MARS2000 User's guide Booklet 5
CALCULATION OF A BULKHEAD ARRANGEMENT
舱壁布置计算

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Chapter 1 : GENERAL COMMENTS 综述

1.1 CONCEPTS概念

BhaRule is able to perform calculations in any bulkhead all along the ship length. The bulkheads are to be defined as described in the booklet "Definition of a bulkhead arrangement".

Local calculations are based on the net scantling of the section. This net scantling is evaluated from the main destination of each compartment.

An elementary plate panel (E.P.P.) is a subdivision of plate bordered by primary stiffeners, ordinary stiffeners and bulkhead bounds.

Local calculations for plating are always performed by E.P.P. As strakes can be divided in E.P.P., syntheses of calculations are made to the strake level.

When a welding joint is located between two stiffeners, the E.P.P. belongs to both jouxting strakes. But it is calculated twice, each time with the thickness of one of the two strakes.

1.2 MAIN FEATURES主要特色

The BhaRule module performs, for plates and ordinary stiffeners located on a transverse bulkhead, rule calculations according to Jap Rules and Regulations for classification of Steel Ships.

All the calculations carried out by this module which is explained in this booklet, are relative to the bulkhead arrangement which has been selected in MarsShell.

The module allowing to perform the calculation for a given bulkhead arrangement is organized around the following application:

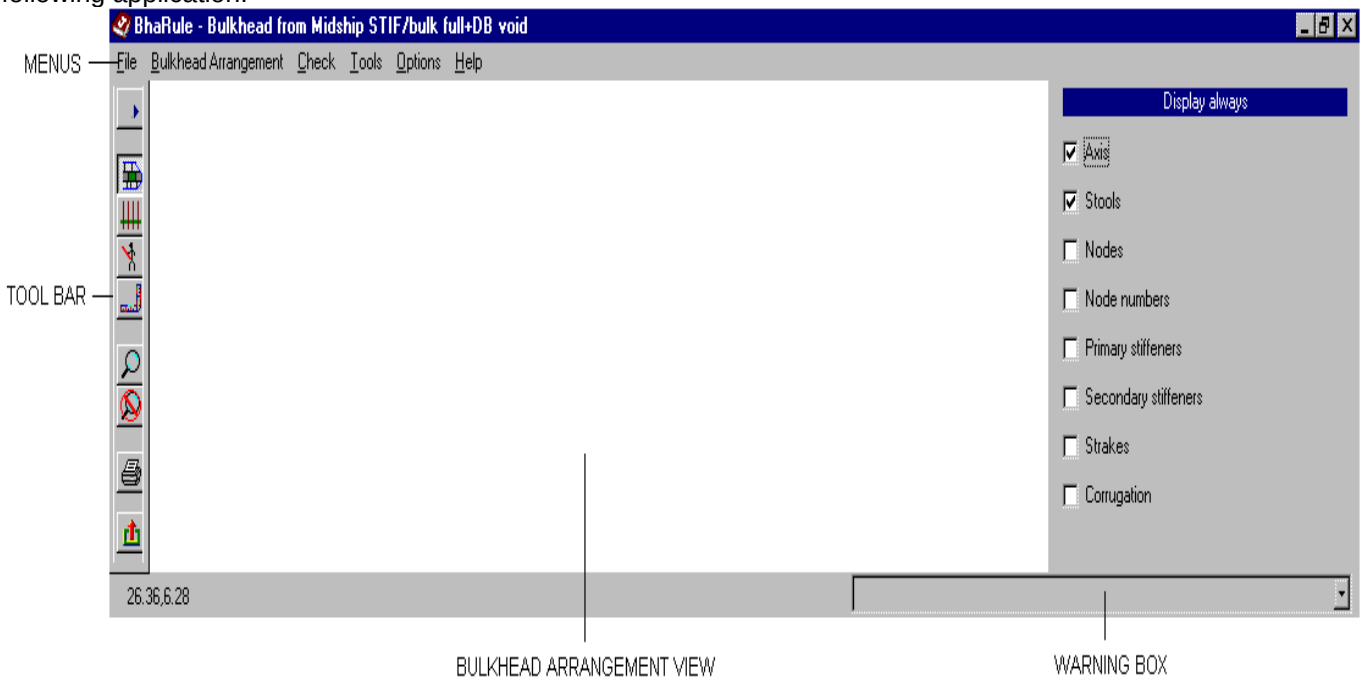


Figure 1 : BHARULE

Warning Box : displays warning message when BhaRule detects incoherence in the Bulkhead arrangement definition.

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

1.3 COMPUTE BULKHEAD ARRANGEMENT计算舱壁布置

When you launch BhaRule module or you click on the Compute bulkhead arrangement button  or on Compute bulkhead arrangement on the File menu (Figure 2), the following window is displayed:

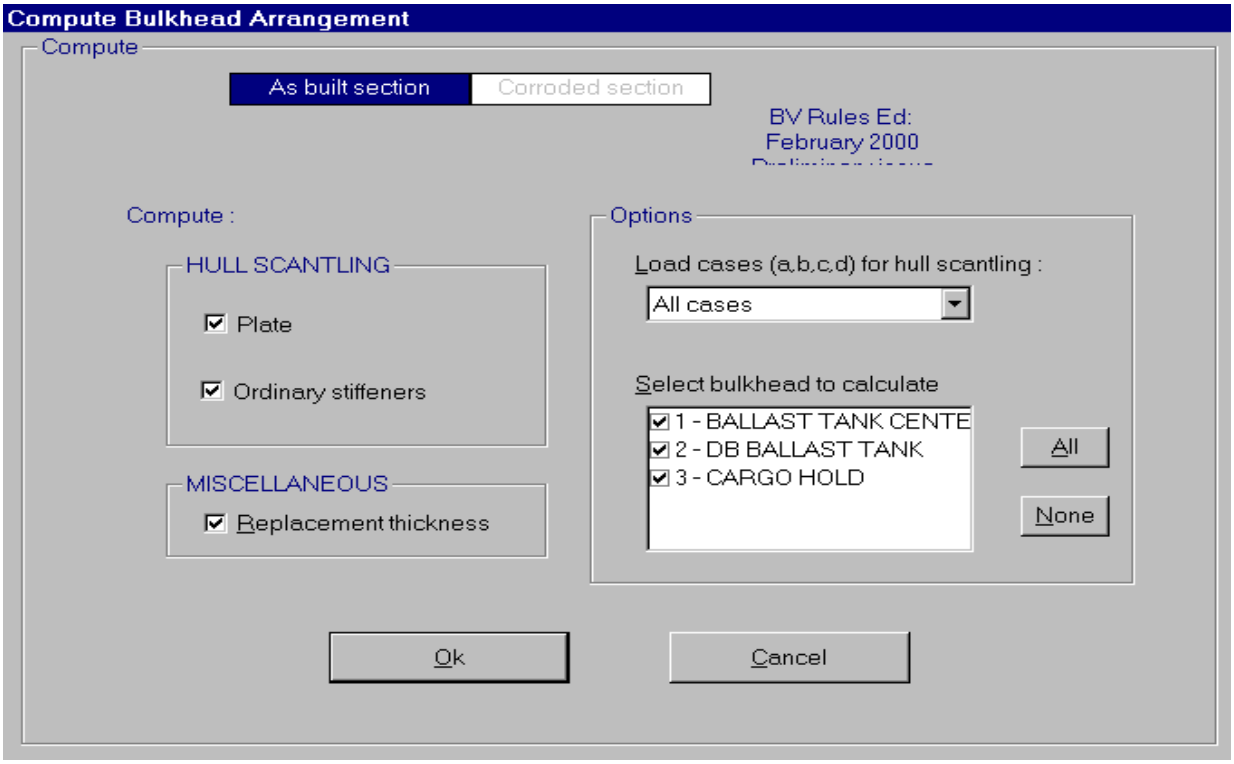


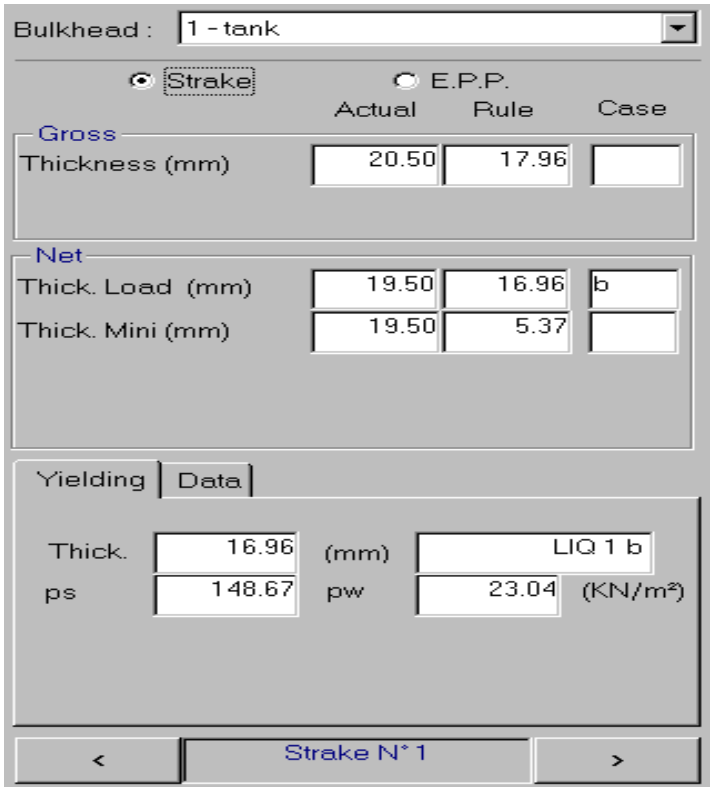
Figure 2 : COMPUTE BULKHEAD ARRANGEMENT WINDOW

This window allows carrying out the hull scantling calculation. It is possible to require calculations for only plates or only stiffeners (by default both of them).

Options选项

It is possible to require calculations for all the load cases (default value) or for only one of these (e.g. case a, case b,…).

Moreover, it is possible to select all the bulkheads of the bulkhead arrangement (default) or only some of them. The All (None) button selects (deselects) all the items of the list.



Chapter 2 : STRAKE RESULTS 船底板（列板）结果

Clicking on Strakes button  or on Strakes on Bulkhead Arrangement menu (Figure 3), you enter the Strake results window:

Figure 3 : STRAKE RESULT WINDOW

2.1 SCANTLING CALCULATION规格计算

The purpose of this calculation is to check in a given bulkhead the actual scantling of strakes.

The window display the results at strake level or in more detailed way for each elementary plate panel forming the strake. To highlight the strake anomalies if the actual value of considered result is lower then rule value this latter become red.

2.2 SYMBOLS符号

Gross frame总厚度

	Actual	Rule
Thickness	Gross thickness of the strake.	Maximum of Rule thick. Load and Rule Thick. Mini added with the corrosion margin of the strake.

Net frame净规格

	Actual	Rule
Thick. Load	Net thickness of the strake.	Thickness based on internal design pressure. It is calculated on each E.P.P. considered by the program. The output value of Thick. Load is the maximum one.

Thick. Mini	Net thickness of the strake.	Minimum rule thickness. Maximum of the values calculated on each E.P.P

Yielding tab屈服强度

This tab gives details of the Thick. Load result on the E.P.P. where it is maximized.

Thick	Thickness based on internal design pressure.
Load reference	Code indicating the corresponding type of loading and load case. The possible items of loading are described hereafter.
Ps	Still water pressure.
Pw	Wave pressure.

Load references载况参考

LIQ i	Liquid pressure
BULK i	Bulk pressure
Slosh I	Sloshing pressure
Impact i	Impact pressure

For the code described hereabove the figure i means: number of the compartment, the data of which are used in the calculation of pressure.

Chapter 3 : STIFFENER RESULTS 型材结果

Clicking on Stiffeners button  or on Stiffeners on Bulkhead Arrangement menu (Figure 3), you enter the Stiffener results window:

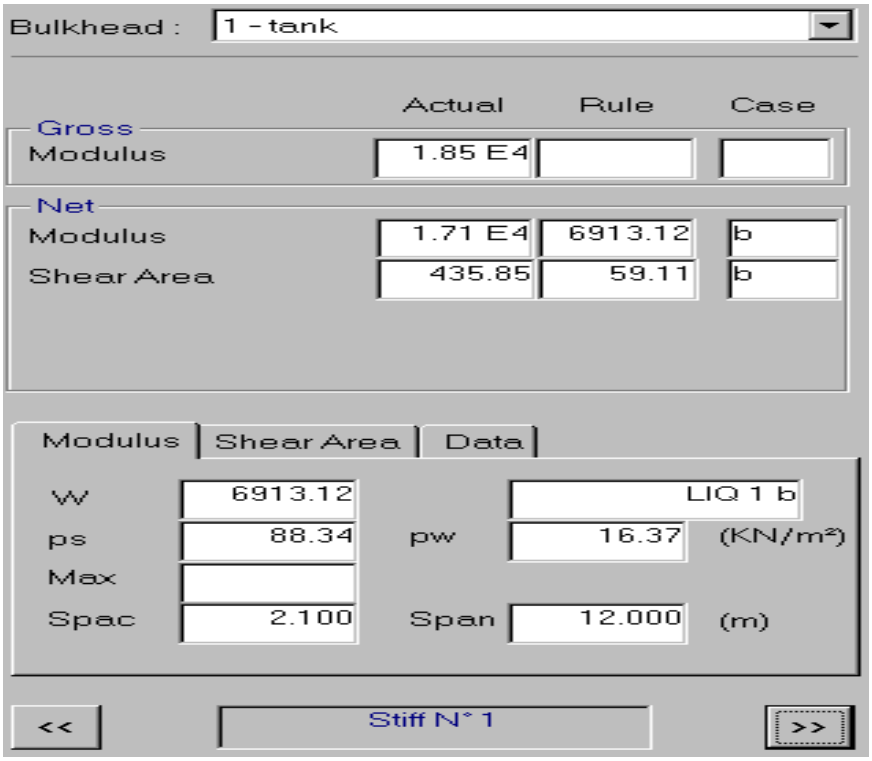


Figure 4 : STIFFENER RESULT WINDOW

3.1 SCANTLING CALCULATION规格计算

The purpose of this calculation is to check in a given bulkhead the actual scantling of Stiffeners.

To highlight the stiffener anomalies if the actual value of considered result is lower then rule value this latter become red.

3.2 SYMBOLS符号

Gross frame总规格

	Actual	Rule
Modulus	Modulus of the stiffener based on its gross scantling.	

Net frame净规格

	Actual	Rule
Modulus	Modulus of the stiffener based on its net scantling.	Modulus based on internal design pressure.
Shear Area	Shear area of the stiffener based on its net scantling.	Shear area based on internal design pressure.

Modulus tab模型负荷表

This tab gives details of the net modulus result.

W Modulus based on internal design pressure.

Load reference	Code indicating the corresponding type of loading and load case. The possible items of loading are described hereafter.
Ps	Still water pressure.
Pw	Wave pressure.
Max	Code indicating the position along the stiffener where the ratio Rule/Actual is maximal. The possible items of position are described hereafter.
Spac	Spacing of the stiffener.
Span	Span of the stiffener.

Shear A. tab剪力

This tab gives details of the shear area result.

S Area	Shear area based on internal design pressure.
Load reference	Code indicating the corresponding type of loading and load case. The possible items of loading are described hereafter.
Max	Code indicating the position along the stiffener where the ratio Rule/Actual is maximal. The possible items of position are described hereafter.
Ps	Still water pressure.
Pw	Wave pressure.
Spac	Spacing of the stiffener.
Span	Span of the stiffener.

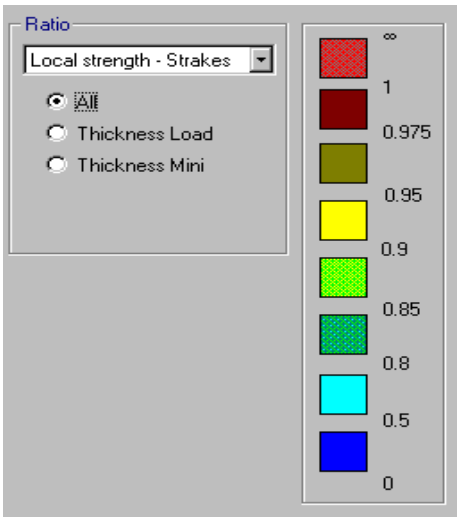
Load references参考载荷

LIQ i	Liquid pressure
BULK i	Bulk pressure
Slosh I	Sloshing pressure
Impact i	Impact pressure

For the code described hereabove the figure i mean: number of the compartment, the data of which are used in the calculation of pressure.

Position references参考位置

Start	Lower position on the span.
End	Upper position on the span.
Between	Point where the moment is maximal.



Chapter 4 : RATIO RESULTS 比例系数

Clicking on Ratio button  you enter the Ratio results window:

Figure 5 : RATIO RESULT WINDOW

The window allows to select one or several types of ratio from the following list:

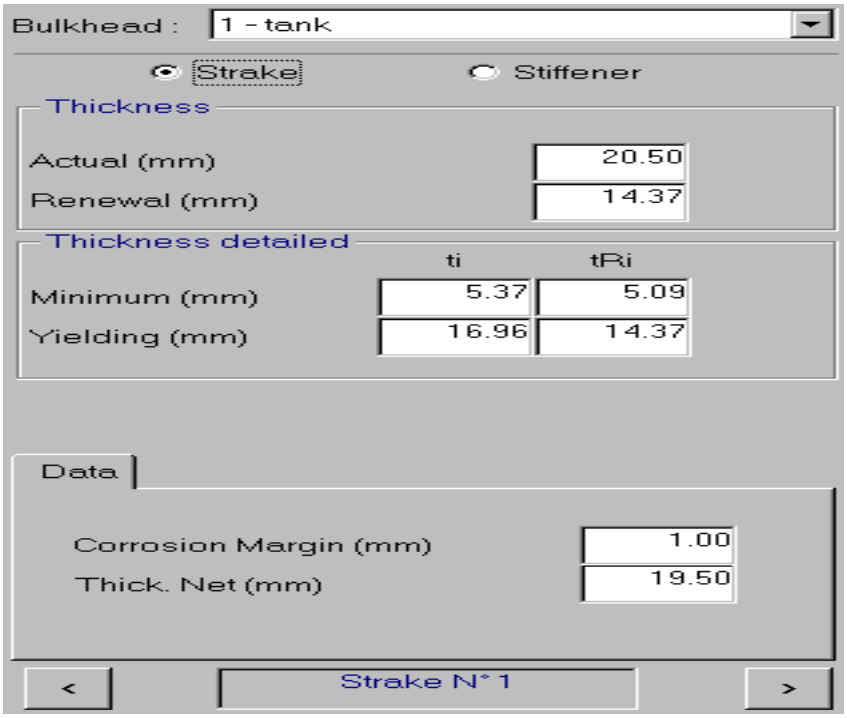
- Local strength - Strakes.
- Local strength - Secondary.
- Hereafter the different type of ratio available for each item:

Local strength – Strakes载荷强度-船底板（列板）

- All
- Thickness Load
- Thickness Mini

Local strength - Stiffeners载荷强度-型材

- All
- Net modulus
- Net shear area



Chapter 5 : RENEWAL RESULTS 更新结果

Clicking on *Renewal*  button you enter the Renewal results window.

5.1 STRAKES船底板（列板）

Figure 6 : RATIO RESULT WINDOW (1)

Thickness frame厚度

Actual	Gross thickness of the strake.
Renewal	Maximum of tRi.

Thickness detailed frame详细厚度

	ti	tRi
Minimum	Minimum net thickness.	Minimum renewal thickness.
Yielding	Thickness based on internal design pressure.	Renewal thickness of plating subjected to lateral pressure.

5.2 LONGITUDINAL STIFFENERS纵向型材

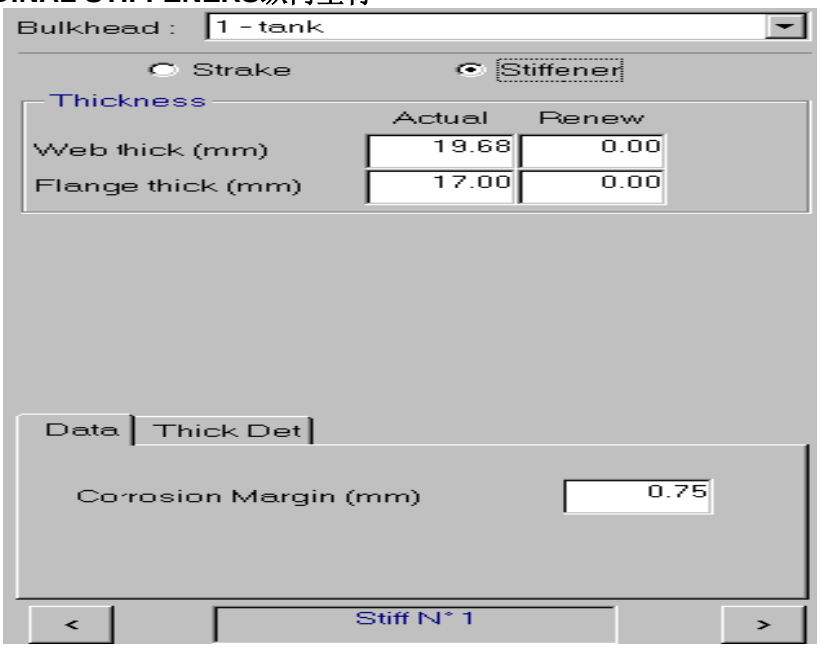


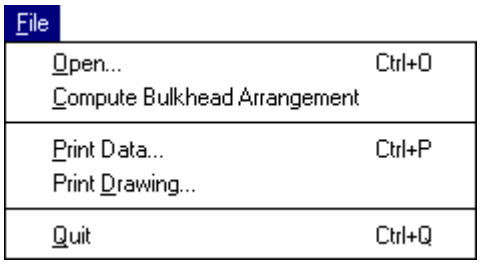
Figure 7 : RATIO RESULT

WINDOW (2) Thickness frame

	Actual	Renew
Web thick	Actual web thickness	Renewal web thickness.
Flange thick	Actual flange thickness	Renewal flange thickness.

Thick Dat tab

	Web	Flange
%		
Buck		



Chapter 6 : GENERAL FEATURES 通则

6.1 MENUS菜单

File Menu

It allows to manage the sections (save, open), to print and to quit MARSIN.

Figure 8 : FILE MENU

Item	Use	Shortcut
Open..	opens an existing bulkhead.	Ctrl + O
Compute Bulkhead Arrangement	allows to set calculation options (see 1.3).	
Print Data…	prints the data of the bulkhead (see 1.4.1).	Ctrl + P or
Print Drawing…	prints a drawing of a bulkhead (see 1.4.2).	
Quit	Quits BHARULE to return to MARSHELL.	Ctrl + Q or

Edit Menu

It gathers the results from calculation.

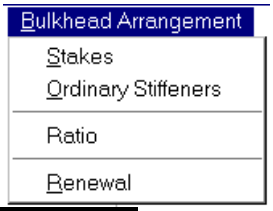


Figure 9 : BULKHEAD ARRANGEMENT MENU

Item	Use	Shortcut

Strakes	displays the Strake results window.	
Stiffeners	displays the Stiffeners results window.	

Check menu
It includes checking tools.

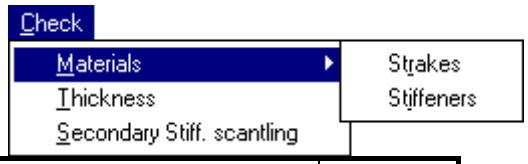


Figure 10 : CHECK MENU

em	Use	Shortcut
Materials - Strakes	displays the strakes with a different color for each material.	
Materials - Stiffeners	displays the stiffeners with a different color for each material.	
Thickness	displays the strakes with a different color for each thickness.	
Secondary Stiff. scantling	displays the secondary stiffeners with a different color for each stiffener scantling.	

***Tools* menu :**

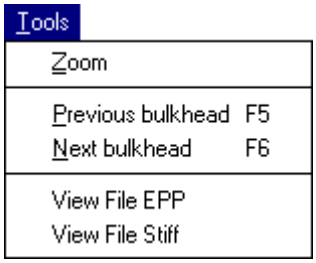


Figure 11 : TOOLS MENU

Item	Use	Shortcut
Zoom	allows to zoom in (see 6.3).	
Previous bulkhead	changes the current bulkhead to the previous one.	F5
Next bulkhead	changes the current bulkhead to the next one.	F6
View File EPP	displays yielding values for all the Elementary Plate Panel in the bulkhead.	
View File Stiff	displays modulus values for all the stiffeners in the bulkhead.	

Options menu

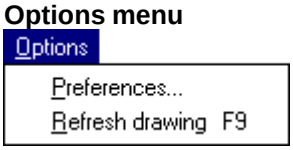


Figure 12 : OPTIONS MENU

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

6.2 PRINTING

6.2.1 Printing data

Clicking on  or on Print Data… on the File menu (Figure 8) or pressing Ctrl + P, you enter the Print Data management window :

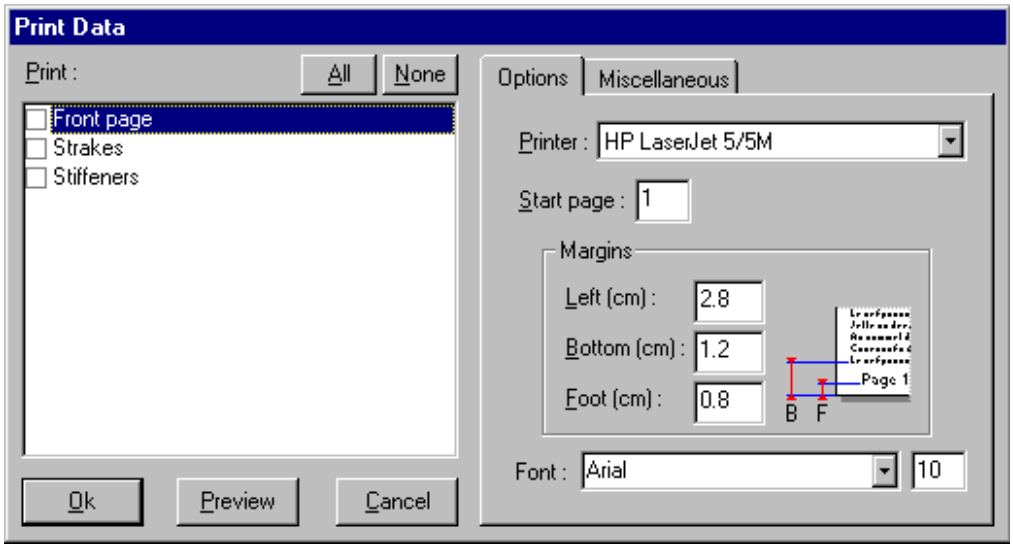


Figure 13 : PRINT DATA MANAGEMENT WINDOW

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.

6.2.2 Printing drawing

Clicking on *Print Drawing…* on the *File* menu (Figure 8), you enter the *Print Drawing management window* :

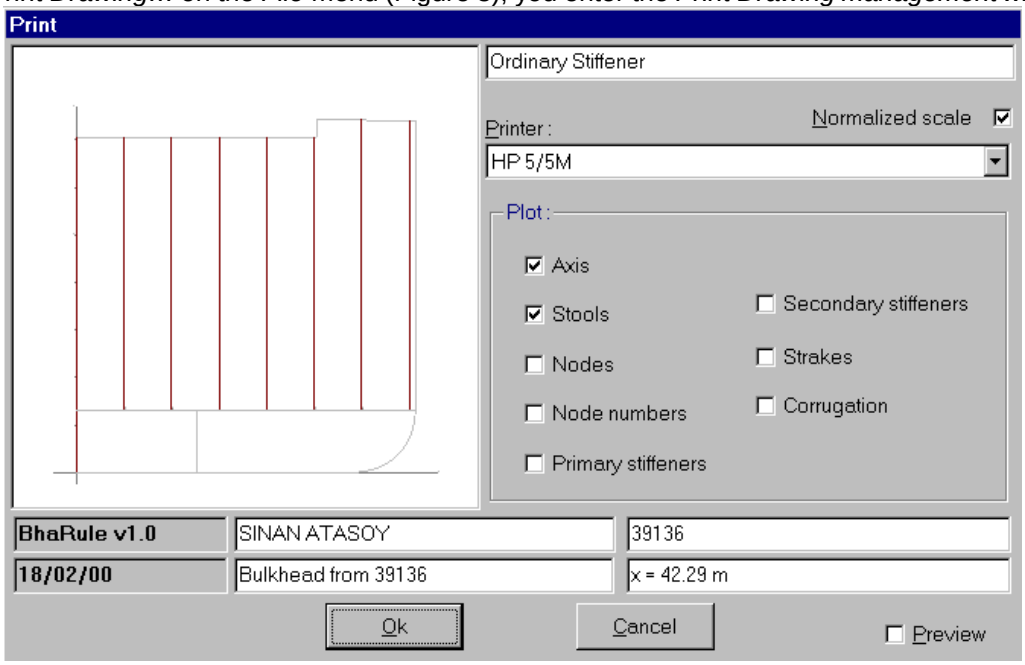


Figure 14 : PRINT DRAWING MANAGEMENT WINDOW

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, …).

6.3 ZOOM

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

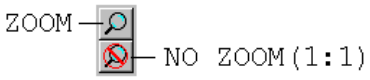


Figure 15 : ZOOM TOOLBAR

A first click on the *Zoom* button (Figure 9) or on *Zoom* on the *Tools* menu (Figure 5) changes the cursor in  and allows you to zoom in the section view by simple click on it. A second click on the *Zoom* button (Figure 9) or on *Zoom* on the *Tools* menu (Figure 5) changes back the cursor in  and allows you to work on your zoomed section view. To zoom out of the section view, you can :

- click on the *No Zoom (1:1)* button (Figure 9) to bring back the view to the initial size.
- right-click on the section view when the *Zoom* button is down.