



# RUSSIAN MARITIME REGISTER OF SHIPPING

**CIRCULAR LETTER**

**No. 382-08-1504c**

dated 08.02.2021

Re:

amendments to the Collection of the Rules for Containers, 2021, ND 2-090201-012-E

Item(s) of supervision:

containers, technical documentation for containers, manufacture and testing of containers

Entry-into-force date:

**From the date of publication**

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Appendices:

Appendix 1: information on amendments introduced by the Circular Letter

Appendix 2: text of amendments to the General Regulations for the Technical Supervision of Containers; Parts I "Basic Requirements", II "General Freight Containers", III "Thermal Containers", IV "Tank Containers", V "Platform Containers and Platform-Based Containers", IV "Non-pressurized Dry Bulk containers" и VII "Offshore Containers" of Rules for the Manufacture of Containers; Rules for Technical Supervision During Manufacture of Containers, Rules for Technical Supervision of Containers in Service

Director General

Konstantin G. Palnikov

Text of CL:

We hereby inform that the General Regulations for the Technical Supervision of Containers, Rules for the Manufacture of Containers, Rules for Technical Supervision During Manufacture of Containers, Rules for Technical Supervision of Containers in Service shall be amended as specified in the Appendices to the Circular Letter.

It is necessary to do the following:

1. Bring the content of the Circular Letter to the notice of the RS surveyors, interested organizations and persons in the area of the RS Branch Offices' activity.
2. Apply the provisions of the Circular Letter in the RS practical activity from the entry-into-force date of amendments.

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

General Regulations for the Technical Supervision of Containers:

Tables 2.1.2, 2.1.3, 2.1.4 and 2.1.5 and paras 3.1.1 and 3.1.3

Rules for the Manufacture of Containers:

Part I: Table 2.1.2, para 2.6.4.7, Table 3.2.7, paras 3.3.4, 3.3.7 and 3.7.1

Part II: para 1.4.1

Part III: para 1.4.1

Part IV: paras 1.4.1, 3.7.7, 3.7.8 and 4.4.2.1.1

Part V: para 1.4.1

Part VI: para 1.4.1

Part VII: paras 1.4.1, 2.2.1, 3.1.4, 3.1.9, 7.2.3, 8.4.5, 9.1.2.1.1, 9.1.2.1.2 and 9.3.4 and Appendix 1

Rules for Technical Supervision During Manufacture of Containers

Rules for Technical Supervision of Containers in Service:

para 3.4.5.1.3.3

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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	General Regulations for the Technical Supervision of Containers, Table 2.1.2	Codes of items of technical supervision have been specified	382-08-1504c of 08.02.2021	08.02.2021
2	General Regulations for the Technical Supervision of Containers, Table 2.1.3	Codes of items of technical supervision have been specified	382-08-1504c of 08.02.2021	08.02.2021
3	General Regulations for the Technical Supervision of Containers, Table 2.1.4	Requirements for stages of technical supervision during manufacture of containers have been specified	382-08-1504c of 08.02.2021	08.02.2021
4	General Regulations for the Technical Supervision of Containers, Table 2.1.5	Group code "Types of activities of the firms (service providers) on containers" has been added	382-08-1504c of 08.02.2021	08.02.2021
5	General Regulations for the Technical Supervision of Containers, paras 3.1.2 and 3.1.3	Requirements for terms for review of technical documentation have been specified and registration of changes	382-08-1504c of 08.02.2021	08.02.2021
6	Rules for the Manufacture of Containers, Part I, Table 2.1.2	Requirements for container sizes have been specified	382-08-1504c of 08.02.2021	08.02.2021
7	Rules for the Manufacture of Containers, Part I, para 2.6.4.7	Requirements for cargo securing device have been specified	382-08-1504c of 08.02.2021	08.02.2021
8	Rules for the Manufacture of Containers, Part I, Table 3.2.7	Requirements for steel of strength grade 375 have been added	382-08-1504c of 08.02.2021	08.02.2021
9	Rules for the Manufacture of Containers, Part I, para 3.3.4	Requirements for impact testing have been specified	382-08-1504c of 08.02.2021	08.02.2021
10	Rules for the Manufacture of Containers, Part I, para 3.3.7	Para has been deleted	382-08-1504c of 08.02.2021	08.02.2021

Nos.	Amended paras/chapters/sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
11	Rules for the Manufacture of Containers, Part I, para 3.7.1	Requirements for welding consumables have been specified	382-08-1504c of 08.02.2021	08.02.2021
12	Rules for the Manufacture of Containers, Part II, para 1.4.1	Requirements for scope of technical documentation have been specified	382-08-1504c of 08.02.2021	08.02.2021
13	Rules for the Manufacture of Containers, Part III, para 1.4.1	Requirements for scope of technical documentation have been specified	382-08-1504c of 08.02.2021	08.02.2021
14	Rules for the Manufacture of Containers, Part IV, para 1.4.1	Requirements for scope of technical documentation have been specified	382-08-1504c of 08.02.2021	08.02.2021
15	Rules for the Manufacture of Containers, Part IV, para 3.7.7	Requirements for allowable stress value have been specified	382-08-1504c of 08.02.2021	08.02.2021
16	Rules for the Manufacture of Containers, Part IV, para 3.7.8	Requirements for leakproofness test pressure have been added	382-08-1504c of 08.02.2021	08.02.2021
17	Rules for the Manufacture of Containers, Part IV, para 4.4.2.1.1	Requirements for marking of pressure relief devices have been specified	382-08-1504c of 08.02.2021	08.02.2021
18	Rules for the Manufacture of Containers, Part V, para 1.4.1	Requirements for scope of technical documentation have been specified	382-08-1504c of 08.02.2021	08.02.2021
19	Rules for the Manufacture of Containers, Part VI, para 1.4.1	Requirements for scope of technical documentation have been specified	382-08-1504c of 08.02.2021	08.02.2021
20	Rules for the Manufacture of Containers, Part VII, para 1.4.1	Requirements for scope of technical documentation have been specified	382-08-1504c of 08.02.2021	08.02.2021
21	Rules for the Manufacture of Containers, Part VII, para 2.2.1	Requirements for pad eyes have been added	382-08-1504c of 08.02.2021	08.02.2021
22	Rules for the Manufacture of Containers, Part VII, para 3.1.4	Requirements for calculations of horizontal shock loads have been specified	382-08-1504c of 08.02.2021	08.02.2021
23	Rules for the Manufacture of Containers, Part VII, para 3.1.9	New para with requirements for calculations of fork pockets has been introduced	382-08-1504c of 08.02.2021	08.02.2021

Nos.	Amended paras/chapters/sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
24	Rules for the Manufacture of Containers, Part VII, para 7.2.3	New para with requirements for marking has been introduced	382-08-1504c of 08.02.2021	08.02.2021
25	Rules for the Manufacture of Containers, Part VII, para 8.4.5	Requirements for testing have been specified	382-08-1504c of 08.02.2021	08.02.2021
26	Rules for the Manufacture of Containers, Part VII, para 9.1.2.1.1 and 9.1.2.1.2	Requirements for scope of technical documentation have been specified	382-08-1504c of 08.02.2021	08.02.2021
27	Rules for the Manufacture of Containers, Part VII, para 9.3.4	New para with requirements for calculations of lifting sets has been introduced	382-08-1504c of 08.02.2021	08.02.2021
28	Rules for the Manufacture of Containers, Part VII, Appendix 1	New Appendix 1 with requirements for calculations of lifting sets has been introduced	382-08-1504c of 08.02.2021	08.02.2021
29	Rules for Technical Supervision During Manufacture of Containers	The text of the Rules has been completely revised considering General Regulations for the Technical Supervision of Containers	382-08-1504c of 08.02.2021	08.02.2021
30	Rules for Technical Supervision of Containers in Service, para 3.4.5.1.3.3	Requirements for frangible disks have been specified	382-08-1504c of 08.02.2021	08.02.2021

**COLLECTION OF THE RULES FOR CONTAINERS, 2021,**  
**ND 2-090201-012-E**

**GENERAL REGULATIONS FOR THE TECHNICAL SUPERVISION OF CONTAINERS**

**2 TECHNICAL SUPERVISION**

1 **Table 2.1.2** is replaced by the following text:

"Table 2.1.2

Code of item of technical supervision	Name of item of technical supervision	Branding
30000000MK	<b>Containers</b>	
30010000MK	General freight containers	K
30020000MK	Thermal containers	K
30030000MK	Tank-containers	K
30030100MK	Tank-containers with fiber-reinforced plastic shell	K
30040000MK	Platform containers	K
30040100MK	Platform-based containers	K
30050000MK	Non-pressurized solid bulk containers	K
30060000MK	Named-cargo containers	K
30070000	Offshore containers	K
30070000MK	Offshore containers (if covered by the requirements of International Codices and/or Conventions)	K
30080000	Auxiliary offshore containers	K
30080000MK	Auxiliary offshore containers (if covered by the requirements of International Codices and/or Conventions)	K
30100000MK	Open top containers	K
30110000MK	Dry bulk tank containers	K
30120000MK	Containers capable of being folded	K

"

2 **Table 2.1.3** is replaced by the following text:

"Table 2.1.3

Code of item of technical supervision	Name of item of technical supervision	Group of item of technical supervision (1 — 5)	Branding
50000000	<b>Materials and products for containers</b>		
50010000	<b>Materials for containers</b>		
50010100	Sheet steel for tanks <sup>1</sup>	3M	K <sup>2</sup>
50010200	Rolled metal for manufacturing of pad eyes for offshore containers	3M	K <sup>2</sup>
50010300	Rolled metal for manufacturing of container framework members	1M	—
50020000	<b>Products for containers</b>		
50020100	End frames <sup>3</sup>	3	K <sup>2</sup>
50020200	Corner and intermediate fittings	4	K <sup>2</sup>
50020300	Shell (vessel) of tank containers <sup>3</sup>	3	K
50020310	Tank heads <sup>3</sup>	3	K
50020320	Tank shells <sup>3</sup>	3	K
50020400MK	Container fittings		
50020410MK	Tank hatches <sup>1</sup>	3	—
50020420MK	Frangible disks <sup>1</sup>	1	—
50020430MK	Fusible elements <sup>1</sup>	1	—
50020440MK	Pressure-relief (safety) valves <sup>1</sup>	3	—
50020450MK	Vacuum valves <sup>1</sup>	3	—
50020460MK	Stop valves of tank <sup>1</sup>	3	—
50020500MK	Covers for containers	2	—
50020600MK	Ropes for fastening a cover to a container	2	—
50020700	Lifting set for offshore containers	3	K
50020800	Components of lifting set for offshore containers <sup>3</sup>	3	K <sup>2</sup>
50020900	Refrigerating and/or heating appliances of a container	3	—
50021000	Supports for NiS material ingot <sup>3</sup>	1	—
15110101	(Electrical) sensors and indicators of level <sup>1</sup>	2	—
14000000	Welding consumables <sup>4</sup>	2M	—
<sup>1</sup> For tank containers that are intended for the carriage of dangerous goods. <sup>2</sup> On each material and product tested under RS technical supervision. <sup>3</sup> For products supplied separately under cooperation agreement for assembly of containers or as spare parts. <sup>4</sup> Codes of groups "Welding consumables" and relative issued documents refer to Appendix 1, Part I "General Provisions for Technical Supervision" of the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships.  Note. Groups of technical supervision are specified in accordance with Section 5, Part I "General Provisions for Technical Supervision" of the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships.			

3 **Table 2.1.4** is replaced by the following text:

"Table 2.1.4

Stage of technical supervision during manufacture of containers		Forms of technical supervision	
		1	2
Prototype (first lot)	Approval of technical documentation	x	
	Examination of welders, approval of welding consumables and welding procedures. Inspection of availability of internal monitoring system during manufacture of containers	x	
	Technical supervision during manufacture	x	
	Technical supervision during testing in the scope prescribed for a prototype	x	
	Survey of finished container(s)	x	
	Branding	x	
	Documents issued by RS	СОД and С <sup>1</sup>	СОД and С <sup>1</sup>
Type-series container <sup>2</sup>	Survey of the firm	–	СПИ
	Technical supervision during manufacture	x	–
	Technical supervision during testing to confirm manufacture stability	x	x
	Technical supervision during testing at serial manufacture	x	– <sup>3</sup>
	Survey of finished container(s)	x	x
	Branding	x	x
	Documents issued by RS	С <sup>1</sup>	С <sup>1</sup>
<sup>1</sup> Except for form 6.5.30. <sup>2</sup> Serial manufacture of containers is carried out upon positive results of manufacture and test of a prototype (first lot). <sup>3</sup> Required for tank containers and offshore containers.  <b>Notes.</b> 1. "x" means "required", "–" means "not required". 2. Requirements for firms (manufacturers) of containers to receive СПИ are specified in 1.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers. 3. Requirements for the scope of survey are specified in the Rules for Technical Supervision during Manufacture of Containers, Materials and Products for Containers.			

4 **Table 2.1.5** is replaced by the following text:

"Table 2.1.5

Code	Name of activities	Documents issued by RS
40000000	<b>Types of activities of the firms (service providers) on containers</b>	
40000001	Repair and modernization of tank containers	ССП or СП
40000002	Repair and modernization of containers except for tank containers	ССП or СП
40000003МК	Test of containers	СПЛ
40000004МК	Freight containers examination/inspection (except for tank containers) in service in compliance with the CSC requirements	СПО
40000005МК	Confirmation of gross mass of containers	СП
40000006	Preparation and tests of tank containers for periodical survey	ССП or СП
40000007	Design engineering services for containers and associated products <sup>1</sup>	ССП
<sup>1</sup> Carried out on a voluntary basis.  <b>Note.</b> Requirements for firms, excluding testing laboratories, are specified in Sections 4, 6 and 7 of the Rules for Technical Supervision of Containers in Service.		

### 3 TECHNICAL DOCUMENTATION

5 **Paras 3.1.2 and 3.1.3** are replaced by the following text:

**"3.1.2** In general, the Register review of the documentation set specified in the relevant parts of the Rules for the Manufacture of Containers takes 30 working days.

In case the documentation is submitted by parts, its review takes 30 working days from the date of receiving the last portion.

Duration of the documentation review may be reduced/extended upon agreement by the parties in each particular case.

The procedure, place, terms and other conditions of technical documentation review by the Register shall be determined upon agreement with the RS Branch Office responsible for review of technical documentation.

**3.1.3** Any amendments to the technical documentation approved (agreed) by the Register that may relate to the requirements regulated by the RS rules or international conventions shall be approved (agreed) by the Register based on the results of review of the appropriate notifications on the amendments or of the reissued amended documents.

The amendments shall be detailed or specified in the amended documents, plans."

## RULES FOR THE MANUFACTURE OF CONTAINERS

### PART I. BASIC REQUIREMENTS

#### 2 GENERAL TECHNICAL DATA

6 Table **2.1.2**. In the second column for items "1EEE" and "1AAA" the value  $2869_{-5}^0$  is replaced by  $2896_{-5}^0$ , in the fourth column for items "1BBB" — "1BX" the value  $9215_{-10}^0$  is replaced by  $9125_{-10}^0$ .

7 **Para 2.6.4.7** is replaced by the following text:

**"2.6.4.7** Cargo securing devices shall provide, on all sides, an unobstructed access to allow for:

passage of the through the aperture of cargo securing devices, or attachment of restraint fixtures such as hooks, clips, shackles, etc."

#### 3 MATERIALS AND WELDING

8 **Table 3.2.7**. Between strength grade items "355" and "390" a new item is introduced reading as follows:

Strength grade	Yield stress $R_e$ , MPa, min.	Tensile strength $R_m$ , MPa, min.	Elongation, %, min.	Average impact energy $KV_L$ at minimum working temperature, J, min	Average impact energy $KV_T$ at minimum working temperature, J, min
375	375	510	20	37	25

9 **Para 3.3.4** is replaced by the following text:

**"3.3.4** The materials with thickness of 6 mm shall be impact tested with V-type notch at minimum operating temperature of the tank container. The minimum value of impact energy obtained during testing of each specimen shall not be less than 27 J for transverse specimens and 41 J for longitudinal specimens.



Notes: 1. Impact tests for austenitic steels shall not be performed unless it is specified in the technical documentation.

2. The dimensions of test specimens and the impact test procedure shall comply with 3.2.8."

10 **Para 3.3.7** is deleted.

11 Note to **para 3.7.1** is deleted.

## **PART II. GENERAL FREIGHT CONTAINERS**

### **1 GENERAL**

12 **Para 1.4.1** is replaced by the following text:

**"1.4.1** Scope of technical documentation submitted for review as applicable for general freight containers shall comprise:

.1 technical conditions or technical specification (for firms for which the development of technical conditions is not provided according to the applied normative documents) of the container with description of its purpose, structure, technical characteristics, mechanical properties of materials involved, with indication of manufacturers of the components purchased from external suppliers, adopted welding procedures, etc.;

.2 test program and test procedure for type-series containers;

.3 the State Health Authorities approval of the floor material and its antiseptic impregnation, coverings and sealants (if necessary);

.4 drawings of the following parts, assemblies and general views, inclusive of all the specified dimensions:

.4.1 corner fittings (during manufacture of containers at the manufacturer's);

.4.2 door locks (during manufacture of containers at the manufacturer's);

.4.3 ventilation arrangements (during manufacture of containers at the manufacturer's);

.4.4 corner posts;

.4.5 top and bottom end rails;

.4.6 base and roof latitudinal rails;

.4.7 roof;

.4.8 base with bottom corner fittings and "gooseneck" tunnel (if applicable);

.4.9 floor (fastening, caulking, size of panels and boards, construction of planking);

.4.10 doors assembled with gaskets and locks;

.4.11 units covered by the CCC requirements;

.4.12 CSC and CCC plates;

.4.13 general views and markings of the container;

.4.14 roof and detachable bows for affixing the container sheet;

.4.15 container sheet with views of seams and edges, wire rope with end-pieces for affixing of the Customs seals;

.4.16 locks of top rails (if the rails are removable);

.4.17 cargo securing arrangements of the container, if any;

.4.18 specifications.

Notes: 1. Requirements of 1.4.1.4.14 — 1.4.1.4.16 are applicable only to general freight containers with the open top.

2. The extent of the above documentation is the minimum required."

## **PART III. THERMAL CONTAINERS**

### **1 GENERAL**

13 **Para 1.4.1** is replaced by the following text:

**"1.4.1** Scope of technical documentation submitted for review shall comply with the applied requirements of 1.4, Part II "General Freight Containers" for thermal containers as well as with the requirements of this Chapter:

- .1** drawings of thermal insulation;
- .2** thermal calculations (except for insulated containers);
- .3** information of the manufacturer, model and characteristics of the refrigerating and/or heating plants;
- .4** program and procedure for thermal tests indicating values which shall be attained (may be developed by a testing laboratory during the test preparation);
- .5** documentation in compliance with 1.4.2, when the refrigerating and/or heating plants are approved together with the container.

**N o t e .** The extent of the above documentation is the minimum required."

## **PART IV. TANK CONTAINERS**

### **1 GENERAL**

14 **Para 1.4.1** is replaced by the following text:

**"1.4.1** Scope of technical documentation submitted for review as applicable for tank containers shall comprise:

- .1** technical conditions or technical specification (for firms for which the development of technical conditions is not provided according to the applied normative documents) of the container with description of its type and purpose (cargoes carried in accordance with 1.4.1.3) applicable normative documents, technical characteristics, materials used and their strength properties including welding consumables, types of welds and methods of their inspection (where weld control scheme is unavailable);
- .2** calculations of the framework (frame members) and tank, including calculations using finite element method in accordance with the requirements of 2.2.3, 2.2.4 and 3.7, and calculations of safety devices, piping, thermotechnical calculations (containers for refrigerated liquefied gases);

**N o t e .** It is permitted not to perform calculations according to 3.7 in case strain-gauging is done during strength testing of the tank.

**.3** list of hazard categories of cargo or a list of goods (when this requirement is available in the rules on the transportation of goods, national or international normative documents), cargoes that may be carried in a tank container.

**N o t e .** In addition, the Register may request the documents to verify the resistance of materials of a container, its fittings and seals for the goods.

**.4** program and procedure for testing of the series-type containers.

**.4.1** The program and procedure of thermotechnical tests shall be additionally submitted by the testing laboratory for containers carrying refrigerated liquefied gases (estimation of reference holding time and effectiveness of the insulation system);

**.5** operation manual (instructions) (to the extent sufficient for verifying the observance of the requirements of the Register rules);

.6 drawings of the following parts, assemblies, their general views, inclusive of all the specified dimensions and materials used:

.6.1 corner fittings (during manufacture of containers at the manufacturer's);

.6.2 framework (corner posts, attachments of the tank to the framework, top and bottom side and end rails, walkways and ladders);

.6.3 tank or tanks;

.6.4 hatch and manhole covers (during manufacture of containers at the manufacturer's);

.6.5 piping;

.6.6 cargo refrigerating and/or heating systems;

.6.7 items covered by the CCC requirements;

.6.8 CSC and CCC Plates;

.6.9 plate bearing the particulars of tank;

.6.10 general views of the container and its marking;

.7 summary table of welded joint types and their structural elements where this information is unavailable on the drawings;

.8 weld control scheme where this information is unavailable on the drawings or in design/technical specification.

Note. The extent of the above documentation is the minimum required."

### 3 TESTING

15 Para 3.7.7. Stress value 0,315 is replaced by 0,375.

16 Para 3.7.8 is replaced by the following text:

"3.7.8 If the results of pressure test are satisfactory, the tank assembled with operational and safety fittings with standard service equipment shall be subjected to leakproofness test.

The test is performed using pressurized air. The test pressure shall be taken with regard to the valid safety requirements relevant to the test location and shall be 0,25 to 0,9 times the maximum allowable working pressure, subject to special consideration by the Register in each particular case.

For tank-containers intended for transportation of non-refrigerated liquefied gases, the test pressure should be taken at least 0,9 times the maximum allowable working pressure.

A tank container shall be under pressure during a period of time necessary to enable a complete inspection of the tank and its fittings but not less than 5 min. Other tank leakproofness test procedures may be used, subject to the Register approval."

### 4 MARKING

17 Para 4.4.2.1.1 is replaced by the following text:

".1 the pressure at which the valve is set to discharge (MPa or bar) or an operational temperature range (°C);".

## PART V. PLATFORM CONTAINERS AND PLATFORM-BASED CONTAINERS

### 1 GENERAL

18 Para 1.4.1 is replaced by the following text:

"1.4.1 Scope of technical documentation submitted for review as applicable for platform containers and platform-based containers shall comprise:

.1 technical conditions or technical specification (for firms for which the development of technical conditions is not provided according to the applied normative documents) of the container with description of its purpose, structure, technical characteristics, mechanical properties of materials

involved, with indication of manufacturers of the components purchased from external suppliers, adopted welding procedures;

.2 test program and test procedure for type-series containers;

.3 State Health Authorities approval of the coverings, the floor material with antiseptic impregnation, and the sealants (if necessary);

.4 drawings of the following parts, assemblies and general views, inclusive of the specified dimensions:

.4.1 corner fittings (during manufacture of containers at the firm's (manufacturer's) works);

.4.2 bottom side rails;

.4.3 bottom end rails;

.4.4 corner posts (if applicable);

.4.5 base structure with corner fittings, and the "gooseneck" tunnels (if applicable);

.4.6 end walls, if provided (if applicable);

.4.7 hinges and locking devices of end walls, in case of folding end structure;

.4.8 interlocking devices connecting similar empty platform containers or platform-based containers with folding ends to form a pile (module);

.4.9 securing devices for cargo (if applicable);

.4.10 floor (fastening, caulking, size of panels and boards, construction of planking);

.4.11 CSC Plate;

.4.12 CCC Plates (if applicable);

.4.13 framework;

.4.14 general views and markings of containers.

Note. The extent of the above documentation is the minimum required."

## **PART VI. NON-PRESSURIZED DRY BULK CONTAINERS**

### **1 GENERAL**

19 **Para 1.4.1** is replaced by the following text:

"**1.4.1** Scope of technical documentation submitted for review as applicable for non-pressurized dry bulk containers shall comprise:

.1 technical conditions or technical specification (for firms for which the development of technical conditions is not provided according to the applied normative documents) of the container with description of its purpose, structure, technical characteristics, mechanical properties of materials involved, with indication of manufacturers of the components purchased from external suppliers, adopted welding procedures;

.2 test program and test procedure for type-series containers;

.3 State Health Authorities approval of the floor material with antiseptic impregnation, covering and materials (if necessary);

.4 drawings of the following parts, assemblies and general views, inclusive of the specified dimensions:

.4.1 corner fittings (during manufacture of containers at the firm's (manufacturer's) works);

.4.2 door locks and closures of manholes (during manufacture of containers at the firm's (manufacturer's) works);

.4.3 walls;

.4.4 corner posts;

.4.5 top and bottom side rails;

.4.6 top and bottom end rails;

.4.7 roof and manhole (if applicable);

.4.8 base structure with bottom corner fittings and gooseneck tunnel (if applicable);

.4.9 floor (fastening, caulking, size of panels and boards, construction of planking);

.4.10 doors with their gaskets, locks and manholes (if applicable);

.4.11 items covered by CCC requirements;

.4.12 CSC and CCC Plates;

.4.13 general views and markings of the container.

Note . The extent of the above documentation is minimum required."

## PART VII. OFFSHORE CONTAINERS

### 1 GENERAL

20 **Para 1.4.1** is replaced by the following text:

**"1.4.1** Scope of technical documentation submitted for review as applicable for offshore containers shall comprise:

.1 technical conditions or technical specification (for firms for which the development of technical conditions is not provided according to the applied normative documents) of the container with description of its purpose, structure, technical characteristics, mechanical properties of materials involved, with indication of manufacturers of the components purchased from external suppliers, adopted welding procedures;

.2 operation manual (instruction) (to the extent sufficient for verifying the observance of the requirements of the Register rules);

.3 program and procedure for testing of the prototype and series-type containers;

.4 primary structure and secondary structure strength calculations using finite element method;

.5 pad eyes strength and fork lift pockets calculations (if applicable);

.6 drawings of parts, assemblies, general views, marking and plates, including materials and thickness, welding procedures and welded joints dimensions;

.7 weld control scheme where this information is unavailable on the drawings.

Note . The extent of the above documentation is the minimum required."

### 2 TECHNICAL REQUIREMENTS

21 **Para 2.2.1** is replaced by the following text:

**"2.2.1** Pad eye structure shall consider size and form of the shackle to be applied, in particular, shackle pin diameter, inner width and length of the shackle as well as free space necessary to install the shackle. General view of a pad eye is shown in Fig. 2.2.1-1.

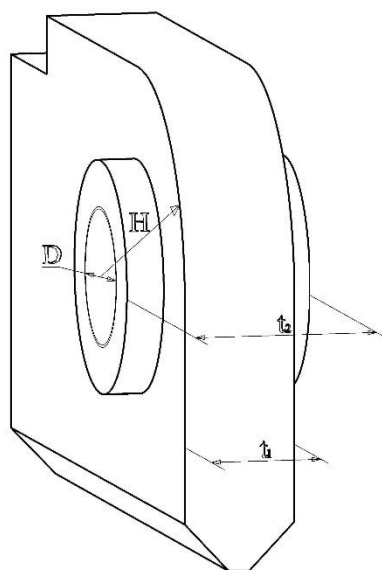


Fig. 2.2.1-1  
Pad eye

Shackles are usually designed according to one of the common standards indicated in 9.4.4. Standard shackle sizes according to EN 13889 are given in Table 2.2.1, however, some shackle manufacturers use their own standards, with different design and sizes of shackles.

Table 2.2.1

Nominal WLL	Pin diameter <sup>1</sup>	Inside width at pin	Inside length of dee shackles	Inside length of bow shackles
<i>WLLs</i> , t	<i>Dn</i> , mm	<i>Wn</i> , mm	<i>S</i> , mm	<i>S</i> , mm
3,25	19	27	47	57
4,75	22	31	52	65
6,5	25	36	65	76
8,5	28	43	74	88
9,5	32	46,5	83	101
12	35	51,5	87	108
13,5	38	57	104	126
17	42	60	115	139
25	50	74	139	168

<sup>1</sup> According to 9.4.4 the shackle pins shall have a tolerance of -0/+3 % on the diameter.

Since screw pin shackles are not allowed, the pad eyes shall be located so that there is sufficient space to fit shackles with pin, nut and split cotter pins."

### 3 STRUCTURAL STRENGTH

22 The second paragraph of **para 3.1.4** is replaced by the following text:

"The deflections when designing other structural members of the container for horizontal shock loads shall not exceed  $ln/250$ , where  $ln$  is the length of the shortest element divided by another structural member of the container, in mm or for one-piece member  $ln$  is an actual length, in mm."

23 **New para 3.1.9** is introduced reading as follows:

**"3.1.9** Where fork pockets are provided in the container structure, the bottom side rails shall be additionally calculated to bear shear stress occurring in dangerous vertical areas above and below the fork pocket.

When lifted from pad eyes, the shear stress shall be calculated according to the formula:

$$\tau = \frac{F_p}{A_1} \quad (3.1.9-1)$$

where  $F_p$  — shear force appeared when lifted from pad eyes, in N;

$A_1$  — vertical area above and below each fork pocket, in mm<sup>2</sup> (refer to Fig. 3.1.9-1).

When lifted from fork pockets, the shear stress shall be calculated according to the formula

$$\tau = \frac{F_f}{A_2} \quad (3.1.9-2)$$

where  $F_f$  — shear force appeared when lifted from fork pockets, in N;

$A_2$  — vertical area above each fork pocket, in mm<sup>2</sup> (refer to Fig. 3.1.9-2)

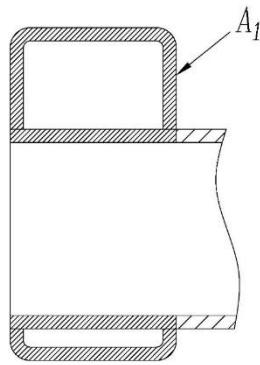


Fig. 3.1.9-1

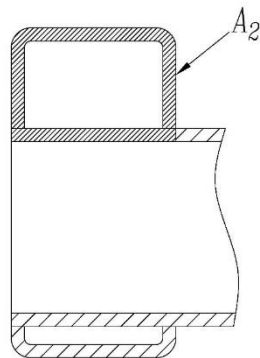


Fig. 3.1.9-2

Permissible shear stress for calculations of bottom side rail with fork pockets shall be determined by the formula

$$\tau_e = 0,58 \cdot 0,85 \cdot R_e \quad (3.1.9-3)$$

where  $R_e$  — yield stress of the pad eye, in MPa."

## 7 MARKING

24 **New para 7.2.3** is introduced reading as follows:

**"7.2.3** An information template with indication of Certificate of Freight Container Safety Approval by Design Type (COД) number shall be welded on each container on the bottom rail from the template side. The plate shall be made of corrosion protection material, rectangular form and at least 150 x 40 mm. The characters shall be at least 10 mm."

## 8 TESTING

25 **Para 8.4.5** is replaced by the following text:

**"8.4.5** Closed containers shall be tested for weathertightness (irrigation) in accordance with the requirements of 3.15, Part II "General Freight Containers".

**N o t e .** Each container shall be subject to testing."

## 9 LIFTING SET

26 **Paras 9.1.2.1.1 and 9.1.2.1.2** are replaced by the following text:

"1 technical conditions or specification (for firms for which the development of technical conditions is not provided according to the applied normative documents) with the data on the standards it complies with, information on accessories, technical characteristics, periodicity and methods of in-service inspections;

.2 assembly drawings of the lifting set, drawings of components and parts (if necessary);".

27 **New para 9.3.4** is introduced reading as follows:

"9.3.4 Examples of calculations for wire rope and chain slings of lifting sets are given in Appendix 1."

28 **New Appendix 1** is introduced reading as follows:

"APPENDIX 1

## CALCULATION OF LIFTING SET SLINGS FOR OFFSHORE CONTAINERS

### 1 CALCULATION OF WIRE ROPE SLINGS

1.1 Calculation of wire rope slings of the lifting set is performed by the following formula:

$$WLL = \frac{BL_{min} \cdot K_T \cdot n \cdot \cos \beta}{5 \cdot g} \quad (1.1)$$

where  $BL_{min}$  = minimum breaking force of the rope, in kN;

$K_T$  = a factor which allows for the efficiency of the ferrule termination, shall be 0,9;

$n$  = a factor that depends on the number of lifting set slings. For one-leg sling (1CK)  $n = 1$ , for two-leg sling (2CK)  $n = 2$ , for four-leg sling (4CK)  $n = 3$ ;

$\beta$  = angle between the lifting set sling and the vertical, in degrees;

$g$  = factor relating mass to force and has the value = 9,81 m/s<sup>2</sup>.

### 1.2 Dimensions of wire rope slings.

1.2.1 Tables 1.2.1-1, 1.2.1-2, 1.2.1-3 and 1.2.1-4 contain values of working load limits (WLL) at different angles for one-, two and four-leg slings with organic core depending on the wire rope diameter.

Table 1.2.1-1

GOST 7668-80, 1770											
Nominal rope diameter	Working load limits (WLL), in t										
	1CK	4CK					2CK				
mm	0°	45°	40°	35°	30°	25°	45°	40°	35°	30°	25°
18,0	3,22	6,83	7,40	7,92	8,37	8,76	4,56	4,94	5,28	5,58	5,84
20,0	3,94	8,37	9,07	9,70	10,25	10,73	5,58	6,05	6,46	6,83	7,15
22,0	4,74	10,07	10,90	11,66	12,32	12,90	6,71	7,27	7,77	8,22	8,60
23,5	5,58	11,84	12,82	13,71	14,49	15,17	7,89	8,55	9,14	9,66	10,11
25,5	6,47	13,73	14,87	15,90	16,81	17,59	9,15	9,91	10,60	11,20	11,73
27,0	7,28	15,44	16,72	17,88	18,90	19,78	10,29	11,15	11,92	12,60	13,19
29,0	8,34	17,70	19,17	20,50	21,67	22,68	11,80	12,78	13,67	14,45	15,12
31,0	9,49	20,13	21,81	23,32	24,65	25,80	13,42	14,54	15,54	16,43	17,20
33,0	10,79	22,90	24,80	26,52	28,03	29,34	15,26	16,53	17,68	18,69	19,56
34,5	11,83	25,10	27,19	29,07	30,73	32,16	16,73	18,12	19,38	20,49	21,44
36,5	12,91	27,39	29,67	31,73	33,54	35,10	18,26	19,78	21,15	22,36	23,40
38,0	14,27	30,27	32,80	35,07	37,07	38,79	20,18	21,86	23,38	24,71	25,86
39,5	15,80	33,53	36,32	38,83	41,05	42,96	22,35	24,21	25,89	27,37	28,64
42,0	17,53	37,21	40,30	43,09	45,56	47,67	24,80	26,87	28,73	30,37	31,78



GOST 7668-80, 1770											
Nominal rope diameter	Working load limits (WLL), in t										
	1CK	4CK					2CK				
43,0	18,44	39,13	42,39	45,33	47,92	50,14	26,09	28,26	30,22	31,94	33,43
44,5	20,09	42,64	46,19	49,39	52,21	54,63	28,43	30,79	32,92	34,81	36,42
46,5	21,65	45,95	49,77	53,22	56,26	58,87	30,63	33,18	35,48	37,51	39,25
48,5	23,67	50,23	54,41	58,18	61,51	64,36	33,49	36,27	38,79	41,00	42,91
50,5	25,69	54,51	59,05	63,14	66,75	69,85	36,34	39,37	42,09	44,50	46,57
53,5	28,81	61,13	66,22	70,81	74,86	78,33	40,76	44,15	47,21	49,90	52,22

Table 1.2.1-2

GOST 7668-80, 1960											
Nominal rope diameter	Working load limits (WLL), in t										
	1CK	4CK					2CK				
mm	0°	45°	40°	35°	30°	25°	45°	40°	35°	30°	25°
18,0	3,50	7,42	8,04	8,59	9,08	9,50	4,95	5,36	5,73	6,06	6,34
20,0	4,28	9,09	9,85	10,53	11,13	11,65	6,06	6,57	7,02	7,42	7,77
22,0	5,15	10,92	11,83	12,65	13,37	14,00	7,28	7,89	8,43	8,92	9,33
23,5	6,20	13,16	14,26	15,24	16,12	16,86	8,77	9,50	10,16	10,74	11,24
25,5	7,03	14,91	16,15	17,27	18,26	19,11	9,94	10,77	11,52	12,17	12,74
27,0	7,90	16,76	18,16	19,42	20,53	21,48	11,18	12,11	12,94	13,68	14,32
29,0	9,06	19,22	20,82	22,26	23,53	24,62	12,81	13,88	14,84	15,69	16,42
31,0	10,30	21,86	23,68	25,32	26,77	28,02	14,58	15,79	16,88	17,85	18,68
33,0	11,72	24,86	26,93	28,80	30,44	31,86	16,57	17,95	19,20	20,30	21,24
34,5	12,84	27,26	29,53	31,57	33,37	34,93	18,17	19,68	21,05	22,25	23,28
36,5	14,02	29,75	32,23	34,46	36,43	38,12	19,83	21,48	22,97	24,28	25,41
38,0	15,45	32,79	35,52	37,97	40,15	42,01	21,86	23,68	25,32	26,76	28,01
39,5	17,16	36,41	39,44	42,17	44,58	46,65	24,27	26,29	28,11	29,72	31,10
42,0	18,90	40,11	43,45	46,45	49,11	51,39	26,74	28,96	30,97	32,74	34,26
43,0	19,82	42,05	45,55	48,71	51,49	53,89	28,04	30,37	32,47	34,33	35,92
44,5	21,74	46,14	49,98	53,44	56,50	59,12	30,76	33,32	35,63	37,67	39,42
46,5	23,49	49,84	53,99	57,73	61,03	63,86	33,23	35,99	38,49	40,69	42,58
48,5	25,60	54,32	58,84	62,92	66,51	69,60	36,21	39,23	41,94	44,34	46,40
50,5	27,71	58,80	63,69	68,10	71,99	75,34	39,20	42,46	45,40	48,00	50,23
53,5	31,28	66,39	71,92	76,90	81,29	85,07	44,26	47,94	51,26	54,19	56,71

Table 1.2.1-3

EN 12385-4, 1770											
Nominal rope diameter	Working load limits (WLL), in t										
	1CK	4CK					2CK				
mm	0°	45°	40°	35°	30°	25°	45°	40°	35°	30°	25°
18,0	3,47	7,36	7,97	8,52	9,01	9,43	4,91	5,31	5,68	6,01	6,29
20,0	4,29	9,11	9,87	10,55	11,16	11,68	6,07	6,58	7,04	7,44	7,78
22,0	5,19	11,02	11,94	12,76	13,49	14,12	7,35	7,96	8,51	9,00	9,41
24,0	6,17	13,08	14,17	15,15	16,02	16,76	8,72	9,45	10,10	10,68	11,18
26,0	7,25	15,38	16,66	17,81	18,83	19,71	10,25	11,11	11,88	12,56	13,14
28,0	8,40	17,83	19,32	20,66	21,84	22,85	11,89	12,88	13,77	14,56	15,23
32,0	10,97	23,29	25,22	26,97	28,51	29,84	15,52	16,82	17,98	19,01	19,89
36,0	13,89	29,48	31,93	34,14	36,09	37,77	19,65	21,29	22,76	24,06	25,18
40,0	17,16	36,41	39,44	42,17	44,58	46,65	24,27	26,29	28,11	29,72	31,10
44,0	20,73	44,00	47,66	50,96	53,88	56,38	29,33	31,78	33,98	35,92	37,59
48,0	24,77	52,57	56,94	60,89	64,37	67,36	35,04	37,96	40,59	42,91	44,90
52,0	28,99	61,52	66,64	71,26	75,33	78,83	41,02	44,43	47,51	50,22	52,55
56,0	33,58	71,26	77,19	82,53	87,25	91,31	47,51	51,46	55,02	58,17	60,87
60,0	38,53	81,77	88,58	94,71	100,12	104,78	54,51	59,05	63,14	66,75	69,85

Table 1.2.1-4

EN 12385-4, 1960											
Nominal rope diameter	Working load limits (WLL), in t										
	1CK	4CK					2CK				
mm	0°	45°	40°	35°	30°	25°	45°	40°	35°	30°	25°
18,0	3,85	8,18	8,86	9,47	10,01	10,48	5,45	5,91	6,31	6,67	6,99
20,0	4,75	10,09	10,92	11,68	12,35	12,92	6,72	7,28	7,79	8,23	8,61
22,0	5,74	12,19	13,20	14,12	14,92	15,62	8,13	8,80	9,41	9,95	10,41
24,0	6,84	14,52	15,73	16,82	17,78	18,61	9,68	10,49	11,22	11,86	12,41
26,0	8,02	17,02	18,43	19,71	20,84	21,80	11,34	12,29	13,14	13,89	14,54
28,0	9,30	19,74	21,39	22,87	24,17	25,30	13,16	14,26	15,24	16,12	16,86
32,0	12,15	25,78	27,92	29,86	31,56	33,03	17,18	18,62	19,90	21,04	22,02
36,0	15,38	32,63	35,35	37,79	39,95	41,81	21,75	23,56	25,20	26,64	27,87
40,0	19,08	40,50	43,87	46,90	49,59	51,89	27,00	29,24	31,27	33,06	34,59
44,0	22,94	48,67	52,73	56,38	59,60	62,37	32,45	35,15	37,58	39,73	41,58
48,0	27,34	58,02	62,85	67,20	71,04	74,34	38,68	41,90	44,80	47,36	49,56
52,0	32,11	68,14	73,82	78,93	83,44	87,31	45,43	49,21	52,62	55,62	58,21
56,0	37,25	79,05	85,63	91,55	96,79	101,28	52,70	57,08	61,04	64,52	67,52
60,0	42,75	90,73	98,28	105,08	111,09	116,25	60,48	65,52	70,06	74,06	77,50

**1.2.2** Tables 1.2.2-1, 1.2.2-2, 1.2.2-3 and 1.2.2-4 contain working load limits (WLL) at different angles for one-, two- and four-leg slings with metal core depending on the rope diameter.

Table 1.2.2-1

GOST 7669-80, 1770(180)											
Nominal rope diameter	Working load limits (WLL), in t										
	1CK	4CK					2CK				
mm	0°	45°	40°	35°	30°	25°	45°	40°	35°	30°	25°
16,0	3,03	6,42	6,96	7,44	7,87	8,23	4,28	4,64	4,96	5,24	5,49
17,5	3,60	7,63	8,27	8,84	9,34	9,78	5,09	5,51	5,89	6,23	6,52
19,5	4,45	9,44	10,23	10,94	11,56	12,10	6,30	6,82	7,29	7,71	8,07
21,0	5,31	11,27	12,21	13,06	13,80	14,44	7,52	8,14	8,70	9,20	9,63
23,0	6,26	13,28	14,38	15,38	16,26	17,01	8,85	9,59	10,25	10,84	11,34
25,0	7,27	15,42	16,70	17,86	18,88	19,76	10,28	11,14	11,91	12,59	13,17
26,5	8,15	17,29	18,73	20,02	21,17	22,15	11,53	12,49	13,35	14,11	14,77
28,0	9,29	19,72	21,36	22,84	24,15	25,27	13,15	14,24	15,23	16,10	16,85
30,0	10,62	22,55	24,42	26,11	27,61	28,89	15,03	16,28	17,41	18,40	19,26
32,5	12,14	25,76	27,90	29,83	31,54	33,00	17,17	18,60	19,89	21,03	22,00
35,5	14,45	30,66	33,22	35,52	37,55	39,29	20,44	22,14	23,68	25,03	26,19
36,5	16,10	34,17	37,01	39,58	41,84	43,78	22,78	24,68	26,38	27,89	29,19
39,0	17,84	37,87	41,02	43,86	46,37	48,52	25,25	27,35	29,24	30,91	32,35
41,0	19,72	41,86	45,34	48,48	51,25	53,64	27,91	30,23	32,32	34,17	35,76
42,0	20,92	44,39	48,09	51,41	54,35	56,88	29,59	32,06	34,28	36,24	37,92
45,5	24,59	52,18	56,52	60,43	63,89	66,86	34,79	37,68	40,29	42,59	44,57
49,0	28,90	61,33	66,43	71,03	75,09	78,58	40,89	44,29	47,36	50,06	52,39
52,0	32,39	68,73	74,45	79,60	84,15	88,06	45,82	49,63	53,07	56,10	58,71

Table 1.2.2-2

GOST 7669-80, 1960(200)											
Nominal rope diameter	Working load limits (WLL), in t										
	1CK	4CK					2CK				
mm	0°	45°	40°	35°	30°	25°	45°	40°	35°	30°	25°
16,0	3,28	6,95	7,53	8,05	8,51	8,91	4,63	5,02	5,37	5,67	5,94
17,5	3,91	8,29	8,98	9,61	10,16	10,63	5,53	5,99	6,40	6,77	7,08
19,5	4,83	10,24	11,09	11,86	12,54	13,12	6,83	7,40	7,91	8,36	8,75
21,0	5,75	12,21	13,22	14,14	14,95	15,64	8,14	8,82	9,43	9,96	10,43
23,0	6,76	14,35	15,54	16,62	17,57	18,39	9,57	10,36	11,08	11,71	12,26
25,0	7,87	16,70	18,10	19,35	20,45	21,40	11,14	12,06	12,90	13,64	14,27
26,5	8,82	18,71	20,27	21,67	22,91	23,97	12,47	13,51	14,45	15,27	15,98
28,0	10,05	21,32	23,09	24,69	26,10	27,32	14,21	15,40	16,46	17,40	18,21
30,0	11,50	24,41	26,45	28,28	29,89	31,28	16,28	17,63	18,85	19,93	20,86

GOST 7669-80, 1960(200)											
Nominal rope diameter	Working load limits (WLL), in t										
	1CK	4CK					2CK				
mm	0°	45°	40°	35°	30°	25°	45°	40°	35°	30°	25°
16,0	3,28	6,95	7,53	8,05	8,51	8,91	4,63	5,02	5,37	5,67	5,94
32,5	13,14	27,88	30,20	32,29	34,14	35,72	18,59	20,13	21,53	22,76	23,82
35,5	15,64	33,20	35,96	38,45	40,65	42,53	22,13	23,97	25,63	27,10	28,36
36,5	17,43	36,99	40,07	42,85	45,29	47,40	24,66	26,71	28,56	30,20	31,60
39,0	19,17	40,69	44,08	47,13	49,82	52,14	27,13	29,39	31,42	33,22	34,76
41,0	21,47	45,56	49,35	52,77	55,78	58,38	30,37	32,90	35,18	37,19	38,92
42,0	22,66	48,09	52,09	55,70	58,88	61,62	32,06	34,73	37,13	39,26	41,08
45,5	26,70	56,66	61,37	65,62	69,37	72,60	37,77	40,91	43,75	46,25	48,40
49,0	31,28	66,39	71,92	76,90	81,29	85,07	44,26	47,94	51,26	54,19	56,71
52,0	34,95	74,18	80,35	85,92	90,83	95,05	49,45	53,57	57,28	60,55	63,36

Table 1.2.2-3

EN 12385-4, 1770											
Nominal rope diameter	Working load limits (WLL), in t										
	1CK	4CK					2CK				
mm	0°	45°	40°	35°	30°	25°	45°	40°	35°	30°	25°
18,0	3,74	7,94	8,60	9,20	9,73	10,18	5,30	5,74	6,13	6,48	6,79
20,0	4,62	9,81	10,63	11,37	12,01	12,57	6,54	7,09	7,58	8,01	8,38
22,0	5,60	11,88	12,86	13,76	14,54	15,22	7,92	8,58	9,17	9,69	10,15
24,0	6,66	14,13	15,31	16,37	17,31	18,11	9,42	10,21	10,91	11,54	12,07
26,0	7,82	16,59	17,97	19,21	20,31	21,25	11,06	11,98	12,81	13,54	14,17
28,0	9,06	19,24	20,84	22,28	23,55	24,65	12,82	13,89	14,85	15,70	16,43
32,0	11,83	25,12	27,21	29,09	30,75	32,18	16,74	18,14	19,39	20,50	21,45
36,0	14,99	31,81	34,46	36,85	38,95	40,76	21,21	22,97	24,56	25,97	27,18
40,0	18,53	39,33	42,60	45,55	48,16	50,39	26,22	28,40	30,37	32,10	33,60
44,0	22,39	47,51	51,46	55,02	58,17	60,87	31,67	34,31	36,68	38,78	40,58
48,0	26,61	56,46	61,16	65,40	69,13	72,35	37,64	40,77	43,60	46,09	48,23
52,0	31,19	66,20	71,71	76,67	81,05	84,82	44,13	47,80	51,11	54,04	56,55
56,0	36,33	77,10	83,52	89,30	94,40	98,79	51,40	55,68	59,53	62,94	65,86
60,0	41,65	88,39	95,75	102,38	108,23	113,26	58,93	63,83	68,25	72,15	75,51

Table 1.2.2-4

EN 12385-4, 1960											
Nominal rope diameter	Working load limits (WLL), in t										
	1CK	4CK					2CK				
mm	0°	45°	40°	35°	30°	25°	45°	40°	35°	30°	25°
18,0	4,15	8,80	9,53	10,19	10,78	11,28	5,87	6,36	6,80	7,18	7,52
20,0	5,12	10,86	11,77	12,58	13,30	13,92	7,24	7,85	8,39	8,87	9,28
22,0	6,20	13,16	14,26	15,24	16,12	16,86	8,77	9,50	10,16	10,74	11,24
24,0	7,38	15,65	16,96	18,13	19,17	20,06	10,44	11,30	12,09	12,78	13,37
26,0	8,66	18,38	19,91	21,29	22,50	23,55	12,25	13,27	14,19	15,00	15,70
28,0	10,04	21,30	23,07	24,67	26,08	27,29	14,20	15,38	16,45	17,39	18,19
32,0	13,12	27,84	30,16	32,25	34,09	35,67	18,56	20,11	21,50	22,73	23,78
36,0	16,59	35,20	38,13	40,77	43,10	45,10	23,47	25,42	27,18	28,73	30,07
40,0	20,55	43,61	47,24	50,51	53,40	55,88	29,07	31,49	33,68	35,60	37,25
44,0	24,77	52,57	56,94	60,89	64,37	67,36	35,04	37,96	40,59	42,91	44,90
48,0	29,54	62,69	67,91	72,61	76,76	80,33	41,79	45,27	48,41	51,17	53,55
52,0	34,68	73,59	79,72	85,24	90,11	94,30	49,06	53,15	56,83	60,07	62,87
56,0	40,18	85,28	92,37	98,77	104,42	109,27	56,85	61,58	65,85	69,61	72,84
60,0	46,06	97,74	105,87	113,20	119,67	125,23	65,16	70,58	75,47	79,78	83,49

## 2 CALCULATION OF CHAIN SLINGS

2.1 Calculation on chain slings is performed by the formula

$$WLL = \frac{0,5 \cdot \pi \cdot 200 \cdot d_{nom}^2 \cdot n \cdot \cos \beta}{1000 \cdot g} \quad (2.1)$$

where  $\pi$  = mathematical constant,  $\pi = 3,14$ ;

$d_{nom}$  = caliber of chain links (nominal link thickness), in mm;

$n$  = factor that depends on the number of lifting set slings. For one-leg sling (1CK)  $n = 1$ , for two-leg sling (2CK)  $n = 2$ , for four-leg sling (4CK)  $n = 3$ ;

$\beta$  = angle between the lifting set sling and the vertical, in degrees;

$g$  = factor relating mass to force and has the value  $g = 9,81 \text{ m/s}^2$ .

## 2.2 Dimensions of chain slings.

2.2.1 Table 2.2.1-1 contains values of working load limits (WLL) at different angles for one-, two- and four-leg chain strings depending on the chain caliber.

Table 2.2.1-1

EN 818-4, grade 8											
Caliber of chain link	Working load limits (WLL), in t										
	1CK	4CK					2CK				
mm	0°	45°	40°	35°	30°	25°	45°	40°	35°	30°	25°
10,00	3,15	6,68	7,24	7,74	8,19	8,57	4,46	4,83	5,16	5,46	5,71
13,00	5,30	11,25	12,18	13,03	13,77	14,41	7,50	8,12	8,68	9,18	9,61
16,00	8,00	16,98	18,39	19,66	20,79	21,75	11,32	12,26	13,11	13,86	14,50
18,00	10,00	21,22	22,99	24,58	25,98	27,19	14,15	15,33	16,39	17,32	18,13
19,00	11,20	23,77	25,75	27,53	29,10	30,46	15,85	17,16	18,35	19,40	20,30
20,00	12,50	26,53	28,74	30,72	32,48	33,99	17,68	19,16	20,48	21,65	22,66
22,00	15,00	31,83	34,48	36,87	38,98	40,79	21,22	22,99	24,58	25,98	27,19
23,00	16,00	33,95	36,78	39,33	41,58	43,51	22,64	24,52	26,22	27,72	29,00
25,00	20,00	42,44	45,98	49,16	51,97	54,38	28,30	30,65	32,77	34,65	36,26
26,00	21,20	44,99	48,73	52,11	55,09	57,65	29,99	32,49	34,74	36,73	38,43
28,00	25,00	53,05	57,47	61,45	64,96	67,98	35,37	38,31	40,97	43,31	45,32
32,00	31,50	66,85	72,41	77,43	81,85	85,65	44,57	48,28	51,62	54,57	57,10
36,00	40,00	84,89	91,95	98,32	103,94	108,77	56,59	61,30	65,55	69,29	72,51
40,00	50,00	106,11	114,94	122,90	129,92	135,96	70,74	76,63	81,93	86,62	90,64
45,00	63,00	133,70	144,83	154,85	163,70	171,31	89,13	96,55	103,24	109,14	114,21

## RULES FOR TECHNICAL SUPERVISION DURING MANUFACTURE OF CONTAINERS

29 RULES FOR TECHNICAL SUPERVISION DURING MANUFACTURE OF CONTAINERS are replaced by the following text:

### "RULES FOR TECHNICAL SUPERVISION DURING MANUFACTURE OF CONTAINERS, MATERIALS AND PRODUCTS FOR CONTAINERS

#### 1 GENERAL REGULATIONS FOR THE TECHNICAL SUPERVISION

##### 1.1 APPLICATION

1.1.1 The present Rules for Technical Supervision during Manufacture of Containers (hereinafter referred to as these Rules) are applied by the Russian Maritime Register of Shipping (hereinafter referred to as the Register) during technical supervision of the manufacture of containers of various types as well as associated materials and products.

1.1.2 The requirements of the Rules are mandatory for all firms and individuals involved in design, manufacture and testing of containers and/or engaged in the manufacture of materials and products for them. When the technical supervision is performed in other countries the provisions of

the Rules may be applied regarding salient features and differences in the in the production processes typical of each particular country.

**1.1.3** The Nomenclature of Items of the Register Technical Supervision (hereinafter referred to as the Nomenclature) of containers manufacture is given in Table 2.1.2 of the General Regulations for the Technical Supervision of Containers.

**1.1.4** The RS nomenclature during manufacture of materials and products for containers is given in Table 2.1.3 of the General Regulations for the Technical Supervision of Containers.

**1.1.5** Matters not covered by the Rules are settled by the Register Head Office (RHO).

**1.1.6** Interpretation of provisions herein is within the RHO terms of reference.

## **1.2 DEFINITIONS, ABBREVIATIONS AND EXPLANATIONS**

**1.2.1** Definitions, abbreviations and explanations related to the general terminology of the Rules are given in 1.1 of the General Regulations for the Technical Supervision of Containers. The following definitions and explanations have been adopted.

**Vacuum infusion** means FRP manufacture method by impregnation of dry fillers, preliminarily manually or automatically placed under vacuum bag.

**Products** mean machinery, appliances, pressure vessels, apparatuses, devices, items of equipment or outfit intended for the containers covered by the requirements of the Rules.

**Contact molding** means a process of FRP manufacture by means of filler placing in a mold and impregnation. Curing proceeds at room temperature using a catalyst-promoter system or by heating, and no additional pressure is applied.

**Laminate** means a product made by bonding together two or more layers of material or materials.

**Tape** means a large number of rovings interconnected by cross-linking. It is applied to filament winding technology.

**Materials** mean metal, welding, sealing materials, fiber reinforced materials, plastics, wood, plywood, clothes covered by the requirements of the Rules.

**Resin transfer molding (RTM method)** means FRP manufacture method in airproof molds using overpressure for fiber impregnation.

**Type-series (production) sample** is a sample of a container batch or product batch manufactured as per the technology adopted by the firm (manufacturer) for mass production, where it is tested for its compliance with the pilot specimen (prototype) according to the technical documentation approved by the Register.

### **1.2.2 Explanations.**

Containers, materials and products for containers are considered as the items of the RS technical supervision in these Rules.

## **1.3 GENERAL**

**1.3.1** The purpose of the technical supervision is to determine and to establish compliance of items of technical supervision with the RS requirements.

**1.3.2** All technical supervision services are rendered by the Register based on requests and agreements with organizations, firms and individuals involved in manufacture of items of the RS technical supervision (refer to 1.5).

**1.3.3** Items of the Register technical supervision are given in Table 2.1.2 and 2.1.3 of the General Regulations for the Technical Supervision of Containers, technical requirements applicable thereto are defined in the Rules for the Manufacture of Containers.

**1.3.4** Items of the RS technical supervision as well as production processes other than provided for in these Rules where special requirements are placed thereupon are specified by the Register as items of technical supervision in each particular case, and technical requirements for such items are specified as additional requirements.

Later, based on the results of technical supervision during manufacture and in service, the items of technical supervision may be introduced into the relevant parts of the RS rules and the RS Nomenclature.

**1.3.5** Scope of technical supervision is established by the following provisions of these Rules.

**1.3.6** A possibility of deviations from the RS requirements, where application of those requirements, methods and scope of supervision prescribed by RS is impracticable or unreasonable, is decided by RHO upon a request of the RS Branch Office responsible for carrying out technical supervision.

**1.3.7** During technical supervision surveyor may allow deviations from the approved technical documentation only within his/her authorization scope.

**1.3.8** Items subject to the Register technical supervision in accordance with the RS Nomenclature may be used for their intended purpose only in case documents of the Register or manufacturer's documents, in cases provided for in the RS rules, or other classification societies are available.

The possibility of recognition of documents for materials and products manufactured under technical supervision of ACS without the Register authorization is decided by the Register in each particular case during survey of these materials and products to an extent sufficient to confirm their compliance with the RS requirements, conventions, IMO recommendations, standards and normative documents.

**1.3.9** In case any defects are detected and there is any doubt about the feasibility of using the materials and products as intended, the required control surveys shall be carried out. In case of unsatisfactory results of the surveys, the use of the materials and products is not permitted regardless of the availability of the prescribed documents.

**1.3.10** Items of the RS technical supervision shall be manufactured in accordance with the RS-approved technical documentation.

**1.3.11** Review and approval of technical documentation for items of the RS technical supervision are carried out in compliance with the General Regulations for the Technical Supervision of Containers and the Rules for the Approval of Containers for the Transport of Goods Under Customs Seal (where applicable).

**1.3.12** When carrying out technical supervision, the Register reserves the right to check the compliance of the design, technology and production standards, which are not required but affect the fulfillment of the RS rules.

**1.3.13** Technical supervision of the manufacture of containers, materials and products shall determine their compliance with the requirements of the approved technical documentation and the RS rules. During technical supervision the Register shall not determine a grade or a category of the product quality and shall not check if the safety engineering, sanitary and labor organization requirements are met, as well as other production aspects beyond the Register terms of reference.

**1.3.14** In its activity the Register does not substitute the prescribed activity of the state supervision authorities or officials of owner, shipyard or firm.

**1.3.15** The Register may impose in the course of technical supervision the necessary requirements for the items and production processes not supervised by the Register if it appears that application thereof has resulted or is likely to result in violation of the RS rules.

**1.3.16** The Register carries out technical supervision during manufacture of materials and products at the firm (manufacturer) by means of surveys. Thus, all the questions shall be settled within the frames regulated by the RS requirements.

RS performs its duties during the tests according to the approved test program and technical documentation checking the fulfillment of the RS requirements. Relevant RS documents are drawn up upon results of the technical supervision.

**1.3.17** The Register can entrust technical personnel at the firm (manufacturer) with the check tests or part thereof aiming to check the compliance of items of the RS technical supervision with the RS requirements (refer to 1.5).

**1.3.18** In case of the differences associated with requirements and decisions of the surveyor carrying out technical supervision, a designer, owner or firm may apply directly to the RS Branch Office to resolve the problem. In case of the differences with the RS Branch Office, an appeal containing justifications together with a copy of the RS Branch Office decision may be sent to RHO.

**1.3.19** The Register performs its supervision activities on condition that manufacturers and individuals meet their commitments on manufacturing adequate products. In case of any structural deficiencies of the item of technical supervision, unsteady production process, low technological discipline and inadequate efficiency of quality system at the firm, the Register does not admit any claims for delays in production, caused by an increase in the scope of surveys of the products because of the above reasons.

**1.3.20** The Register charges for the services rendered, in accordance with the procedure established in the General Conditions for the Provision of Services by the Russian Maritime Register of Shipping (hereinafter referred to as the General Conditions for Rendering Services).

## **1.4 TYPES OF TECHNICAL SUPERVISION**

**1.4.1** Table 2.1.4 of the General Regulations for the Technical Supervision of Containers contains types of technical supervision during manufacture of containers included in the RS Nomenclature (refer to Table 2.1.2 of the General Regulations for the Technical Supervision of Containers) as well as types of documents issued or certified upon results of the technical supervision.

**1.4.2** When determining forms of technical supervision during manufacture of materials and products for containers, items of technical supervision shall be divided into groups (refer to Table 2.1.3 of the General Regulations for the Technical Supervision of Containers). Possible schemes of technical supervision during manufacture of products for different groups are given in Section 5, Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

## **1.5 REQUESTS, CONTRACTS AND AGREEMENTS ON TECHNICAL SUPERVISION**

**1.5.1** Where the necessity of the RS technical supervision in contracted documentation for manufacture of items of the RS technical supervision is indicated, the firm shall address to RS a written request to carry out technical supervision and to guarantee payment of the Register services, reimbursement of the Register expenses, as well as with the confirmation of familiarization and agreement with the General Conditions for Rendering Services. The General Conditions for Rendering Services are constituent and integral part of all the contracts concluded by the Register.

**1.5.1.1** If in case of type approval the firm is not the manufacturer of the products for containers, the firm shall, in addition to the provisions of 1.5.1, be authorized by the manufacturer (which shall be documented) to do the following:

.1 to submit technical documentation for the product for RS review and approval or to use the technical documentation approved by RS;

.2 to arrange for survey of the product within the necessary scope;

.3 to arrange for testing of the product within the necessary scope or to use reports of the tests earlier conducted by the manufacturer;

.4 to supply the container, material or product and to install and mount it if necessary.

**1.5.1.2** Deviations from the provisions of 1.5.1.1 shall be regulated in accordance with 1.3.6.

**1.5.2** The request shall provide the information to an extent sufficient for review and execution thereof. In reviewing the request for technical supervision during manufacture of the material or product, a kind of approval (single or type approval) and for technical supervision during manufacture of container, type shall be identified.

**1.5.3** Upon results of request review depending on the particular conditions of the future technical supervision (scope and item of supervision, duration, etc.), the Register, being guided by the regulations in force, decides on the necessity to conclude a contract on technical supervision or carries out technical supervision based on the request without concluding the contract.

**1.5.4** The contract on technical supervision of the Register at the manufacturer specifies the items of technical supervision and regulates mutual relations, rights and responsibilities of the parties in the course of the Register technical supervision.

The contract specifies cost of technical supervision, procedure and terms of payment. Where technical supervision is carried out based on the request, without concluding the contract, services are paid and expenses reimbursed according to the invoices made out by the Register.

For concluding the contract for the Register technical supervision, use is made of the established forms or the contract may be drawn up in a free form.

**Note.** Where it is necessary to determine the cost of technical supervision during manufacture of containers the firm shall provide the Register with the list of items of the RS technical supervision (refer to 3.2.2 and 5.2.2).

**1.5.5** The Register can entrust the firm's (manufacturer's) technical personnel with performance of the check tests or part thereof, serial materials and products for containers that in addition to the contract, is drawn up by the Manufacturer's Quality Control System Certificate (CKK 1 or CKK 2 Certificate).

The procedure to issue CKK 1 and CKK 2 is indicated in Section 7, Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships.

**1.5.5.1** The contract as well as CKK 1 and CKK 2 become invalid in case of inadequate fulfilment of the commitments under the contract, including payments for the RS services as well as in the following cases:

- .1 upon expiry of type approval for material or product manufactured by the firm (manufacturer);
- .2 subject to non-compliance of the firm (manufacturer) with the requirements of survey;
- .3 contract and/or CKK 1 or CKK 2 Certificate expiration;
- .4 contract and/or CKK 1 or CKK 2 termination.

## **1.6 PROVISION OF TECHNICAL SUPERVISION**

**1.6.1** The manufacturer shall provide all the conditions necessary for the Register to carry out technical supervision, namely:

- .1 provide a surveyor with:
  - free access to all places where the items of the RS technical supervision are manufactured;
  - safety of the surveyor during survey;
  - availability of the officials authorized to present to the surveyor containers for survey;
  - timely information of the time and place of surveys and tests;
  - possibility of inspection of any part and assembly of the container or product with the use of necessary means and tools;
- .2 provide a surveyor with:
  - necessary documentation;
  - manufacturer's quality control documents;
  - standards and other normative documents;
  - possibility of inspection of any container or product out of the batch presented.

**1.6.2** The manufacturer's notices are drawn up on the work stages or the items of technical supervision readiness for survey and on the invitation of the Register surveyor.

**1.6.3** Where the conditions required for performance of surveys are not fulfilled by the manufacturer, the surveyor has the right to refuse to carry out surveys and to witness tests of the item of technical supervision.

## **1.7 TECHNICAL DOCUMENTATION**

**1.7.1** Prior to commencement of the technical supervision during the manufacture of items of the RS technical supervision the surveyor shall make sure that the firm is provided with the RS-approved technical documentation.

## **1.8 DOCUMENTS**

**1.8.1** Upon results of the Register technical supervision during manufacture of items of the RS technical supervision the documents provided for by the RS List of Documents to be Issued during Technical Supervision and specified in 1.4 of the General Regulations for the Technical Supervision of Containers, are drawn up.

## **1.9 TYPE APPROVAL OF MATERIALS AND PRODUCTS**

**1.9.1** Requirements for CTO on materials and products for containers are given in Section 6, Part I "General Regulations for Technical Supervision" of the Rules for Technical



Supervision during Construction of Ships and Manufacture of Materials and Products for Ships, as well as relevant provisions of these Rules.

## **2 TECHNICAL SUPERVISION DURING MANUFACTURE OF MATERIALS AND COMPONENT PARTS**

### **2.1 GENERAL**

**2.1.1** The general provisions on the organization of technical supervision during manufacture of materials and component parts are given in Section 1.

**2.1.2** During technical supervision of the manufacture of products the surveyor checks the used materials and component parts according to the manufacturer's documents or the OEM documents of another classification society (refer to 1.3.8), when the materials or components are included in the RS Nomenclature in 2.1.3 of the General Regulations for the Technical Supervision of Containers, for conformity thereof with the requirements of the Register.

**2.1.3** The surveyor may require the incoming control of materials and component parts when in doubt of their conformity with the Register requirements or if it is found that in case where they are used the items of technical supervision will not meet those requirements.

In case of unsatisfactory results of the incoming control the use of such materials and component parts is not allowed, regardless of availability of certificates and other documents certifying their conformity with the requirements of technical documentation.

*Note.* In each case the scope of testing shall be specified as regards the requirements of the applicable parts of the Rules for the Manufacture of Containers containing the requirements to the material or product. The tests shall be carried out in the laboratories having Recognition Certificate of Testing Laboratory or complying with the applicable requirements of 1.6.1.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers being part of the firm (manufacturer).

**2.1.4** In case of unsatisfactory results of the incoming control the results of survey are presented in the form of the Register Report. A copy of the Report is forwarded to the firm (manufacturer).

## **3 TECHNICAL SUPERVISION DURING MANUFACTURE OF PRODUCTS**

### **3.1 GENERAL**

**3.1.1** The provisions of this Section apply in technical supervision during manufacture of products listed in the RS Nomenclature.

**3.1.2** The Section contains the technical supervision requirements during manufacture of preproduction and serially produced articles on the firm (manufacturer).

**3.1.3** The general provisions on the organization of technical supervision during manufacture of articles are given in Section 1.

### **3.2 TECHNICAL SUPERVISION**

**3.2.1** The technical supervision is effected by carrying out surveys according to the list of items being the main working document of the supervision.

**3.2.2** The list of items is developed by the manufacturer based on the RS Nomenclature and Table 3.2.4 for each preproduction (one-off) product and also for serially-produced products, and is agreed with the RS Branch Office performing technical supervision.

The RS Branch Office can change the list of items to extend the scope of control or for its cutting being guided therewith by production conditions and products quality, as well as by the results of supervision during manufacture of containers and technical supervision of containers in service.

**3.2.3** The scope of technical supervision and the prescribed types of checks, examinations and inspections performed by the surveyor in surveying technical supervision items according to the list are given in Table 3.2.3.

Depending on the conditions of the Register technical supervision, the surveys according to Table 3.2.3 are effected by the surveyor or personnel of the firm's (manufacturer's) technical control body.

Additional requirements to the scope of technical supervision of corner and intermediate fittings are given in Appendix 1.

Table 3.2.3

No.	Item of technical supervision	Verification						control of flow detection	tests	marking	branding
		technical documentation	material and visual examination	matching of parts	welding operations	manufacture of parts and assemblies	assembly of products				
1.	<b>Products:</b>										
1.1	end frames	+	+		+	+	+	+	+	+	+ <sup>1</sup>
1.2	corner and intermediate fittings	+	+				+	+	+	+	+ <sup>1</sup>
1.3	vessels of the tank containers	+	+	+	+	+	+	+	+	+	+ <sup>1</sup>
1.4	tank heads	+	+	+	+	+	+	+		+	+ <sup>1</sup>
1.5	tank shells	+	+	+	+	+	+	+		+	+ <sup>1</sup>
1.6	tank hatches	+	+		+	+	+		+	+	
1.7	frangible disks	+	+				+			+	
1.8	fusible elements	+	+				+			+	
1.9	pressure-relief (safety) valves	+	+		+		+		+	+	
1.10	vacuum valves	+	+		+		+		+	+	
1.11	stop valves of tank	+	+		+		+		+	+	
1.12	covers for containers	+	+				+			+	
1.13	ropes for fastening a cover to a container	+	+				+			+	
1.14	lifting set for offshore containers	+	+		+	+	+	+	+	+	+
1.15	components of lifting sets for offshore containers	+	+		+	+	+	+	+	+	
1.16	refrigerating and/or heating appliances of a container	+	+			+	+		+	+	
1.17	(electrical) sensors and indicators of level	+	+				+			+	
<sup>1</sup> On each product tested under the RS technical supervision.											

### 3.3 TECHNICAL DOCUMENTATION

**3.3.1** Manufacture of products as well as production processes shall be performed under the Register supervision in accordance with the approved technical documentation.

### **3.4 MATERIALS AND VISUAL EXAMINATION**

**3.4.1** Materials intended for the manufacture of products shall meet the requirements of the technical documentation approved by the Register.

Along with that, availability of the RS brands on the material (where applicable) and compliance of the firm's (manufacturer's) marking with the documents confirming the quality of this material shall be checked.

If the marking does not correspond to the provided documents for material or if brands are unavailable (where applicable), the RS surveyor is entitled to require repeated tests of this material.

**3.4.2** Material shall be checked by external examination for absence of defects (dents, hollows, cracks, etc.) which may be considered as an indication for rejecting the material. Special attention shall be paid to the sealing materials for fittings.

**3.4.3** Materials subject to RS branding are listed in the RS Nomenclature.

**3.4.4** The procedure of branding, transfer of brands during matching of parts, etc., is given in the Instructions on Branding of Items of the Register Technical Supervision (refer to Appendix 2, Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships).

### **3.5 MATCHING OF PARTS**

**3.5.1** Cold bending of steel plates shall be allowed to a radius not less than three times the plate thickness.

**3.5.2** Heating of plates for forming, flanging, flaring and other similar work as well as the conditions and heating monitoring method shall comply with the practice of the firm (manufacturer).

**3.5.3** The formed and flared parts and other components after hot treatment shall have no bursts, cracks, shoulders, crumples, folds, lamination, dents, etc.

### **3.6 WELDING**

**3.6.1** Prior to welding, edge preparation which shall be carried out in compliance with national standards and/or drawings approved by the Register shall be checked. The surface of the edges shall be free of cracks, lamination and other defects.

**3.6.2** Welding may be permitted after verification that the used welding consumables comply with the technical documentation approved by the Register; along with that, the welders shall have documents certifying their qualifications.

**3.6.3** Welding of the components, their subsequent dressing and after-welding heat treatment shall be performed in compliance with the technological process approved by the Register.

**Note.** The decision on recognition of documents confirming the results of check tests of welding production processes surveyed by ACS or an authorized competent body is made by the Register in each particular case on the basis of sufficiency of the submitted documents for evaluation of the compliance of welding production process with the requirements of 3.7.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers and the RS-approved technical documentation.

Results of the review of the above-mentioned documents and confirmed possibilities of their application shall be presented in the form of the Register Report.

### **3.7 MANUFACTURE OF THE PRODUCT COMPONENTS AND ASSEMBLIES. FITTING-UP**

#### **3.7.1 General.**

**3.7.1.1** Before assembly, the components of the products shall be checked for compliance with the drawing dimensions (plate thickness, flanging radii, hole pitch, etc.), markings and documents for them. For edge preparation for welding refer to 3.5.1.

**3.7.1.2** The components and assemblies shall be fitted up within tolerance for the clearances between elements according to the technical documentation approved by the Register.

**3.7.1.3** In order to obtain the required mating between them, the components joined shall not be straightened through an excessive interference by bolts, tacks or mated in cold condition by blows. If necessary mating may be carried out by heating.

**3.7.2 Vessels of tank containers, tank heads and tank shells.**

**3.7.2.1** After welding, the shell shall be calibrated to eliminate the shape distortions.

**3.7.2.2** After heat treatment and machining, the tank heads shall be thoroughly examined. No bulges, dents, deep scores, metal thinning-out shall be permitted. Longitudinal scores of not more than negative deviation limits provided by the relevant standards and technical conditions or if after their elimination the wall thickness is less than permitted by calculations shall be permitted on the cylindrical part.

### **3.8 CONTROL OF FLOW DETECTION**

**3.8.1** Inspection of the welded joint quality shall be performed after heat treatment, if provided.

**3.8.2** The scope of the butt weld inspection, the choice of the inspection method as well as requirements for assessment of butt weld quality shall comply with the technical documentation approved by the Register.

When assessing the weld quality, the guidelines of Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships or international and/or national rules for pressurized vessels shall be taken as a guide adopted on the firm (manufacturer).

**3.8.3** Reports (Acts) confirming results of flow detection shall contain information specified in 3.2.7, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships.

### **3.9 TESTS**

**3.9.1 General.**

**3.9.1.1** Product tests shall be carried out by the Register approved test program.

**3.9.2 Hydraulic tests, general.**

**3.9.2.1** Hydraulic tests by pressure indicated in 3.7, Part IV "Tank Containers" of the Rules for the Manufacture of Containers shall be conducted in the presence of the RS surveyor on condition that:

all assembling, welding and weld inspecting operations are completed and accepted by the technical control body of the firm (manufacturer);

components of the product have no insulation and other protective coatings;

component or product has been surveyed by the RS surveyor;

devices intended for tests (instruments, etc.) have documents of the appropriate competent authorities.

**3.9.2.2** Hydraulic tests shall be conducted with the current regulations and the firm's (manufacturer's) instructions being adhered to.

**3.9.2.3** The temperature of water and ambient air shall be not lower than + 5 °C. The difference in water and ambient air temperature shall preclude sweating.

**3.9.2.4** Pressure gauges used in hydraulic tests shall have an accuracy class not lower than 2,5. Pressure gauges shall be calibrated.

**3.9.2.5** The pressure during the test shall rise smoothly without water hammers.

**3.9.2.6** No other works accompanied by noise hindering the tests shall be performed during the hydraulic tests.

**3.9.2.7** During the hydraulic tests the pressure shall be raised up to the proof pressure and shall be maintained during the time period required for examination but not less than 30 min.

**3.9.2.8** If during the tests, knocks, booms are heard in the product, or defects affecting the strength thereof are detected, the test shall be interrupted and resumed anew only after correction of these defects.

When the product is held under the proof pressure, no pressure drop shall take place.

**3.9.2.9** Upon completion of the hydraulic test of the product, the RS surveyor shall carry out internal examination (if the product is accessible for examination), in the process of which the accessible areas shall be checked for condition of the working surfaces, absence of residual deformation and other defects.

Appearance of sweating and water drops on the welds shall not be permitted. Such welds shall be chipped out and welded anew. Correction of the weld defects by caulking, centre-punching or other mechanical methods shall not be permitted.

**3.9.2.10** The products shall be considered as having passed the test by proof pressure, if weld leaks, cracks, local bulges, residual deformations and other indication of any joint disturbances are not found.

**3.9.3 End frames.**

**3.9.3.1** Tensile testing of end frames shall be carried out by upper corner fittings with application of force  $1/2R$  on each fitting with fastened bottom fittings.

**3.9.3.2** Number of end frames for testing is established by the Register upon agreement with the firm depending on stability of workmanship but not less than 10 % from the batch.

**3.9.3.3** The products shall be considered as having passed the test, if cracks, residual deformations and other indication of any joint disturbances are not found.

**3.9.4 Vessels of tank containers.**

**3.9.4.1** Vessels of tank containers shall be hydraulically tested in accordance with 3.9.2.

**Note.** Upon agreement with RHO it is permissible to replace hydraulic tests by other testing methods by the Register approved test program.

**3.9.4.2** Each vessel is subject to testing.

**3.9.5 Tank hatches, stop valves and pressure-relief (safety) valves.**

**3.9.5.1** Products shall be hydraulically tested in accordance with 3.9.2.

**3.9.5.2** The pressure-relief valves capacity is checked on their prototypes. Where a flame arresting mesh is available, inflammability of combustible mixture vapors at specified temperature shall be checked.

**3.9.5.3** Number of serial products for testing is established by the Register upon agreement with the firm depending on stability of workmanship.

**3.9.6 Lifting sets for offshore containers and their components.**

**3.9.6.1** Requirements for testing prototype and type-series lifting sets for offshore containers or their components (when approved separately) are specified in 9.6, Part VII "Offshore Containers" of the Rules for the Manufacture of Containers.

**3.9.7 Refrigerating and/or heating appliances of a container.**

**3.9.7.1** Requirements for testing prototype and type-series refrigerating and/or heating appliances of a container are given in Section 3, Part III "Thermal Containers" of the Rules for the Manufacture of Containers.

### **3.10 MARKING AND BRANDING**

**3.10.1** Marking of products is carried out in accordance with acting provisions on the firm (manufacturer) as well as with normative documents with obligatory consideration of requirements of the RS rules and the Register approved documentation.

**3.10.2** All manufactured products shall be marked including factory number and year of manufacture.

**3.10.3** Requirements for marking of service equipment are given in 4.4, Part IV "Tank Containers" of the Rules for the Manufacture of Containers.

**3.10.4** Requirements for marking of lifting sets for offshore containers and their components are given in 9.7, Part VII "Offshore Containers" of the Rules for the Manufacture of Containers.

**3.10.5** Requirements for marking of refrigerating and/or heating appliances of a container are given in Section 4, Part III "Thermal Containers" of the Rules for the Manufacture of Containers.

**3.10.6** For lifting sets for offshore containers, the RS brand is put near the date of manufacture on the identification plate as well as near the factory number on the sleeve or on the upper link of the lifting set sling.

**Note.** When issuing C3 for lifting set branding may be carried out by the firm's (manufacturer's) authorized person, which shall be specified in the Contract for RS technical supervision.

**3.10.7** For end frames, vessels of tank containers, tank heads and tank shells, the RS brand is put near the factory number and year of manufacture.

**3.10.8** Information on branding is given in Appendix 2 to Part I of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

## 3.11 DOCUMENTS

### 3.11.1 General.

RS documents shall contain the following information:

name and site address of the firm (manufacturer);

name of product;

type of product and/or model and/or relevant catalogue number;

serial number (except for corner fittings).

Additional requirements for information that shall be entered in the documents for products, are given below.

### 3.11.2 Lifting sets for offshore containers.

In addition to the information indicated in 3.11.1, RS documents shall contain at least the following:

reference to RS CTO (if applicable);

value of working load limit ( $WLL_{off}$ );

value of minimum required working load limit ( $WLL_{min}$ );

number of slings;

value of maximum sling angle to the vertical;

value of lifting set mass;

value of rope diameter or caliber of sling links;

value of working load limit ( $WLL_s$ ) of shackles;

value of sling length;

date of manufacture of lifting set;

description of lifting set components;

identification numbers of shackles;

lifting set complies with the requirements of Section 9, Part VII "Offshore Containers" of the Rules for the Manufacture of Containers.

Additionally:

marking group and type of wire rope shall be indicated for wire rope lifting set;

chain class shall be indicated for chain lifting set and a reference shall be made to the Report drawn up upon results of mechanical tests after heat treatment for chain lifting set manufactured by means of welding;

reference to applicable standards.

### 3.11.3 Lifting set components for offshore containers.

In addition to the information indicated in 3.11.1, RS documents shall contain at least the following:

reference to RS CTO (if applicable);

characteristics of components (in accordance with standards for components);

reference to documents on material including information on chemical composition and mechanical characteristics;

date of testing.

### 3.11.4 Corner and intermediate fittings.

In addition to the information indicated in 3.11.1, RS documents shall contain at least the following:

reference to RS CTO (if applicable);

number(s) of heat(s);

value of mass;

quantity;

name of material;

mechanical characteristics (yield stress, tensile strength, elongation, reduction of area, impact energy  $KV$  at minimum temperature).

### 3.11.5 Pressure-relief (safety) valves.

In addition to the information indicated in 3.11.1, RS documents shall contain at least the following:

reference to RS CTO (if applicable);

size (inlet hole), for example, DN xxx;

pressure at which the valves begin opening to tolerances (in bar);

actuating pressure of frangible disks (in bar) (if applicable);

actuating pressure of safety vacuum valve (in bar);  
operating temperature range (°C);  
value of discharge capacity (nm<sup>3</sup>/s);  
value of discharge area (mm<sup>2</sup>);  
brand of sealing material;  
brand of body material.

**3.11.6 Stop valves and manholes.**

In addition to the information indicated in 3.11.1, RS documents shall contain at least the following:

reference to RS CTO (if applicable);  
value of conditional passage (mm);  
value of maximum permissible working pressure (in bar);  
operating temperature range (°C);  
brand of valve body material;  
brand of sealing material.

**3.11.7 Vessels of tank containers, heads and tank shells.**

In addition to the information indicated in 3.11.1, RS documents shall contain at least the following:

brand of material;  
thickness of material;  
dimensions including the diameter;  
operating temperature range (°C);  
hydraulic test pressure (where applicable).

**3.11.8 Refrigerating and/or heat appliances of a container.**

In addition to the information indicated in 3.11.1, RS documents shall contain at least the following:

designation of refrigerant;  
characteristics.

## **3.12 PARTICULARS OF TECHNICAL SUPERVISION DURING MANUFACTURE OF PROTOTYPES**

**3.12.1** Prototypes shall be surveyed by the RS surveyor according to the RS Nomenclature.

**3.12.2** All the requirements of this Section which apply to the manufacture of the items of supervision in case of stable production shall apply equally to the manufacture of the prototypes.

The assemblies and components of ultimately new engineering designs or manufactured according to new production procedures and techniques shall be additionally subjected to a special check by the Register.

**3.12.3** Prototypes shall be subjected to comprehensive tests (applicable to this specimen) according to an extended program approved by the Register to check the reliability and long-term performance of the components, assemblies and the products as a whole as well as to check for the compliance of the parameters and characteristics with the approved technical documentation.

**3.12.4** The findings of the surveys and tests of the prototype shall be presented in the Report on Survey of Prototype (Pilot) Specimen (form 6.3.18).

## **4 TECHNICAL SUPERVISION DURING MANUFACTURE OF MATERIALS FOR CONTAINERS**

### **4.1 GENERAL**

**4.1.1** The provisions of this Section cover technical supervision during manufacture of materials listed in the RS Nomenclature.

**4.1.2** The general provisions on organization of technical supervision during manufacture of materials are given in Section 1.

## **4.2 ACCEPTANCE OF MATERIAL**

**4.2.1** Material shall comply with the requirements of the RS-approved technical documentation on the item of application and shall meet the requirements of Section 3, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

**4.2.2** Materials shall be tested under the RS technical supervision in compliance with the standards on material as well as requirements in the Section 3, Part I "Basic Requirements" of the Rules for the Manufacture of Containers applicable to the product to be tested.

Methods, sampling and sample preparation shall meet the requirements of Section 2, Part XIII "Materials" of the Rules for the Classification and Construction of Sea-Going Ships, where applicable.

**4.2.3** Welding consumables shall be approved in accordance with Section 5, Part III "Technical Supervision during Manufacture of Materials" of the Rules of Technical Supervision during Construction of Ships and Manufacture of Material and Products for Ships.

**4.2.4** During technical supervision the Register has the right to set forth additional requirements to check features of the manufactured products according to application.

## **4.3 MARKING**

**4.3.1** General provisions on marking of the materials are given in 1.4.2, Part XIII "Materials" of the Rules for the Classification and Construction of Sea-Going Ships. Peculiarities of marking may also be specified in the appropriate chapters of Part XIII "Materials" of the Rules for the Classification and Construction of Sea-Going Ships containing the requirements for steel, cast iron, copper and light alloys. Marking is carried out according to the effective international and/or national standards.

**4.3.2** When semi-finished products are packed in bundles, the manufacturer shall confirm the identification system of every semi-finished product in a bundle. It is allowed to put the RS stamp or brand on labels. When using labels of waterproof film, an imprint of the RS stamp or brand shall be put on the solid surface of these labels.

When branding, it is necessary to be guided by the applicable provisions of Appendix 2 to Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

## **4.4 DOCUMENTS**

**4.4.1** The RS documents mentioned in 1.8 shall be mandatorily supplemented with the Manufacturer's Certificates. The test results shall be specified in the Certificates and/or the attached test reports. The numbers of the attached reports and Manufacturer's Certificates shall be indicated in the RS Certificate of Conformity.

**4.4.2** The content of the Manufacturer's Certificates shall meet the requirements given in the procurement documents and RS-agreed documentation and shall enable to identify the products supplied. The Certificate of Conformity shall contain at least the following:

- order number (if applicable);
- manufacturer and customer requisites;
- general information of material such as: size of semi-finished products, weight, brand and grade of the material, the numbers of the firm's certificates/reports.

## **5 TECHNICAL SUPERVISION DURING MANUFACTURE OF CONTAINERS**

### **5.1 GENERAL**

**5.1.1** The provisions of this Section cover technical supervision during manufacture of containers listed in the RS Nomenclature.

**5.1.2** The Section contains requirements for technical supervision during manufacture of prototype (first lot) and type-series containers on the firm (manufacturer).



**5.1.3** The general provisions on organization of technical supervision during manufacture of containers are specified in Section 1.

## 5.2 TECHNICAL SUPERVISION

**5.2.1** The technical supervision is effected by surveying according to the list of items being the main working document of the supervision.

**5.2.2** The list of items may be developed by the firm (manufacturer) based on Table 5.2.3 for each container (batch of containers) and is agreed with the RS Branch Office carrying out technical supervision.

The RS Branch Office can change the list of items to extend the scope of control or for its cutting being guided therewith by production conditions and products quality, as well as by the results of technical supervision during the container operation.

**5.2.3** The scope of technical supervision performed by the RS surveyor in technical supervision of containers according to the list is given in this Section.

Depending on the type of technical supervision chosen by the firm (manufacturer) taking into account Table 5.2.3, the surveys are carried out by the RS surveyor and/or specialist of Quality Control Department of the firm (manufacturer).

Form 2 of the technical supervision is applied at serial manufacture of containers on the firm (manufacturer) surveyed in accordance with the requirements of 1.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers with issuance of СПИ.

Table 5.2.3

No.	Stages of technical supervision during manufacture of containers	Section of the RS rules	Forms of technical supervision	
			1	2
1	Technical documentation	5.3	×	×
2	Qualification of personnel	5.4	×	×
3	Welding consumables	5.5	×	×
4	Welding procedures	5.6	×	×
5	Materials and products for containers	5.7	×	—
6	Manufacture of components and assemblies for containers	5.8	×	—
7	Assembly of containers	5.9	×	—
8	Flow detection	5.10	×	—
9	Tests	5.11		
9.1	Prototype of a container, testing to confirm manufacture stability	5.11.2	×	×
9.2	Type-series containers	5.11.3	×	— <sup>1</sup>
10	Final assembly of container	5.12	×	—
11	Marking	5.13	×	×
12	Survey of finished containers	5.14	×	×
13	Branding	5.15	×	×
<sup>1</sup> Required for tank containers and offshore containers.				
Notes: 1. "×" means "required", "—" means "not required".				
2. Serial manufacture of containers is carried out upon positive results of manufacture and test of a prototype (first lot), refer to Table 2.1.4 of the General Regulations for the Technical Supervision of Containers.				

**5.2.4** Additional requirements to the scope of technical supervision during manufacture of tank containers with a FRP shell are given in Appendix 2.

## 5.3 TECHNICAL DOCUMENTATION

**5.3.1** Containers are manufactured under the RS technical supervision by the Register agreed technical documentation.

**5.3.2** Prior to the beginning of manufacture, availability of letter of conclusion as well as a set of the RS-approved technical documentation are checked on the firm (manufacturer).

The technical documentation shall belong to the firm (manufacturer) or a written confirmation for the right of disposal for manufacture shall be submitted to the Register.

## **5.4 QUALIFICATION OF PERSONNEL**

**5.4.1** Welding of containers shall be performed by the welders, who have passed the respective tests in accordance with the RS procedures. Welders shall comply with the requirements of 3.7.3, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

*Note.* The welders who have passed the tests according to the international and/or national standards (for example, ISO 9606, ASME Section IX, ANSI/AWS D1.1) may be admitted to the welding operations.

Recognition of documents confirming the qualification of welders and issued by another classification society or authorized competent authority shall be determined in each case by the Register depending on the sufficiency of the submitted documents to determine welders' conformity with the requirements of 3.7.3, Part I "Basic Requirements" of the Rules for the Manufacture of Containers and the RS-approved documentation.

The results of considering the above-mentioned documents and confirmation of possible admission for welders shall be issued as a Register Report.

**5.4.2** The firm (manufacturer) shall adopt an internal control system during manufacture of containers.

## **5.5 WELDING CONSUMABLES**

**5.5.1** Welding consumables used during manufacture of containers shall comply with the requirements of 3.7.1, Part I "Basic Requirements" of the Rules for the Manufacture of Containers and the RS-approved documentation.

*Note.* 1. The decision on recognition of documents confirming the results of welding consumables testing surveyed by another classification society or an authorized competent authority shall be made by the Register in each particular case on the basis of sufficiency of the submitted documents for evaluation of the compliance of 3.7.1, Part I "Basic Requirements" of the Rules for the Manufacture of Containers and the RS-approved documentation.

The results of considering the above mentioned documents and confirmation of possible admission for welders shall be issued as a Register Report.

2. The decision on application of welding consumables for austenitic steels supplied with the certificates as per form 3.1 of EN 10204 or ISO 10474 standards shall be made by the Register in each particular case on the basis of sufficiency of information, its compliance with the requirements of 3.7.1, Part I "Basic Requirements" of the Rules for the Manufacture of Containers and the RS-approved documentation as well as availability of certified QMS of the firm (manufacturer) of welding consumables.

In case of reasonable doubts in the quality of used welding consumables, the Register reserves the right to require additional tests of compliance of the welding consumables to the declared features.

The results of considering the above mentioned documents and confirmation of possible admission for welders shall be issued as a Register Report.

**5.5.2** Where marking does not correspond to the provided documents for welding consumables, the RS surveyor reserves the right to require check tests of the welding consumables.

## **5.6 WELDING PROCEDURES**

**5.6.1** Welding procedures applied during manufacture of containers shall comply with the requirements of 3.7.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers and the RS-approved documentation.

*Note.* The decision on recognition of the welding procedure qualification test results (WPQR) surveyed by another classification society or an authorized competent body is made by the Register in each particular case on the basis of sufficiency of the submitted documents for evaluation of the welding procedure compliance with the requirements of 3.7.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers and the RS-approved documentation.

The results of considering the above-mentioned documents and confirmation of possible admission for welders shall be issued as a Register Report.

**5.6.2** Changes made in the production procedures for manufacture of containers followed by amendments of the RS-approved technical documentation for a container, changing of strength characteristics or affect the results of the prototype testing, shall be agreed with the Register prior their manufacture introduction.

**5.6.3** During the manufacture of tank container tanks in case the welding procedures, applicable welding consumables are changed and in the case the tank container materials differ from those specified in the approved technical documentation, the mechanical properties of the welding seams shall be checked on the specimen cut from the inspection plates of longitudinal welding seams of the tank in compliance with 2.4, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships or in compliance with 3.6, Part IX "Materials and Welding" of the Rules for the Classification and Construction of Ships Carrying Liquefied Gases in Bulk for tank containers carrying gas.

## **5.7 MATERIALS AND PRODUCTS FOR CONTAINERS**

### **5.7.1 General.**

**5.7.1.1** On agreement with RHO a limited lot/scope of sheet steel for tanks, rolled metal for manufacturing of pad eyes for offshore containers, fusible elements, covers for containers, ropes for fastening a cover to a container, (electrical) sensors and indicators of level are permitted to be supplied with the documents of the firm (manufacturer) certified by the RS surveyor by applying incoming inspection if the Rules shall be additionally confirmed and with the Register approved technical documentation.

### **5.7.2 Material.**

**5.7.2.1** Materials used for the manufacture of containers shall meet the requirements of the Register-approved technical documentation.

Check shall be carried out for availability of the RS documents or factory documents as well as RS brands on the materials indicated in Table 2.1.3 of the General Regulations for the Technical Supervision of Containers.

Notes: 1. The decision on recognition of ACS documents on materials shall be made by the Register in each particular case on the basis of sufficiency of the submitted documents for evaluation of the compliance with Section 3, Part I "Basic Requirements" of the Rules for the Manufacture of Containers and the RS-approved documentation.

2. The decision on application of material for manufacture of vessel parts as well as vessels of tank containers manufactured in accordance with the requirements of acting national and/or international standards covering rolled metal for pressure vessels and supplied with the certificates as per form 3.1 of EN 10204 or ISO 10474 standards shall be made by the Register in each particular case on the basis of sufficiency of information, its compliance with the requirements of 3.3, Part I "Basic Requirements" of the Rules for the Manufacture of Containers and the RS-approved documentation as well as availability of certified QMS of the firm (manufacturer) of the welding consumables.

In case of reasonable doubts in the quality of used material, the Register reserves the right to require additional tests of compliance of the material to the declared features.

The results of considering the above-mentioned documents and confirmation of possible admission for welders shall be issued as a Register Report.

**5.7.2.2** Within the incoming inspection the compliance of material marking with the documents confirming its quality shall be verified.

Where the marking does not correspond to the submitted documents on material or absence of brands (where applicable), the RS surveyor is entitled to require repeated trials of this material.

**5.7.2.3** The material shall be checked by external examination for absence of defects (dents, hollows, cracks, etc.) which may be considered as an indication for rejecting the material.

**5.7.2.4** Wood intended for the manufacture of containers shall be checked for absence of sap and other defects the number and size of which shall not exceed allowed values specified in normative documents.

### **5.7.3 Products.**

**5.7.3.1** Purchased products indicated in Table 2.1.3 of the General Regulations for the Technical Supervision of Containers shall be checked for compliance of their marking with the

documents submitted to the Register as well as RS-approved technical documentation for the container.

Notes: 1. Where the ACS documents for the product are available, one shall be guided by the requirements of 1.3.8.

2. Corner and intermediate fittings manufactured without RS technical supervision including submission of ACS documents shall be checked in the following scope: verification of mechanical properties in accordance with 3.2.4.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers. Test samples shall be taken from fittings. The number of fittings shall be determined by RHO in each particular case depending on the number of heats in the batch but not less than one fitting from each batch containing 100 sets.

**5.7.3.2** Spring-loaded safety valves shall be tested for opening/closing pressure before installation.

**5.7.3.3** In case if the firm (manufacturer) of containers manufactures the products indicated in Table 2.1.3 of the General Regulations for the Technical Supervision of Containers one shall be guided by the requirements of Section 3.

**5.7.3.4** The Inspection Department documents for door locks and other products if manufactured by this manufacturer shall be checked.

## **5.8 MANUFACTURE OF CONTAINER PARTS AND ASSEMBLIES**

**5.8.1** Container parts and assemblies shall be checked for compliance with the drawing dimensions, markings and documents for them. Absence of cracks especially on parts and assemblies of primary structure shall be checked.

**5.8.2** Prior to welding, edge preparation which shall be carried out in compliance with national standards or drawings approved by the Register shall be checked. The surface of the edges shall be free of cracks, lamination and other defects.

**5.8.3** The components and assemblies shall be fitted up within tolerance for the clearances between elements according to the RS-approved technical documentation.

**5.8.4** In order to obtain the required mating between them, the components joined shall not be straightened through an excessive interference by bolts, tacks or mated in cold condition by blows. If necessary mating may be carried out by heating.

## **5.9 ASSEMBLY OF CONTAINER**

**5.9.1** Specified dimensions of containers shall comply with the requirements of the RS rules as well as the RS-approved technical documentation. Special attention shall be drawn to the dimension and inner sizes of container.

For ISO containers dimensions on fittings as well as value of container diagonal differences shall be checked.

For offshore containers correctness of pad eyes installation shall be checked.

**5.9.2** Workmanship of the floor, in particular, attachment of boarding to the base rails and cross-members, application of sealing and protective materials at places specified in the documentation, adhesion of the sealing materials with sealing surfaces shall be checked.

When verifying the floor boarding made of glued panels, it is necessary to pay attention to defects in gluing as applied to seams and butts of the bars and boards. It is allowed to manufacture glued panels from timbers with faces prepared for rabbeted joints for gluing. The seams of the floor boards and glued panels shall be made as rabbeted joints. Cracks and defects in gluing of the panel shall be revealed by illumination of the container bottom on the outside.

**5.9.3** Documents on impregnation of the floor boards by wood preservatives shall be checked.

## 5.10 FLAW DETECTION

### 5.10.1 General.

**5.10.1.1** Welded joints of any container shall be tested by visual and measuring examination prior to application of protective coatings.

**5.10.1.2** Non-destructive testing and quality assessment of welded joints shall be performed by testing laboratories (centers) or firms (manufacturers) whose competence and status comply with the requirements to accreditation in accordance with national or international standards.

The Recognition (Accreditation) Certificate issued by the Register or by other authorized national body is a document confirming competence of the testing laboratory. In the latter case the copy of the Certificate with supplements shall be submitted to the RS surveyor prior to start of non-destructive testing.

Requirements for testing laboratories and procedure of their acceptance by RS are given in Chapter 1.6, Part I of the Rules for manufacture of containers.

**5.10.1.3** Non-destructive testing and quality assessment of welded joints shall be performed by the specialists who have passed the appropriate training, have the proper qualification and practical experience in a particular NDT method which shall be documented.

Personal qualification level and personnel certification in non-destructive testing shall be determined in accordance with the requirements of national standards (GOST R ISO 9712) unified with the standard ISO 9712 as well as other RS-recognized requirements.

**5.10.1.4** Requirements for non-destructive testing of container welded joints by specified methods are given in 3.2, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships.

**5.10.1.5** The RS surveyor may change location of separate sections for non-destructive testing or extend the scope of testing.

**5.10.1.6** Reports confirming inspection results shall contain the information specified in 3.2.7, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships.

### 5.10.2 Tank containers.

**5.10.2.1** General requirements for inspection are specified in 5.10.1.

**5.10.2.2** Welded joints of vessels of tank containers shall be tested via visual and measuring examination as well as by radiographic and/or ultrasonic methods depending on the applicability and instructions of the RS-approved documentation.

The scope of testing of welded joints shall comply with the RS-approved technical documentation.

When assessing the weld quality, the guidelines of Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships or international and/or national Rules for pressure vessels in force at the firm (manufacturer) shall be taken as a guide.

### 5.10.3 Offshore containers.

**5.10.3.1** General requirements for inspection are specified in 5.10.1.

**5.10.3.2** Scope of non-destructive testing of welded joints of offshore containers shall comply with Table 5.10.3.2. Welded joints between essential primary structure and non-essential primary structure shall be controlled in scope as for non-essential primary structure.

Table 5.10.3.2

Category of structural members	Inspection methods			
	Visual examination	Magnetic particle or capillary method <sup>1</sup>	Ultrasonic method <sup>2</sup>	Radiographic method <sup>2</sup>
essential primary structure	100 %	100 %	100 % of pad eyes and 20 % of other welds	10 %
non-essential primary structure	100 %	20 %	20 %	10 %
Secondary structure	100 %	—	—	—

<sup>1</sup> If it is impossible to use the magnetic particle method, the capillary method shall be used.  
<sup>2</sup> Depending on the thickness of the material and its applicability.

**5.10.3.3** Quality of welded joints of offshore containers shall be assessed in accordance with Table 5.10.3.3.

Table 5.10.3.3

Assessment of welded joint quality				
Visual and dimensional methods	Magnetic particle method	Capillary method	Ultrasonic method	Radiographic method
ISO 5817 <sup>1</sup> Level B	ISO 23278 Level 1	ISO 23277 Level 1	ISO 11666 Level 2	ISO 10675-1 <sup>2</sup> Level 1
<sup>1</sup> For aluminum ISO 10042.				
<sup>2</sup> For aluminum ISO 10675-2.				

**5.10.3.4** The operator on non-destructive testing shall be certified as a minimum to Level 2 in accordance with standard ISO 9712.

## 5.11 TESTS

### 5.11.1 General.

**5.11.1.1** Tests shall be conducted by the Register approved test program.

**5.11.1.2** Subject to technical supervision during tests are:

- .1 fulfillment by the testing laboratory or firm (manufacture) of requirements of the RS rules and the RS-approved test programs;
- .2 scope and conditions of tests;
- .3 correct container securing and application of loads;
- .4 measurement of container deformations;
- .5 conformity of the measurement methods with those specified in the procedure;
- .6 pattern and magnitude of deformation of the container components during tests and evaluation of residual deformations of these after unloading;
- .7 correct taking of readings of devices and measuring instruments and calculation of deformations;
- .8 taking of check measurements of the container with the mass being checked on each container subjected to tests;
- .9 strength of welded joints.

**5.11.1.3** Where crackling occurs during the tests, the container shall be carefully examined under sufficient illumination from the inside and outside in order to reveal damages of welds or other structural defects.

**5.11.1.4** The measuring instruments used during tests shall be calibrated by a competent body and shall have the following minimum accuracy class (error):

Table 5.11.1.4

Measurement device	Accuracy class (error)
pressure gauge	2,5
flow meter	2
thermometer	1
electrical measuring instruments	2
tape measures	2
mass measuring instrument	maximum percentage error 2 %
dynamometer	2

### 5.11.2 Container prototype, tests to confirm the stability of production.

**5.11.2.1** Testing of a prototype container as well as testing to confirm the stability of production shall be performed:

- .1 in the testing laboratory recognized by the Register. The requirements for testing laboratories and procedure of their recognition is established in 1.6, Part I "Basic requirements" of the Rules for the Manufacture of Containers, or
- .2 in particular cases, at the discretion of the Register, tests may be conducted at the testing laboratories not recognized by the Register. In this case one shall be guided by 1.6.1.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers, or
- .3 on the test bench/facility of the firm (manufacturer) taking into account requirements of 5.11.2.2.

**5.11.2.2** When testing the container on the testing bench/facility of the firm (manufacturer) depending on the type of container and conducted tests the following shall be checked:

.1 availability of equipment, devices and measuring instruments which make it possible to conduct all the required tests and measurement of container deformations;

.2 design of equipment, capability of appliances to provide application of external loads to the container in accordance with the requirements of the RS rules and the RS-approved test program;

.3 availability of documents on inspection of the equipment, devices of testing benches and measuring instruments performed by competent bodies and conformity of technical characteristics of the equipment and devices with the specified data of the benches;

.4 provision for stowing and securing of the container during:

.4.1 stacking tests (provision shall be made for all variants of displacement of the test fittings and pads in longitudinal and transverse directions in relation to the top corner fittings of the container);

.4.2 tests for longitudinal and transverse racking (provision shall be made for securing all the bottom corner fittings against vertical movement by means of anchor device, while against transverse movement — only at corners diagonally opposite to those at which forces are applied);

.4.3 tension and compression tests of the bottom frame (provision shall be made for restraint of each pair of the bottom end corner fittings when the bottom is asymmetrical in construction);

.4.4 dynamic test of tank containers;

.4.5 longitudinal restraint tests (provision shall be made for securing all the bottom corner fittings by means of anchor device in which case the pair of the bottom fittings is secured against vertical and transverse movements, while the pair of top fittings — only against transverse movements);

.5 availability of measuring testing loads to create various internal loading conditions with appropriate layouts thereof in the container; along with that, the loads shall be:

.5.1 weighed, marked with the Inspection Department report issued;

.5.2 checked by the RS surveyor for availability of marking prior to testing;

.6 conformity of the testing truck with the requirements of the Rules for the Manufacture of Containers and its capability of manoeuvre over the entire floor area;

.7 availability of appliances to conduct strength tests of the end and side walls of the container;

.8 availability of a bench (facility) for testing each container for weathertightness in accordance with the requirements of the Rules for the Manufacture of Containers; in this case subject to inspection shall be nozzle diameter, pressure (at nozzle outlet), speed of stream, as well as the possibility of coverage of all the external surfaces of the container. When testing the container with the use of several nozzles, each nozzle shall meet the requirements of the Rules for the Manufacture of Containers;

.9 availability of a bench (facility) to conduct pressure and leakproofness tests of tank containers;

.10 availability of devices and measuring instruments to ensure the necessary check measurements before, during and after the container tests.

**5.11.2.3** After 6 years from the date of technical documentation approval, one container shall be tested in the scope agreed by the Register depending on the type of container.

**5.11.2.4** One container shall be tested in the scope of a prototype as well as to confirm the stability of production.

#### **5.11.3 Type-series containers.**

**5.11.3.1** Type-series containers shall be tested at the firm (manufacturer) taking into account the provisions of 5.11.2.2. These tests shall include at least the following:

.1 testing of container (except for tank containers) for weathertightness in accordance with 3.15, Part II "General Freight Containers" of the Rules for the Manufacture of Containers. Each container from the batch shall be subject to testing;

.2 testing of tank containers for strength (without strain gauging), tightness as well as testing of cooling and/or heating system of cargo in tank containers in accordance with 3.7, Part IV "Tank Containers" of the Rules for the Manufacture of Containers. Each tank container shall be subject to testing;

.3 testing of offshore containers for lifting in accordance with 8.2, Part VII "Offshore Containers" of the Rules for the Manufacture of Containers. Minimum number of containers subject to testing is given in 8.1.8, Part VII "Offshore Containers" of the Rules for the Manufacture of Containers.

.4 thermal containers shall be tested for airtightness in accordance with 3.4, Part III "Thermal Containers" of the Rules for the Manufacture of Containers. Number of containers shall be

established by the Register in each particular case but at least one container from the batch or every 50<sup>th</sup> container.

**.5** thermal containers shall be tested with refrigerating/heating plant for operability thereof in accordance with 3.6, Part III "Thermal Containers" of the Rules for the Manufacture of Containers when the parameters of refrigerating/heating plant are confirmed by the Register. Each thermal container shall be subject to testing.

#### **5.11.4 Evaluation of test results.**

**5.11.4.1** The container test report shall be certified by the persons authorized to conduct tests and submitted to the Register for consideration. The requirements for test report are given in 1.6.2.4, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

**5.11.4.2** The test results are considered as satisfactory provided that:

**.1** elastic and residual deformations of the container components do not render the container incapable of being used for its designed purpose;

**.2** standards of leakproofness and special characteristics corresponding to each container type are complied with;

**.3** critical safety margins for containers are ensured;

**.4** regulated container dimensions as based on check measurements after all tests correspond to those given in the RS Rules.

### **5.12 FINAL ASSEMBLY OF CONTAINER**

**5.12.1** Correct installation of fittings and thermal insulation shall be checked during final assembly of the container. Herewith painting and/or application of thermal insulation shall be carried out only after testing.

**5.12.2** Internal coating inspection (rubber, polyurethane, enamel, etc.), if applicable, shall be exercised after the pressure test of the tank.

**5.12.3** Where the containers comply with the requirements of the Rules for the Approval of Containers for the Transport of Goods under Customs Seal, the attention shall be given to availability and reliability of the door locking bars which make possible sealing of the door lock of only one door half, preventing opening of the second door half without opening of the first one (sealed), obstacles preventing access to the container interiors (guard nets, restriction of the apertures dimensions, etc.), devices for putting customs seals on the fitting compartments of tank containers (if applicable).

**5.12.4** Door locks shall be tested for correct installation of the door locks through repeated opening and closing of doors by one person (satisfactory operation of the door locks is characterized by simultaneous entry of the top and bottom cams into the cam retainers when closing the door and correct abutment of the sealing rubber without curling of edges of the rubber section on the outside and inside when the door is closed).

### **5.13 MARKING**

**5.13.1** During survey of ISO containers attention shall be given to availability and conformity of the following marking with the requirements of the approved documentation:

**.1** the Register emblem (refer to Fig. 5.13.1.1);

**.2** code of the owner, identification number of the owner and reference number (correctness of calculation of the reference number shall be checked).

**Note.** Location of mandatory particulars and symbols, registration of the owner's code, algorithm of the reference number calculation, codes of container sizes and types are in conformity with ISO 6346.

**.3** code of type and code of size in accordance with ISO 6346;

**.4** gross mass and tare mass of the container on the rear wall surface of the container, and tank capacity for tank containers;

**.5** date of the next container examination (where applicable);

**.6** manufacturer's serial number in the right bottom back corner fitting;

**.7** particulars indicating purpose of the fittings;

**.8** marking of safety devices.





Fig. 5.13.1.1

**5.13.2** The CSC and CCC plates shall be checked for:

.1 conformity of dimensions, location, method of attachment and method of indication of particulars and content thereof with the requirements of 4.1, Part I "Basic Requirements" of the Rules for the Manufacture of Containers and 3.1 of the Rules for the Approval of Containers for the Transport of Goods under Customs Seal.

*Note.* The surveyor shall satisfy himself/herself that the plate is made of durable, non-corrosive and fireproof material.

.2 correct indication of the load values in the CSC Plate;

.3 conformity of the maximum gross mass of the container with the value indicated on the CSC Plate and directly on the container.

**5.13.3** Availability and content of the identification plate with tank data shall be checked. Along with that, the surveyor shall make sure that the requirement of the Note to 5.13.2.1 is fulfilled and the plate is attached in an accessible place and the letters and figures are not less than 3 mm in height.

The particulars on the plates shall conform to the requirements of 4.3, Part IV "Tank Containers" of the Rules for the Manufacture of Containers.

**5.13.4** The identity of the manufacturer's numbers on the plates and the corner fitting shall be checked.

**5.13.5** On offshore containers and lifting sets for them the conformity of the marking, plates and particulars indicated on them with the requirements of Section 7, Part VII "Offshore Containers" of the Rules for the Manufacture of Containers shall be checked.

## **5.14 SURVEY OF FINISHED CONTAINERS**

**5.14.1** The following shall be checked during survey of finished containers:

- .1 documents for materials and products (including material test reports where necessary);
- .2 documents on welders, welding consumables and welding production process;
- .3 Inspection Department documents drawn up during manufacture of container (acts, reports, technological charts, etc.);
- .4 reporting documents drawn up upon results of non-destructive testing;
- .5 test reports (results) of type-series containers;
- .6 documents on painting (if applicable);
- .7 correct application of marking;
- .8 results of weighting of each tank containers;
- .9 measurement results of standard dimensions of not less than 10 % of containers of the batch presented (during survey of tank containers, each container shall be subjected to inspection of

standard geometric dimensions) shall be checked for compliance with the standard geometrical dimensions of containers with dimensions indicated in the RS-approved technical documentation and the Rules for the Manufacture of Containers.

Notes: 1. When containers are manufactured without the conductors ensuring the consistency of geometric dimensions, each container shall be subject to inspection of standard geometric dimensions after assembling.

2. If even one dimension does not correspond to the specified one, the surveyor shall require:
  - to define and eliminate the causes for the non-conformity between the dimensions;
  - to inspect the entire batch of containers by dimensions;
  - to submit an official document on fulfillment of the requirements set out in this Note;
  - to present repeatedly the batch of containers after checking by the Inspection Department.

## **5.15 BRANDING**

**5.15.1** The RS brand shall be put on:

- .1** right bottom back corner fitting or on the center on the inner surface of right back corner post (if applicable) of the container (except for offshore containers).
- .2** on CSC Plate (in the vicinity of the date of the next survey) and on the plate with particulars on the tank for tank containers (in the vicinity of the date of the next survey).

Where the CSC Plate contains the information on the RS-approved ACEP program or a sticker of established form is applied, the RS brand is put in the vicinity of the date of manufacture of container.

- .3** on the information plate as well as on the marking plate in the vicinity of COД number on offshore container.

**5.15.2** When branding one shall be guided by the applied provisions of Appendix 2 to Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

## TECHNICAL SUPERVISION DURING MANUFACTURE OF FITTINGS

### 1 GENERAL

**1.1** The present provisions apply to corner and intermediate fittings intended for use in manufacture of containers.

**1.2** The dimensions of fittings and test loads shall meet the requirements of 2.1 and 2.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers. At the Register request, working drawings of fittings shall be submitted for approval.

**1.3** Upon agreement with the Register, the fittings may be manufactured by casting or other technique. The same technique may be applied for manufacture of built-up fittings with the use of welding, namely:

fittings completely welded from individual elements —for side and end faces;  
cast or stamped fittings with weldable plate (additional wall which develops box-shaped fitting as per ISO 1161).

**1.4** The firm (manufacturer) of fittings shall apply to the Register with a written request. Enclosed with the request shall be the technical conditions or technical specification (for firms for which the development of technical conditions is not provided according to the applied normative documents) and/or drawings for fittings where the chemical composition and mechanical properties of the fitting materials, thermal treatment procedures and the procedure used in the manufacture and repair of fittings by welding shall be stated.

### 2 STEEL FITTINGS MANUFACTURED BY CASTINGS

#### **2.1 Requirements for fittings.**

##### **2.1.1 Manufacturing method and chemical composition.**

Fittings shall be manufactured in electric furnaces or oxygen-converter or other process on agreement with the Register and steel shall be killed.

**2.1.2** When selecting material composition for fittings it is necessary to take into account the range of ambient working temperatures in service. In any case, the capacity of the material to resist brittle failure within the range of the item (container) operational temperatures from – 40 up to 50 °C shall be assured. In this case, the value of impact strength shall meet, as a minimum, the requirements of Table 3.2.4, Part I "Basic Requirements" of the Rules for the Manufacture of Containers. Other temperature ranges may be accepted subject to agreement with the Register and the customer in accordance with the requirements of national standards.

##### **2.1.3 Thermal treatment.**

All the fittings shall be treated according to conditions given in the agreed specification taking into consideration requirements of 3.8.4, Part XIII "Materials" of the Rules for the Classification and Construction of Sea-Going Ships.

##### **2.1.4 Mechanical properties.**

The mechanical properties of the castings material after thermal treatment according to procedures given in the technical documentation approved by the Register shall comply with the requirements of Table 3.2.4, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

##### **2.1.5 Workmanship.**

All fittings shall have clean surface.

The following defects are not permitted:

cracks;  
casting defects located in the window areas for container fastening arrangements in the stress points due to loads during the container operation (test loads according to 2.2.6);  
internal defects in other areas of actual size above 5 mm, but not exceeding 200 mm<sup>2</sup> of the total area at one fitting surface.

Defects may be removed using one of the methods specified in 2.5.

Single surface defects of maximum 3 mm in diameter and 1,5 mm in depth are permitted, but not more than 15 defects per fitting.

## **2.2 Survey and tests.**

### **2.2.1 Mechanical tests and impact tests.**

Samples to make test specimens for determining mechanical properties may be taken either from a cast fitting or from a separately cast sample (ladle analysis) subjected to similar thermal treatment procedure. At least one specimen shall be tested for tension and three V-type sharp-notch specimens shall be subjected to impact test. The impact tests are conducted in accordance with Table 3.2.4, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

### **2.2.2 External examination and checking of dimensions.**

The manufacturer shall carry out external examination of 100 % fittings and by measuring of at least 10 % fittings from a batch. Fittings shall be submitted to the RS surveyor for random inspection to check their compliance with the requirements of 2.1 and 2.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

### **2.2.3 Non-destructive testing.**

One fitting from each heat, but not more than from a batch of 400 castings shall be subjected to non-destructive testing in compliance with the standards agreed with the Register.

### **2.2.4 Strength tests.**

The tests are conducted according to the Register approved program in the recognized testing laboratories. In individual cases, at the discretion of the Register, tests may be conducted at the testing laboratories not recognized by the Register (refer to 1.6.1.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers).

Test loads are established taking into account the loads arising during the tests of containers in compliance with the standards specified in 2.2.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers. One lower and one upper fitting from each 100 sets of thermally-treated fittings are subject to testing. Other methods to confirm the strength characteristics may be accepted subject to agreement with RHO.

## **2.3 Marking and branding.**

**2.3.1** The marking shall meet the requirements of 2.2.4, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

**2.3.2** The RS surveyor puts the Register brand on each fitting tested under RS technical supervision.

## **2.4 Certificates.**

**2.4.1** For each batch the manufacturer shall submit to the RS surveyor a Certificate or specification containing, as a minimum, the following information:

- customer and number of contract (order);
- type of fitting and casting material category;
- number of drawing and/or specification;
- method of manufacture;
- number of heat;
- thermal treatment procedures;
- quantity and mass of fittings;
- results of non-destructive testing and mechanical tests;
- results of fittings measurements.

## **2.5 Correction of defects.**

### **2.5.1 Conditioning.**

Minor defects shall be removed by conditioning provided that the depth of conditioning shall not exceed the allowable negative tolerances.

### **2.5.2 Welding.**

**2.5.2.1** Defects which cannot be removed only by conditioning shall be corrected by welding with preliminary conditioning of the defective places provided that the depth of defect occurrence does not exceed 40 % of the fitting wall thickness. When defects of the fittings are corrected by welding, the following requirements shall be fulfilled:

.1 pre-heating shall be provided prior to welding if the ambient temperature is below 5 °C or moisture is present in the welding area;

.2 welding shall be performed by certified welders;

.3 after correction all the cast fittings shall be subjected to thermal treatment with the use of procedures agreed with the Register;

.4 welded up places shall be conditioned and checked for defects by one of the non-destructive testing methods approved by the Register.

When repairing, it is also required to consider the requirements of 2.6.3 and 2.6.4 of Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships.

## TECHNICAL SUPERVISION DURING MANUFACTURE OF TANK CONTAINERS WITH FIBER-REINFORCED PLASTICS (FRP) SHELL

### 1 REQUIREMENTS FOR MANUFACTURE

**1.1** The requirements of this section apply to tank containers with FPR shell designed according to Part VIII "Tank Containers with Fiber-Reinforced Plastics (FRP) Shell" of the Rules for the Manufacture of Containers.

**1.1.1** The requirements and definitions of Section 5 (with the exception of 5.7.2) of the Rules for Technical Supervision during Manufacture of Containers apply to tank containers with a FRP shell.

**1.1.2** The manufactured structural elements of the FRP shell shall meet the requirements of construction and production documentation approved by the Register.

#### **1.2 Technical supervision of raw materials and components.**

**1.2.1** The manufacturer of the FRP shell shall have a specification for all the raw materials and components, a description of their storage conditions with shelf life, and certificates for the batches provided by the manufacturer. The specified data shall be included in the process instruction for the manufacture of the shell.

#### **1.2.2 Incoming inspection of raw materials and components.**

The following materials and components are subject to incoming inspection:

.1 resins used for shell manufacture. The list of parameters subject to incoming control is given in Table 1.2.2.1;

Table 1.2.2.1

**Requirements for incoming inspection of resins used for shell manufacture**

List of characteristics to be mentioned in the resin batch manufacturer's specification		List of the resin batch characteristics to be determined by the shell manufacturing firm	
Characteristics	Testing standard	Characteristics	Testing standard
Unsaturated polyester and vinyl ester resins			
1. Viscosity	ISO 3104, ISO 3219, ISO 2555 ISO 2114	1. Viscosity	ISO 3104, ISO 3219, ISO 2555 ISO 2535
2. Acid number		2. Gel time and exothermic reaction temperature during cure of binder	
3. Specific density	ISO 12185, ISO 2811, ISO 1675	3. Specific density	ISO 12185, ISO 2811, ISO 1675
4. Appearance	Visual inspection	4. Appearance	Visual inspection
Epoxy resins			
1. Viscosity	ISO 3104, ISO 3219 ISO 3001	1. Viscosity	ISO 3104, ISO 3219 Testing method shall be specified in the process specification on shell manufacture
2. Epoxy equivalent		2. Gel time	
3. Specific density	ISO 12185	3. Specific density	ISO 12185, ISO 1675
4. Appearance	Visual inspection	4. Appearance	Visual inspection
Phenolic resins			
1. Viscosity	ISO 3104	1. Viscosity	ISO 3104, ISO 3219, ISO 2555 ISO 12185, ISO 1675 Visual inspection
2. pH value	ISO 8975	2. Specific density	
3. Volatile content	ISO 3251	3. Appearance	
4. Specific density	ISO 12185		
5. Appearance	Visual inspection		

.2 reinforcement fibers. The manufacturer of reinforcement fibers shall ensure that the minimum values of strength and elongation modulus are equal to at least 90 % of the values mentioned in the

manufacturer's specifications for impregnated fiber bundles, whose strength and elongation modulus are determined in compliance with ISO 9163;

.3 glass fabric. The manufacturer shall mention the mass-to-area ratio determined according to ISO 4605 in the specification and shall provide information on minimum strength and elongation modulus values in the directions along warp and weft;

.4 mats. The manufacturer shall mention mass-to-area ratio in the specification.

### **1.2.3 Resins.**

Resin origin shall be unambiguously identified by the manufacturer's name or trade mark and batch number (code).

**1.2.3.1** The resin manufacturer shall submit a certificate for the resin batch with the following information to the FRP shell manufacturer:

- resin identification;
- manufacturer (including address);
- batch numbers;
- date of manufacture;
- shelf life;
- storage conditions.

**1.2.3.2** The resin manufacturer shall specify characteristics (refer to Table 1.2.2.1) with tolerance intervals in the certificate for each resin batch.

**1.2.3.3** The shell manufacturer shall verify compliance of the resin characteristics specified in Table 1.2.2.1 with the values given in the process specification considering the tolerance intervals.

**1.2.3.4** Additives required for resin processing such as catalysts, accelerators, hardeners and thixotropic agents, as well as materials used to improve the shell properties, such as fillers, coloring materials, pigments, etc. shall be specified in the process specification on shell manufacture. Each additive shall be unambiguously identified by the manufacturer's name and/or notation.

**1.2.3.5** Polymerized resin hardness shall be determined through Barcol tests according to EN 59 and shall be within permissible values specified in the process specification on shell manufacture.

### **1.3 Manufacture process for FRP shells.**

**1.3.1** Change of manufacture process and characteristics of raw materials and components shall be reviewed and approved by the Register.

**1.3.2** Shell structural layer placing sequence and orientation shall be specified in the process specification on shell fabrication.

**1.3.2.1** The weight content of the fiber reinforcement shall be within a tolerance of +10 % ...– 0 % of the weight content specified in the process specification on shell manufacture. It is allowed to use fiber reinforcement specified in 2.2.6.2 Part VIII "Tank Containers with Fiber-Reinforced Plastics (FRP) Shell" of the Rules for the Manufacture of Containers.

**1.3.2.2** It is allowed to use resins specified in 2.2.6 Part VIII "Tank Containers with Fiber Reinforced Plastics (FRP) Shell" of the Rules for the Manufacture of Containers. It is not permitted to use pigment additives and coloring materials not specified in the process specification on shell manufacture.

### **1.3.3 Filament winding process.**

Shell's structural layers shall be manufactured by winding resin-impregnated unidirectional tapes.

**1.3.3.1** Structural layers shall be wound according to the diagram specified in the process specification on shell manufacture. The shell winding diagram shall enable accommodation of loads as specified in 2.2.8, 2.2.9, 2.2.12 and 3.3.3 of Part VIII "Tank Containers with Fiber-Reinforced Plastics (FRP) Shell" of the Rules for the Manufacture of Containers.

**1.3.3.2** Tension on the strands of filaments during the winding operation shall be controlled to assure uniformly stressed filaments in the composite shell under loads specified in 2.2.8, 2.2.9, 2.2.12 and 3.3.3 of Part VIII "Tank Containers with Fiber-Reinforced Plastics (FRP) Shell" of the Rules for the Manufacture of Containers.

**1.3.3.3** The speed of winding shall be limited only by the ability to meet the tensioning requirements, to conform to the specified winding pattern, and to assure adequate resin impregnation.

**1.3.3.4** The bandwidth of the previously impregnated tapes to be wound and the spacing between them shall be controlled to meet the requirements specified in the process instruction for the manufacture of the shell.

#### 1.3.4 Contact molding process.

The shell structure shall consist of random short length (25 to 100 mm) fiber filaments and roving (or biaxial fabric, singular or in combination) in a resin matrix.

**1.3.4.1** Flat mats for cylindrical reinforcement shall be laid up as separate layers and overlapped in a staggered pattern. Resin shall be applied to each layer in such a manner as to wet out completely.

**1.3.5** Vacuum infusion process. Vacuum infusion process shall be used for fabrication of elliptical or hemispherical end or structural parts of the shell using glass fabrics.

#### 1.4 Technical supervision during manufacture of shells.

**1.4.1** When manufacturing a prototype FRP shell, compliance with the manufacture methods in accordance with the requirements in 1.3 is subject to technical supervision.

**1.4.2** Visual inspection of the prototype and serial items.

**1.4.2.1** The state of structural layers shall comply with the criteria specified in Table 1.4.2.1.

Table 1.4.2.1

Criteria for permissible defects in shell's structural layers

No.	Defects description	Defect intensity and permissible sizes
1	Voids (air bubbles)	6 per 10cm <sup>2</sup> , max. 3 mm in diameter, 15 per 10cm <sup>2</sup> max. 1,5 mm in diameter
2	External blisters at shell's structural layers	1 per 1000 cm <sup>2</sup> , max. 6 mm in diameter, max. 3 mm in height, min. distance between adjacent defects is 50 mm
3	Surplus heat evolution areas	Not allowed
4	Chipping	Max. 6 mm in diameter or 13 mm in length, max. 1,5 mm in depth
5	Cracks	Not allowed
6	External hairline cracks at shell's structural layers	Max. 25 mm in length, max. 0,4 mm in depth, max. 5 per 1000 cm <sup>2</sup>
7	Internal delaminations	Permissible delamination dimensions shall be specified in the process specification on shell manufacture
8	Edge delaminations	Max. 3 mm in length; not allowed on surfaces in contact with transported cargo
9	Dry (poorly impregnated) spots	Not allowed
10	Exposure of structural layer cut ends	Not allowed
11	Foreign inclusions	Max. 10 mm in diameter; through penetration in structural layers is not allowed; shall be completely covered with resin
12	Fish eye defect (a ball-like matter inside transparent or translucent material)	Max. 3 mm in diameter
13	Pits	Max. 6 mm in diameter, max. 1,5 mm in depth. Exposure of fiber cut ends is not allowed
14	External porosity (small pits, ~ 0.25 mm) of the shell's structural layers	Surface intensity max. 24 per 100 cm <sup>2</sup>
15	Scratches	Max. 150 mm in length; exposure of fiber cut ends is not allowed
16	Shrinks and pinches	Not allowed for filament winding. Maximum deviation from the specified surface shall not exceed 20 % or 3 mm, whichever is less
17	Tapes winded with gaps (filament winding)	According to the process specification
18	Tapes winded with overlapping (filament winding)	According to the process specification
19	Tape skewing with a gap between fiber bundles (filament winding)	According to the process specification

**1.4.2.2** The state of the shell's chemical resistant layer and fire protection layer shall comply with the criteria specified in the process specification on the shell manufacture.

#### 1.4.3 Thickness and dimension inspection for the prototype and serial items.

**1.4.3.1** Thicknesses of the shell's structural layers shall be measured. Thicknesses shall be measured in at least 12 points, and the measurement results shall be checked for compliance with



the design documentation, and the number and thicknesses of individual layers specified in the process specification on shell manufacture.

**1.4.3.2** Diameters, thickness and other physical dimensions of flanges and nozzles for shut-off valves and safety devices shall be checked for compliance with design documentation.

**1.4.4 Hardness tests of the prototype and serial items.**

**1.4.4.1** Hardness of shell's structural and chemical resistant layers after the resin is hardened shall be determined through Barcol tests according to EN 59 and shall be within permissible values specified in the process specification on shell manufacture.

**1.4.5** All the connections between parts of thermoplastic liners shall be tested for electric breakdown using an electric tester with operating voltage of 20,000 V. The areas of detected electric breakdown shall be repaired and retested.

**1.4.6** The prototype and type-series items are subject to internal test pressure according to 3.7 (except for 3.7.7), Part IV "Tank Containers" of the Rules for the Manufacture of Containers. Under this load, no visible damage of or leakage from the vessel shall be observed.

**1.4.7 Verification of type-series items' identity to the prototype.**

**1.4.7.1** Tests of representative sample shall be performed according to 3.2.2 of Part VIII "Tank Containers with Fiber-Reinforced Plastics (FRP) Shell" of the Rules for the Manufacture of Containers, except for tensile tests (refer to 3.2.2.3). Witness sample may be used only when representative sample cannot be cut out of the shell.

**1.4.7.2** For bending creep testing according to 3.2.2.4 of Part VIII "Tank Containers with Fiber Reinforced Plastics (FRP) Shell" of the Rules for the Manufacture of Containers, the test time may be reduced down to 100 h.

**1.4.7.3** Test results shall comply with the values assumed for the approved design of the tank container with the FRP shell."

## **RULES FOR TECHNICAL SUPERVISION OF CONTAINERS IN SERVICE**

### **3 SURVEYS**

30 **Para 3.4.5.1.3.3** is replaced by the following text:

**".3.3** the frangible disks shall be visually inspected for integrity and compliance of the breakdown pressure specified on a tag to the pressure required in accordance with 2.3.2.6, Part IV "Tank Containers" of the Rules for the Manufacture of Containers as well as the international and national normative documents (frangible disks without a tag or with unreadable information on a tag shall be replaced);".