VOLUME 6

LOADING CONDITIONS

Contents:

6.1 Summary

Seaking loading condition has been designed to perform draught, stability, trim and longitudinal strength calculation for both preliminary and final stages of design. For preliminary calculations, where limited data is available and a quick turnaround is required, the amount of input and output can be kept to a minimum.
For the final calculation the degree of accuracy and detailing can be increased and output extended to a complete loading condition report, including stability and longitudinal strength evaluations.
As the search for the feasible conditions is often of an iterative nature and hence the time consuming, an effort has been made to give maximum assistance to the user. This is achieved by subdividing program in to three steps:

1. Preparation of basic data for loading conditions - program PREPC
   All basic data are read only once and stored in the computer. When calculating loading conditions simple reference to the stored data area sufficient. this reduces the amount of input data in the calculation stage considerably.
2. Calculation of individual loading conditions - program COND
   This step covers the calculation of feasible loading conditions. Conditions can be stored and used as a starting point when calculating other conditions (e.g. when calculating conditions during a voyage the cargo does not change and therefore the “cargo only” condition can be stored). Once a feasible condition is found, the result can be saved for a final print.
3. Presentation of final results - program COFINC
   From the conditions calculated and saved in step “COND” a selection can be made for final presentation. Optionally full details of the deadweight distribution, stability and longitudinal strength evaluation can be printed.

6.2 Preparation for condition calculations (PREPC.EXE)

Program PREPC reads and initially processes the following data:

- Hydrostatic and stability data
- Hull geometry data
- Lightship data
- Longitudinal strength data
- Compartment data
- Deadweight description
- Condition requirements

The input data is subdivided into logical groups. Each such data group starts with a data code number pre--printed on the data sheets (and has to be typed in the input file). These codes guide the program which also means that data groups, to some extent, can be submitted in random order.
Also, if not relevant, data groups can be omitted without inserting a blank card. However, to use the program efficiently, it is recommended to maintain the input sequence as indicated by the data code numbers as far as possible.
The input for program PREPC can be prepared according to data sheets cond1 to cond7. The input can be given in free format. For a detailed description of the free format rules reference is made to the relevant section in the Seaking manual.
Unless otherwise stated, all data are in metric units – tones-meters.
In this section, all data sheets for PREPC are described in detail. It is recommended to read the description along with the data sheets given in section 4.

Data sheet cond1

The first input data set **11** contains identification data. It provides the program with information pertaining to the ship (reference to data in Seaking working files), and the type of calculations required.

11 ***ship no*** is the ship number (reference to other Seaking files)
alt =-1; for the very first run of PREPC for this ship
alt =0; normally (data changed or added)
alt =1; for new start of PREPC (all conditions data deleted)
lstr =0; longitudinal strength has to be calculated
lstr =1; do not calculate the longitudinal strength
lstr (the value of lstr can not be changed when rerunning PREPC, in the normal mode alt =0)
print codes the print codes to control the output
print(1) =0 (or blank); input data is printed
print(1) =1; input data omitted

For use of the other print codes, the following convention is used:
=blank no action
=1 intermediate results printed
>1 only for debugging
where:
print(2) refers to hydrostatic calculations
print(3) refers to lightship calculations
print(4) interpolation of sections for Bon-Jean
print(5)
print(6)
print(7)
print(8)
print(9)
print(10)

Necessary hydrostatic and stability data are calculated by executing STHYD - HYDB - STABB

Bon-Jean data

Part 2 of the data sheet cond1 contains data relating to the buoyancy distribution for longitudinal strength calculations. If lo longitudinal strength is required (lstr =1 on data sheet cond1) this part can be skipped.

21 ***hmin*** is the height above base line of the lowest waterline at amidships (always>0)
hmax is the height above base line of the highest waterline at amidships
nvl is the number of waterlines in the range hmin – hmax
tmin is the lowest trim (trim aft is negative)
tmax is the greatest trim (trim forward is positive)
ntr is the number of trims in the range tmin – tmax

Data sheet cond3

Data sheet cond3 contains lightship weight data and modifications to the lightweight (if any).
In data set **36** the lightship and its centre of gravity are stated. If longitudinal strength calculation is not required (***lstr*** =1), the weight input can be submitted according to ***type*** =1 or ***type*** =2.
However, if longitudinal strength is required, the longitudinal distribution of weight must be known. For this purpose the user can give a number of local weight items and the program will process these into a longitudinal weight distribution. The local weight input is given in data sheet 4B and subdivided into weight classes. The total weight is now defined via data set **36** where the user may, in the ***type***=3 input, describe which classes have to be included in the lightship weight.

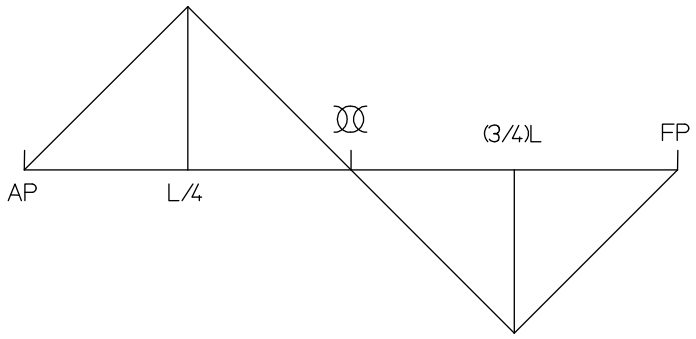
36 ***type*** is the flag for type of input
type =1 or 2 if longitudinal strength is not required (***lstr*** =1)
type =3 if longitudinal strength has to be calculated
draft is the extreme draft amidships
trim is the trim (forward is positive)
KG is the lightship vertical centre of gravity above the base
TCG is the lightship transverse centre of gravity from the centreline (starboard is positive)
sw is the specific gravity of seawater
displ is the extreme displacement in sea water
LCG is the lightship longitudinal centre of gravity forward of amidships
CL no is the weight class numbers to be included in the lightship (see data sheet 4B)

It will often be the case that the lightship weight or its centre of gravity should be modified. Especially, for ***type*** =3 input, this is rather difficult. Therefore, the program offers some alternative ways to modify the lightship data via data sets **31** to **35**.

31 In data set **31** all weight items with class number ***iclass*** on sheet 3b are modified with the constant factor in such a way that a lightship weight of ***wtot*** is obtained. If ***iclass*** =0 all classes are modified.

32 In data set **32** all weight items with class number ***iclass*** on sheet 4b are modified by means of weight in order to obtain the required longitudinal centre of gravity LCG. If ***iclass*** =0 all classes are modified (for weight correction, see the following figure).

33 Data set **33** offers the same possibility as data set **32**, but now instead of the longitudinal centre of gravity, the required trim can be specified.



34 In data set **34** weight is transferred between weight items with class numbers ***iclass*** and ***jclass*** until the required longitudinal centre of gravity is obtained.

35 In data set **35** the same object is achieved as in data set **34** but now a required trim is specified.
The maximum number of data set 31 to 35 is 30 per run. All modifications are performed according to the order of submission

Data sheet cond4

Data sheets cond4 – cond4a and cond4b contain information relevant only if the longitudinal strength is required. There fore these data sheets can be omitted when lstr =1 has been submitted in data set 11.
In data sheet cond4, the framework for describing the longitudinal subdivision in calculation parts is defined, This is required for generating the longitudinal weight and buoyancy distribution from which loads, shear forces and bending moments are derived. All lightweight items, deadweight items and buoyancy are distributed trapezoidal inside each calculation part. Loads, bending moments and shear forces are calculated for each section between the calculation parts.

It is recommended to choose the intervals between actual bulkheads. That way, peak shear forces correction factors can be handled, and also discontinuities in the weight distribution resulting from alternating loading can be properly taken into account.

41 ***code*** is the card code (41)
E is the modulus of elasticity (default =210000 ton/m^2)
G is the shear modulus (default =820000 ton/ m^2)

42 ***fr.no.*** defines beginning /end of an interval
dx is the distance to the frame no.
no.of parts is number of parts taken in the preceding interval; not relevant for first data set **42**
corr. fact. is a peak shear force correction factor; if this factor has a non zero value, the shear force for this section (bulkhead) will be multiplied by the factor. Not relevant for the first data set **42**

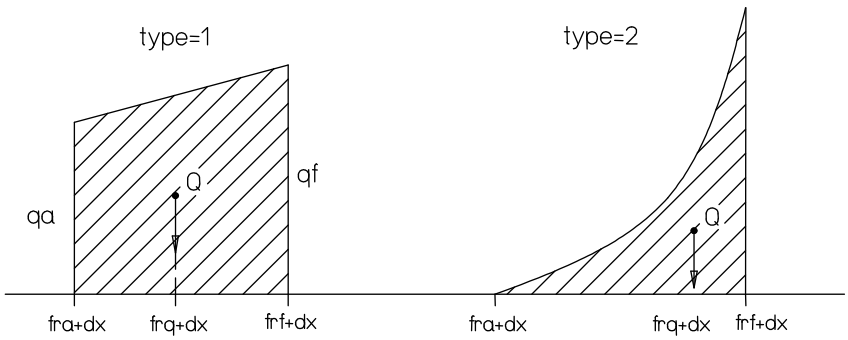
Data sheet cond4a

Data sheet cond4a is part of the longitudinal strength information following data set 41. this sheet therefore should only be submitted together with data sheets cond4a and cond4b if lstr =0 in data set 11. Data sheet cond4a contains information that is relevant for calculating the hull girder deflection resulting from both bending and shear.

43 ***fr.no.*** defines section for which girder properties are given
dx is the distance to the frame no.
inertia is the moment of inertia of gird section (m^4)
static is the static moment of girder section to base line (m^3)
thickness is the thickness of vertical plates (m)
elast. coeff. is the modulus of elasticity (ton/ m^2); if not stated, the value from data set **41** is used

Data sheet cond4b

Data sheet cond4b is part of the longitudinal strength information, following data set **41**. Therefore this sheet should be submitted only together with data sheets cond4 and cond4a if ***lstr*** =0 in data set **11**.
The program will process the items with the selected class numbers (see data set **36**) into a lightweight distribution over the calculation parts. Therefore, if a new subdivision is given via data sheet cond4, data sheet cond4b has also to be resubmitted. It is not possible to add items to already saved items, nor is possible to make modifications. In such cases, the complete package of data sets **44** has to be resubmitted.
The weight items can be defined in two alternative ways, as indicated by type code.
In the first alternative, it is assumed that the items have a trapezoidal distribution, and this distribution is defined by the aft and forward weight ordinates. If the weight of the item (Q) is not specified, it is calculated from these ordinates. Otherwise, the ordinates are used as relative numbers for distribution purposes.
In the second alternative, the weight distribution is related to the position of the centre of gravity. If this is situated within 1/3 to 2/3 of the length of the item, a trapezoidal distribution is assumed. Outside that range, bit not closer to the item's ends than 5% of its length, a non linear distribution is assumed to exist. for this alternative, the weight Q must always be given.



44 ***type*** flag for type of input
type =1 weight ordinates will be given
type =2 centre of gravity will be given
class is the class identification code; this code is a basis for selecting items into the weight distribution (see data sets **36**); limits 1<**class**<17
fra defines aft end of the item
dx is the distance to the frame no.
frf defines forward frame of the item
dx is the distance to the frame no.
frq defines longitudinal centre of gravity of item
dx distance to the frame no.
qa is the aft weight ordinate (only relevant for trapezoidal distribution, i.e. ***type*** =1), tonnes/metre
qf is the forward weight ordinate (only relevant for trapezoidal distribution, i.e. ***type*** =1), t/m
Q is the weight of the item (tonnes)

Data sheet cond5

In data sheet cond5. all of the compartments required for the loading calculation are described. The compartments can be described in six alternatives ways, depending on the information available. The required alternative is selected by entering one of the following type codes.

type =1

This type refers to a compartment calculated by the Seaking volume program CVOL, which therefore has to be executed prior to PREPC with the correct save code for saving the volumes, centres of gravity etc. Often, wing compartments are described in CVOL for one side of the ship only. However, in performing loading condition calculations, port and starboard wing tanks normally are loaded simultaneously. To account for this, flag ***sym*** can be set to 1 and then the volume and moment of inertia of the compartment will be doubled, also the transverse centre of gravity is set to zero (i.e. on the centerline). The compartment description (***text***) is optional. If not submitted, text saved in Seaking working files is used.

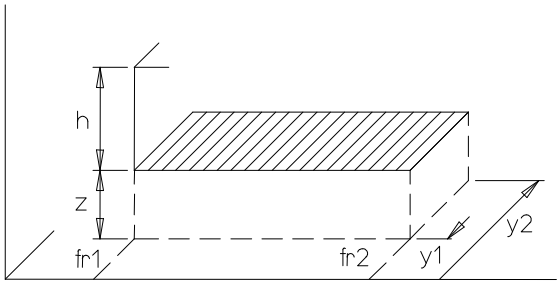
type =2

This type of compartment is used for concentrated load. The only data required is the centre of gravity. The compartment volume and moment of inertia may be stated, but are optional. The same centre of gravity applies independent of the amount of the load.

type =3

The third alternative describes a loading area, e.g. deck area for deck load. The input data is submitted as indicated in the sketch.

z =deck area level above base
h =max. height of loading



type =4

This type can be used when the longitudinal and vertical boundaries of the compartment are known along with the maximum volume with the corresponding center of gravity.

type =5

Type 5 is used to define "point loads" for fixed loads to be included in certain loading condition.

type =6

A ***type*** =6 compartment is equivalent to a type =4 compartment but the longitudinal boundaries and the longitudinal centre of gravity are defined according to the Seaking convention: distance to frame no.

51 ***code*** is card code: 51
delete is the flag for a new start:
delete =0 normally saved
delete =1 all previously saved compartments are deleted

52 ***compt.no***. is the compartment reference number to use in condition programs
type is the flag for type of input (see description)
l1 - l4 are the triggers for loading
l1 =1 the tank will always be filled but the maximum free surface considered (day tanks)
l2 – ***l4*** are not not yet operational

53 ***cno*** is the compartment number as has been used in CVOL calculations
sym is the symmetry option; if ***sym*** =1 the tank read from Seaking files is doubled, i.e. volume and inertia moment doubled, transverse centre of gravity is zero (amidships)
fr, fr1, fr2 are the frame numbers, defining the longitudinal position of compartment boundaries and the centers of gravity
y, y1, y2 is the transverse position of compartment boundaries and centers of gravity (meters from the centerline, starboard is positive)
z, z1, z2 is the vertical position of compartment boundaries and centers of gravity (meters above base)
vol is the compartment volume (m^3)
jt is the free surface moment (m^4)
h is the maximum loading height for deck area (m)
LCG is the longitudinal center of gravity (meters from amidships, forward is positive)
VCG is the vertical center of gravity (meters above base)
dx is the distance to frame (meters, forward is positive)

Data sheet cond6

With data sheet cond6 compartments can be assembled into groups. This makes it possible to load deadweight in the group of compartments by using a single reference number, which is assigned to this group along with the corresponding text.
Also the printout produced by program COFINC can be made either for each individual compartment or only the total value for a group. Text stated on data sheet 6 is then used as identification text in the printout.
Data sheet 6 provides for many variations and simplifications when using the program. For example if three different compartment-grouping for cargo should be analyzed all compartments can be described on data sheet 5 and on data sheet6 assembled into groups corresponding to the three different arrangements. The loading condition calculation can then easily be made in parallel for the three alternatives.

61 ***code*** is the card code: 61
delete is the flag for a new start
delete =0 normally
delete =1 delete previously saved compartment groups

62 ***ref.no.*** is the reference number for group of compartments; these numbers have to be unique and different from any compartment number
text is the description of a group of compartments
63 ..... numbers of compartments which belong to a certain group

Data sheet cond7

In data sheet 7, characteristics of various types of deadweight can be specified. This way it is possible to have these characteristics available with a single reference number when loading.

71 ***code*** is the card code: 71
delete is the flag for a new start
delete =0 normally
delete =1 app previously saved deadweight descriptions are deleted

72 ***type*** is the reference number for type of deadweight
behavior is the code for deadweight behaviour:
behavior =0 solid deadweight
behavior =1 liquid deadweight, i.e. free surface effects will be taken into account
density is the flag for density value
code =0 normal density, i.e. ton/m^3
density value is the value of density
% filling is the maximum percentage filling (e.g. 98% for fuel tanks)
text is the description of deadweight

6.3 Calculation of loading condition (COND.EXE)

With program COND, individual loading conditions are calculated and the results are stored for a final printout by program COFINC. For each loading condition, data sheet COND9 has to be submitted. Based on the data already saved and submitted via data sheet cond9, the loading condition is calculated. The user can control the loading in detail, but still have valuable help from the program when distributing deadweight over various compartments. This, for instance, is achieved by loading a certain amount of deadweight into a compartment group on a predetermined order, either homogenously or sequential. In the next section, the input to program COND, data sheet cond9 is discussed in detail. It is recommended to read the description along with the data sheet.

Data sheet cond9

For each loading condition, data sheet cond9 has to be submitted. Data set **91** is required to be stated only once with the very first loading condition, but may be resubmitted if one or more of the input data has to be changed.

91 ***code*** is the card code: 91
units; units – flag
units =0 for metric units
units =1 for imperial units
SW water density used for the loading conditions
level of acc. flag for level of accuracy:
level =1 use fixed center of gravity of comp., without considering the angle of heel
level =2 use variable center of gravity of comp., without considering the angle of heel
level =3 use variable center of gravity of comp., take into account the angle of heel (program VOLLC has to be executed prior to using this level of accuracy)
print =0 input data printed
print =1 input data not printed
peak s.f. is flag for applying shear force correction (see also data sheet cond4)
peak s.f. =0 no shear force correction
peak s.f. =1 shear force correction

92 ***code*** is the card code: 92
cond.no. is the condition identifier number. Two decimals can be stated. The condition will be saved under this number, which therefore must be unique.
calc.save is the flag for saving the condition
save =0 calculate and print the condition
save =1 calculate and print the condition and save the input data
save =4 save the input data, no calculation
iprms =0 for the SEA max. permissible bending moments and shear forces (default)
iprms =1 for the HARBOUR max. permissible bending moments and shear forces
sub.cond; reference can be made to loading conditions which have been saved previously

Option to include the sub-conditions can be used in many alternative ways. If, for instance, consumables for departure and arrival conditions are fixed, and alternative payload arrangements are to be analyzed, the two consumables groups can be saved as sub-conditions for further reference.
Another is another example: there are three alternative consumable groups, five differing wing tank arrangement and three alternative centre tank arrangements. By treating them as separate sub-conditions, calculations for various combinations can be performed easily.

93 ***text*** is the identification text for the loading condition
94 ***code*** is the card code: 94
p1-p16; print codes for intermediate results
p =0 no intermediate results printed
p =1 intermediate results printed

The required loading conditions can be obtained by assigning the different deadweight types to the stipulated compartments. For each such deadweight type, data sets **95** and **96** have to be submitted.
In data set **95** the deadweight to be loaded is described.

95 ***type*** is the type of the deadweight (see data sheet cond7)
weight is weight to be loaded. The weight may be omitted (enter zero) if the compartments have to be loaded full or to a stipulate draught.
dens is the density of the deadweight. Normally the density can be omitted (enter zero) as the value is already stated in data sheet cond7. If given here, this value will be used.

In data set **96** the loading procedure and the compartments to be loaded are stipulated.

96 ***load code*** is the flag for the loading procedure
load code =0 place deadweight as a concentrate load
load code =1 load homogeneously
load code =2 load full and in sequence
compartments; compartments or comp. groups to be loaded (see data sheet cond5 and cond6)

6.4 Presentation of results (COFINC.EXE)

The intention, as previously mentioned is that the user creates loading conditions, by a number of separate runs if necessary. During there runs, the user is primarily interested only in a limited preliminary output data. That data is printed directly with the calculation. When the user is satisfied with the created loading conditions in all respects, a complete loading condition report printout is desired. For the reason the program stores all the calculated data, and only the program CONFIC has to be executed to generate such a report.
The input data for program COFINC is divided into three categories:

1. Information applicable for all loading conditions (data sheet cond10)
2. The title which has to precede the loading conditions (data sheets cond11)
3. Text and data to be printed for every loading condition, divided into three groups:
    - Printing of weights (data sheet cond12)
    - Printing of trim and stability data (data sheet cond13)
    - Printing of longitudinal strength data (data sheet cond14)

The sequence of input data is category 1, category 2, category 3. For category 3 the three groups can be stated in any sequence and repeated any number of times with various code figures. The required sequence is illustrated in table 3. An example is given in table 4.

Table 1 – input sequence for program COFINC

data set	201	
	202 or a blank card	
	203	Data set to be submitted in this sequence
	210	
	211	

data set	220, 221, 222	These data groups can be given in any sequence and repeated a number of times (max.20)
	230, 231	
	240	

Table 4 – example of input

Exec COFINC

data set	201	
	202	
	203	
	210	
	211	
	220, 221, 222	Summarized output which is contained on one or more pages for each loading condition
	230, 231	
	240	
	220, 221, 222	Contents in each individual compartment printed on a separate page
	220, 221 222	Contents in each individual compartment but printed under heading of deadweights
	230, 231	Detailed trim and stability information printed on a separate page
	240	Full printing of bending moment shear forces and deflection along the full ship length

Identification data

				←			normally blank						→
	ship.no	alt	lstr	←			print codes pr(10)						→
11													

alt =-1 very first PREPC run for this ship no
=0 normally (data added or altered)
=1 new start of PREPC (all condition data deleted)
lstr =0 longitudinal strength has to be calculated
=1 longitudinal strength is omitted
Print codes named pr(1), pr(2) etc. control printing as follows:
pr(1) =blank input data is printed
=1 input data is omitted
pr(2) – pr(10) =blank no action
=1 intermediate results printed
>1 only for debugging
pr(2) hydrostatic calculation
pr(3) lightship calculation

Bon-Jean data

The following data is stated only if longitudinal strength has to be calculated (lstr =0 above)

	code	hmin	hmax	nvl	tmin	tmax	ntr
21	21						

hmin height above base line of the lowest waterline as amidships (always>0)
hmax height above base line of the highest waterline at amidships
nvl number of waterlines in the range hmin – hmax
tmin lowest trim (trim aft is negative)
tmax greatest trim (trim forward is positive)
ntr number of trims in the range tmin – tmax
Note
limit: nvl*ntr < 1200
hmin >0
2. (→ type in this number)

Lightship data

Class numbers refer to weight items on data sheet cond4b.

		moulded							
	type1	draught	trim	KG	TCG	SW			
	type2	displ	LCG	KG	TCG	SW			
	type3	KG	TCG	cl.no.	cl.no.	cl.no	cl.no.	cl.no.	(cl.no. – class number)
36	36								

type =1 used if longitudinal strength is not required (lstr =1 in **11**)
=2
=3 used if longitudinal strength has to be calculated (lstr =0 in **11**)

Modification of lightship data given in data sheet cond4b (optional)

Limits: Max. number of data sets **31** - **35** is 30 per PREPC run.
Modifications will be executed in order of submission

		iclass	wtot
31	31		

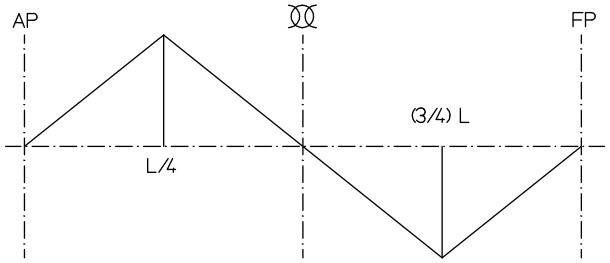
All ELEM with class no. iclas on sheet 4b are modified with constant percent to obtain lightship weight =wtot. If iclas =0 all items are modified with constant percent.

		iclass	LCG
32	32		

All ELEM with class no. iclas on sheet 4b are modified with weight in order to obtain the required LCG. If iclas =0 all classes are modified in this way (see the figure).

		iclass	trim
33	33		

As above but trim instead of LCG is given.



		iclass	jclass	LCG
34	34			

Move load between iclas and jclas in order to meet specific LCG.

		iclass	jclass	trim
35	35			

As above but trim instead of LCG is given.

Data for the longitudinal strength calculation (optional)

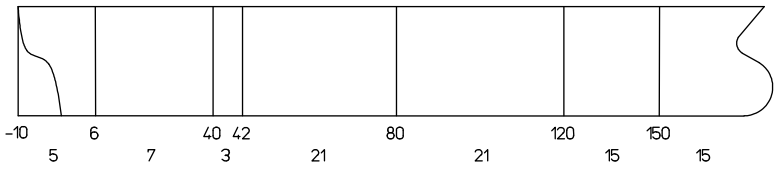
Data sheets cond4, cond4a, cond4b are omitted if longitudinal strength is not required (lstr =0 in data set **11**)

	code	E	G
41	41		

E is the elasticity coefficient, if blank then E =21 000 000 ton/m^2
G is the shear modulus, if blank then G =820 000 ton/m^2
E and G have to be stated in ton/m^2 or ton/ft^2 depending if m or ft are used as units.

42	frame no	dx	no of parts	peak shear force correction factor
			for preceding interval	
			-	-
one blank line				

Division of ship in calculation parts
Bulkheads are specified by a peak shear force correction factor ≠0 (if there is no peak shear force correction factor give 0.0001 to indicate bulkhead).



fr	dx	calc. parts
-10	0	-
6	0	5
40	0	7
42	0	3
80	0	21
120	0	21
150	0	15
162	0	15

These data control the calculation procedure. All loads except point forces are distributed trapezoidal inside each part. Moment and shear forces are calculated for each section between the calculated parts.
Limitations:

1. total no. of calc part <200
2. no. of calc parts*nvl <4000
3. no. of bulkheads <30

If data sets **42** are not submitted insert only one blank line.

Description of permissible bending moments and shear forces

This data sets are inserted after the blank line at the end of data sets **42**. If no data for the permissible bending moments and shear forces are submitted, insert a blank line.

		max. permissible S.W.B.M.			
		hogging		sagging	
fr	dx	sea-going	harbour	sea-going	harbour
one blank line					

		max. permissible values of S.F.			
		sea-going		harbour	
fr	dx	positive	negative	positive	negative
one blank line					

Example of maximum permissible values

Max. permissible S.W.B.M. (kNm)				
Fr.No.	Hogging		Sagging	
	Sea-going (kNm)	Sheltered waters (kNm)	Sea-going (kNm)	Sheltered waters (kNm)
42	563424	962727	-506035	-933389
70	924593	1579860	-830417	-1532700
98	924593	1579860	-830417	-1532700
126	924593	1579860	-830417	-1532700
151	924593	1579860	-830417	-1532700
154	880739	1504926	-791030	-1460002
182	471432	805541	-423414	-781495
204	149839	256025	-134573	-248382

Max. permissible values of S.F. (kN)				
Fr.No.	Sea-going		Sheltered waters	
	Positive (+) (kN)	Negative (-) (kN)	Positive (+) (kN)	Negative (-) (kN)
42	60116	-59128	66973	-66479
70	58943	-57988	66386	-65909
98	61386	-61386	67608	-67608
126	61386	-61386	67608	-67608
151	61386	-61386	67608	-67608
154	56053	-57249	64941	-65539
182	56053	-57249	69941	-655395
204	68045	-68434	70937	-71132

Note

To get tm, divide values in kNm by 9.81.

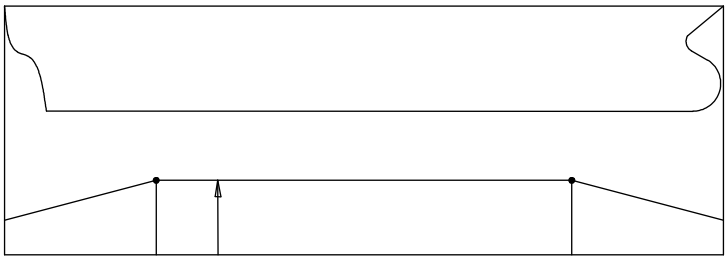
Data necessary only for calculation of deflection

If the calculation of deflection is not required, give only one blank line.

max. 48 lines

43 fr.no.	dx	moment of inertia	static moment	thickness of vertical plates	elasticity coeff.
one blank line					

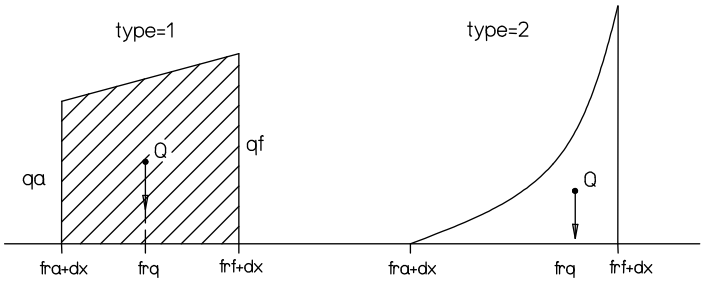
If elasticity coefficient is given, the value from data set **43** is used.



So many points have to be given that the straight line interpolation gives required accuracy.

Lightship data specification

If no data set **43** is submitted (e.g. an update run) give only one blank line.
If new weight items are submitted, all previously saved weight items will be deleted.



$1 <$ class no. < 17

$0.05 < \frac{frq - fra}{frf - fra} < 0.95$ for type 2

	type =1	class	aft end		fore end		qa	qf	Q	
	type =2		fra	dx	frf	dx	frq	dx	Q	comments (not printed)
43										
	one blank line									

Three alternatives for the input are available:

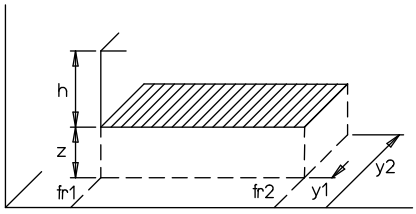
1. Type =1, qa, qf are stated
2. Type =1, qa, qf and Q are stated
3. Type =2 frq, dx and Q are stated

Note
In alternative 2) qa and qf are used only as relative numbers.

Compartment definition

	code	delete	
51	51		delete =0 normally delete =1 all previously submitted compartments are deleted

52							**53**										**54**
compt no.	type	trigger for loading					geometry definition										text description
		l1	l2	l3	l4												
	1						cno	sym									if the text is omitted, the corresponding text from the compartment description is included
	2						fr	dx	y	z	vol	It					
	3						fr1	fr2	y1	y2	z	h					
	4						fr1	fr2	y	z1	z2	vol	LCG	VCG	It		
	5						fr	dx	y	z	weight						
	6						fr	dx	fr	dx	y	z1	z2	vol	It		
						/										/	
						/											
						/											
						/											
						/											
						/											
						/											
						/											
						/											
						/											
						/											
						/											
						/											
						/											
						/											
one blank line																	



comp. no.this number is reference on this data sheet
type =1 used for reference to compartments calculated by the volume program
type =2 for concentrated load; values for vol and It are optional
type =3 for loading on a specific area; h is the highest possible loading (sketch)
type =4 used when all mentioned data are known
type =5 for definition of fixed loads
type =6 similar to type 4 with possibility to give dx
l1 =0 normally
=1 tank will always be filled, but max free surface considered
cno compartment number used in compartment data in the volume program
sym =0 normally
=1 as above but the tank volume doubled and the C.O.G. from CL is set =0
fr frame number
dx distance forward of the frame number (dx may be negative)
y distance from CL positive to SB. Note is optional. State o if no interest.
z distance from BL positive above BL.
vol volume capacity
It transverse moment of inertia
LCG longitudinal centre of gravity from amidships. Positive is forward.
VCG vertical centre of gravity from BL.

Assembling of compartments for group loading

	code	delete	
61	61		delete =0 normally delete =1 delete all previously data of this type

	ref.no.	text for the group
62		
63		
	one blank line	

The first line states reference number and text. The second line states the compartments contained in the group. Reference numbers have to be unique and also different from the compartment numbers because the specified load can be referred to a single compartment as well as to all the compartments in any of the above described groups.

Example

ref.no.	text for the group
101	Wing tanks SB and P
11 12 13 14 15 16 17 18	
102	Center tanks
1 2 3 4 5 6 7 8	

General deadweight description

	code	delete	
71	71		delete =0 normally delete =1 delete all previously data of this type

72							**73**
type	behav	density		max % fill	free surf		text
		code	value		p1%	p2%	/
definition of the propeller geometry (optional, only for type 41)							
41	D_p	Z_{BL}	X_{AP}				
one blank line							

type standard types according to the types table
behav =0 for solid load
=1 for liquid load
code =0
value ton/m^3
max% maximum filling (98 for cargo, 100 for water)
p1 control factors of free surface correction; correction is made only when p1 < filling <p2
default values: p1 =1%
p2 =97.99%

Types table

Type	Indicating
1	fuel oil
2	diesel oil
3	lubricating oil
4	fresh water
5	water ballast
6	crew
7	passengers
8	provisions
9	stores
10	cargo
21	required displacement, Δ_R
31	required draught, T_R
41	propeller immersion; where: D_p = propeller diameter Z_{BL} = distance of the propeller shaft the base line X_{AP} = horizontal distance of the propeller tip to the AP

Data controlling calculation and printout

Data sheet 91 has to be submitted before the first loading condition. However, data sheet 91 can be re-submitted before any of the following loading conditions.

	code	units	SW	acc.	print	peak s.f.
91	91					

units	=0 for metric
	=1 for imperial units
SW	salt water density
acc.	accuracy code
print	=0 input is printed
	=1 input is omitted
peak s.f.	=0 no shear force correction
	=1 shear force correction

Input data for each individual loading condition

	code	cond.no.	calc.save	iprms	subconditions to be included (max. 10 subconditions can be stored)									
92	92													

identification text for the condition

93	

	code	print codes for the intermediate results															
94	94																

95 deadweight specification **96** loading procedure for distributing the deadweight

type	ton	density		loadcode		compartments and/or group of compartments (max. 14 input numbers, max 50 compartments loaded)
			/		0	
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
definition of the required displacement (see the types table)						
type	Δ_R (t)					
21		0				
definition of the required draught (see the types table)						
type	T_R (m)					
31		0				
one blank line						

Example of required displacement definition:

21	60000	0

Example of required draught definition:

31	13	0

Printing of the condition result

	ship.no	printout	calc	delete
201				

ship no. has to same to the ship number used in hull form description
printout =0 normally
=1 for future standard
calc =0 print only conditions specified below
=1 print all conditions
=-1 no printing, see next data
delete =0 no action
=999 delete all saved conditions when printing is finished

conditions to be printed (maximum 50) or a blank line

202	

		print units			L/2 =0		
		m =0	ton/1000 =0	BL =0	AP =1		
	mline	ft =1	ton/1016 =1	keel =1	Fr0 =2	corr	end
203							

mline maximum number of lines on each page
m/ft meters or feet to be printed
ton weight unit to be used
BL / keel draught from BL or underside keel
L/2 / AP / Fr0 reference point for LCG data
corr =0 real free surface effect; VOLLC has to be executed
=1 sinus correction for free surfaces
end =-1 continue the calculation always
=0 terminate the calculation if any error is found
=1 continue if smaller errors are found

Common text and data to be printed in front of the loading conditions

210 | 210 |

211

code	ndec	mult	text (max. 80 characters
1000			

ndec number of decimals to be used
=-1 no of decimals decided by the program

mult optional, if stated, the value is multiplied by this factor before printing

code =-1 change to a new page
=0 print the text given on the line in question (if no text is stated, a blank line is printed)
(blanks punched before the text are neglected; if the text has to be moved, this give a figure for ndec; number of added blanks will then be 4*ndec)
=1 print ship number
=2 print a ship name
=3 print a ship length between perpendiculars
=4 print a ship breadth moulded
=5 print a ship depth moulded

Note
The last line is indicated by 1000 instead of a blank line.

Printing of the deadweights and loads in the individual compartments

		seq	print level	newp										
220	220													

subshort numbers of loading conditions to printed only in short form (as included sub-conditions)

a blank line or input for re-sequencing the compartments

221

a blank line or input for re-sequencing the compartments

222

If the blank lines are stated above for data set **221** and **222** the individual compartments will be printed in the same sequence as they are stated in data sheet cond5. In the same way the various deadweight components will be printed in the same sequence as stated on data sheet cond7.
In some cases it might be of interest to change this sequence at printing. This can be made by stating the wanted compartment or deadweight sequence above.

seq	=0	print a table stating the load in each individual compartment and an extra line stating the total deadweight. (no sorting on deadweight headings)
seq	=1	print the loads but sorted under deadweight headings.
		For seq =1 the following print level has also to be given:
		print level =0 only the total of each deadweight is printed
		print level =1 the deadweight are specified for each compartment
		print level =2 as above with the heading printed for each type of the deadweight
seq	=2	print the deadweight only (without the lightship)
newp	=0	printing continuous on previous page, no extra heading
	=1	printing on the new page; ship name, condition number and condition name are printed on the top of the page

Printing of the trim and stability data

230 230

231

code	ndec	mult	text (max. 80 characters
1000			

Code

6 salt water density
10 condition number and name
11 draft amidships
12 mean draft (=draft at LCF)
13 draft aft
14 draft fore
15 trim
16 displacement
17 LCG longitudinal centre of gravity
18 CCG transverse centre of gravity
19 KG vertical centre of gravity
20 correction for the free surface effect
22 KMT transverse metacentre
23 GM transverse metacentric height
24 G'M transverse metacentric height corrected for the free surface
25 propeller immersion
26 angle of heel
27 immersion (emergence) at side
31 angles of heel
32 KN curve
33 MS curve
34 GZ curve
35 GZ curve corrected for free surface
36 area under the GZ curve
37 area under corrected GZ curve

Note

Print codes from cond11 can also be used.
The last line is indicated by 1000 instead of a blank line.

Printing of the longitudinal strength data

		ipr	idef	newp	bha	sha
240	240					

ipr =0 compressed output
=1 full printout
idef =0 deflection data included (if required input data are stated)
=1 deflection data are omitted
newp see description to data set **240**
sha max shear force for print plot (default values =max. calc values)
bha max bending moment for print plot (default values =max. calc values)