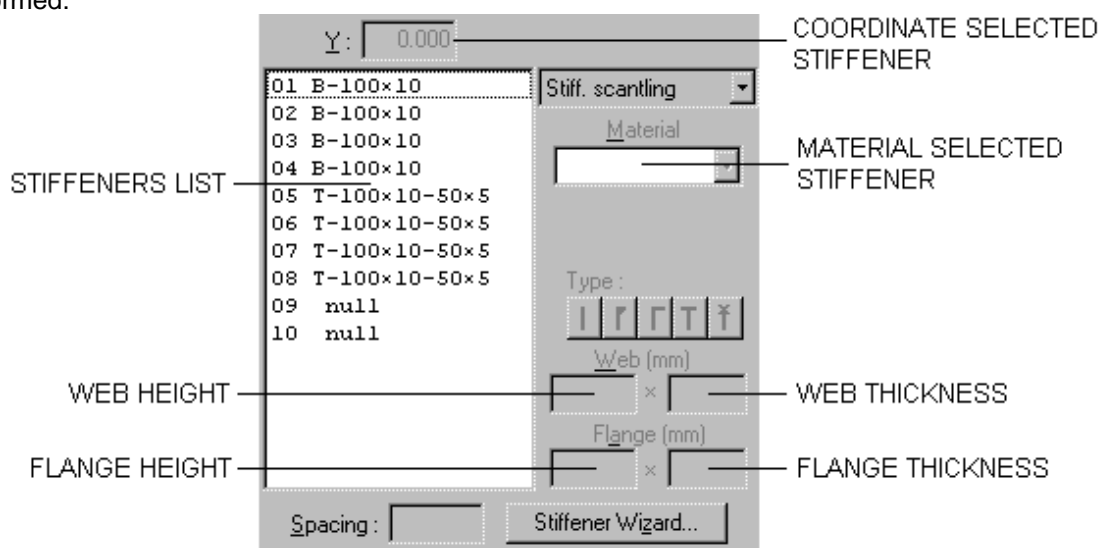

Figure 13 : SECONDARY STIFFENER MANAGEMENT WINDOW

The location is done by defining a coordinate of stiffener. The *creation* and the *deletion* buttons (Figure 6) or the Stiffener Wizard button (see 3.6.2) allow you to create or delete stiffener.

Stiffener List: Display of the stiffeners defined on the current bulkhead and of their scantling.

The list shows: the stiffener number and its scantling. The stiffeners selected are the current stiffeners.

Selection of one stiffener选择一个扶强材

click the stiffener in the Stiffener List or in the Bulkhead Arrangement view.

Selection of stiffeners that are next to each other选择多个扶强材（shift键）

select the first stiffener you want to select; hold down the SHIFT key and click the last stiffener you want to select.

select in the list the first stiffener you want to select, hold down the mouse button and drag the selection to the last stiffener you want.

Selection of stiffeners that are not next to each other选择多个扶强材（ctrl键）

hold down the CTRL key, and then click each stiffener you want to select.

Material: allows changing the current stiffener material which, by default, is the supporting bulkhead one.

Spacing (in m): spacing of the selected stiffeners.

3.6.2 Stiffener Wizard 扶强材设定

The stiffener wizard is the best way to easily define a group of stiffeners regularly spaced.

Clicking on the Stiffener Wizard button you enter the Secondary stiffeners creation window where these inputs are performed:

Figure 14 : SECONDARY STIFFENERS CREATION WINDOW

Start position (in m): 起点coordinate of first stiffener. 第一个扶强材坐标

Spacing (in m): 间距spacing of considered stiffeners.

Number: number of considered stiffeners.

3.6.3   Scantling规格

Scantling tab列表

Stiffener Type: allows to select the stiffener type:

- *: flat stiffener*

- *: bulb stiffener*

- *: angle stiffener*

- *: T-bar stiffener*

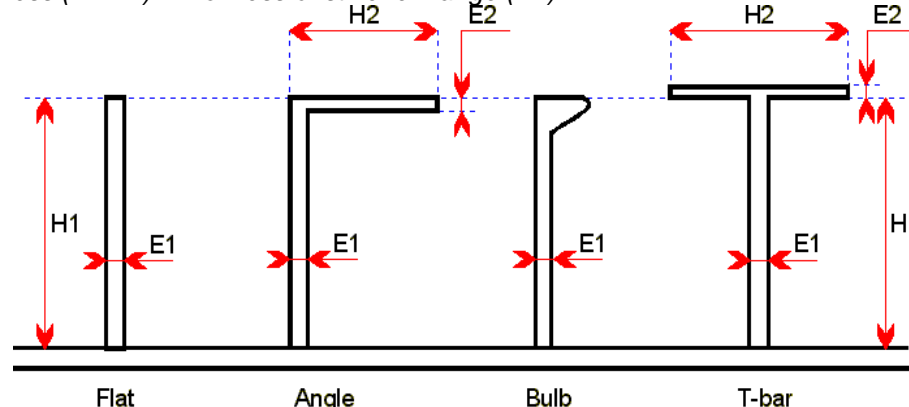*In case of flat or bulb type, flange characteristics aren't available.*

If none type is chosen, the stiffener is considered as a NULL type which is defined in 3.6.4.

Web Height (in mm): Height of stiffener web (H1).

Web Thickness (in mm): Thickness of stiffener web (E1).

Flange Height (in mm): Width of stiffener flange (H2).

Flange Thickness (in mm): Thickness of stiffener flange (E2).

3.6.4   Null type没有扶强材的类型（不影响舱壁的几何特征）

A stiffener with NULL type has no effect on the geometric characteristics (areas, inertia, moduli) of the bulkhead.

3.7   CORRUGATION波形

Choosing a type corrugated for a bulkhead the corrugation button and Corrugated item on the Bulkhead Arrangement menu (Figure 24) become active; clicking on one of these you enter the Corrugation management window where these inputs are performed:
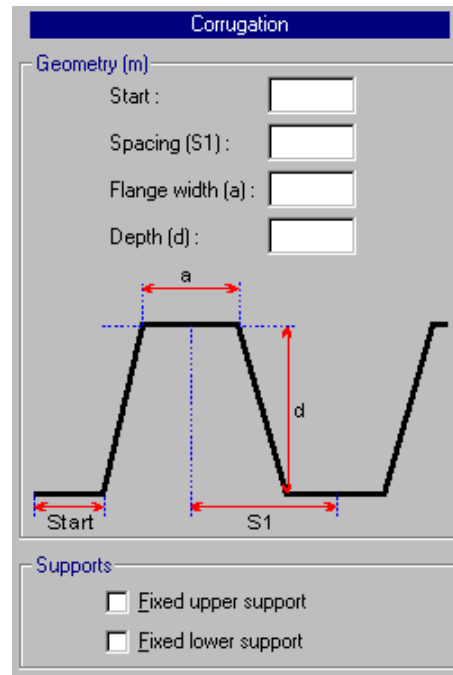
Figure 27 : CORRUGATION MANAGEMENT WINDOW

3.8 STRAKES船底板（列板）

Clicking on the *Strakes* button (Figure 6) or on *Strakes* on the *Bulkhead Arrangement* menu (Figure 24), you enter the *Strake band management window* where these inputs are performed:
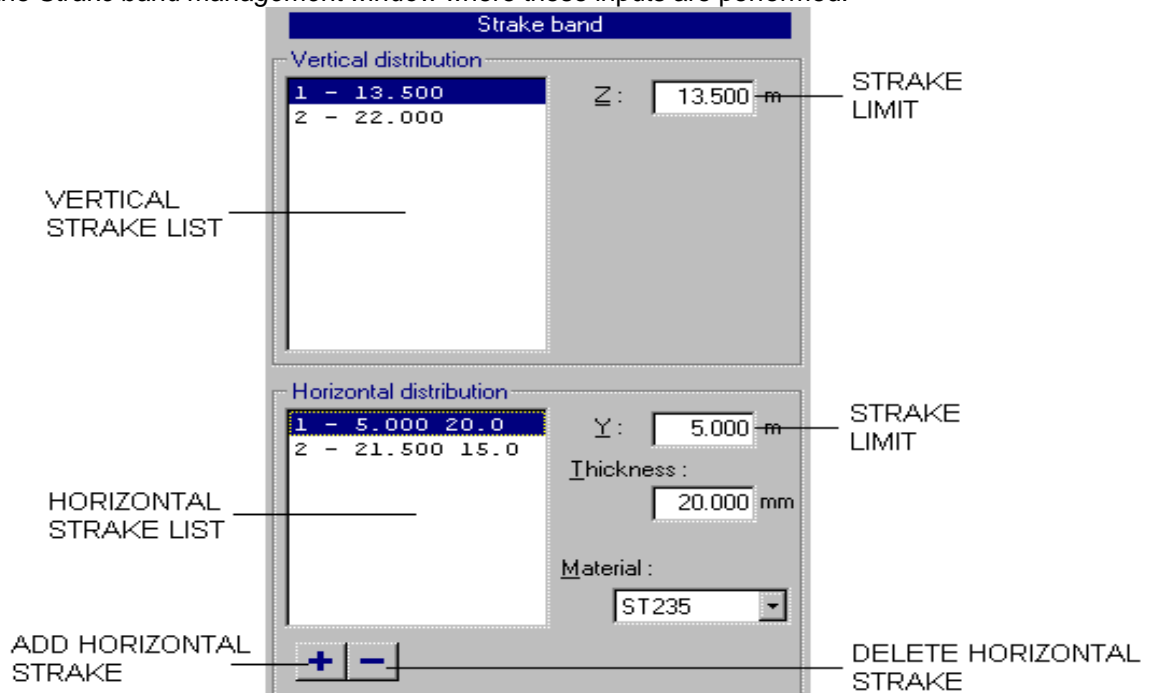

Figure 15 : STRAKE BAND MANAGEMENT WINDOW

During a first input, there is a strake automatically created on each bulkhead with width equal to the width of the bulkhead.

The creation and the deletion buttons (Figure 6) in the Tool bar allow you to create or delete vertical strakes.

To create or delete horizontal strakes you have to use the creation and the deletion buttons located in Horizontal distribution frame.

Creating a strake means to divide the strake selected in the strake list (Figure 29) into two strakes of same characteristics, thickness and material, and with width equal to the half width.

Vertical Strake List: display of the number and limit of the strakes defined on the current bulkhead. The strake selected is the current strake. To select a strake, click on a strake in the list or in the Bulkhead Arrangement view.

Horizontal Strake List: display of the number, limit and thickness of the strakes defined on the current bulkhead.

The strake selected is the current strake

Thickness (in mm): thickness of the current strake.

Material: material of the current strake.

3.9   COMPARTMENTS分舱

Clicking on the compartment button (Figure 13) or on Forward and aftward compartments on the Bulkhead Arrangement menu (Figure 24), you enter the Compartments management window:
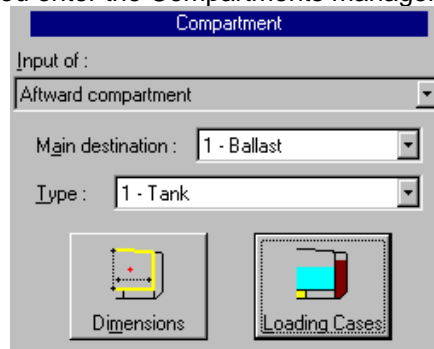

Figure 16 : COMPARTMENTS MANAGEMENT WINDOW

In this window, you can define the data for forward and aftward compartments.

Main destination: main load type.

Type: choose a compartment type in the list.

The possible types are:

1	Tank
2	Double bottom, skin
3	Dry compartment
4	Engine room
5	Boiler compartment
6	Tunnel
7	Hopper well 1
8	Hopper well 2

3.9.1   Dimensions

Clicking on the Dimensions button (Figure 16), the compartment-dimension window is displayed:
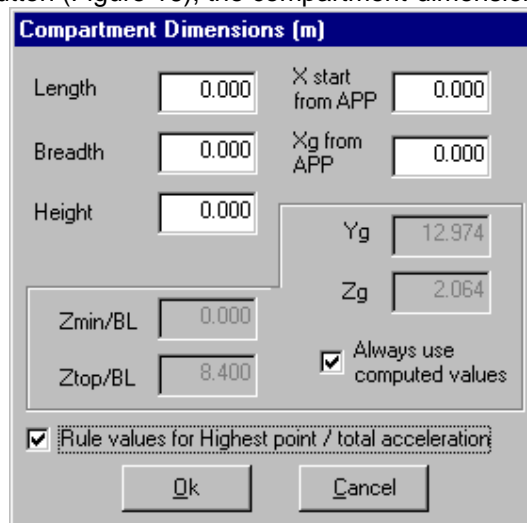

Figure 17 : COMPARTMENT-DIMENSION WINDOW

Breadth (in m): compartment breadth.

Height (in m): compartment height.

X start (in m): longitudinal location of start compartment from APP.

Xg (in m): longitudinal location of compartment center of gravity from APP.

The following data may be obtained by calculation clicking on Always use compute values check or by direct input:

Yg (in m): center of gravity (Center line).

Zg (in m): center of gravity above base line.

Zmin/BL (in m): min of compartment from base line.

Ztop/BL (in m): top of compartment from base line.

If you don't want use the Rule values for highest point / total acceleration click in the related check. The window become:

Figure 18 : COMPARTMENT-DIMENSION WINDOW (2)

3.9.2   **Loading cases**载荷状况

Clicking on the *Loading Cases* button (Figure 16), the compartment load window is displayed:

Type: select a load type.
Figure 19 : COMPARTMENT LOAD WINDOW

Liquid cargo液货舱

Load test height (in m): tank testing load height from base line. Air Pipe (in m): distance from top of air pipe height to base line. Density liquid: density of liquid cargo.

Setting pressure (in bar): setting pressure of safety valves.

Bulk cargo散货舱

Load in hold (in t): load in hold (bulk or spoil). Density of bulk or spoil (in t): density of bulk or spoil. Friction angle (in °): internal friction angle for bulk.

This input allows to define for the same compartment a liquid cargo and a bulk cargo. This facility may be used for ballastable hold in bulk carrier.

3.10   MENUS菜单

File Menu文件

It allows to manage the bulkheads (save, open), to print and to quit BHAIN.

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Figure 20 :FILE MENU

Item	Use	Shortcut
New…	Creates a bulkhead.	
Open..	Opens an existing bulkhead.	you can also press Ctrl + O.
Save	Saves the opened bulkhead.	you can also press Ctrl + S or
Save As…	Saves a copy of the bulkhead with another name.	
Export Drawing	Creates a bitmap file from the bulkhead drawing	
Print Data…	Prints the data of the bulkhead (see3.12.1).	you can also press Ctrl + S or
Print Drawing…	Prints a drawing of a bulkhead (see1.3.2).	
Quit	Quits BHAIN to return to MARSHELL.	you can also press Ctrl + Q or

Edit Menu编辑

It allows to undo the last action or copy the section drawing to clipboard.

Figure 21 : EDIT MENU

Item	Use	Shortcut
Undo	cancels the last action.	Ctrl + Z
Copy Section Drawing to clipboard	allows to paste the section drawing in any other application.	

Bulkhead Arrangement menu舱壁布置菜单

It gathers the entries to the input fields.

Figure 22 : BULKHEAD ARRANGEMENT MENU

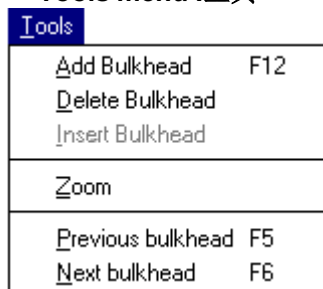| Item	Use	Shortcut
Main data	displays the Main Bulkhead Arrangement Data Window (see Chapter 2 :).	
Bulkhead	displays the Bulkhead management window(see 3.3).	
Nodes	displays the Nodes management window(see 3.4).	
Primary stiffeners	displays the Primary stiffeners management window (see 3.5).	
Secondary stiffeners	displays the Secondary stiffeners management window (see 3.6).	
Corrugated	displays the Corrugation management window (see 3.7).	
Strakes	displays the Strake Band management window (see 3.8).	
Forward and aftward compartments	displays the Forward and aftward compartments management window (see 3.9).	

Check menu检查

It includes checking tools.

Figure 23 : CHECK MENU

Item	Use	Shortcut
Check Materials - Strakes	displays the strakes with a different color for each material.	
Check Materials - Stiffeners	displays the stiffeners with a different color for each material.	

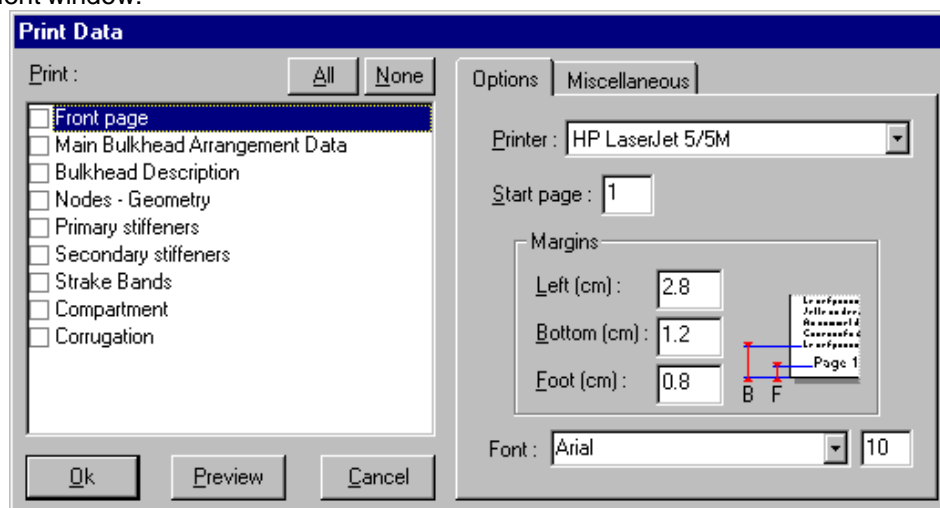| Check Thickness	displays the strakes with a different color for each thickness.	
Check Secondary Stiffeners scantling	displays the secondary stiffeners with a different color for each stiffener scantling.	

Tools menu :工具

Figure 24 : TOOLS MENU工具菜单

Item	Use	Shortcut
Add object	creates data (see 3.2).	**or F12**
Delete object	deletes data (see 3.2).	
Insert node…	inserts a node (see 3.4.1), this item is available only during the node input sequence.	
Zoom	allows to zoom in (see 3.13).	
Previous bulkhead	changes the current bulkhead to the previous one (see 3.1).	F5
Next bulkhead	changes the current bulkhead to the next one (see 3.1).	F6

Options menu

Figure 25 : OPTIONS MENU

Item	Use	Shortcut
Preferences…	displays a set up window for the section drawing on the screen or a printer.	
Refresh drawing	refreshes the screen in case of display anomalies.	F9

3.11

3.12   PRINTING打印

3.12.1   Printing data打印数据

Clicking on or on Print Data… on the File menu (Figure 20) or pressing Ctrl + P, you enter the Print Data management window:

Figure 26 : PRINT DATA MANAGEMENT WINDOW

This window allows you to select what you want to print. The All (None) button selects (deselects) all the items of the list.

Front page produces the cover page of a report.

3.12.2   Printing drawing

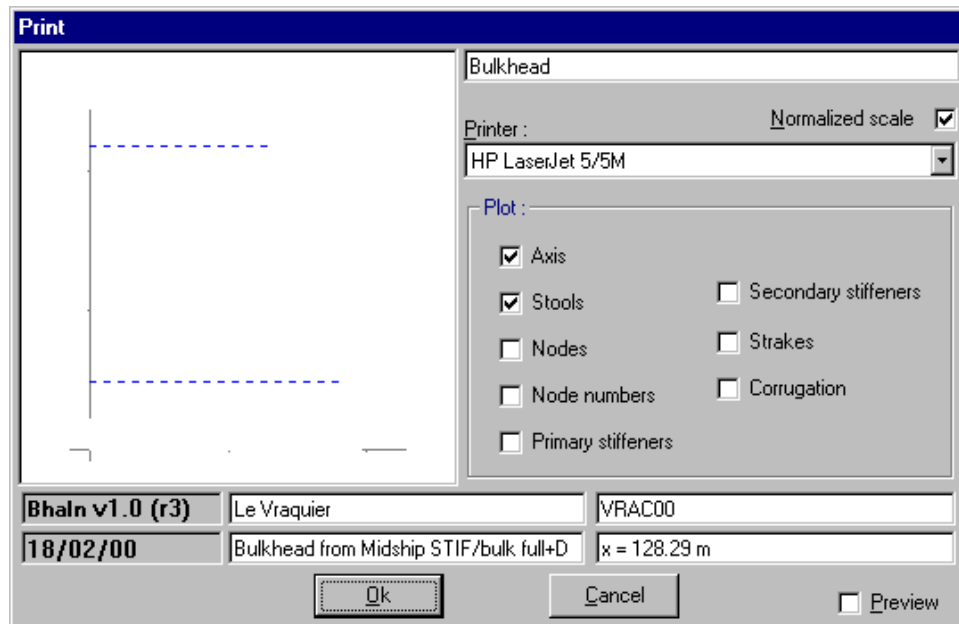Clicking on Print Drawing… on the File menu (Figure 20), you enter the Print Drawing management window:

Figure 27 : PRINT DRAWING MANAGEMENT WINDOW

This window allows you to select which item will be printed on the item.

The *Normalized scale* check box will make the drawing printed with a regular scale (e.g. 1/50, 1/100, …).

3.13 ZOOM视窗

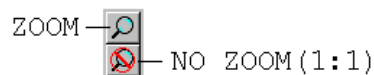It is possible to Zoom in on or out of the Bulkhead view thanks to the *Zoom* Toolbar:

Figure 28 : ZOOM TOOLBAR

A first click on the *Zoom* button (Figure 28) or on *Zoom* on the *Tools* menu (Figure 24) changes the

cursor in and allows you to zoom in the bulkhead view by simple click on it.

A second click on the *Zoom* button (Figure 28) or on *Zoom* on the *Tools* menu (Figure 24) changes back
the cursor in and allows you to work on your zoomed bulkhead view.

To zoom out of the section view, you can:

• click on the *No Zoom (1:1)* button (Figure 28) to bring back the view to the initial size.

right-click on the section view when the *Zoom* button is down.