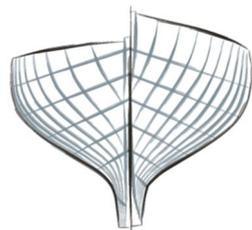


LoadmatePlus

On-board loading software

Tutorial 3 – Containers



Ship Design
solutions

John Archer
Ship Design Solutions
Revision 0 August 2013

Introduction

LoadmatePlus is intended as an on-board stability, strength and load planning program. The program complies with the IMO rules, and the primary purpose is to ensure that the vessel is safe to sail with respect to stability and longitudinal strength.

This is the third of the series of tutorials to demonstrate **LoadmatePlus** and its various features. This one demonstrates the loading of containers in bays on specialised containerships and general cargo ships fitted with container guides. Other tutorials will explore the other advanced or specialised features.

In these tutorials, use will be made of a series of demonstration vessels that are included with the special demonstration installation, which can be obtained by filling out a contact form on our website: <http://shipdesign.co.uk/contact/> .

The demo ships may borrow features from similar ships, but are not direct copies of any actual ship. No proprietary information has been used and the hull forms, in particular, have been specially designed in house.

To follow this tutorial, it is assumed that the user has downloaded and run the demonstration setup program.

Container Loading

Container loading is implemented in LoadmatePlus by means of a plug-in called Containers.lmp, which is in effect a special dynamic link library or DLL. For Container Loading to work, the plug-in must be located in the same folder as the LoadmatePlus executable, and the program build number must be greater than 7.32.0. If LoadmatePlus cannot find the plugin, it will still function normally, but container loading will not be available.

Containership Stability

Containerships over 100m in length must comply with the IMO Intact Stability (IS) Code, section 4.9.2, as well as the weather criterion (section 3.2.).

For containerships over 100m, the “IMO Containerships” criteria set should be selected. These rules use a Containership Form Factor, C, which is automatically calculated from the ship’s main dimensions and hatch size.

Note that, if the vessel’s length is less than 100m, then the ordinary IMO Intact Stability rules, section 3.1.2, apply.

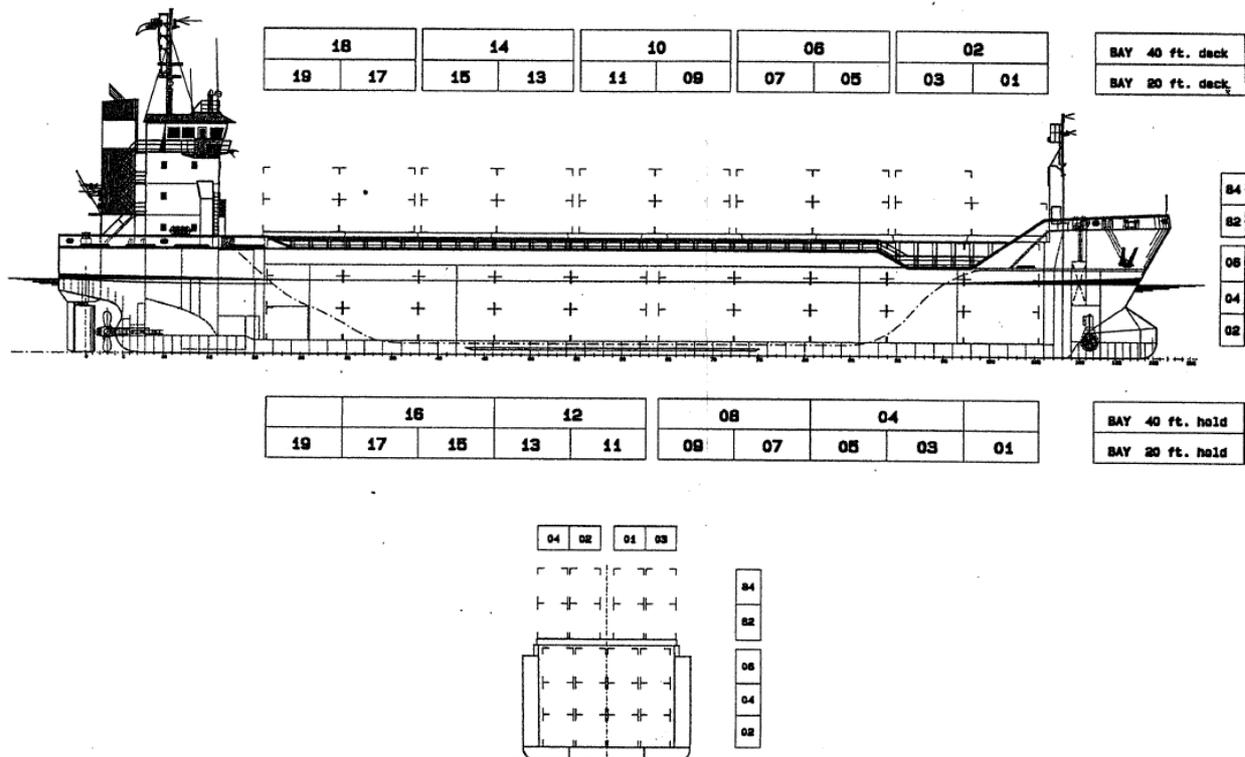
Deck containers are automatically added to the calculation of the wind profile, when evaluating the IMO weather criterion.

Container Bays

LoadmatePlus only allows bays for 20ft or 40ft standard ISO containers. Other sizes are unusual and are not currently supported. Also the program assumes the conventional numbering of container bays:

- 20ft bays have odd numbers from forward to aft (1,3,5...etc.).
- 40ft bays have even numbers, also numbered from forward to aft.

Adjacent numbered bays are assumed to overlap. Thus the 40ft bay number 2, is assumed to overlap 20ft bays 1 and 3. Similarly, 20ft bay 3 would overlap 40ft bays 2 and 4. In practice, bays 2 and 4 would not both exist. It is very important to adhere to this convention, as the program assumes this arrangement when checking the availability of container slots.



This diagram shows a typical bay arrangement. Note the different arrangement and numbering of the 40ft bays in the hold and on deck.

Hold and deck bays are handled separately in the program. Hold bays are numbered internally 010, 030, 050, etc. and deck bays, 018, 038, 058, etc. The last digit in the bay number denotes the base number of the first tier. Thus deck tiers are number 82, 84, 86, etc. by convention, whereas in the hold tiers are numbered 02, 04, 06, etc.

Rows are numbered from the centreline alternating between port and starboard sides, odd numbers to starboard and even numbers to port. If there are an odd number of rows, row 0 is astride the centreline.

Individual container slots are numbered bbrtt, where bb is the bay number, rr the row number and tt the tier number. For example, 050282 means bay 5, row 2, tier 82. Tier 82 indicates that the bay is on deck. Note that if this slot is occupied by a 20ft container, then the equivalent 40ft slots, 040282 and/or 060282, are unavailable for 40ft containers.

Container Loading Conditions

Before containers can be added to a loading condition, the Containers in Bays option must be enabled on the Loading Condition Particulars dialog as shown:

For a containership, as opposed to a vessel that occasionally carries containers, this option will be set by default. The effect of setting this option, is to add a CONTAINERS row to the **Loading Grid** and enable the **Containers...** option in the Loading Condition menu.

* Total													
WATER BALLAST HOLDS POTABLE WATER FUEL OIL													
ID	Group	Capacity	Content	Density/SF	Measure	MaxFSM	Damage	Weight	LCG	TCG	VCG	FSM	
lightwt	LIGHTWEIGHT	1226.74						1226.74	38.020	0.000	5.910	0.00	
WB	WATER BALLAST	1891.98						1643.27	46.854	0.096	2.325	19.30	
HLD	HOLDS	5601.76						0.00	0.000	0.000	0.000	0.00	
FW	POTABLE WATER	32.86						32.86	8.399	-4.302	4.932	0.00	
FO	FUEL OIL	229.19						195.40	22.597	-0.000	4.259	5.42	
CONT	CONTAINERS							1470.00	44.524	0.000	6.707	0.00	
FIXED	FIXED WEIGHTS							0.00	0.000	0.000	0.000	0.00	
TOTAL	DISPLACEMENT							4568.27	42.418	0.004	4.799	24.72	

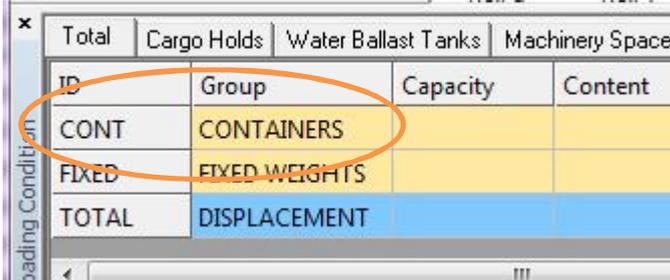
Container List Dialog

All container operations are controlled from the **Container List** dialog, which gives a list of all the containers loaded, together with their slot, weight, centre, loading and destination ports.

To illustrate this we can use the **Demo Container** vessel and open the **Ballast Departure** condition as a basis.

There are 3 ways of opening the **Container List** dialog:

1. Click on the Container toolbar button, ,
2. Double-click on the **Containers** row of the **Loading Grid**, or

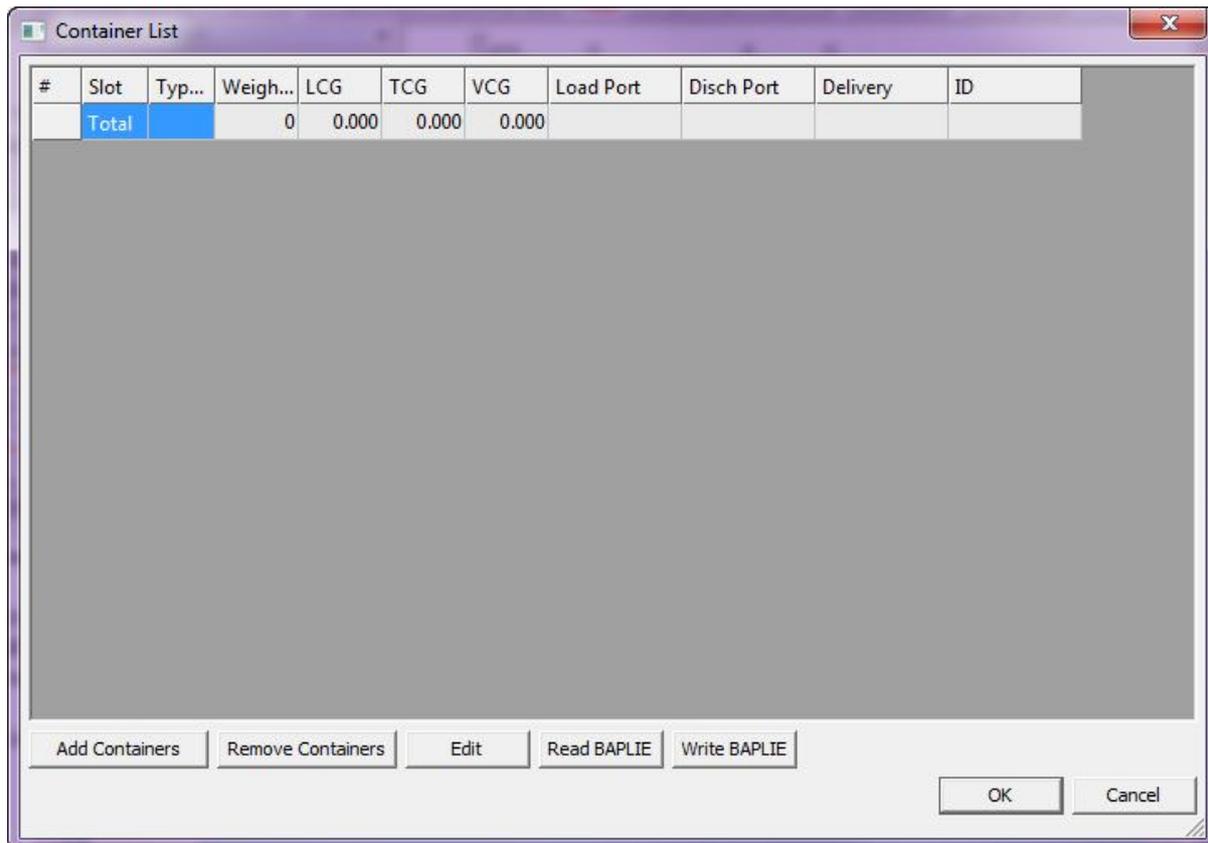


Total	Cargo Holds	Water Ballast Tanks	Machinery Space
ID	Group	Capacity	Content
CONT	CONTAINERS		
FIXED	FIXED WEIGHTS		
TOTAL	DISPLACEMENT		

3. Select **Containers...** from the Loading State menu.

If the toolbar button and the menu options are greyed out, or there is no Containers row on the Loading Grid, then Containers in Bays... has probably not been selected in the Loading Condition Particulars menu (see above).

The Container List dialog will initially look like this:



The following table describes the columns in this dialog:

<i>Column</i>	<i>Text</i>	<i>Description</i>
1	#	Container index number
2	Slot	Slot code in the format bbrttt, where bb = bay number, rr = row number and tt = tier.
3	Type code	ISO Container type code. The first digit indicates the length (2 = 20ft, 4 = 40ft). The second digit indicates the height (0 = 8ft, 2 = 8ft 6in, etc.). The 3rd and 4th characters, indicate the container type. For example G0 = general purpose container. See the ISO documentation for the complete specification of ISO container type codes.
4	Weight	Total weight of the container and its contents in kg (Note NOT tonnes)
5	LCG	Longitudinal centre of gravity
6	TCG	Transverse centre of gravity
7	VCG	Vertical centre of gravity
8	Load Port	Code for loading port
9	Disch Port	Code for discharging port
10	Delivery	Code for delivery place
11	ID	Container ID (not used in LoadmatePlus, but may be relevant for output to a Baplie file)

The container weights and ID's can be edited directly in the dialog, but other values are set up and edited through the Add and Edit dialogs.

Loading Containers

Pressing the Add button brings up the following dialog. This dialog allows a block of identical containers to be added to the loading condition. The number of containers to add is given in the first edit box. If more containers are specified than can be accommodated then the excess containers will be ignored.

The size, type and weight of the containers, are specified in the next input block. Note that only 20 and 40ft containers are allowed.

The containers can be located in the hold, on deck, or both. The drop-down list gives the available slots. *Occupied slots are not listed.* If multiple containers are specified, then the slots will be filled in the order given in the list, starting with the first slot selected. Containers are first added to the given tier. When this is full containers will be loaded into the next available tier. This is continued until the bay is full, when the next bay will be loaded. When all available slots are used, then any remaining containers, will be discarded.

The loading and discharging ports, as well as the delivery place, may be selected from the drop down lists. The ports are read in from a file located in the program folder called ISOPorts.Dat, which lists all the ports in the world. The User may want to edit this to something more manageable.

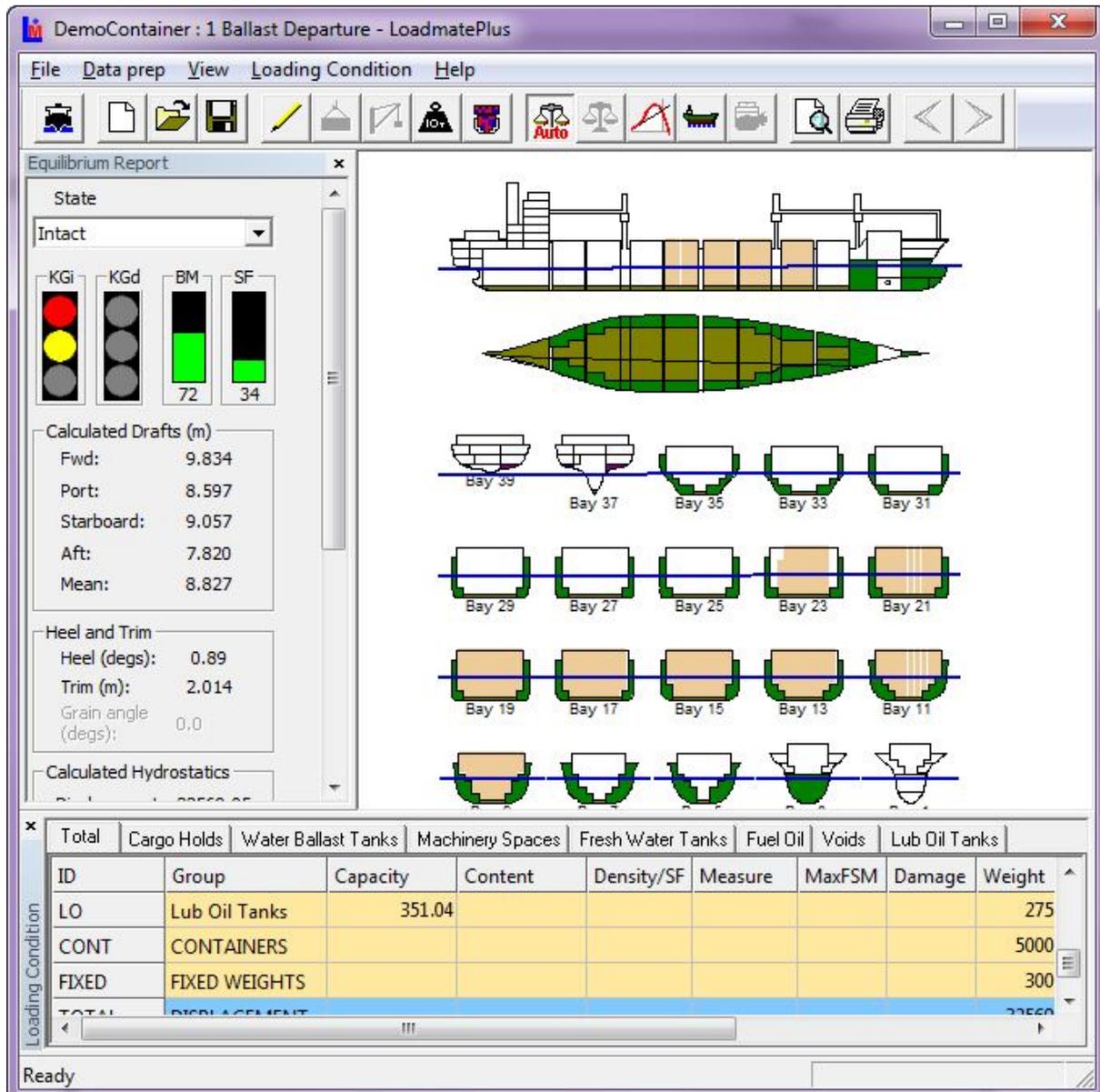
The screenshot shows a Windows-style dialog box titled "Add Containers". It has a close button in the top right corner. The dialog is divided into several sections:

- Number of Containers to add:** A text input field containing the number "500".
- Size and Type:** A section containing:
 - Length:** Radio buttons for "20'" (selected) and "40'".
 - Height:** Radio buttons for "8'" and "8' 6\"" (selected).
 - Type Code:** A dropdown menu showing "G0=GP:Opening(s) at one end or both ends".
 - Gross Weight (kg):** A text input field containing "10000".
- Location on-board:** Radio buttons for "Hold" (selected), "Deck", and "Either". To the right, a dropdown menu for "First Slot" shows "90102".
- Handling Ports:** Three dropdown menus:
 - Loading Port:** "NLRTM=Rotterdam"
 - Discharging Port:** "USNYC=New York"
 - Delivery Place:** An empty dropdown menu.

At the bottom of the dialog are two buttons: "OK" and "Cancel".

Here we are loading 500 20ft containers weighing 10000kg each, starting in bay 9 row 1 tier 2. The containers are loaded in Rotterdam and discharged in New York.

Press OK to add the containers to the list and then OK on the Container List dialog to update the loading condition. The loading diagram now looks like this:



We will now add 50 40ft containers on deck starting with bay 26:

Add Containers

Number of Containers to add:

Size and Type

Length: 20' 40'

Height: 8' 8' 6"

Type Code:

Gross Weight (kg):

Location on-board

Hold Deck Either

First Slot:

Handling Ports

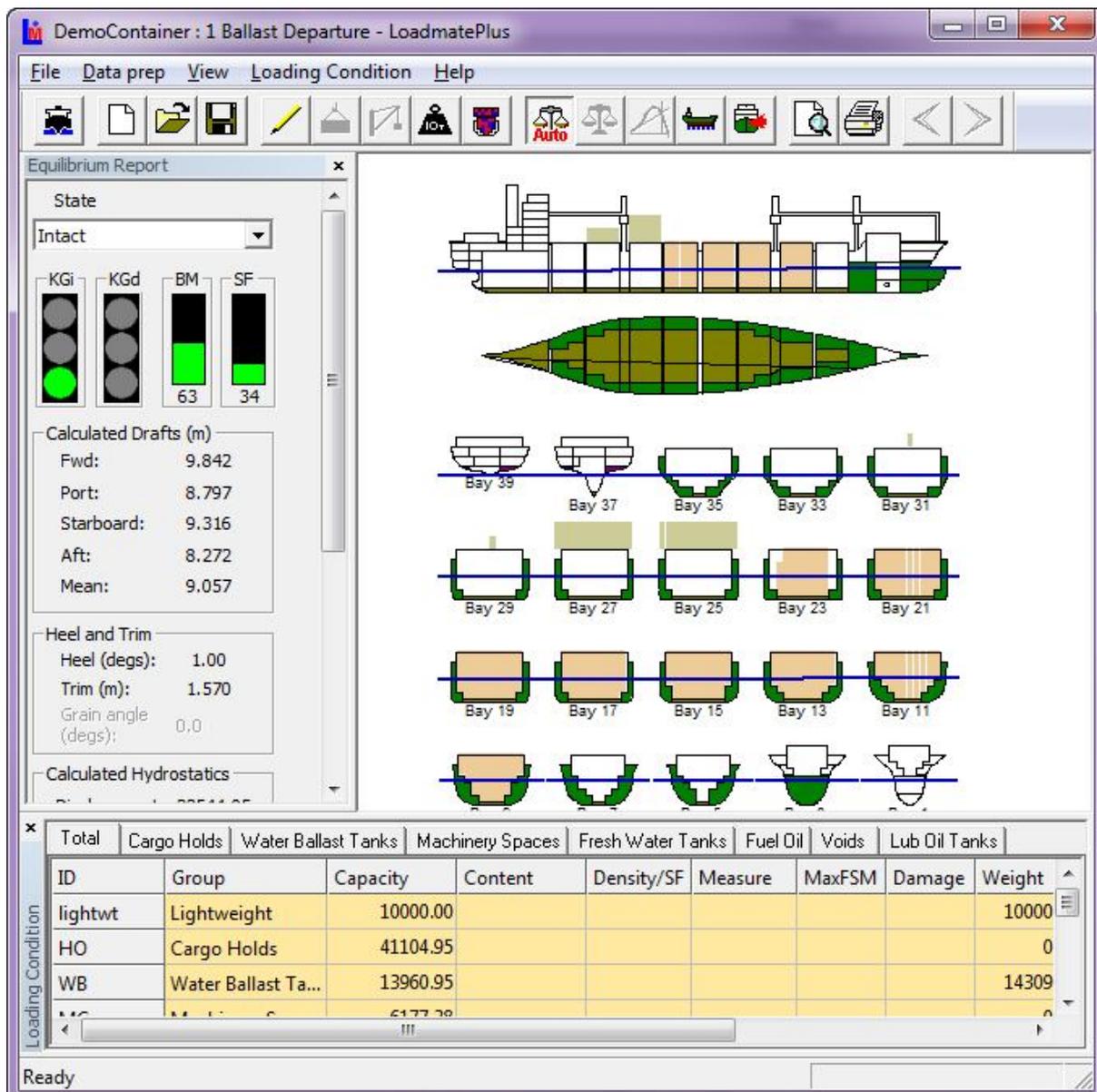
Loading Port:

Discharging Port:

Delivery Place:

These containers are destined for Baltimore and weigh 19500kg each.

The resulting loading condition now looks like this:



Note that 20ft containers are shaded in light brown and 40ft in light green.

Containers appear in the report like this:

Name	Content	% Full	Volume (m3)	Density (t/m3)	Weight (tonnes)	LCG (metres)	TCG (metres)	VCG (metres)	FSM (t*m)
Lub Oil Tank	LO	98.0	344.0	0.800	275.2	9.36	7.57	10.55	1072.1
Total Lub Oil Tanks					275.2	9.36	7.57	10.55	1072.1
FIXED WEIGHTS									
Crew & stores					300.0	6.00	0.00	20.00	0.0
Total FIXED WEIGHTS					300.0	6.00	0.00	20.00	0.0
HOLD CONTAINERS									
Bay 9 Hold	54 TEU				540.0	127.93	0.00	11.88	0.0
Bay 11 Hold	58 TEU				580.0	121.58	0.00	11.69	0.0
Bay 13 Hold	64 TEU				640.0	111.83	-0.00	11.09	0.0
Bay 15 Hold	66 TEU				660.0	105.50	-0.00	10.83	0.0
Bay 17 Hold	68 TEU				680.0	98.35	-0.00	10.67	0.0
Bay 19 Hold	68 TEU				680.0	92.00	-0.00	10.67	0.0
Bay 21 Hold	68 TEU				680.0	83.83	-0.00	10.67	0.0
Bay 23 Hold	54 TEU				540.0	77.48	0.32	10.20	0.0
Total HOLD CONTAINERS	1000 TEU				5000.0	101.82	0.03	10.94	0.0
DECK CONTAINERS									
Bay 26 Deck	48 FEU				922.5	67.15	-0.01	24.35	0.0
Bay 30 Deck	2 FEU				39.0	51.05	1.26	21.76	0.0
Total DECK CONTAINERS	100 TEU				961.5	66.50	0.04	24.25	0.0
DEADWEIGHT					23530.5	95.87	0.10	7.92	41008.5
Lightweight					10000.0	71.91	0.00	10.00	0.0
DISPLACEMENT					33530.5	88.72	0.07	8.54	41008.5

Hold and deck containers are listed separately. Note also that the lateral area of deck containers is automatically added to the wind profile for the stability check.

IMO Containerships

ID	Name	Value	Units	Limit	OK?
1	Containership Form factor C	0.1043			
2	Area to 30 degs	0.4181	m-rads	> 0.0863	Yes
3	Area 30 to 40 degs	0.3770	m-rads	> 0.0575	Yes
4	Area to 40 degs	0.7951	m-rads	> 0.1534	Yes
5	Area to flood angle degs	1.9078	m-rads	> 0.2780	Yes
6	Max GZ at angle > 30degs	2.680	m	> 0.403	Yes
7	Position of Max GZ	48.93	degs	> 30.00	Yes
8	GZ at 30degs	1.838	m	> 0.316	Yes
9	0.8 x deck immersion angle	17.53	degs		
10	Wind steady state angle	2.48	degs	< 16.00	Yes
11	Wind gust angle	3.01	degs		
12	Rollback angle	20.52	degs		
13	Heeling moment arm	0.053	m		
14	Area A	0.2000	m-rads		
15	Area B	1.1828	m-rads		
16	AreaB/ AreaA	5.9137		> 1.0000	Yes

A line of sight calculation is also carried out.

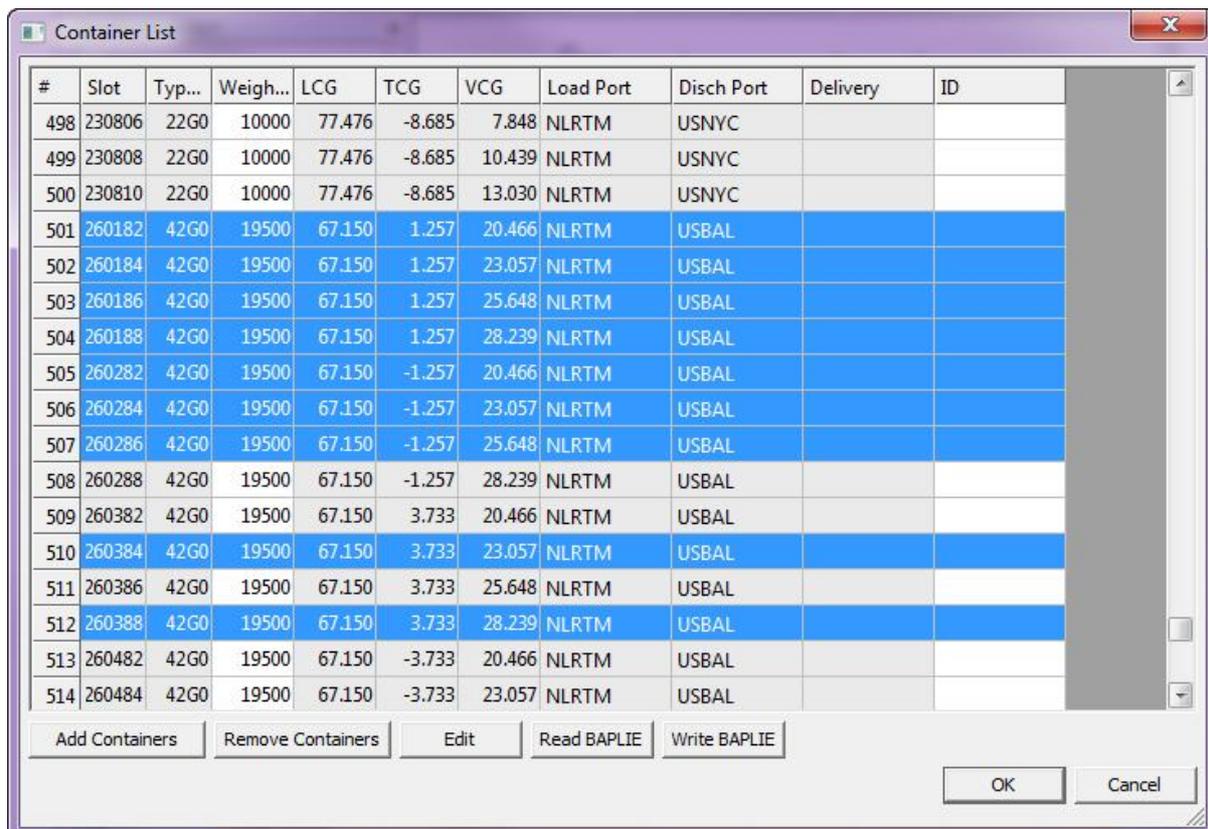
<i>Point</i>	<i>Distance</i>	<i>Height</i>
	<i>from AP</i>	<i>above BL</i>
	(metres)	(metres)
Eye position	30.000	36.000
Obstruction	164.000	22.700
Obscured Length	104.501	metres
Obscured Length/L	0.584	

Selecting containers for removal or editing

Containers to be removed or edited, must first be selected in the Container List dialog. A single container is selected simply by clicking on it. A block of containers can be selected by clicking on the first container and then the last, while holding down the SHIFT key.

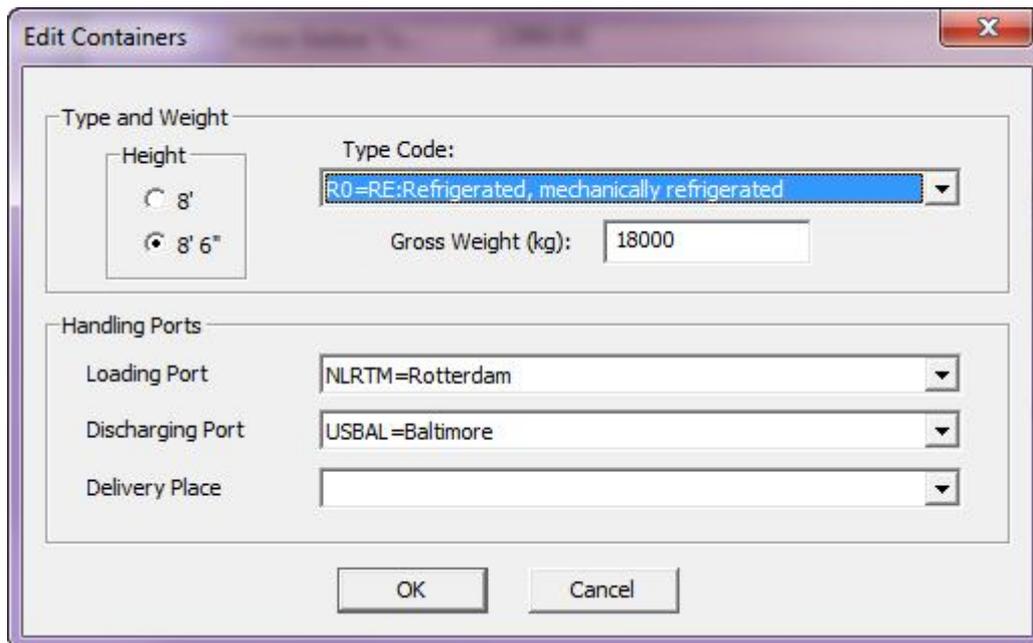
Alternatively, containers can be randomly selected by holding down the CTRL key while clicking on the containers to be edited or removed.

Here is the dialog with several containers selected:



Editing Containers

Pressing the Edit button enables certain data for selected containers to be edited:



Here we have changed the container type of all selected containers to refrigerated, the weight to 18000kg and the discharging port to Baltimore. Note that none of this data is set up by default, thus all fields need to be entered.

The fields in this dialog have the same meaning as the equivalent fields in the Add Containers dialog described above. Note that only the container slots selected in the Container Loading Dialog, will be changed. Also the slot and length of container cannot be changed.

Unloading Containers

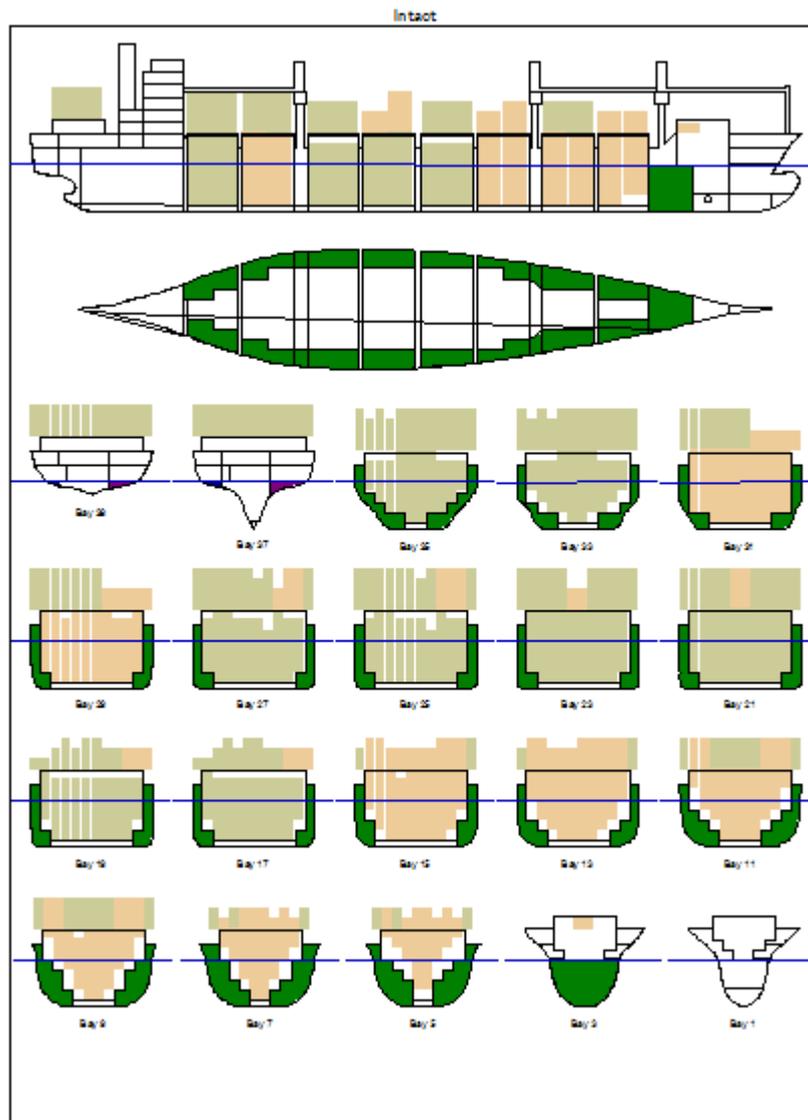
Containers can be removed or unloaded by selecting them in the Container Loading dialog and pressing the pressing the Remove Containers button.

BAPLIE file import and export

By pressing the Read BAPLIE button, containers can also be loaded by importing A BAPLIE (*.edi) file. This is a standard file for transferring Container Loading data. BAPLIE stands for “BAYPLAN/STOWAGEPLAN OCCUPIED AND EMPTY LOCATIONS MESSAGE”. *The format was designed by the SMDG (User Group for Shipping Lines and Container Terminals) and is specified in the document “UN/EDIFACT BAYPLAN MESSAGE – BAPLIE”. The format is open to interpretation, so if any discrepancies are found, please contact Ship Design Solutions. If the BAPLIE file specifies a slot location that is unavailable, then the associated container, will not be loaded.*

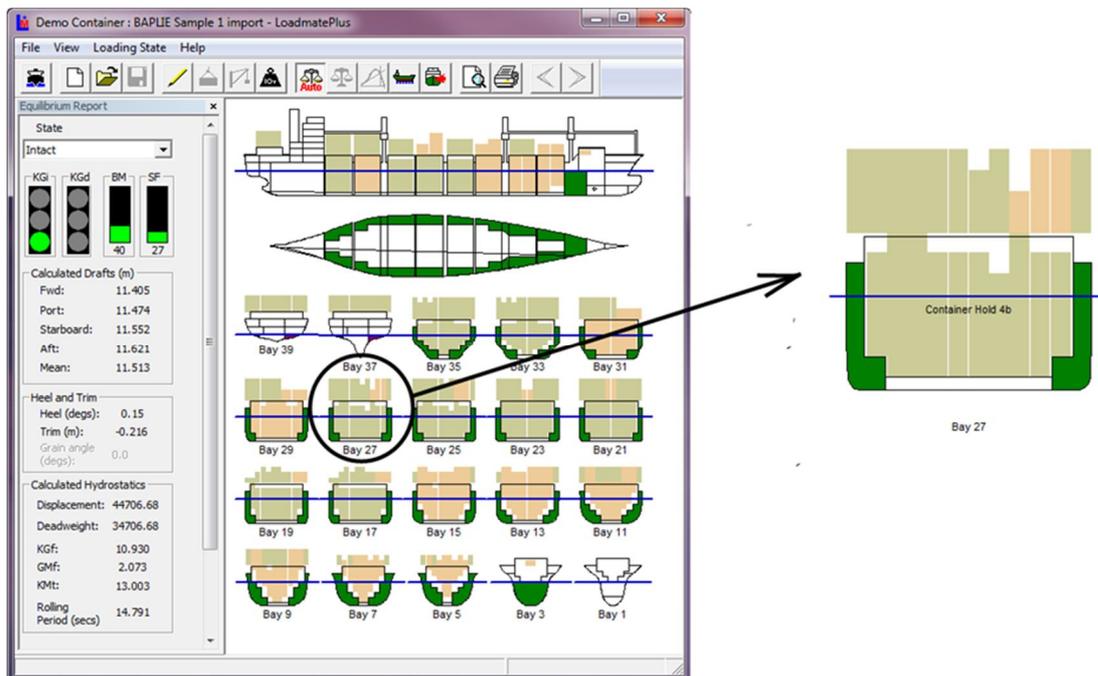
Pressing the Write BAPLIE button, will output a BAPLIE file containing information about the loaded containers.

The following figure shows a typical loading report for a containership after inputting a BAPLIE file:



Note that 20' containers are shaded light brown and 40' containers, light green.

Zooming and panning in the Loading Diagram



You can zoom in on a part of the loading diagram using the mouse wheel and the diagram can be panned by holding down the mouse wheel while moving the mouse.

Conclusion

This tutorial has explored the container loading feature of **LoadmatePlus**.

Please contact us if you have comments or queries, preferably using the contact form on our website: <http://shipdesign.co.uk/contact> which can also be used to request a demonstration version of **LoadmatePlus** including a selection of demo vessels.