

**MARS2000 User's guide Booklet 1****INTRODUCTION SHELL / BASIC SHIP DATA**外板和船舶数据

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**Chapter 1 : GENERAL COMMENTS 综述****1.1 GENERAL**

MARS2000 is a software tool that allows to input sections, bulkheads and torsion models; it is organized around the following seven modules: 软件各模块和功能

- MARS2000 (Shell). 外板
- MIRE2000 (Basic Ship Data). 基本船舶数据
- MarsIn2000 (Section's Input). 剖面输入
- MarsRule2000 (Section's Check). 剖面检查
- BhaIn (Bulkhead Arrangement's Input). 舱壁布置输入
- BhaRule (Bulkhead Arrangement's Check). 舱壁布置检查
- Torsion (Input of torsion model and check). 扭矩模型输入和检查

The geometry and the scantling are defined using an user friendly process. MARS2000 checks that the actual local scantlings (Hull girder strength, plating and ordinary stiffeners) are in accordance with the Rules.

构件规格和定义由用户确定，软件按规则进行检查（强型材、板和普通型材）

The program is updated each time the Rules are modified. 程序将按规则随时更新。

## Chapter 2 : SHELL 外板

### 2.1 MAIN FEATURES 主要功能

The Mars shell module allows creating a new database or choice an existing database. The module is organized around the following application: 程序界面: 创建新的数据或打开已有的

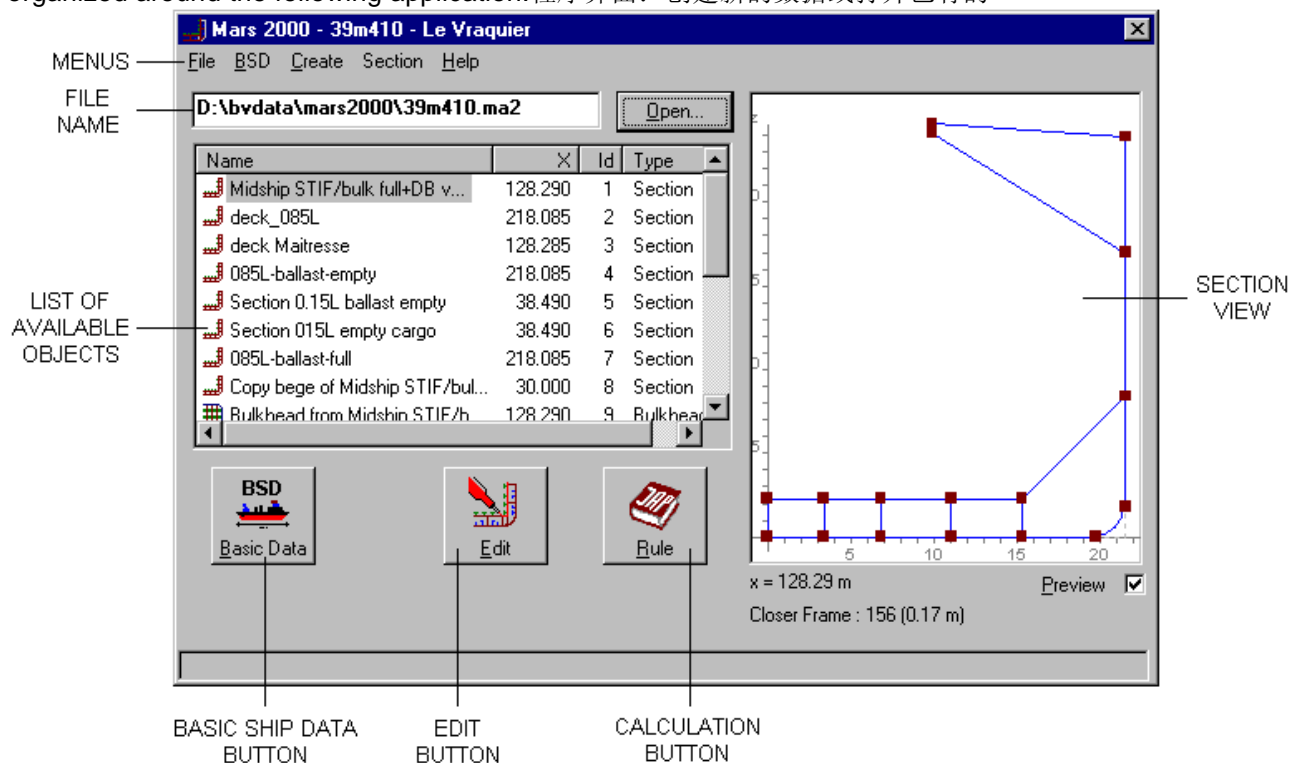


Figure 1 : MARSSHELL

List of available objects: displays all the existing objects in the database.

**Basic Ship Data button** 基本船舶数据: run the Basic Ship Data program.

**Edit button** 编辑: run the MarsIn2000 program if the user have choice a section in the list of available objects. In case of Bulkhead Arrangement the button run the BhaIn program. In case of torsion model the button run the Torsion program. 当选择剖面时即进入剖面程序

**Rule button** 规范计算: run the MarsRule2000 program if the user have choice a section in the list of available objects. In case of Bulkhead Arrangement the button run the BhaRule program.

WARNING: BUTTON NOT AVAILABLE IN TORSION MODEL CASE

Section view: displays a view of the section (not available in case of torsion model).

### 2.2 MENUS 菜单

#### File Menu 文件

It allows to manage the databases (save, open...) and to quit MARS2000.

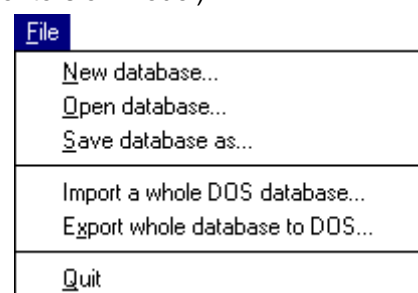


Figure 2 : FILE MENU

Item	Use
New database...	Creates a new database.
Open database...	Opens an existing database.
Save database as...	Saves the opened database.
Import a whole DOS database...	Imports from a old MARS DOS database (.mar)
Export whole database to DOS...	Exports to a old MARS DOS database (.mar)
Quit	Quits MARS2000

#### BSD Menu 基本船舶数据

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



Figure 3 : BSD MENU

Item	Use
------	-----

<i>Open...</i>	Runs Basic Ship Data program.
<i>Import ...</i>	imports BSD from a file <b>.mar, .maw, .ma2, .bsd</b>

**Create Menu** 创建菜单

It allows creating a new section, bulkhead arrangement or model for torsion.

Create

Section...

Bulkhead Arrangement

Model for Torsion

**Figure 4 : CREATE MENU**

Item	Use
<i>Section...</i>	Creates a new section.
<i>Bulkhead Arrangement</i>	Creates a new bulkhead arrangement.
<i>Model for Torsion</i>	Creates a new model for torsion.

**Section Menu** 剖面菜单

It allows managing the objects.

Section

Edit...

Rule...

Copy...

Delete...

Import from another DB (DOS or Win)...

Export to Mars Dos...

**Figure 5 : SECTION MENU**

Item	Use
<i>Edit...</i>	Runs input module related to selected object.
<i>Rule...</i>	Runs check module related to selected object.
<i>Copy...</i>	Copy the selected object.
<i>Delete...</i>	Delete the selected object.
<i>Import from another DB (DOS or Win)...</i>	Imports section from a file .mar, .maw, .ma2
<i>Export to Mars Dos...</i>	Exports to a old section DOS (.mar)

## Chapter 3 : BASIC SHIP DATA 基本船舶数据

### 3.1 GENERAL COMMENTS概述

#### 3.1.1 MAIN FEATURES主要功能

The Basic Ship Data module allows the input of general data common for all the transverse sections, bulkhead arrangements and models of torsion. It also performs calculations that may be done from those data. The module is organized around the following application:

船舶数据模块允许的一般常见的所有的横截面，舱壁安排和扭转模型数据输入。它还执行从这些数据进行计算。该模块主要是围绕以下应用程序

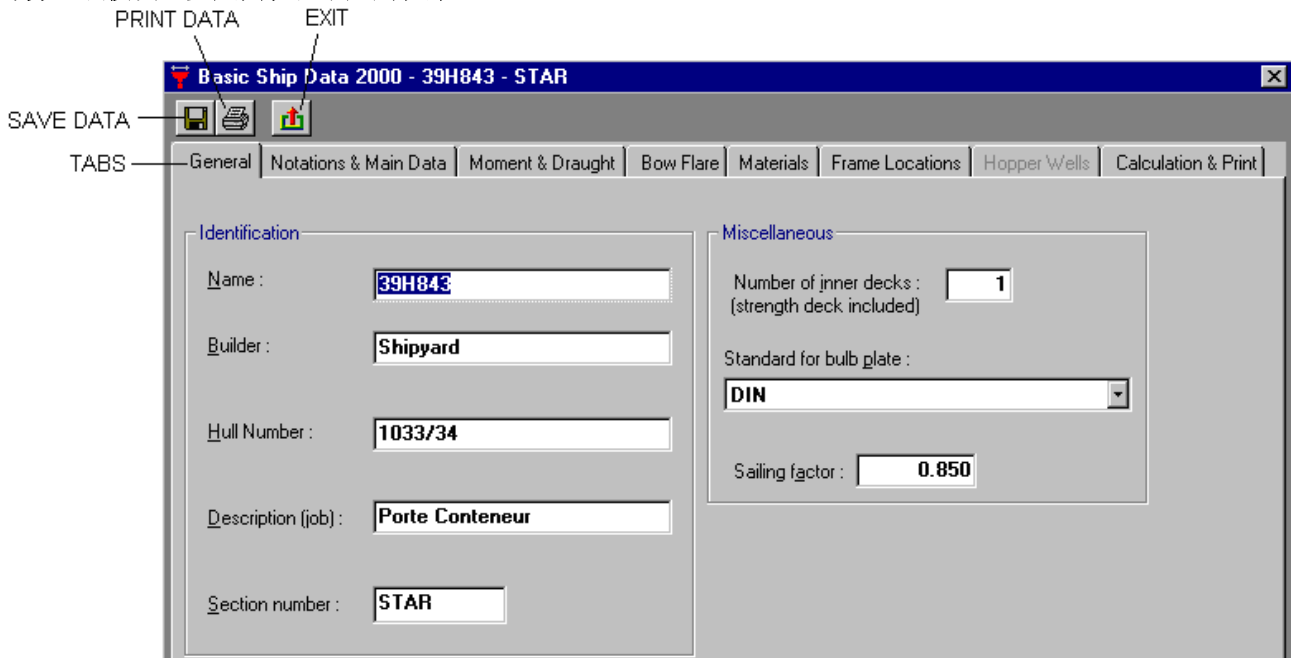


Figure 6 : BASIC SHIP DATA

The **BSD** module is divided into eight main parts:基本船舶数据模块分为八部分

- General.总体
- Notations & Main Data.船级和主要数据
- Moment & Draught.弯矩和吃水
- Bow Flare.首飘
- Materials材料
- Frame Locations.肋骨
- Hopper wells (Hopper dredgers & split hopper dredgers only)挖泥船用
- Calculation & Print.计算和打印

### 3.2 GENERAL综述

The first tab of the basic ship data window allows defining the identifiers of the ship and the general data.

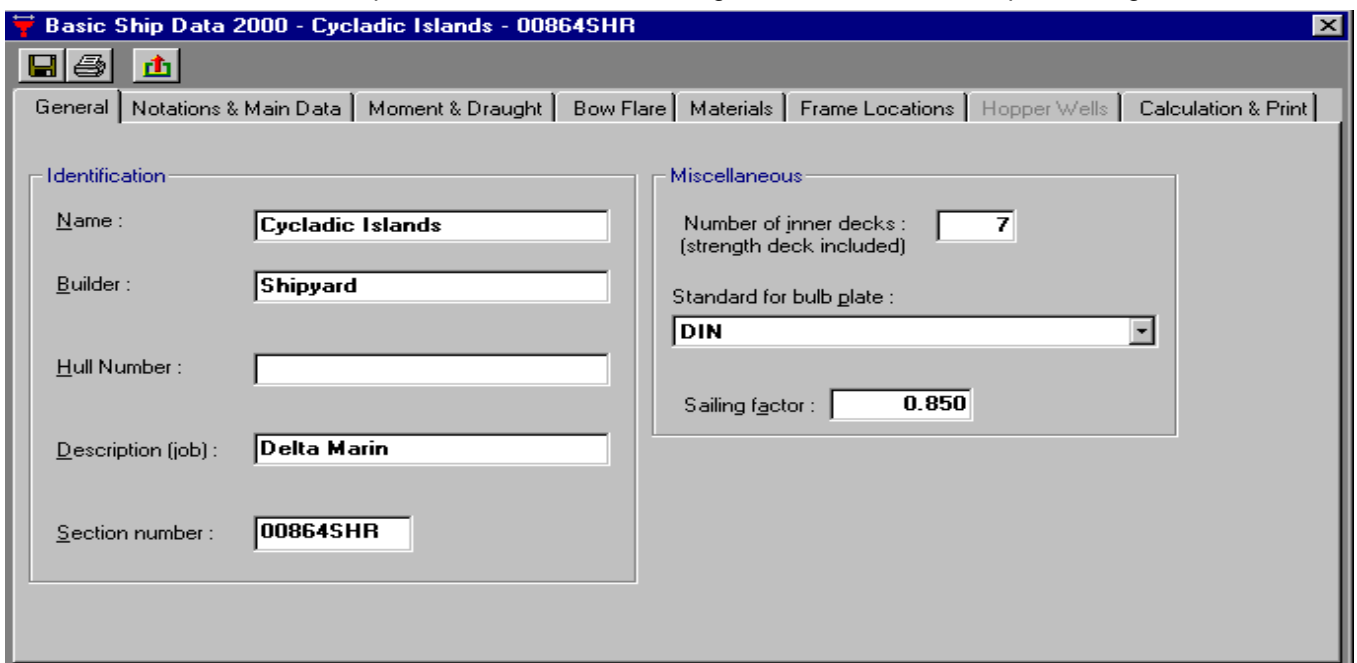


Figure 7 : GENERAL

**TAB Miscellaneous填表注意**

- Number of inner decks: the strength deck has to be included in this number. So the minimum value is 1.甲板数至少为1
- Standard for bulb plate: select one of the 5 standards in the list. The geometrical properties of the bulb plates are stored on internal files corresponding to the 5 cases of the list.标准球扁钢按列表5种选
- Sailing factor: ratio of sailing time of the ship in its life.**航行时间和船生存时间的比值: 船报废时间(一般按20年)

**3.3 NOTATION AND MAIN DATA注释和主要数据**

The data defined in this tab are the main ship dimensions, notations, depths and location of hold regions.

**Basic Ship Data 2000 - 5889CNI - RI69738**

General | **Notations & Main Data** | Moment & Draught | Bow Flare | Materials | Frame Locations | Hopper Wells | Calculation & Print

**Notation**

Service :

Navigation :

**Location of hold regions**

Aft end :  m

Fore end :  m

**Main dimensions**

Scantling length :  m

Breadth moulded :  m

Block coefficient :

Contractual service speed :  Knots

**Depths**

At strength deck :  m

At freeboard deck :  m

At top of continuous member :  m

Figure 8 : NOTATION &amp; MAIN DATA TAB

**3.3.1 NOTATION注释**

- Service: identifies the service notation of the ship. This notation is used in the local rule scantling to determine, for example, the load heights and the minimum rule thickness.

The possible service notations are:船型

1	Cargo ship货船	12	Tanker油船
2	Container ship集装箱船	13	Dredger挖泥船
3	Ro-ro cargo ship滚装船	14	Hopper dredger/barge挖泥船/驳船
4	Ro-ro passenger ship滚装载客船	15	Split hopper dredger/barge开底泥驳
5	Passenger ship客船	16	Fishing vessel渔船
6	Oil tanker (and easy chemical)油船和化学品船	17	Launch快艇
7	Bulk carrier散货船	18	Sea going launch出海汽艇
8	Ore carrier矿砂船	19	Yacht游艇
9	Combination carrier兼用运输船	20	Tug拖船
10	Liquefied gas carrier液化气船	21	Supply vessel供应船
11	Chemical tanker化学品船		

- Navigation: identifies the area where the ship may navigate. This notation is used to calculate some rule coefficient.

The possible navigation notations are :航区

1	Unrestricted navigation无限航区
2	Summer zone夏季区域
3	Tropical zone热带
4	Coastal area近海
5	Sheltered waters遮蔽

If the service notation is equal to Hopper dredger/barge or Split hopper dredger/barge the window

become: 以下为挖泥船

**Figure 9 : NOTATION & MAIN DATA TAB –2**

- Operating area: indicates where the dredger may operate. The possible operating areas are:

1	Dredging over 15 miles offshore and over 20 miles from port
2	Dredging within 15 miles from shore or within 20 miles from port
3	Dredging within 8 miles from shore

### 3.3.2 MAIN DIMENSION 主要尺寸

- Scantling length: length of the ship as defined in Rules for ship scantlings. 结构计算船长
- Breadth moulded: breadth moulded of the ship as defined in Rules. 船宽
- Block coefficient: block coefficient as defined in Rules, corresponding to the scantling draught amidship. 方型系数
- Contractual service speed: contractual service speed used to calculate the ship motions. 合同约定的服务速度

### 3.3.3 LOCATION OF HOLD REGIONS 位置

- Aft end: It is the longitudinal location of the aft end of the hold region measured from the aft perpendicular in metres. 货舱后端壁到尾垂线的距离
- Fore end: It is the longitudinal location of the fore end of the hold region measured from the aft perpendicular in metres. 货舱前端壁到首垂线的距离

### 3.3.4 DEPTHS 型深

- At strength deck: depth moulded at strength deck in metres. The strength deck is defined in Rules. 强力甲板型深
- At freeboard deck: depth moulded at freeboard deck. When this value is not defined the strength deck is supposed to be freeboard deck also. 干舷甲板型深
- At top of continuous member: this depth has to be defined when there are continuous member above the strength deck taking part into the longitudinal strength. This value is useful to determine the scale of plotting. But even when it is no completed the program searches for continuous member above the strength deck to calculate a modulus at top if necessary.

在顶部连续构件: 这个深度被定义, 当有强力甲板以上的连续构件考虑到纵向强度的一部分。此值是有用的, 以确定策划的规模。但是, 即使它没有强力甲板以上的连续构件完成程序一个模数计算, 如果有必要的顶部。

### 3.4 MOMENT AND DRAUGHT 弯矩和吃水

The third tab of the basic ship data window allows defining moments and draughts for scantling or ballast.

#### 3.4.1 SCANTLING CASE 结构计算状况

Figure 10 : MOMENT &amp; DRAUGHT TAB – SCANTLING

**CASE Still water bending moments**计算静水弯矩

This item allows defining the still water bending moment in midship region, in hogging and sagging conditions, for which the ship will be calculated. If these value are yet unknown, the scantling will be done using permissible rule value.

- Hogging condition: still water bending moment in hogging condition and calculated in midship region.
- Sagging condition: still water bending moment in sagging condition and calculated in midship region.

**Ship**船舶状态

- Ship behavior: this data is used in buckling calculation.

The possible ship behaviors are:

1	Both Hogging / Sagging 中拱和中垂	The different loadings of the ship cause both hogging and sagging condition
2	Always in sagging总是中垂	The ship is always in sagging condition whatever the loadings
3	Always in hogging总是中拱	The ship is always in hogging condition whatever the loadings

**Vertical wave bending moments**垂向波浪弯矩

The vertical wave bending moments are rule values that are determined automatically by the program. However the user can define other bending moments clicking on Rule vertical wave bending moments but it is important to know that WAVE BENDING MOMENTS DEFINED BY THE USER LEAD TO NON RULE

**SCANTLINGS CALCULATION**构件规格计算

This option may be used in a vue of experimental calculation.

**Draughts**吃水

This item is used to define the scantling draught.

- Scantling draught: at midship perpendicular used for scantlings. This data is compulsory.
- GM transverse metacentre: GM corresponding to scantling draught or minimum ballast draught defined hereabove. 横倾中心

**3.4.2 BALLAST CASE**压载工况

**Basic Ship Data 2000 - 5889CNI - RI69738**

General | Notations & Main Data | **Moment & Draught** | Bow Flare | Materials | Frame Locations | Hopper Wells | Calculation & Print

☐ Scantling ☒ **Ballast** ☐ Dredging

**Still Water Bending Moments**

Hogging condition : 1989770 kN.m

Sagging condition : 1647040 kN.m

**Ship**

Ship behavior : Both Hogging / Sagging

Min S.W.B.M. in Hogging condition : 0 kN.m

**Vertical Wave Bending Moments**

The following values of wave bending moments do not lead to rule calculation

Hogging condition : 0 kN.m

Sagging condition : 0 kN.m

☐ Rule vertical wave bending moments

**Draughts**

Minimum ballast draught : 0.000 m

GM transverse metacentre : 0.000 m

Roll radius of giration (delta) : 0.000 m

Figure 11 : MOMENT &amp; DRAUGHT TAB – BALLAST

**CASE Draughts吃水**

This item is used to define the Minimum ballast draught and the Heavy ballast draught.

- Minimum ballast draught: if it is not defined the program assumes a rule default value.

**3.4.3 DREDGING CASE挖泥工况**

If the service notation is equal to Hopper dredger/barge or Split hopper dredger/barge the window become:

**Basic Ship Data 2000 - Cycladic Islands - 00864SHR**

General | Notations & Main Data | **Moment & Draught** | Bow Flare | Materials | Frame Locations | Hopper Wells | Calculation & Print

☐ Scantling ☐ Ballast ☒ **Dredging**

**Still Water Bending Moments**

Hogging condition : 0 kN.m

Sagging condition : 0 kN.m

**Ship**

Ship behavior : Both Hogging / Sagging

Min S.W.B.M. in Hogging condition : 0 kN.m

**Vertical Wave Bending Moments**

The following values of wave bending moments do not lead to rule calculation

Hogging condition : 0 kN.m

Sagging condition : 0 kN.m

☒ Rule vertical wave bending moments

**Draughts**

Dredging draught : 0.000 m

GM transverse metacentre : 0.000 m

Roll radius of giration (delta) : 0.000 m

Figure 12 : MOMENT &amp; DRAUGHT TAB – DREDGING CASE

In this case a new field is displayed:

- Dredging draught: draught in dredging condition.

**3.5 BOW FLARE首飘**

Clicking on the Bow Flare tab, you can define the dimension of the bow flare:

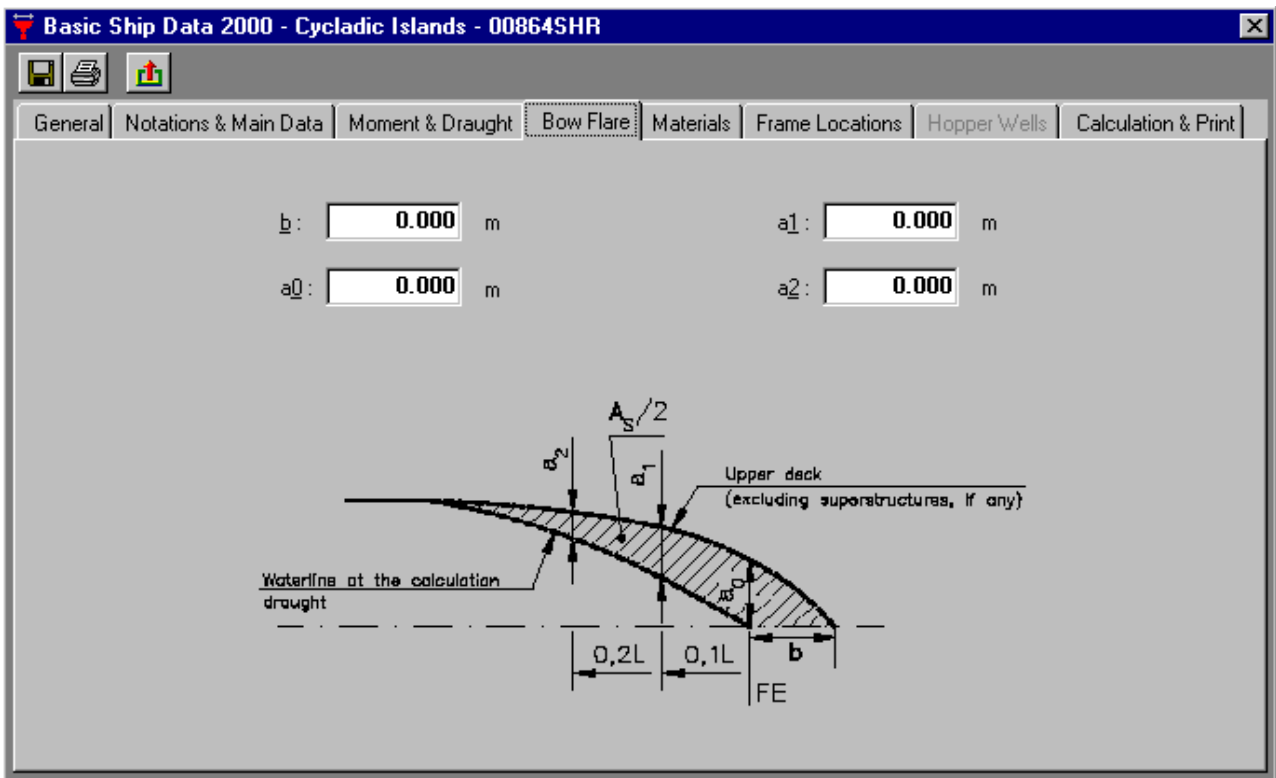


Figure 13 : BOW FLARE TAB

The effects of bow flare impact are to be considered where all the following conditions occur:

- Ship length between 120 m and 180 m.
- Maximum ahead service speed greater than 17.5 knots.

$$\frac{100FAs}{LB} > 1$$

, where As is twice the shaded area shown in Figure 13.

### 3.6 MATERIALS材料

The item Materials allows to define up to 6 different materials used in the ship and their corresponding mechanical properties.有六种材料可填写

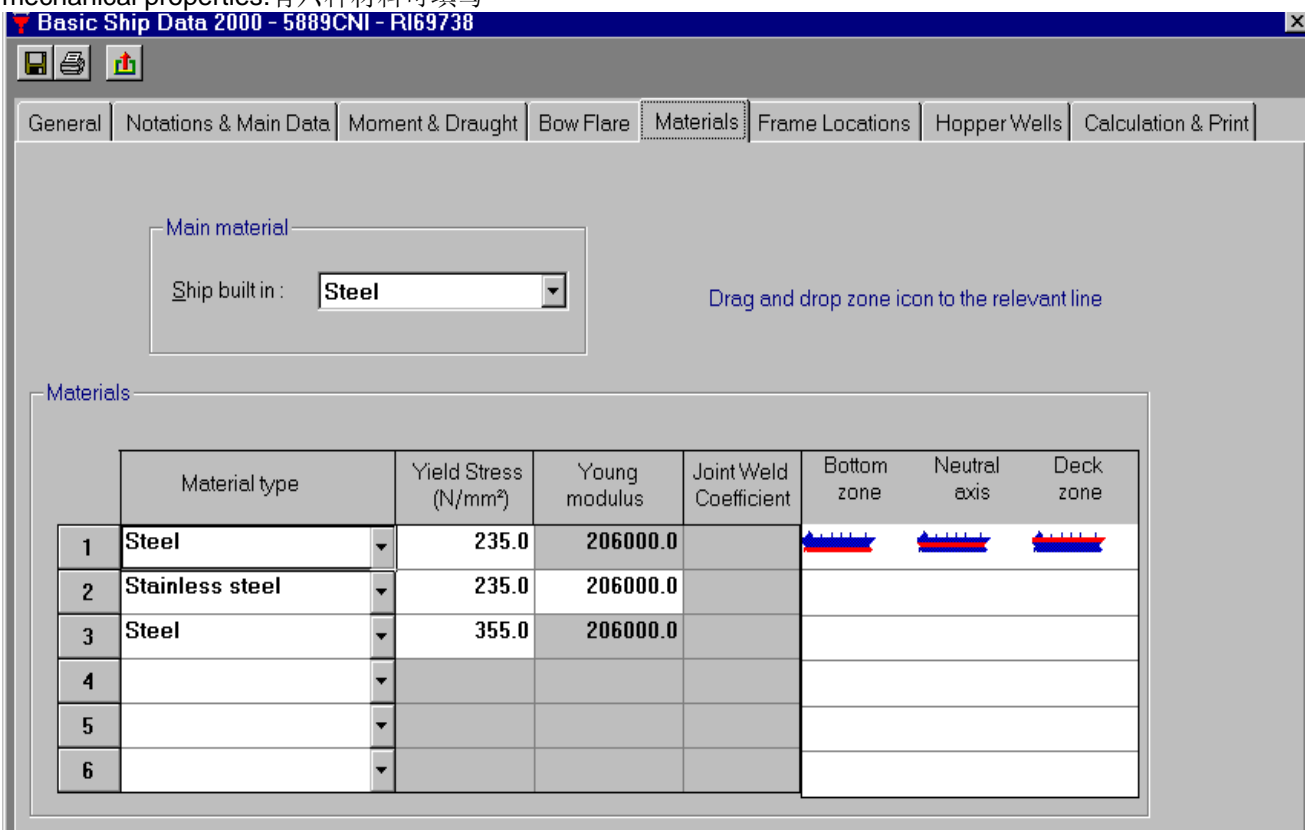


Figure 14 : MATERIALS TAB材料表

- Ship built in: indicates if the ship is a steel ship or an aluminium ship.

- Material type: type of the material. The possible materials are :

1	Steel
2	Stainless steel
3	Aluminium rolled
4	Aluminium extruded

- Yield stress: Yield stress of the material in newtons per square millimetres.
- Young modulus: Young modulus in newtons per square millimetres. For steel the program assumes a standard value of 206.000 N/mm<sup>2</sup>.
- Joint Weld coefficient: have to be defined only for aluminium
- Bottom zone, Neutral axis, Deck zone: this data allows to define the material used in their 3 horizontal zones of the ship. This data is considered, for example, in the evaluation of global strength criteria, to calculate the rule moduli at top, bottom and top of continuous member if any.

材料适用区间：底部；中间；甲板。拖拉图标到相应材料。

### 3.7 FRAME LOCATIONS 肋骨位置表

The frame locations need to be defined, only when the user asks for the calculation of longitudinal strength distributions. In this case the calculation points may be defined by the frame number or by distance from aft perpendicular in meters. The frame location definition is done by means of the following window:

Figure 15 : FRAME LOCATIONS

#### TAB General frame data 肋骨位表

- Distance with sign from AP to frame N°0: location of frame number 0 from the aft perpendicular. This value is positive when the frame 0 is forward the aft perpendicular and negative when it is backward.
- First frame number: this value may be negative if there are frames located backward the frame 0.

#### Frame spacing definition 肋骨间距定义

- From frame N°: indicates the number of the first frame of the group.
- To frame N°: indicates the number of the last frame of the group.
- Frame spacing: frame spacing of the group.
- Clicking Valid button you may enter a new group of frame with the relevant properties; using Delete button you may erase a group of frame previously selected on the frame list. 输入后确认即可，也可选定后删除

### 3.8 HOPPER WELLS 泥驳

If the service notation is equal to Hopper dredger/barge or Split hopper dredger/barge the Hopper Wells tab become active:

**Basic Ship Data 2000 - Cycladic Islands - 00864SHR**

General | Notations & Main Data | Moment & Draught | Bow Flare | Materials | Frame Locations | **Hopper Wells** | Calculation & Print

**Hopper well description for dredger**

	Hopper Well 1	Hopper Well 2
Distance from spoil level to base line when working at the dredging freeboard (h1)	0.000 m	0.000 m

**Hopper well description for split hopper dredger**

	Hopper Well 1	Hopper Well 2
Hopper well are	<input type="text"/>	<input type="text"/>
Distance between deck hinges (ld)	<input type="text"/> m	<input type="text"/> m
Distance from the bottom to the sealing joint located at the lower part of the hopper well (a)	<input type="text"/> m	<input type="text"/> m
Distance from spoil level to base line when working at the dredging freeboard (h1)	<input type="text"/> m	<input type="text"/> m
Distance from spoil level to base line when working at the international freeboard (h2)	<input type="text"/> m	<input type="text"/> m

**Figure 16 : HOPPER WELLS TAB Warning: Rule calculations for dredgers have not yet been implemented.**

### 3.8.1 HOPPER DREDGER CASE 泥驳

#### Hopper well description for dredger

- h1: Distance from base line to highest weir level, when working at the dredging freeboard.

### 3.8.2 SPLIT HOPPER DREDGER CASE 泥驳

#### Hopper well description for split hopper dredger


- Hopper well are: the possible hopper wells are :

1	Partly fixed
2	Simply supported

- h1: Distance from base line to highest weir level, when working at the dredging freeboard.
- h2: Distance from base line to highest weir level, when working at the international freeboard.

### 3.9 CALCULATION AND PRINT 计算和打印

#### 3.9.1 PRINTING DATA 打印

Clicking on  you enter the Print Data management window:

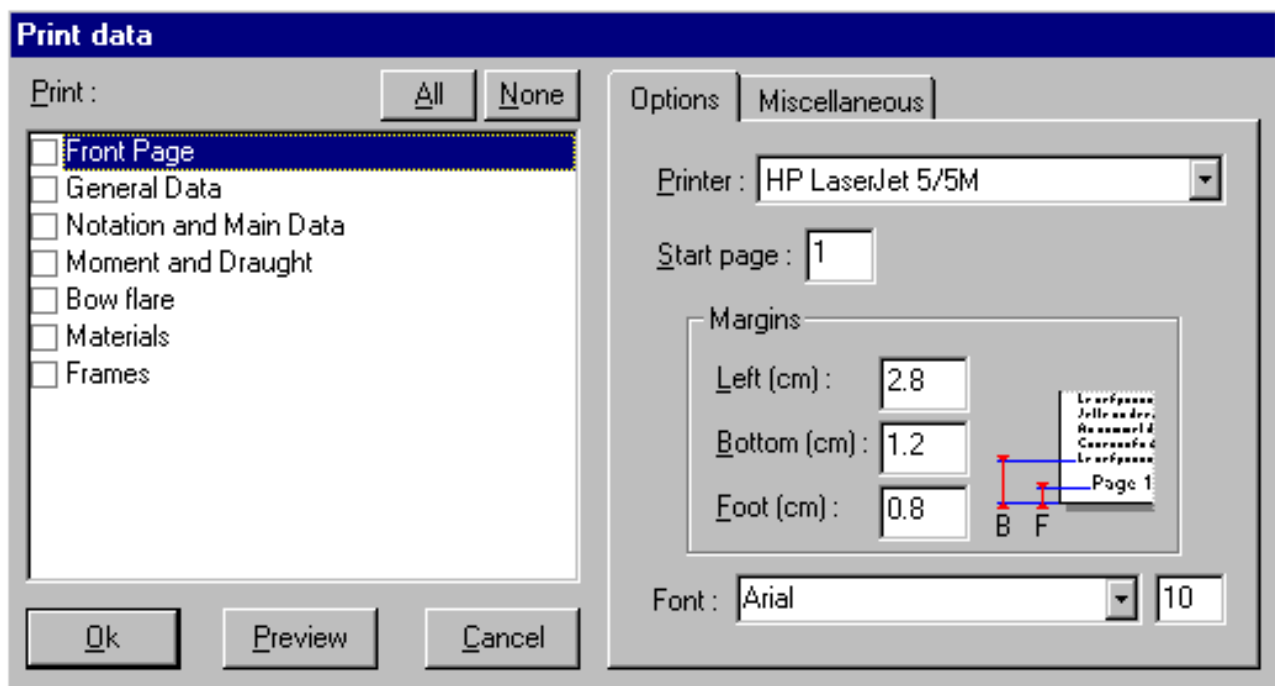


Figure 17 : PRINT DATA MANAGEMENT WINDOW

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.

### 3.9.2 CALCULATION 计算

The program is able to perform basic calculations from the basic ship data only. The window with the available possibilities is the following:

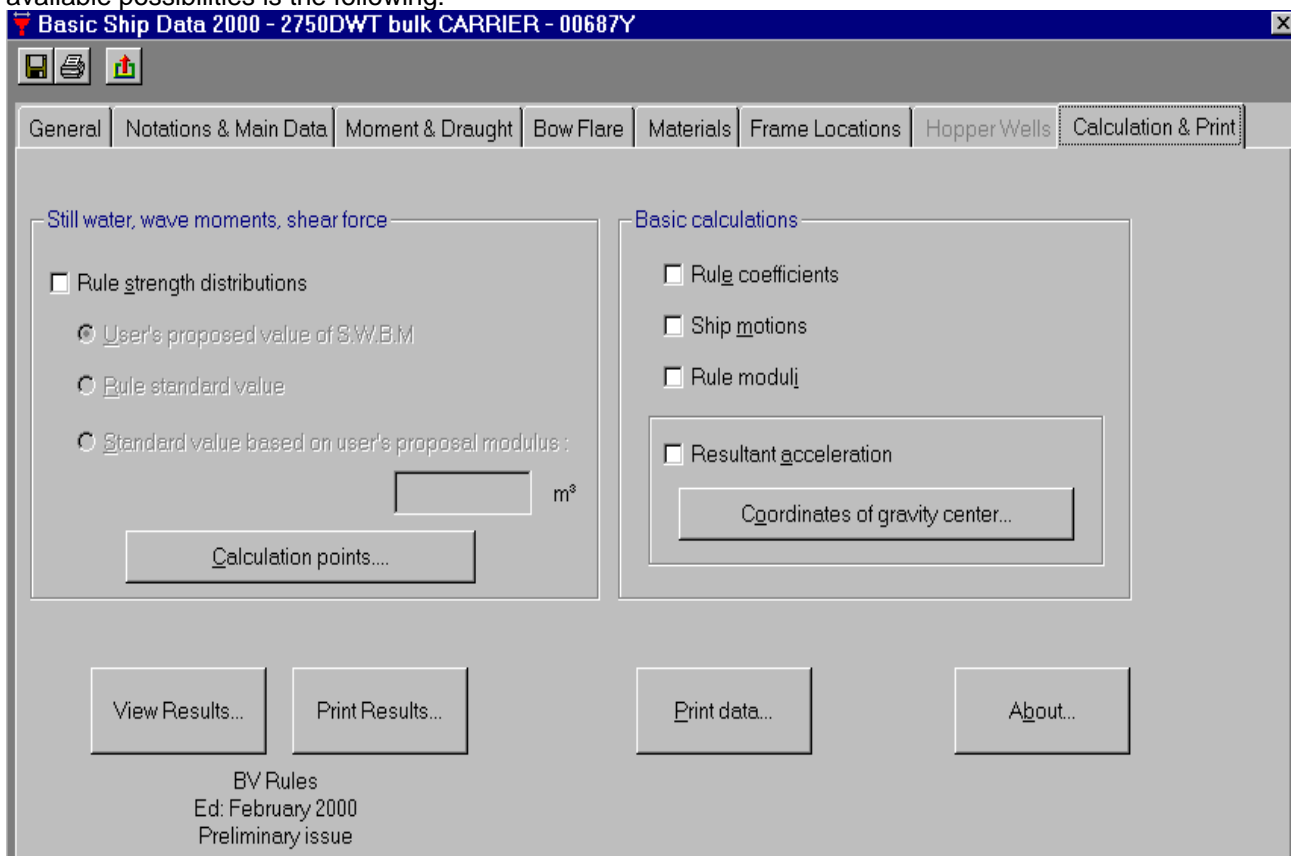


Figure 18 : CALCULATION &amp; PRINT TAB

#### 3.9.2.1 STILL WATER, WAVE MOMENTS, SHEAR FORCE 静水、波浪弯矩和剪力

The longitudinal strength distributions which can be obtained clicking on Rule strength distributions are :

- Vertical still water bending moments, in hogging and sagging conditions.
- Vertical wave bending moments, in hogging and sagging conditions.
- The resultant moments, in hogging and sagging conditions corresponding to the combined effect of the still water bending moments and wave bending moments, as defined in Rules.
- The horizontal wave bending moment.

- The horizontal wave shear force.

The distribution of still water bending moments is based on values in hogging and sagging conditions in midship region with the rule longitudinal distribution applied. Those values may have different origine selected from the window:

- User's proposal value of **S.W.B.M.**: distribution based on user's proposal values in midship region in hogging and sagging conditions.
- Rule standard value: distribution based on the rule permissible still water bending moments.
- Standard value based on user's proposal modulus: the section modulus amidships is a user's proposal

value. The still water bending moment amidships are calculated from this user's proposal modulus amidships and from the rule horizontal wave bending moment amidships.

The longitudinal strength distributions are displayed for calculation points selected by the user. There are 3 ways to define those points:

- Direct input of their X coordinates.
- Selection of a list of frame numbers.
- Both, X coordinates and list of frames.
- Clicking on Calculation points button you enter the following window which allows the definition of the longitudinal calculation points:

Frame n°	X coordinates (m)
-7	-4.260 m
-6	-3.660 m
-5	-3.060 m
-4	-2.460 m
-3	-1.860 m
-2	-1.260 m
-1	-0.660 m
0	-0.060 m
1	0.540 m
2	1.140 m
3	1.740 m
4	2.340 m
5	2.940 m
6	3.540 m

Frame n°	X coordinates (m)
27	18.540 m
45	32.940 m
107	82.540 m
133	103.340 m

1	0
2	10
3	100
4	110
5	120
6	130
7	20
8	30
9	40
10	50
11	60
12	70
13	80
14	90
15	

**Figure 19 : CALCULATION POINTS WINDOW**

### 3.9.2.2 BASIC CALCULATIONS基本计算

- Rule coefficients: provides the rule coefficients, parameters and material factors.规则计算
- Ship motions: provides the ship acceleration and amplitude of motions.船舶运动及加速度
- Rule moduli: provides the rule section moduli at midship perpendicular.规范剖面计算
- Resultant acceleration: this item allows to calculate the components of the resultant acceleration in upright ship condition and inclined ship condition at scantling and minimum ballast draughts for a list of points the coordinate of which are defined with the following window:

**Figure 20 : COORDINATES OF GRAVITY CENTER WINDOW**

Up to 10 points may be defined in the same calculation. Each point may be considered as the center of gravity of a compartment.可以计算每个舱中心不同10个位置的计算

### 3.9.3 PRINTING RESULT打印结果

Clicking on Print Result button you enter the Print Result management window:

	XG	YG	ZG
1	1.000	1.000	1.000
2			
3			
4			
5			
6			
7			
8			
9			
10			

**Figure 21 : PRINT RESULT 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.