



# RUSSIAN MARITIME REGISTER OF SHIPPING

**CIRCULAR LETTER**

**No. 312-12-1564c**

dated 26.05.2021

Re:

amendments to the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships, 2021, ND No. 2-020101-139-E

Item(s) of supervision:

ships under construction and in service

Entry-into-force date:

**01.07.2021**

~~Valid till:~~

~~Validity period extended till:~~

~~Cancels / amends / adds Circular Letter No.~~

~~dated~~

Number of pages:

1 + 14

Appendices:

Appendix 1: information on amendments introduced by the Circular Letter

Appendix 2: text of amendments to Part II "Technical Documentation"

Director General

Konstantin G. Palnikov

Text of CL:

We hereby inform that the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships shall be amended as specified in the Appendices to the Circular Letter regarding the software, including in accordance with IACS Unified Requirements (UR ) L5 (Rev.4 June 2020).

It is necessary to do the following:

1. Familiarize the RS surveyors and interested organizations in the area of the RS Branch Offices' activity with the content of the Circular Letter.
2. Apply the provisions of the Circular Letter during review and approval of the technical documentation on ships contracted for construction or conversion on or after 01.07.2021, in the absence of a contract, the keels of which are laid or at a similar stage of construction on or after 01.07.2021, as well as during review and approval of the technical documentation on ships, delivery of which is on or after 01.07.2021.
3. Apply the provisions of the Circular Letter to ships in service based on requests received on or after 01.07.2021.

List of the amended and/or introduced paras/chapters/sections:

Part II: paras 3.8, 12.1.1, 12.1.2, 12.1.4 and 12.1.6, Chapters 12.2 and 12.3

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**Information on amendments introduced by the Circular Letter  
(for inclusion in the Revision History to the RS Publication)**

Nos.	Amended paras/chapters/sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
1	Para 3.8	Para has been specified regarding necessity of type approval for programs used for calculations	312-12-1564c of 26.05.2021	01.07.2021
2	Para 12.1.1	Para has been specified regarding necessity of Register approval for software capable of performing calculations according to RS rules and guidelines	312-12-1564c of 26.05.2021	01.07.2021
3	Para 12.1.2	Para has been specified regarding necessity of Register approval for software used for counting assistance. Footnote has been introduced with a list of software, the use of which for performing calculations eliminates the need for Register to carry out control calculations	312-12-1564c of 26.05.2021	01.07.2021
4	Para 12.1.4	Para has been specified regarding distribution of responsibility for approval of software depending on its purpose	312-12-1564c of 26.05.2021	01.07.2021
5	Para 12.1.6	References to new Chapter 12.3 and codes of nomenclature of items of RS technical supervision have been introduced	312-12-1564c of 26.05.2021	01.07.2021
6	Chapter 12.2	Chapter heading has been specified. The structure of Chapter has been revised. Requirements have been specified in accordance with IMO resolution MSC.415(97) and IACS UR L5 (Rev.4 June 2020)	312-12-1564c of 26.05.2021	01.07.2021

Nos.	Amended paras/chapters/sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
7	Chapter 12.3	New Chapter has been introduced containing requirements to software for strength calculations in connection with the transfer from Appendix 2 to Part II "Hull" of the Rules for the Classification and Construction of Sea-Going Ships	312-12-1564c of 26.05.2021	01.07.2021

## **RULES FOR TECHNICAL SUPERVISION DURING CONSTRUCTION OF SHIPS AND MANUFACTURE OF MATERIALS AND PRODUCTS FOR SHIPS, 2021,**

### **ND No. 2-020101-139-E**

#### **PART II. TECHNICAL DOCUMENTATION**

##### **3 GENERAL**

1 **Para 3.8** is replaced by the following text:

**"3.8** Calculations necessary for determination of parameters and values regulated by the RS rules shall be made in compliance with the provisions of these Rules or according to the standards, methods and other normative documents agreed by the Register.

The procedures and methods of calculations used shall provide an adequate accuracy of the problem solution.

The requirements regarding the approval of software are specified in Section 12.

The Register does not check the correctness of computing operations in calculations, including those made according to the programs having type approval of the Register but examines only the final results of the calculations.

In separate cases, the Register may conduct additional expertise of the accuracy of the final results."

##### **12 SOFTWARE**

2 **Para 12.1.1** is replaced by the following text:

**"12.1.1** Software which is capable of performing calculations according to the RS rules and guidelines which results are part of technical documentation in accordance with 3.8, and which is related to codes 20100000, 20200000 according to the Nomenclature of items of the RS technical supervision, shall be approved by the Register as it pertains to the calculations according to the RS rules and guidelines."

3 **Para 12.1.2** is replaced by the following text:

**"12.1.2** The software used for counting assistance, which comes down to performance of a number of separate calculations for determination of auxiliary values, shall not be subject to approval by the Register. The software User Manual (or other documentation) shall confirm that the software used is suitable for performing the submitted calculations.

When submitting the results of finite element analyses and results of hydrodynamic calculations to the Register, the input data used (mathematical model of ship/structure/device) for the control calculations shall also be submitted<sup>1</sup>. The format for providing such information is determined on a case-by-case basis."

4 **Footnote 1** is added to **para 12.1.2** reading as follows:

<sup>1</sup> Control calculations by the Register are not required if the calculations are carried out using the following software: ANSYS, NASTRAN, ABAQUS, FESTA, SCAD, LIRA, Anchored Structures, LS-DYNA, DIODORE, Zenit-95."

5 **Para 12.1.4** is replaced by the following text:

"**12.1.4** The software related to code 20100000 is approved by RHO. The software related to code 20200000 is approved by the RS Branch Office when duly authorized by and jointly with RHO".

6 **Para 12.1.6** is replaced by the following text:

"**12.1.6** Type approval of the design software for ship theory and strength calculations (code of the Nomenclature of items of the RS technical supervision 20101000) and onboard software for ship theory and strength calculations (code of the Nomenclature of items of the RS technical supervision 20102000) shall be carried out according to 12.2.2 and 12.3.2.".

7 **Chapter 12.2** is replaced by the following text:

## **"12.2 ONBOARD SOFTWARE FOR STABILITY CALCULATIONS**

### **12.2.1 Definitions.**

Onboard software for stability calculations (stability software) is a software which calculates the stability for actual loading condition and which is installed onboard of a ship and a floating unit.

Active software is a software that uses, data from sensors automatically reading the contents of tanks and other ship loading parameters as input information.

Passive software is a software that requires manual entry of input data for calculation.

### **12.2.2 General.**

**12.2.2.1** The technical documentation on software submitted for review shall include as follows:  
name of the software;

User Manual;

results of test calculations carried out using the software;

input data for test calculations (ship's hull form data, compartmentation data, lines plan, offset tables, hydrostatic tables, capacity tables, etc.).

**12.2.2.2** Test calculations may be performed on the basis of input data provided by the Register or selected by the software designer and agreed upon with the Register.

Test calculations shall be carried out for a minimum of two types of ships (tanker, bulk carrier, container ship, dry cargo ship, passenger ship). Where the software approval is required for only one type of ship, test calculations for a minimum of two ships of this type shall be submitted.

For approval of software which is based on a hull form model, test calculations shall be carried out for a minimum of three types of ships, or three different ships, if approval is required for only one type of ship.

**12.2.2.3** The approval procedure includes verification for compliance of the results of test calculations and results of control calculations, performed by the Register, or contained in documentation approved earlier.

**12.2.2.4** In case of satisfactory verifications results the Report (form 6.3.29) and Type Approval Certificate for Software (CTOP) (form 6.8.5) are issued.

**12.2.2.5** For renewal of the Type Approval Certificate for Software (CTOP), the results of test calculations confirming that calculation procedure has not been changed since CTOP issue shall be submitted to the Register. Calculations approved by the Register and carried out during the period of validity of CTOP using the software, may be submitted for confirmation.

### **12.2.3 Onboard software approval for a specific ship.**

**12.2.3.1** For review of the onboard software, documentation specified in 12.2.2.1 and approved documentation on stability shall be submitted to the Register.

**12.2.3.2** The approval procedure includes:

.1 verification of Type Approval Certificate for Software (CTOP) compliance (where available): software name including version number;

.2 verification that the following input data is consistent with the approved documentation: main dimensions, hydrostatic particulars and, if applicable, the ship profile;

the position of the forward and after perpendiculars, and if appropriate, the calculation method to derive the forward and after draughts at the actual position of the ship's draught marks;  
light ship displacement and centre of gravity derived from the most recently approved inclining test or light-weight check;

lines plan, offset tables or other suitable presentation of hull form data, if required;  
compartment definitions, including frame spacing, and centres of volume, together with capacity tables (sounding/ullage tables), free surface corrections, if appropriate;

.3 verification that the following parameters of the test loading conditions are consistent with the approved documentation:

cargo and consumables distribution for each loading;

output data of calculations taking into account the acceptable tolerances stated in 12.2.11;

.4 verification that the software type is appropriate for the type of ship and stability calculations required;

.5 verification of general requirements under 12.2.9;

.6 verification of functional requirements under 12.2.10;

.7 verification that the User Manual is consistent with the requirements under 12.2.12.

**12.2.3.3** The test loading conditions normally shall cover the range of load draughts from the deepest envisaged loaded condition to the light ballast condition and shall include at least one departure and one arrival condition. Calculations shall be provided for at least four loading conditions, taken from the ship's approved documentation on stability. For tankers and ships carrying grain in bulk at least one of the conditions shall include partially filled cargo spaces. Within the selected loading conditions each cargo hold shall be loaded at least once.

For Type 4 stability software (refer to 12.2.8.5), at least three damage cases shall be selected, each of them associated with at least three test loading conditions taken from the ship's approved Stability Booklet.

**12.2.3.4** In case of satisfactory verifications results the Report (form 6.3.29) is issued, the test loading conditions are approved, and the User Manual is agreed.

**12.2.3.5** The satisfactory operation of the software with the onboard computer(s) for stability calculations shall be verified by testing upon installation onboard. The software operation shall be verified in the presence of the RS surveyor in accordance with 12.2.5. The approved test loading conditions, the User Manual and the Report (form 6.3.29) shall be available on board.

**12.2.3.6** Approval by the Register does not absolve the software designer and shipowner of responsibility for ensuring that the information programmed into the onboard computer software is consistent with the current condition of the ship.

**12.2.4 Approval of the ship computer model used in shore-based emergency response service.**

**12.2.4.1** For review of the ship computer model used by shore-based emergency response service, the test loading conditions complying with the requirements of 12.2.3.3 as well as approved documentation on stability and strength shall be submitted to the Register. The shore-based emergency response service shall have the Certificate of Firm Conformity (form 7.1.27) with code 22013000 (refer to Table 11.1.1, Part I "General Regulations for Technical Supervision").

**12.2.4.2** The procedure for review of the ship computer model includes verifications specified in 12.2.3.2.1 — 12.2.3.2.3.

**12.2.4.3** In case of satisfactory verifications results, the Report (form 6.3.29) is drawn up, the test loading conditions are approved.

**12.2.4.4** After drawing up the Report (6.3.29), the prompt access to shore-based emergency response service shall be verified in the presence of the RS surveyor in accordance with 12.2.5. Agreement with a shore-based emergency response service undertaking damage stability and residual structural strength calculations, user manual for a system of prompt access to shore-based emergency response service and the Report (form 6.3.29) shall be available on board.

**12.2.5 Onboard verification.**

**12.2.5.1** Acceptance tests of the software shall be conducted on board the ship in the presence of the RS surveyor with drawing up the Report on Survey of the Ship (form 6.3.10) or with the relevant entries made in the Survey Checklist (form 6.1.01), as applicable.

**12.2.5.2** The onboard software acceptance tests shall include:

.1 verification of availability of Report (form 6.3.29), approved test loading conditions and User Manual;

.2 verification that the documentation on stability, which is stated in the Report (form 6.3.29) has not been updated since the date of issuance of the above Report;

.3 calculation of at least one load case (other than light-ship) in accordance with 12.2.5.3. Actual loading condition results are not suitable for checking the correct working of the computer.

**12.2.5.3 Steps to be performed during calculation:**

.1 retrieve the test loading condition and start a calculation run. Compare the calculation results with the approved test loading conditions;

.2 change several items of deadweight (tank weights and the cargo weight) sufficiently to change the draught or displacement by at least 10 %. The results shall be reviewed to ensure that they differ in a logical way from those of the approved test condition;

.3 revise the above modified loading condition to restore the initial test loading condition and compare the results. Confirm that the relevant input and output data of the approved test loading condition have been replicated;

.4 alternatively, one or more test loading conditions shall be selected and the calculation performed after entering all deadweight data into the program. The results shall be verified as identical to the results in the approved test loading conditions.

**12.2.5.4** The software shall be installed on the onboard computer of a type approved by the Register or on two unapproved computers.

**12.2.6 Onboard verification of prompt access to shore-based emergency response service.**

**12.2.6.1** Prompt access to shore-based emergency response service shall be verified on board the ship in the presence of the RS surveyor with drawing up the Report on Survey of the Ship (form 6.3.10) or with the relevant entries made in the Survey Checklist (form 6.1.01), as applicable.

**12.2.6.2** Onboard verification of prompt access to shore-based emergency response service shall include:

.1 verification of availability of an agreement with a shore-based emergency response service undertaking calculations;

.2 verification of availability of user manual for a system of prompt access to shore-based emergency response service;

.3 verification of presence of information relating to a shore-based emergency response service recorded in the Shipboard Oil Pollution Emergency Plan (SOPEP)/Shipboard Marine Pollution Emergency Plan for Noxious Liquid Substances (SMPEP)/Operational manual for fire and flooding casualty cases and safe return to port operation (as applicable);

.4 verification of availability of Report (form 6.3.29) on ship computer model used by shore-based emergency response service with approved test loading conditions;

.5 verification that Stability Booklet, Damage Stability Booklet and Loading Manual, which are stated in the Report (form 6.3.29) have not been updated since the date of issuance of the above Report;

.6 verification that the prompt access to shore-based emergency response service may be provided at any time;

.7 verification that results of test calculations, received from the shore-based emergency response service, comply with test loading conditions attached to the Report (form 6.3.29).

**12.2.7 Periodical verifications.**

**12.2.7.1** At annual, intermediate and renewal survey, the software installed onboard shall be verified in the presence of the RS surveyor in accordance with 12.2.5.

**12.2.7.2** At annual, intermediate and renewal survey, the prompt access to shore-based emergency response service shall be verified in the presence of the RS surveyor. The verification shall include:

.1 verification that the Stability Booklet, Damage Stability Booklet and Loading Manual, which are stated in the Report (form 6.3.29) on ship computer model used by shore-based emergency response service, have not been updated since the date of issuance of the above Report;

.2 verification that the prompt access to shore-based emergency response service may be provided at any time.

**12.2.8 Types of onboard stability software.**

**12.2.8.1** Four types of stability software are acceptable depending upon a ship's stability requirements.

**12.2.8.2** Type 1. Software calculating intact stability only.

**12.2.8.3** Type 2. Software calculating intact stability and checking damage stability on basis of a limit curve or checking all the stability requirements (intact and damage stability) on the basis of a limit curve.

**12.2.8.4** Type 3. Software calculating intact stability and damage stability by direct application of preprogrammed damage cases based on the applicable requirements.

**12.2.8.5** Type 4. Software calculating damage stability associated with an actual loading condition and actual flooding case, using direct application of user defined damage, for the purpose of providing operational information for safe return to port (SRtP).

**12.2.8.6** Damage stability of both Type 3 and Type 4 stability software shall be based on a three-dimensional hull form model.

**12.2.9 General requirements for onboard stability software.**

**12.2.9.1** Compliance of active software to the requirements of this Section shall be verified in off-line operation mode.

**12.2.9.2** The scope of a stability calculation software shall be in accordance with the approved Stability Booklet and shall at least include all information and perform all calculations or checks which are necessary to ensure compliance with the applicable stability requirements.

**12.2.9.3** Approved stability software is not a substitute for the approved Stability Booklet, and is used as a supplement to the approved Stability Booklet to facilitate stability calculations.

**12.2.9.4** Content and format of the input/output information shall be easily comparable with the approved Stability Booklet.

**12.2.9.5** The User Manual shall be provided for the onboard computer stability software, the language in which the User Manual is written shall be the same as used in the approved Stability Booklet.

**12.2.9.6** The language of displayed and printed out information shall be the same as used in the approved Stability Booklet.

**12.2.9.7** The onboard computer software for stability calculations shall be ship specific and the results of the calculations shall be only applicable to the ship for which it has been approved.

**12.2.9.8** In case of modifications implying changes in the main data or internal arrangement of the ship as well as in the Stability Booklet, the approval of stability software is not valid. The software shall be modified accordingly and reapproved.

**12.2.9.9** Protection against unintentional or unauthorised modification of the software and preprogrammed data shall be provided.

**12.2.9.10** The software shall warn the user of any input errors (with regard to limitations such as filling a compartment beyond capacity, or exceeding the assigned load line, etc.) and in cases where the calculation results do not comply with the applicable criteria, as well as in case of a wrong use of the very program.

**12.2.9.11** The program and any data stored in the system shall be protected from corruption by loss of power.

**12.2.10 Functional requirements for onboard stability software.**

**12.2.10.1** General requirements for any type of stability software.

**12.2.10.1.1** The stability software shall present the following parameters for a given loading condition:

deadweight data;

light-ship data;

trim;

draught at the draught marks and perpendiculars;

summary of loading condition displacement, vertical centre of gravity, longitudinal centre of gravity and, if applicable, transverse centre of gravity;

downflooding angle and corresponding downflooding opening (not applicable for Type 2 software which uses limit curve for checking all the stability requirements);

compliance with stability criteria: listing of all calculated stability criteria, the limit values, the obtained values and the conclusions (criteria fulfilled or not fulfilled) (not applicable for Type 2 software which uses limit curve for checking all the stability requirements).

**12.2.10.1.2** A clear warning shall be given on screen and in hard copy printout if any of the loading limitations are not complied with.

Loading limitations shall include, but may not be limited to:  
 trim, draught, liquid densities, tank filling levels, initial heel;  
 limiting value of vertical centre of gravity/metacentric height in conjunction with above  
 for Type 2;

restrictions to the stowage height for timber.

**12.2.10.1.3** Loading limitations to be included in the software installed onboard anchor handling vessels shall comprise information on required ballasting, amount of consumables, permissible tension, working sectors, heeling angles and use of roll-reduction devices.

**12.2.10.1.4** Type 3 software shall include pre-defined relevant damage cases for both sides of the ship based on the applicable requirements for location and extent of damages, intended for automatic check of a given loading condition.

**12.2.10.1.5** The date and time of a saved calculation shall be part of the screen display and hard copy printout.

**12.2.10.1.6** Each hard copy printout shall contain identification of the calculation program including version number.

**12.2.10.1.7** Units of measurement shall be clearly identified and used consistently within a loading condition.

**12.2.10.1.8** Type 3 and Type 4 software shall contain a computer model of the ship, including appendages, all compartments, tanks and the relevant parts of the superstructure considered in the damage stability calculation, wind profile, down-flooding and up-flooding openings, cross-flooding arrangements, internal compartment connections and escape routes, as applicable and according to the type of stability software.

**12.2.10.1.9** For Type 1 and Type 2 software, in case a ship model is used for stability calculations, the requirements of the computer model shall be as per 12.2.10.1.8 above to the extent as applicable and according to the type of stability software.

**12.2.10.2** Additional requirements for Type 4 stability software.

**12.2.10.2.1** Where the normal (Type 1, 2 or 3) and SRtP (Type 4) software are not totally separated:

the function of switching between normal software and Type 4 software shall be provided;

the actual intact loading condition shall be the same for both functions (normal operation and SRtP); and

the SRtP module needs only to be activated in case of an incident.

Approval of Type 4 (SRtP) software is for stability only.

**12.2.10.2.2** In passenger ships which are subject to SRtP and have an onboard stability computer and prompt access to shore-based emergency response service, such software need not be identical.

**12.2.10.2.3** Each internal space shall be assigned its permeability as shown in Table 12.2.10.2.3 below, unless a more accurate permeability has been reflected in the approved Stability Booklet.

Table 12.2.10.2.3

Spaces	Permeability			
	Default	Full	Partially filled	Empty
container spaces	0,95	0,70	0,80	0,95
dry cargo spaces	0,95	0,70	0,80	0,95
ro-ro spaces	0,95	0,90	0,90	0,95
cargo liquids	0,95	0,70	0,80	0,95
intended for consumable liquids	0,95	0,70	0,80	0,95
stores	0,95	0,60	0,60	0,95
occupied by machinery	0,85			
void spaces	0,95			
occupied by accommodation	0,95			

**12.2.10.2.4** The stability software shall be capable of accounting for applied moments such as wind, lifeboat launching, cargo shifts and passenger relocation.

**12.2.10.2.5** The stability software shall account for the effect of wind by using the method in 2.5.4.1.2, Part V "Subdivision" of the Rules for the Classification and Construction of Sea-Going Ships as the default, but allow for manual input of the wind speed/pressure.

**12.2.10.2.6** The stability software shall be capable of assessing the impact of open main watertight doors on stability.

**12.2.10.2.7** The stability software shall utilize the latest light-ship parameters stated in the approved Stability Booklet.

**12.2.10.2.8** The output of the software shall be such that it provides the sufficient clear unambiguous information to enable quick and accurate assessment of the stability of the ship for any actual damage, the impact of flooding on the means of escape and the controls of devices necessary for managing and/or controlling the stability of the ship.

**.1** when the actual loading condition is input in the Type 4 software, the following output (intact stability) shall be presented:

- deadweight data;
- light-ship data;
- trim;
- heel;
- draught at the draught marks and perpendiculars;
- summary of loading condition displacement, vertical centre of gravity, longitudinal centre of gravity and, if applicable, transverse centre of gravity;
- downflooding angle and corresponding downflooding opening;
- free surfaces;
- metacentric height;
- righting lever corrected for free surfaces values relevant to an adequate range of heeling (not less than 60°) available indicatively at the following intervals: 0°, 5°, 10°, 15°, 20°, 25°, 30°, 40°, 50°, 60°;
- compliance with relevant intact stability criteria: listing of all calculated intact stability criteria, the limiting values, the obtained values and the conclusions (criteria fulfilled or not fulfilled);
- stability limiting curve;

**.2** when the actual loading condition is associated to the actual damage case(s), the following output (damage stability) shall be presented:

- trim;
- heel;
- draught at the draught marks and perpendiculars;
- progressive flooding angle and corresponding progressive flooding openings;
- metacentric height;
- righting levers relevant to an adequate range of heeling (not less than 60°) available indicatively at the following intervals: 0°, 5°, 10°, 15°, 20°, 25°, 30°, 40°, 50°, 60°;
- compliance with stability criteria: listing of all calculated stability criteria, the limit values, the obtained values and the conclusions (criteria fulfilled or not fulfilled);
- the survivability criteria (if required by the Administration);
- relevant flooding points (unprotected or weathertight) with the distance from the damage waterline to each point;
- list of all flooded compartments with the permeability considered;
- amount of water in each flooded compartment;
- escape route immersion angles;
- a profile view, deck views and cross-sections of the ship indicating the flooded waterplane and the damaged compartments.

**12.2.10.2.9** For ro-ro passenger ships there shall be algorithms in the software for estimating the effect of water accumulation on deck (WOD)<sup>1</sup>.

In addition to the predefined significant wave height taken from the approved Stability Booklet, there shall be possibility for the crew to input manually the significant wave height of the ship navigation area in the stability software.

In addition to the predefined significant wave height taken from the approved Stability Booklet, calculations with two additional significant wave heights shall be submitted.

#### **12.2.11 Acceptable tolerances.**

**12.2.11.1** Depending on the type of program, the computational accuracy shall be within the acceptable tolerances according to 12.2.11.2 or 12.2.11.3, of the results using an independent program or the approved Stability Booklet with identical input.

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<sup>1</sup> These requirements apply to ro-ro passenger ships subject to the Stockholm Agreement (IMO circular letter No. 1891).

**12.2.11.2** In case of programs, which use only pre-programmed data from the approved Stability Booklet as the basis for stability calculations, such data shall have zero tolerances for the output of the Stability booklet data.

Output data tolerances shall be close to zero, however, small differences associated with calculation rounding or abridged input data are acceptable.

Additionally differences associated with the use of hydrostatic and stability data for trims that differ from those in the approved Stability Booklet, are acceptable subject technical background for obtained data.

**12.2.11.3** Programs which use hull form models as their basis for stability calculations, shall have tolerances for the printouts of basic calculated data established against data from the approved Stability Booklet in accordance with Table 12.2.11.3.

Table 12.2.11.3

Parameter	Acceptable tolerances
<b>Hull form dependent</b>	
Displacement	±2 %
Longitudinal center of buoyancy, from AP (after perpendicular)	±1 % / 50 cm
Vertical center of buoyancy	±1 % / 5 cm
Transverse center of buoyancy	±0,5 % of B (breadth) / 5 cm
Longitudinal center of flotation, from AP	±1 % / 50 cm
Moment to trim 1 cm	±2 %
Transverse metacentric height	±1 % / 5 cm
Longitudinal metacentric height	±1 % / 50 cm
Cross curves of stability	±5 cm
<b>Compartment dependent</b>	
Volume or deadweight	±2 %
Longitudinal center of gravity, from AP	±1 % / 50 cm
Vertical centre of gravity	±1 % / 5 cm
Transverse center of gravity	±0,5 % of B / 5 cm
Free surface moment	±2 %
Shifting moment	±5 %
Level of contents	±2 %
<b>Trim and stability</b>	
Draughts (forward, aft, mean)	±1 % / 5 cm
Transverse metacentric height (both initial and corrected)	±1 % / 5 cm
Righting levers	5 % / 5 cm
Downflooding angle	±2°
Equilibrium angles	±1°
Distance from WL (waterline) to unprotected and weathertight openings, or other relevant point, if applicable	±5 % / 5 cm
Areas under righting arm curve	±5 % / 0,0012 mrad
<p><b>Notes:</b> 1. Deviation in % = <math>\{(base\ value - applicant's\ value) / base\ value\} \times 100</math>. Where the "base value" may be from the approved Stability Booklet or control calculation.</p> <p>2. When applying the tolerances in Table 12.2.11.3 having two values, the allowable tolerance is the greater of the two values.</p> <p>3. Where differences in calculation methodology exist between the software used in the comparison, this may be a basis for accepting deviations greater than those specified in Table 12.2.11.3 provided a software examination is carried out in sufficient detail to clearly document that such differences are technically justifiable.</p> <p>4. Deviation from these tolerances shall not be accepted unless the Register considers that there is a technical background (satisfactory explanation) for the difference and that it is clearly evident that the deviation does not impact compliance with the applicable stability criteria.</p>	

**12.2.12 User manual.**

**12.2.12.1** The User Manual shall contain the following information:  
instructions for installation of software on the computer;  
description of the main functions;  
a sample of each displayed screen with explanatory text;  
input and output data;  
required minimum hardware to operate the software;  
description of use of the test loading conditions;  
example of the calculation accompanied by explanations;  
list of warnings." .

8 **New Chapter 12.3** is introduced reading as follows:

## **"12.3 SOFTWARE FOR STRENGTH CALCULATIONS**

### **12.3.1 General.**

**12.3.1.1** The requirements of this Chapter are applicable to the software for strength calculations required by 1.4.9, Part II "Hull" of the Rules for the Classification and Construction of Sea-Going Ships.

### **12.3.2 Type approval of software.**

**12.3.2.1** The technical documentation on software submitted for review shall include the following:

name of the software;

hardware/operation system requirements;

User Manual;

results of test calculations carried out using the software;

input data for test calculations (ship's hull form data, compartmentation data, lines plan, offset tables, hydrostatic tables, capacity tables, etc.).

**12.3.2.2** Test calculations shall be carried out for a minimum of two types of ships (tanker, bulk carrier, container ship, dry cargo ship, passenger ship). Where the software approval is required for only one type of ship, test calculations for a minimum of two ships of this type shall be submitted.

For approval of software which is based on a hull form model, test calculations shall be carried out for a minimum of three types of ships, or three different ships, if approval is required for only one type of ship.

**12.3.2.3** The approval procedure includes verification for compliance of the results of test calculations and the results of control calculations, performed by the Register, or contained in documentation approved earlier.

**12.3.2.4** In case of satisfactory verifications results the Report (form 6.3.29) and Type Approval Certificate for Software (СТОП) (form 6.8.5) are issued.

**12.3.2.5** For renewal of the Type Approval Certificate for Software (СТОП), the results of test calculations confirming that calculation procedure has not been changed since СТОП issue shall be submitted to the Register. Calculations approved by the Register and carried out during the period of validity of СТОП using the software, may be submitted for confirmation.

### **12.3.3 Software approval for a specific ship.**

**12.3.3.1** For review of the software for a specific ship, documentation specified in 12.3.2.1 and approved Loading Manual shall be submitted to the Register.

**12.3.3.2** The documentation review procedure includes:

.1 verification of Type Approval Certificate for Software (СТОП) compliance (where available): software name including version number;

.2 verification that the following input data is consistent with the approved documentation:  
main dimensions and the ship profile, if applicable;

the position of the forward and after perpendiculars, and if appropriate, the calculation method to derive the forward and after draughts at the actual position of the ship's draught marks;

light ship displacement and its distribution through the ship length, light ship gravity centre position;  
lines plan, offset tables or other suitable presentation of hull form data, where required;

compartment definitions, including frame spacing, and centres of volume, together with capacity tables (sounding/ullage tables);

.3 verification that the following parameters of the test loading conditions are consistent with the approved documentation:

cargo and consumables distribution for each loading;

output data of calculations taking into account the acceptable tolerances stated in 12.3.8;

.4 verification of general requirements under 12.3.6;

.5 verification of functional requirements under 12.3.7;

.6 verification that the User Manual is consistent with the requirements under 12.3.9.

**12.3.3.3** The test loading conditions normally shall cover the range of load draughts (from the minimum draught ballast condition to the deepest envisaged loaded condition).

Calculations shall be provided for at least four loading conditions, taken from the ship's approved Loading Manual.

Within the selected loading conditions each compartment shall be loaded at least once.

**12.3.3.4** In case of satisfactory verifications results the Report (form 6.3.29) is issued, the test loading conditions are approved, and the User Manual is agreed.

The satisfactory operation of the software with the onboard computer(s) shall be verified by testing upon installation. The software operation shall be verified in the presence of the RS surveyor in accordance with 12.2.4. The approved test loading conditions, the User Manual and the Report (form 6.3.29) shall be available on board.

**12.3.3.5** Approval by the Register does not absolve the software designer and shipowner of responsibility for ensuring that the information programmed into the onboard computer software is consistent with the current condition of the ship.

**12.3.4 Onboard verification.**

**12.3.4.1** Acceptance tests of the software shall be conducted on board the ship in the presence of the RS surveyor with drawing up the Report on Survey of the Ship (form 6.3.10) or with the relevant entries made in the Survey Checklist (form 6.1.01), as applicable. From the approved test loading conditions at least one load case (other than light-ship) shall be calculated. Actual loading condition results are not suitable for checking the correct working of the computer.

**12.3.4.2** The onboard software acceptance tests shall include:

.1 verification of availability of Report (form 6.3.29), approved test loading conditions and User Manual;

.2 verification that the Loading Manual, which is stated in the Report (form 6.3.29) has not been updated since the date of issuance of the above Report;

.3 calculation of at least one load case (other than light-ship) in accordance with 12.3.4.3. Actual loading condition results are not suitable for checking the correct working of the computer.

**12.3.4.3** Steps to be performed during calculation:

.1 retrieve the test loading condition and start a calculation run. Compare the calculation results with the approved test loading conditions;

.2 change several items of deadweight (tank weights and the cargo weight) sufficiently to change the draught or displacement by at least 10 %. The results shall be reviewed to ensure that they differ in a logical way from those of the approved test condition;

.3 revise the above modified loading condition to restore the initial test loading condition and compare the results. Confirm that the relevant input and output data of the approved test loading condition have been replicated;

.4 alternatively, one or more test loading conditions shall be selected and the test calculation performed after entering all deadweight data into the program. The results shall be verified as identical to the results in the approved test loading conditions.

**12.3.4.3** The software shall be installed on the onboard computer of a type approved by the Register or on two unapproved computers.

**12.3.5 Periodical verifications.**

**12.3.5.1** At annual, intermediate and renewal survey, the software installed onboard shall be verified in the presence of the RS surveyor.

**12.3.5.2** The verification shall be carried out in accordance with 12.3.4.

**12.3.6 General requirements for software.**

**12.3.6.1** The scope of a software shall be in accordance with the approved Loading Manual and shall at least include all information and perform all calculations or checks which are necessary to ensure compliance with the applicable requirements for forces and moments affecting the hull, and for hull bend/sagging.

**12.3.6.2** A loading instrument shall not substitute for an approved Loading Manual.

**12.3.6.3** Content and format of the input/output information shall be easily comparable with the approved Loading Manual.

**12.3.6.4** The User Manual shall be provided for the onboard computer software, the language in which the User Manual is written shall be the same as used in the approved Loading Manual.

**12.3.6.5** The language of displayed and printed out information shall be the same as used in the approved Loading Manual.

**12.3.6.6** The onboard computer software shall be ship specific and the results of the calculations shall be only applicable to the ship for which it has been approved.

**12.3.6.7** In case of modifications affecting the longitudinal strength of hull as well as in the approved Loading Manual, the approval of software is not valid. The software shall be modified accordingly and reapproved.

**12.3.6.8** Protection against unintentional or unauthorised modification of the software and preprogrammed data shall be provided.

**12.3.6.9** The software shall warn the user of any input errors (with regard to limitations such as filling a compartment beyond capacity, or exceeding the assigned load line, etc.) and in cases where the calculation results do not comply with the applicable criteria, as well as in case of a wrong use of the very program.

**12.3.6.10** The program and any data stored in the system shall be protected from corruption by loss of power.

**12.3.7 Functional requirements for software.**

**12.3.7.1** The software shall present the following parameters for a given loading condition:

- trim;
- draught at the draught marks and perpendiculars;
- displacement.

**12.3.7.2** Control points for calculation of forces and moments affecting the hull shall be positioned at compartment centres, on transverse bulkheads or other obvious compartment boundaries. Additional control points may be necessary between the bulkheads of long holds or tanks, or between container stacks.

**12.3.7.3** A clear warning shall be given on screen and in hard copy printout if any of the loading limitations are not complied with. Loading limitations shall include, but may not be limited to:

- permissible still water shearing forces and bending moments;
- permissible still water torques, where applicable;
- all local loading restrictions pertinent to both the loading of a particular hold and of the one adjacent thereto, where applicable;
- mass of cargo contained in the hold;
- ballast tanks and holds capacity;
- restrictions on filling.

**12.3.7.4** The calculation results shall be issued both in digital and graphic form. The calculation results in digital form shall be represented both in the absolute values and as percentage of permissible values. Printouts shall contain description of the relevant loading condition of the ship.

**12.3.7.5** The date and time of a saved calculation shall be part of the screen display and hard copy printout.

**12.3.7.6** Each hard copy printout shall contain identification of the calculation program including version number.

**12.3.7.7** Units of measurement shall be clearly identified and used consistently within a loading condition.

**12.3.8 Acceptable tolerances.**

**12.3.8.1** The computational accuracy of the calculation program results shall be within the acceptable tolerances, specified in Table 12.3.8.1, of the results using an independent program or the approved Loading Manual with identical input.

Table 12.3.8.1

Parameter	Acceptable tolerance (percentage of permissible value)
Still water shearing force $N_{sw}$	±5 %
Still water bending moment $M_{sw}$	±5 %
Still water torque $M_{ESW}$	±5 %
<p><b>Notes:</b> 1. Deviation in % = {(base value – applicant's value) / base value} x 100. Where the "base value" may be from the approved Loading Manual or control calculation.</p> <p>2. Where differences in calculation methodology exist between the software used in the comparison, this may be a basis for accepting deviations greater than those specified in Table 12.3.8.1 provided a software examination is carried out in sufficient detail to clearly document that such differences are technically justifiable.</p> <p>3. Deviation from these tolerances shall not be accepted unless the Register considers that there is a technical background (satisfactory explanation) for the difference and that it is clearly evident that the deviation does not impact compliance with the applicable requirements for strength.</p>	

**12.3.9 User Manual.**

**12.3.9.1** The User Manual shall contain the following information:  
instructions for installation of software on the computer;  
description of the main functions;  
a sample of each displayed screen with explanatory text;  
input and output data;  
required minimum hardware to operate the software;  
description of use of the test loading conditions;  
example of the calculation accompanied by explanations;  
list of warnings.".