

# **RUSSIAN MARITIME REGISTER OF SHIPPING**

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

## **RULES FOR THE MANUFACTURE OF CONTAINERS**

## **RULES FOR THE APPROVAL OF CONTAINERS FOR THE TRANSPORT OF GOODS UNDER CUSTOMS SEAL**

## **RULES FOR TECHNICAL SUPERVISION DURING MANUFACTURE OF CONTAINERS**

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



Saint-Petersburg  
2019

These Rules consist of the General Regulations for the Technical Supervision of Containers, the Rules for the Manufacture of Containers, the Rules for the Approval of Containers for the Transport of Goods under Customs Seal, the Rules for Technical Supervision during Manufacture of Containers, the Rules for Technical Supervision of Containers in Service.

These Rules have been approved in compliance with the established approval procedure, they shall come into force on 1 October 2019 and apply to containers of 10 t gross mass and above intended for the carriage of goods by water, rail and road as well as to offshore containers (handled in open seas) of other gross mass.

The present edition is based on 2015 edition, taking into account additions and amendments developed immediately before publication.

The Rules have taken into account the requirements of the International Convention for Safe Containers (CSC), 1972, edition 2014, Customs Convention on Containers (CCC), as amended in 2008, acting Regulations for transporting dangerous goods by air, sea, road and rail transport, IACS Unified Requirements (UR), ISO standards, European Standards, IMO resolutions and UN Recommendations on the Transport of Dangerous Goods as well as national standards and rules.

In case of discrepancies between the Russian and English versions, the Russian version shall prevail.

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

## **1 GENERAL**

### **1.1 DEFINITIONS AND EXPLANATIONS**

**1.1.1** In the present edition the following definitions have been adopted.

**Additional requirements** are the requirements not contained in the Rules and set forth by Russian Maritime Register of Shipping (hereinafter referred to as the Register) in carrying out technical supervision.

**Product** means an item of machinery, an appliance, a pressure vessel, an apparatus, a device, an item of equipment or outfit to which the requirements of the Rules are applicable.

**Rules** mean the rules stated in 1.3.

**Technical and normative documents** are standards, regulatory documents, technical requirements, norms, calculation methods, instructions, guidelines and other documents defining structural, technical and technological norms during design, construction (manufacture), assembly, testing and service of items of the RS technical supervision..

**1.1.2** The types of containers are given in ISO 830 standard.

**1.1.3** The codes of dimensions and type are given in ISO 6346 standard.

### **1.2 THE REGISTER ACTIVITY ON TECHNICAL SUPERVISION**

**1.2.1** The Register is a body of technical supervision of containers. Being a member of the International Association of Classification Societies (IACS), the Register follows IACS decisions being guided by the provisions of the Code of Ethics of the Register. The Register Quality Management System (RS QMS) complies with applicable requirements of ISO 9001 and ISO/IEC 17020 standards, IACS QSCS and Regulation (EC) 391/2009, IMO resolution MSC.349(92), which is confirmed by the appropriate certificates.

**1.2.2** The Register is authorized to exercise on behalf of the Government technical supervision of implementation of the provisions of international Conventions, agreements and contracts to which the Russian Federation or any other State, the Government of which has authorized the Register to conduct this kind of activities is a party, insofar as matters within the Register scope are concerned.

**1.2.3** The Register establishes technical requirements for containers guided by the provisions of the International Convention for Safe Containers, 1972 (hereinafter referred to as "the CSC"), Customs Convention on Containers, 1972 (hereinafter referred to as "the CCC"), International Maritime Dangerous Goods Code (hereinafter referred to as "IMDG Code") and performs technical supervision of the compliance with these requirements.

It considers the applicability of other Regulations, Conventions and Agreements (European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR), International Regulations for the Carriage of Dangerous Goods by Rail (RID), Rules for the Transport of Dangerous Goods, Appendix 2 to the Agreement on International Carriage of Goods by Rail (SMGS).

**1.2.4** Technical supervision is performed according to the Rules issued by the Register, and is aimed to determine whether the containers liable to technical supervision of the Register, as well as the materials and products, meet the provisions of the Rules and the additional requirements.

The requirements of the Rules and additional requirements are obligatory for design organizations, manufacturers of containers, container owners, firms manufacturing materials and equipment for containers and those engaged in the repair and maintenance of containers subject to technical supervision of the Register.

Technical supervision of the Register does not supersede the quality control services of the container owners and manufacturers.

**1.2.5** The Register performs technical supervision of the containers and associated materials and products during design, manufacture and service.

**1.2.6** The Register reviews and approves Russian technical and normative documents, as well as those of other countries and international technical and normative documents, containing norms and requirements for items of the RS technical supervision.

Technical and normative documents of another country are agreed by the Register when they are officially submitted for the agreement by a state organization of this country.

When technical and normative documents of another country are submitted as part of technical documentation for the items of the RS technical supervision, they are considered its integral part, and their application in each case is confirmed by the approval of technical documentation without separate approval of said technical and normative documents.

**1.2.7** The Register may participate in investigations of matters lying within its scope.

**1.2.8** The fees for the performed work are charged by the Register according to the Register scale of fees. Additional fees are charged by the Register in the case of additional expenses incurred in the course of rendering of service (for instance, traveling expenses, services rendered out of hours etc.).

### **1.3 RULES**

#### **1.3.1 Applicable Rules.**

**1.3.1.1** The Rules used by the Register in technical supervision of containers under manufacture and in service are:

- .1** General Regulations for the Technical Supervision of Containers;
- .2** Rules for the Manufacture of Containers, consisting of the following parts:
  - I "Basic Requirements";
  - II "General Freight Containers";
  - III "Thermal Containers";
  - IV "Tank Containers";
  - V "Platform Containers";
  - VI "Non-Pressurized Bulk Containers";
  - VII "Offshore containers";
  - VIII "Tank Containers with Fiber-Reinforced Plastics (FRP) Shell";
- .3** Rules for the Approval of Containers for the Transport of Goods under Customs Seal;
- .4** Rules for Technical Supervision during Manufacture of Containers;
- .5** Rules for Technical Supervision of Containers in Service;
- .6** Rules for the Classification and Construction of Ships Carrying Liquefied Gases in Bulk, as applicable to containers;
- .7** Rules for the Classification and Construction of Sea-Going Ships as applied to containers;
- .8** Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

**1.3.1.2** In addition to the Rules stated in 1.3.1.1, the Procedures for the Design, Manufacture, Service and Repair of Pressure Vessels for the Storage and Transport of Dangerous Goods are used by the Register in performing technical supervision.

#### **1.3.2 Application of the Rules to containers under manufacture and to products.**

**1.3.2.1** Newly published Rules, as well as amendments introduced in the Rules, come into force from the date specified in the annotation to the publication, unless other terms are fixed in particular cases. Until the date of entry into force, they shall be considered as recommendation.

**1.3.2.2** Interpretation of the requirements of the Rules and other normative documents of the Register is within the Register competence only.

**1.3.2.3** The containers and products whose designs are submitted for approval of the Register after the entry into force of the Rules, or amendments introduced in the Rules, shall satisfy the requirements of these Rules and amendments.

To the containers being manufactured and products whose technical documentation was approved by the Register prior to the entry into force of the Rules, those Rules are applicable which were in force on the date of approving that documentation.

**1.3.3 Deviations from the Rules.**

**1.3.3.1** The Register may allow to use materials, structures or separate devices and items of the container, other than those specified in the Rules, provided they are at least as effective as those required by the Rules; deviations from the Rules, which are covered by the international conventions and agreements, may be permitted by the Register only if the latter is satisfied that such deviations are permissible under these conventions and agreements. In these cases the Register shall be provided with information enabling to ascertain that the materials, structures and products meet the requirements which ensure trouble-free handling of the container and safe carriage of goods.

**1.3.3.2** If the design of the container, its separate machinery, devices, units, equipment and outfit or the materials used cannot be regarded as sufficiently proved in service, the Register may require additional tests to be made during manufacture of the container and in the case of containers in service, may reduce the intervals between periodical surveys or increase the extent of such surveys.

## **1.4 DOCUMENTS**

**1.4.1** In the course of technical supervision the Register issues the appropriate documents.

**1.4.2** Based on the results of technical supervision of containers, the following documents provided for by the List of Forms of the Register documents are issued during technical supervision:

**.1** Certificate of Freight Container Safety Approval by Design Type (COI) which certifies the compliance of the freight container design type with the requirements of CSC and the Register Rules;

**.2** Certificate of Thermal Container Safety Approval by Design Type (COI) which certifies the compliance of the thermal container design type with the requirements of CSC and the Register Rules;

**.3** Certificate of Tank Container Safety Approval by Design Type (COI) which certifies the compliance of the tank container design type with the requirements of CSC and the Register rules;

**.4** Design Type Approval Certificate of the Portable Tank (Tank Container) for Transportation of Dangerous Goods (COI) which certifies the compliance of the tank container design type with the requirements of IMDG Code and the Register rules, with the indication of other applicable technical and normative documents;

**.5** Certificate of Container Approval (COI) at a Stage Subsequent to Manufacture which certifies the compliance of the container design with the requirements of CCC and the Register rules;

**.6** Certificate of Container Approval by Design Type (COI) which certifies the compliance of the container design type with the requirements of CCC and the Register rules;

**.7** Type Approval Certificate for Offshore Container (COI) which certifies the compliance of the offshore container design type with the requirements of the Register rules and with the indication of other applicable regulatory documents.

**.8** Type Approval Certificate (CTO) which certifies the compliance of the types of materials, products or groups of products, type production processes with the requirements of the Register rules;

**.9** Certificate for Freight Containers which certifies the compliance of specific freight containers with the requirements of the CSC, CCC and the Register rules;

**.10** Certificate for Thermal Containers which certifies the compliance of specific thermal containers with the requirements of CSC, CCC and the Register rules;

**.11** Certificate for Tank Container which certifies the compliance of the specific tank container with the requirements of the CSC, CCC, IMDG Code and the Register rules and with the indication of other applicable normative and technical documents;

**.12** Certificate for Offshore Containers which certifies the compliance of offshore containers with the requirements of the Register Rules and with the indication of other applicable normative and technical documents;

**.13** Certificate for Offshore Tank Container which certifies the compliance of a specific offshore tank container with the requirements of the Register Rules and with the indication of other applicable normative and technical documents;

**.14** Recognition Certificate for Manufacturer (СПИ) which certifies the Register recognition of a manufacturer as the manufacturer of materials and products which are under the Register technical supervision;

**.15** Recognition Certificate (СП) which certifies the recognition of a service supplier rendering services (carrying out works) in compliance with the Register requirements;

**.16** Recognition Certificate of Testing Laboratory (СПЛ) which certifies the laboratory competence in the performance of certain types of tests of materials, products and containers;

**.17** Recognition Certificate for the Firm Performing Freight Container Inspection (СПО) which certifies the Register recognition of the firm performing inspections of freight containers (excluding tank containers) in service in compliance with the CSC requirements and 3.2 of the Rules for Technical Supervision of Containers in Service;

**.18** Certificate of Firm Conformity (ССП) which certifies the conformity of the firm with the Register requirements in rendering the declared services (carrying out the declared work) — refer to Section 11, Part I "General Regulations for the Technical Supervision" of the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships;

**.19** Welder Approval Test Certificate (СДС) which is a document of the Register certifying that a particular welder has successfully passed the tests for certification in the scope of the requirements of the Register rules and is allowed to perform welding work on structures subject to Register technical supervision within the scope of approval specified in the Certificate;

**.20** Welding Procedure Approval Test Certificate (СОПС) which is a document of the Register certifying that the welding process used at the shipyard or firm that manufactures welded structures has been tested and approved by the Register for application;

**.21** Certificate (C) (certificate (C3) which is a certificate filled and signed by an official of the firm (manufacturer) and drawn up (certified) by the Register) which is a document certifying the compliance of specific materials, products or groups of products with the Rules of the Register and normative documentation;

**.22** reports.

**1.4.3** The validity period of the certificates and reports listed in 1.4.2.1 — 1.4.2.6 is not specified. The certificates are not valid for newly manufactured containers in case of expiration of the technical documentation validity period.

**1.4.4** The validity period of the Certificate specified in 1.4.2.7 shall not exceed 6 years and the validity period of CTO 1.4.2.8 shall not exceed 5 years. The validity period of the Certificate shall not exceed the approval period of the technical documentation for an item of technical supervision. Upon expiration of the certificate validity period, it is renewed upon the request of the firm.

**1.4.5** The validity period of the certificates specified in 1.4.2.9 and 1.4.2.10 shall not exceed 5 years.

**1.4.6** The validity period of the Certificate for Tank Container specified in 1.4.2.11 shall not exceed 2,5 years.

**1.4.7** The validity period of the certificates specified in 1.4.2.12 to 1.4.2.13 shall not exceed 1 year.

**1.4.8** The validity period of the Certificates specified in 1.4.2.14, 1.4.2.16 to 1.4.2.18 shall not exceed 5 years. Certificates are subject to endorsement not less than once a year. Endorsement shall be done within the period limited by 30 days before and 30 days after the date of the established endorsement date of the certificates.

The validity period of the Certificates specified in 1.4.2.15 is 3 years and is not subject to endorsement. Upon expiration of the certificate validity period, it is renewed upon the request of the firm.

RS reserves the right to carry out occasional surveys of a firm having a valid RS certificate in cases when:

**.1** an item of technical supervision has been found non-complying with the RS requirements, in particular, based on information from a third party;

**.2** the firm has not notified the Register either about the changes of the technical documentation for the item of technical supervision approved by the Register, or of changes of the item of technical supervision stated in the certificate.

**1.4.9** Validity of the documents specified in 1.4.2.14 — 1.4.2.18 (СПИ, СП, СПЛ, СПО, ССП) may be suspended for a period agreed upon with the firm but not more than ninety (90) days from the specified date of endorsement, provided:

**.1** reporting documents have not been properly drawn up;

**.2** the firm has not applied with the request to endorse the certificate within the established period;

**.3** the firm has not informed the Register of the changes in the activity specified in the certificate;

**.4** a single nonconformity of the firm activity to the Register requirements have been found;

**.5** an item of technical supervision has been found non-complying with the Register requirements, in particular, based on information from a third party;

**.6** the firm has not notified the Register either about the changes of the technical documentation for the item of technical supervision approved by the Register or about changes of the item of technical supervision stated in the certificate.

**1.4.10** СПИ, СП, СПЛ, СПО, ССП shall become invalid:

**.1** upon expiry of the certificate period of validity;

**.2** in case the certificate suspension reasons have not been eliminated within the agreed period;

**.3** if the repeatedly detected non-conformities of the firm activity or an item of technical supervision to the Register requirements that have previously been found;

**.4** the firm has not notified the Register either about the changes of the technical documentation for the item of technical supervision approved by the Register or about the changes of the item of technical supervision stated on the certificate affecting the safety of the objects of technical supervision or involving emergency cases;

**.5** in case the certificate has not been endorsed within the specified period;

**.6** in case the contract or agreement on technical supervision become void in cases stipulated under 4.6, Part I "General Regulations on Technical Supervision" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships;

**.7** in case of the firm's bankruptcy or liquidation.

**1.4.11** The Register informs the firm in the writing about the suspension and loss of validity of the certificate in cases specified in 1.4.9.1, 1.4.9.3 to 1.4.9.6 and 1.4.10.2 to 1.4.10.4, and 1.4.10.6.

**1.4.12** The documents are issued by the Register on the basis of satisfactory technical condition determined for the supervised item by means of surveys and tests.

**1.4.13** The Register documents wherein the owner or the applicant is specified, do not confirm the right of ownership of the item of technical supervision.

**1.4.14** The Register shall be notified about all the modifications (introduction of alterations to the design) of the surveyed containers. Such containers may be tested to the necessary extent, if required by the Register.

**1.4.15** The Register may fully or partly recognize the documents issued by other classification societies, technical supervision bodies and other organizations.

**1.4.16** Under the circumstances indicated below, the Register is entitled to suspend the validity of the certificates specified in 1.4.2.1 — 1.4.2.13, 1.4.2.21:

**.1** structural defect of the design type approved by the Register has been revealed and the firm has not agreed the way to eliminate it with the Register within the specified terms;

**.2** the firm has not notified the Register either about the changes in the technical documentation for the item of technical supervision approved by the Register or about the changes of the item of technical supervision stated in the certificate affecting the safety of the objects of technical supervision or involving emergency cases.



**1.4.17** The validity of such documents may be restored, if the Register is satisfied that the grounds, which caused the loss of validity have been eliminated.

## **1.5 THE REGISTER RESPONSIBILITIES**

**1.5.1** The Register entrusts the performance of inspections to adequately qualified experts performing their work in accordance with their functional duties.

The Register is responsible for failure to perform or for improper performance of its commitments only in case of established fault and the cause-effect relation between the damage caused and the Register activity.

## 2 TECHNICAL SUPERVISION

### 2.1 GENERAL

**2.1.1** The scope of the technical supervision includes:

- .1** consideration of technical documentation;
- .2** technical supervision during manufacture of materials and products, specified in the Rules, intended for subsequent manufacture of items of technical supervision;
- .3** technical supervision during manufacture of containers;
- .4** technical supervision of containers in service including repair and modernization of containers;
- .5** drawing up and issuance of the Register documents;
- .6** recognition of manufacturers, repair firms, other organizations involved in operation of containers, certification of laboratories for testing containers, materials and products intended for containers.
- .7** recognition of firms and organizations engaged in weighing the packed containers in compliance with IMO resolution MSC 380(94).

**2.1.2** The nomenclature of items of the Register technical supervision, works and tests performed under the Register technical supervision with regard to containers is given in Table 2.1.2.

Table 2.1.2

Code of item of technical supervision	Items of technical supervision and activities	Certificate of Approval/ Type Approval/ Recognition Certificate for Manufacturer	At the manufacturer's works	
			Document issued	Branding
	<b>Containers</b>			
30010000MK	General freight containers	COД	C	K
30020000MK	Thermal containers	COД	C	K
30030000MK	Tank containers	COД	C	K
30040000MK	Platform and platform-based containers	COД	C	K
30050000MK	Non-pressurized dry bulk containers	COД	C	K
30060000MK	Named-cargo containers	COД	C	K
30070000	Offshore containers	COД	C	K
30070000MK	Offshore containers (covered by Codices and Conventions)	COД	C	K
30070100	Auxiliary offshore containers	COД	C	K
30070100MK	Auxiliary offshore containers (covered by Codices and Conventions)	—	C	—
	<b>Manufacture of materials, products and accessories for containers</b>			
30080100	Sheet steel for tanks <sup>1</sup>	—	C/C3 <sup>2</sup>	K
30080200	Rolled metal for manufacturing of pad eyes for offshore containers <sup>3</sup>	—	C/C3 <sup>2</sup>	K
30090100MK	End frames <sup>4</sup>	—	C	K
30090150MK	Corner and intermediate fittings	—	C/C3	K
30090200MK	Shell (vessel) of tank containers <sup>4</sup>	—	C	K
30090210MK	Tank heads <sup>4</sup>	—	C	K
30090220MK	Tank shells <sup>4</sup>	—	C	K
30090300MK	Tank hatches <sup>1</sup>	CTO <sup>5</sup>	C/C3	—
30090410MK	Frangible disks <sup>1</sup>	CTO <sup>5</sup>	C/C3 <sup>2</sup>	—
30090420MK	Fusible elements <sup>1</sup>	CTO <sup>5</sup>	C/C3 <sup>2</sup>	—
30090430MK	Pressure-relief (safety) valves <sup>1</sup>	CTO <sup>5</sup>	C/C3	—
30090500MK	Vacuum valves <sup>1</sup>	CTO <sup>5</sup>	C/C3	—
30090600MK	Stop valves of tank <sup>1</sup>	CTO <sup>5</sup>	C/C3	—
30090700MK	Cooling and heating appliances	CTO <sup>5</sup>	C/C3	—
30090810MK	Covers for containers	CTO <sup>5</sup>	C/C3	—
30090820MK	Ropes for fastening a cover to a container	CTO <sup>5</sup>	C/C3	—
30090900	Lifting set for offshore containers	CTO <sup>5</sup>	C/C3	—
30091000	Components of lifting sets for offshore containers	CTO <sup>5</sup>	C/C3	K
30091100	Refrigerating and/or heating appliances of a container	CTO <sup>5</sup>	C/C3 <sup>2</sup>	—
30091200	Electrical equipment for containers	CTO <sup>5</sup>	C/C3 <sup>2</sup>	—
15110101	(Electrical) sensors and indicators of level	CTO <sup>5</sup>	C/C3	—

Продолжение табл. 2.1.2

Code of item of technical supervision	Items of technical supervision and activities	Certificate of Approval/ Type Approval/ Recognition Certificate for Manufacturer	At the manufacturer's works	
			Document issued	Branding
	<b>Activity nomenclature</b>			
40000001	Manufacture of containers and associated materials and products	СПИ <sup>6</sup>	—	—
40000002	Repair and modernization of containers	СП/ССП <sup>6</sup>	—	—
40000003МК	Tests of containers	СПЛ	—	—
40000004МК	Freight containers examination /inspection (excluding tank containers) in service in compliance with the requirements of the International Convention for Safe Containers (CSC)	СПО	—	—
40000005МК	Confirmation of gross mass of containers	СП	—	—
40000006	Preparation and tests of tank containers for periodical surveys	СП/ССП	—	—
40000007	Design engineering services for containers and associated products	ССП <sup>6</sup>	—	—
<sup>1</sup> For tank containers that are intended for the carriage of dangerous goods. <sup>2</sup> May be delivered with the manufacturer's documents affirmed by the Register surveyor's appropriate stamp. <sup>3</sup> Thickness of rolled metal is 6 mm and over. <sup>4</sup> For products supplied separately, for assembly of containers. <sup>5</sup> Delivery of products with C/C3 is allowed. <sup>6</sup> Shall be carried out on a voluntary basis.				

**2.1.3** The basic method used by the Register in exercising technical supervision is random inspection, unless any other procedure has been adopted.

**2.1.4** For the technical supervision to be carried out, container owners and manufacturers shall ensure that the representatives of the Register all afforded the possibility of conducting surveys of containers, free access to all places where materials or products subject to the Register technical supervision are manufactured and tested and shall provide all conditions for the technical supervision to be performed.

**2.1.5** Container owners, design organizations and firms shall fulfill the requirements set forth by the Register to perform technical supervision.

**2.1.6** Any changes relating to materials and the structural design of containers and products to which the requirements of the Rules apply, planned by container owners and firms, shall be approved by the Register before they are implemented.

**2.1.7** Controversial issues arising in the course of technical supervision may be transferred by container owners, manufacturers and other interested organizations directly to the higher Register Branch Office. The decision of the Register Head Office (RHO) is final.

**2.1.8** The Register may refuse from the technical supervision in case when the firm systematically violates the Rules or contract on technical supervision concluded with the Register.

**2.1.9** In case of revealing defects in a material or a product with a valid document, the Register may require additional tests or appropriate corrections to be made, and if the defect cannot be remedied, may cancel this document.

**2.1.10** A container manufactured in conformity with the approved technical documentation shall undergo the appropriate tests according to the procedures set out in the relevant parts of the Rules for the Manufacture of Containers.

**2.1.11** If, in the result of testing of the prototype, the design of type-series containers, the associated equipment or the process of manufacture shall be changed as compared with the approved documentation of the prototype, the manufacturer shall submit for consideration of the Register the documentation for series production of the containers, inclusive of the changes proposed.

## **2.2 TECHNICAL SUPERVISION OF MATERIALS AND PRODUCTS DURING MANUFACTURE**

**2.2.1** Relevant parts of the Rules contain the lists of materials and products subject to the Register technical supervision during manufacture.

If considered necessary, the Register may require that such materials and products, which are not covered by the said lists, be also manufactured under its technical supervision.

**2.2.2** The materials and products subject to the Register technical supervision shall be manufactured according to technical documentation approved by the Register.

**2.2.3** Technical supervision during manufacture of materials and products shall be performed in relation to those properties only, which are regulated by the Register rules, as well as parameters and characteristics indicated in the approved technical documentation. 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, or other production aspects beyond the Register terms of reference.

### **3 TECHNICAL DOCUMENTATION**

#### **3.1 GENERAL**

**3.1.1** Prior to the commencement of the manufacture of containers, materials and products, subject to the Register technical supervision, the appropriate technical documentation shall be submitted to the Register in the scope specified in the relevant parts of the Rules for the Manufacture of Containers.

If necessary, the Register may require the scope of documentation to be increased.

Standards for certain materials and products agreed with the Register may substitute the documentation as a whole or a part thereof.

Standards not agreed with the Register may be submitted within the technical documentation for the container or product and are regarded as a constituent part thereof, while the possibility of their use in this particular case is confirmed by approval of the technical documentation without the standards themselves being agreed, to which effect a note is made in the letter of conclusion to be submitted by the Register to the author of the documentation (designer).

The documents shall be submitted in electronic form, in Russian or in English, in pdf format, and the method of transferring files shall be agreed with the Register.

Where landmark decisions are taken, the performance specification, engineering proposal, concept design, preliminary design, as well as the research and development results may be submitted to the Register for review. Such documents are not subject to approval (agreement) and their review results are reported in a written conclusion (opinion).

**3.1.2** The changes which are introduced in the approved technical documentation in respect of the elements and structures covered by the Rules shall be submitted for consideration of the Register before proceeding with such changes.

**3.1.3** The technical documentation submitted for consideration to the Register shall be drawn up in such a way, or is to supply such particulars, so as to afford clear evidence that the requirements of the Rules are met. The technical documentation shall be signed by the persons responsible for the development and duly issued.

**3.1.4** The calculations necessary for determining parameters and values regulated by the Rules shall be prepared according to the requirements of these Rules and according to procedures approved by the Register. The calculation procedures shall ensure sufficient accuracy of solving the problem, which is confirmed by prototype tests carried out under the appropriate provisions.

The Register does not verify the accuracy of calculations, including those obtainable from the computer, while taking into account their results during the consideration of the technical documentation.

Check calculations may be prepared using any program, if required by the Register.

**3.1.5** The approval of technical documentation shall be confirmed by the corresponding stamps of the Register.

The approval does not apply to the elements and structures which are not covered by the Rules.

The documents contradicting the Register requirements shall be returned with comments to the designer for updating and/or correcting.

**3.1.6** The production of containers subject to technical supervision of the Register shall be made according to the technical documentation approved by the Register.

### **3.2 DURATION OF VALIDITY OF APPROVED TECHNICAL DOCUMENTATION**

**3.2.1** The Register approval of the technical documentation is valid for the period of 6 years.

**3.2.2** In justified cases, when serial products are manufactured, the validity term of the approved technical documentation specified in accordance with 3.2.1, may be extended by the Register for a period not longer than that required to manufacture (order) a batch of products.

**3.2.3** The normative and technical documents for the containers and associated materials and products shall be approved for a period of their validity.

**3.2.4** Notwithstanding the terms of approval, the technical documentation on containers, materials and products shall be subjected to compulsory correction due to the necessity to take into account the adopted amendments to the international Conventions and agreements, and the requirements of the Register circular letters.

## **4 KEEPING RECORD OF CONTAINERS**

### **4.1 GENERAL**

**4.1.1** RHO keeps record of the following:

certificates of approval for all types of containers;

certificates and survey reports for all types of containers issued during manufacture and in service;

recognition certificates of firms and test laboratories.

**RULES  
FOR THE MANUFACTURE OF CONTAINERS**



## PART I. BASIC REQUIREMENTS

### 1 GENERAL

#### 1.1 APPLICATION

**1.1.1** The requirements of the Rules for the Manufacture of Containers (hereinafter referred to as these Rules) apply to freight containers with gross mass of 10 t and more intended for the carriage of goods by water, rail and road and for interchange between these modes of transport, unless expressly provided otherwise in these Rules.

Besides, the requirements of these Rules apply to offshore containers and industrial equipment based on general freight containers, as well as to ship equipment storage containers in the scope applicable to such containers.

**1.1.2** Requirements to the containers of ISO series 1 are set forth in Part I "Basic Requirements", Part II "General Freight Containers", Part III "Thermal Containers", Part IV "Tank Containers", Part V "Platform Containers", Part VI "Non-Pressurized Bulk Containers" and Part VIII "Tank Containers with Fiber-Reinforced Plastic Shell" of the Rules.

**1.1.3** Taking into account that there shall always be a need for special containers for particular traffic, containers may differ from ISO series 1 containers in dimensions and be in excess of the maximum gross masses specified in Table 2.1.2. Operation of such containers may require special arrangements and agreements.

**1.1.4** Containers differing in design and dimensions from the requirements specified in these Rules are subject to special consideration by the Register in each particular case.

#### 1.2 DEFINITIONS AND EXPLANATIONS

**1.2.1** For the purpose of these Rules the following definitions and explanations have been adopted.

**F**reight container means transport equipment:

of a permanent character and accordingly strong enough to be suitable for repeated use;

specially designed to facilitate the transportation of goods by one or more modes of transport without intermediate reloading;

designed to be secured and/or readily handled, and having corner fitting for these purposes;

of a size such that the area enclosed by the four outer bottom corners is at least 14 m<sup>2</sup>, or at least 7 m<sup>2</sup> if it is fitted with top corner fittings.

**I**SO container means a freight container complying with all relevant ISO container standards in existence at the time of its manufacture.

**Notes:** 1. Definitions of container types, as well as other terms in relation to containers given in ISO 830.

2. ISO series 1 container is an ISO container complying with ISO 668.

3. The term "container" includes neither vehicles, nor packaging; however, containers when carried on chassis are included.

**M**aximum permissible payload,  $P$ , means the difference between maximum gross mass  $R$  and tare mass  $T$ .

**Note.** In case when during testing gravitational forces are used, the inertial forces of the above values are denoted respectively by:  $R_g$ ,  $T_g$  and  $P_g$ . For the purpose of the present Rules  $g = 9,81 \text{ m/s}^2$ .

**M**aximum operating gross mass,  $R$ , means the maximum allowable combined mass of the container and its cargo.

**Offshore container** (handled in open seas) means transport equipment having sufficient strength, designed for use in the transportation of goods or equipment, capable of being handled in open seas, to, from, and between fixed or floating facilities and ships.

*Note.* Not intended for permanent installation on ships and mobile offshore drilling units/fixed offshore platforms.

**Prototype** means a container representative of those manufactured or intended to be manufactured in a definite design type series.

**Type-series container** means any container manufactured in accordance with the approved design type.

**Tare mass,  $T$ ,** means the mass of the empty container including permanently affixed ancillary equipment.

**Swap body** means transport equipment having sufficient strength, designed, normally, for rail and road vehicle transportation by land or by water, having unified dimensions, unified means of securing and handling, and a width and/or a length exceeding those of ISO series 1 containers.

**Type of container** means the design type of container complying with requirements of these Rules and approved by the Register.

**Corner fittings** mean the structural elements with apertures and faces, arranged at the top and bottom corners of a container for the purposes of handling, stacking and/or securing.

**Bearing structural elements** mean a set of structural components that receive static and dynamic loads during testing and operation of containers.

### **1.3 APPROVAL OF CONTAINERS**

**1.3.1** Approval of containers means the decision of the Register that a design type or an individual container is safe within the terms of these Rules and is suitable for the transportation of cargoes according to designation.

**1.3.2** The container manufactured and tested in accordance with the requirements of these Rules, is considered to be approved under the terms of the CSC and the CCC.

**1.3.3** An application made in writing shall be submitted to the Register to obtain approval of a container by design type.

**1.3.4** The application for approval for each design type of a container shall be accompanied by the following documentation:

**.1** design or technical specification (for firms for which the container design specification is not provided according to the applied normative documents) of the container with description of its purpose, structure, technical characteristics, mechanical and chemical properties of materials involved, with indication of manufacturers of the components purchased from external suppliers, adopted welding procedures as well as methods of assembling, finish and painting;

**.2** general view drawings, sectional views, drawings of assemblies and separate elements as well as the materials involved, drawings of marking and convention plates;

**.3** prototype test list, test program and procedure of series containers to be performed at the manufacturer.

Additional technical documentation may be required by the Register if considered necessary.

*Note.* The test program and procedures for a prototype shall be submitted by a testing laboratory during preparations for testing the prototype.

**1.3.5** A prototype of a container shall be manufactured in accordance with the technical documentation approved by the Register and under the Register technical supervision at the firm where manufacture of type-series products is intended. The scope of supervision is set forth in the Rules for Technical Supervision during Manufacture of Containers. A prototype or an individual container shall be subjected to

testing in accordance with these Rules in a laboratory recognized by the Register in the presence of the Register surveyor. In exceptional cases, tests may be conducted by a laboratory not having a Recognition Certificate, however, this shall be subject to special consideration by the Register.

Containers tested in accordance with the provisions of International Standardization Organization (ISO) series 1496 standards are regarded as tested in compliance with the CSC requirements.

**1.3.6** With satisfactory results obtained in testing and surveying a prototype or an individual container, the Register issues a Certificate of Container Safety Approval by Design Type to the applicant.

**1.3.7** The Certificate of Approval shall entitle the applicant to affix a Safety Approval Plate (refer to 4.1) to every type-series and individual container, manufactured under the Register technical supervision to the design type approved by the Register.

**1.3.8** The Register may approve for service the containers manufactured as modifications of the approved design type, provided that the modifications do not affect the results of tests made in the course of approval by design type.

#### **1.4 TECHNICAL SUPERVISION DURING MANUFACTURE OF TYPE-SERIES CONTAINERS**

At any stage during manufacture of type-series containers and equipment of the approved design type, the Register may examine or test such number of containers and equipment, as it considers necessary. The scope of technical supervision during manufacture of type-series containers and equipment, the extent of tests and their periodicity, unless otherwise provided in these Rules, are specified in the Rules for Technical Supervision during Manufacture of Containers.

##### **1.4.1 General requirements for manufacturers.**

**1.4.1.1** The requirements of this Chapter apply to the manufacturers of containers and associated materials and products (hereinafter referred to as "the manufacturers") that manufacture containers or associated materials and products in series under the Register technical supervision and are subject to the audit.

**1.4.1.2** The audit of conformity of the manufacturer by the Register includes:

**.1** review of the documents confirming compliance of the manufacturer with the Register requirements;

**.2** survey of the manufacturer.

*Note.* The welders' certification shall be carried out prior to the commencement of the prototypes manufacture under the Register technical supervision.

**1.4.1.3** The manufacturer shall inform the Register of the existing experience required for manufacture of containers (and associated materials and products), the types and dimensions of the containers (nomenclature of materials and products) manufactured or planned to be manufactured thereat specifying the models (if any) approved by the Register, of the manufacturer's planned annual capacity, planned number of containers of each type and dimension to be manufactured, and shall also submit for review:

**.1** documents or their copies confirming compliance with the requirements of 1.4.2.1 and 1.4.2.6;

**.2** particulars of tests which may be carried out at the manufacturer's works;

**.3** information on the personnel's qualification involved in designing, manufacturing and tests of containers, materials and products;

**.4** lists of equipment and facilities specified in 1.4.2.3 and 1.4.2.4.1, as well as of welding and testing equipment;

**.5** lists of documents specified in 1.4.2.4.3 and 1.4.2.5.1;

**.6** information on the quality assurance system implemented at the manufacturer's works;

**.7** information on availability of container manufacture procedure;

**.8** welding procedures to be approved (requirements of Sections 6, 7 or 8 Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships, as applicable to containers) or the copies of approved welding procedures, if any;

.9 program of welder's certification complying with the requirements of Appendix 3 to the Rules for Technical Supervision during Manufacture of Containers, in case there are no welders certified by the Register; or copies of Welder Approval Test Certificates (C/C), if any;

.10 copies of certificates and licenses issued previously to products or production (if any).

*Note.* RS Quality Management System (QMS) shall be implemented at the offshore container manufacturer's to comply with ISO 9001 Standard.

**1.4.1.4** Survey of the manufacturer is carried out to confirm compliance of the manufacturer with the requirements of 1.4.2.

**1.4.1.5** The Report on Survey of due form shall be drawn up resulting the survey of the manufacturer.

**1.4.2 Requirements.**

**1.4.2.1 Legal status.**

Legal status of the manufacturer shall comply with the current legislation.

The manufacturer shall have organizational structure and the chief executive officer.

**1.4.2.2 Personnel.**

Personnel of the manufacturer shall have the appropriate education, vocational and special training, qualification and experience required for the manufacture of containers and associated materials and products.

Welders shall be certified by the Register. When manufacturing tank containers, the manufacturer shall have specialists in non-destructive testing.

The manufacturer is responsible for the qualification and vocational training of its personnel in compliance with national, international and branch standards; in case of absence of these standards – in compliance with the standards of the manufacturer. This requirement shall be specified in the manufacturer's documents.

**1.4.2.3 Technique.**

The manufacturer shall have the technique required for serial manufacture and tests of containers and associated materials and products including stands for assembly and welding of units, appropriate equipment, spaces and areas for storage of materials, accessories and finished containers and equipment, as well as the necessary facilities for moving containers across the territory of the manufacturer.

The manufacturer shall provide maintenance of equipment and facilities in compliance with their operating and maintenance documentation.

*Note.* Tests may be carried out at third-party testing laboratories approved by the Register.

**1.4.2.4 Measurement assurance.**

**1.4.2.4.1** The manufacturer shall have and apply the necessary measurement assurance, namely:

.1 measuring equipment verified (calibrated) in accordance with the established procedure;

.2 testing equipment certified in accordance with the established procedure;

.3 references and type specimens;

.4 appropriate consumables (chemicals, substances, etc.).

**1.4.2.4.2** The manufacturer shall provide the maintenance of measuring and testing equipment in compliance with their operating and maintenance documentation.

**1.4.2.4.3** The manufacturer shall have and adhere to the procedures approved by the Register for:

.1 testing of containers and accessories with the required accuracy;

.2 handling of specimens.

**1.4.2.5 Files of the manufacturer's documents.**

**1.4.2.5.1** The manufacturer shall have valid normative and technical documents necessary to manufacture containers, materials and products therefor, including:

.1 documents containing requirements for items of technical supervision, including the Register Rules;

.2 technical documentation on containers and equipment approved by the Register;

.3 process documentation (procedure) on manufacture of containers, materials and products, checking and control;

.4 approved welding procedures and process instructions for non-destructive testing.

1.4.2.5.2 The documentation shall be available for the manufacturer's personnel where necessary.

1.4.2.6 Reporting.

1.4.2.6.1 The form and content of reports shall be acceptable for the Register.

1.4.2.6.2 Reports on the manufacture of containers shall include:

.1 name of the manufacturer;

.2 identification of the report (e.g. report number);

.3 name and address of the customer;

.4 reference to the documents in compliance with which the container or equipment was manufactured;

.5 manufacturer's number of the container or equipment, or code and number of the container owner;

.6 date of launching the production;

.7 marks on passing operation checking with the signatures of responsible persons;

.8 sheets of containers measurement to the extent specified in the Register Rules;

.9 entry about the fact that the activity is carried out under the Register technical supervision;

.10 full name, position and signature of the person who approved the report;

.11 number of every page and the total number of pages in the report.

1.4.2.6.3 The manufacturer shall keep records (databases) of the containers and/or equipment manufactured and delivered to customers.

1.4.2.6.4 The reports shall be stored at the manufacturer for not less than five years on a confidentiality basis. This requirement shall be specified in the manufacturer's documents.

1.4.2.7 Checking and control.

The manufacturer shall carry out checking and control of the compliance of materials and accessories with the approved documentation, as well as control of the process of manufacture and testing of containers and equipment.

The manufacturer shall take measures on the elimination and prevention of non-conformities and claims against its activity in the area indicated in the request. This requirement shall be specified in the manufacturer's documents.

1.4.2.8 Subcontractors.

1.4.2.8.1 The subcontractors recruited by the manufacturer for activity in the area indicated in the request shall meet the requirements of this Chapter.

1.4.2.8.2 The manufacturer shall provide the audit of subcontractors' activity in the area indicated in the request.

1.4.2.8.3 The manufacturer shall have agreements with subcontractors in the area indicated in the request.

## **1.5 CHECKING AND RECOGNITION OF MANUFACTURERS AND TESTING LABORATORIES**

### **1.5.1 Recognition of manufacturers.**

#### **1.5.1.1 General.**

1.5.1.1.1 Recognition of the manufacturer means the Register confirmation of the manufacturer's capability to manufacture products (perform works) with sustained quality of adequate level.

1.5.1.1.2 The manufacturer shall meet the requirements of 1.4.2 and of this Chapter.

1.5.1.1.3 Recognition of the manufacturer by the Register is confirmed by issuing the Recognition Certificate in the appropriate form.

Notes: 1. The manufacturers newly entering upon the manufacture of containers in order to obtain Recognition Certificate for Manufacturer (СПИ) shall manufacture at least 20 containers under Register technical supervision.

2. The recognition of manufacturers in accordance with code 40000001 is carried out on a voluntary basis.

**1.5.1.2 Requirements.**

**1.5.1.2.1 Personnel.**

**1.5.1.2.1.1** The manufacturer shall have documents on the personnel containing the following information:

- .1 duty regulations;
  - .2 personnel training and its terms of validity;
  - .3 certification and terms of its performance.
- 1.5.1.2.1.2** The manufacturer shall have the regular staff of specialists.

**1.5.1.2.1.3** The manufacturer shall have and adhere to the plans (schedules) for:

- .1 training and re-training of the personnel;
- .2 certification of the personnel with respect to certain activities.

**1.5.1.2.2 Files of the manufacturer's documents.**

The manufacturer shall have valid normative and technical documents necessary for performance of activity in the area indicated in the request, including:

- .1 documents on records keeping and archives maintenance;
- .2 the description of the operation checking system of the manufacture of containers and/or equipment;
- .3 the description of the periodical monitoring system for production processes;
- .4 the recording system for claims and nonconformities and for implementing effective corrective actions.

**1.5.2 Recognition of testing laboratories.**

**1.5.2.1 General.**

**1.5.2.1.1** The present requirements apply to testing laboratories conducting tests of containers and equipment thereof.

**1.5.2.1.2** The testing laboratory shall meet the requirements of this Chapter.

**1.5.2.1.3** Recognition of the testing laboratory by the Register is confirmed by Recognition Certificate of Testing Laboratory (CITL) issued, extended and terminated compliant to 1.4 of General Regulations for the Technical Supervision of Containers.

**1.5.2.1.4** The Recognition Certificate of Testing Laboratory is not issued to the manufacturers recognized by the Register and incorporating the testing laboratory.

**1.5.2.1.5** In individual cases, at the discretion of the Register, tests may be conducted at the testing laboratories not recognized by the Register. In so doing, prior to the tests performance the compliance of the testing laboratory with the requirements of 1.5.2.2.2.1, 1.5.2.2.3.1, 1.5.2.2.3.2, 1.5.2.2.5.1, 1.5.2.2.6, 1.5.2.2.7 and 1.5.2.3 shall be verified.

**1.5.2.1.6** Audit of conformity or recognition of the testing laboratory by the Register includes:

.1 review of the documents confirming compliance of the testing laboratory with the Register requirements;

.2 survey of the testing laboratory and participation in check tests.

**1.5.2.1.7** The testing laboratory shall submit for review:

.1 documents or their copies confirming fulfillment of the requirements of 1.5.2.2.1, 1.5.2.2.8.3 and the test report form;

.2 list of types of tests performed;

.3 lists of personnel containing information on compliance of the personnel with the requirements of 1.5.2.2.2.1;

.4 lists of equipment and facilities specified in 1.5.2.2.3.1 and 1.5.2.2.3.2;

.5 lists of documents specified in 1.5.2.2.4.1.

**1.5.2.2 Requirements**

**1.5.2.2.1 Legal status.**

The legal status of the testing laboratory shall comply with the current legislation.

The testing laboratory shall have organizational structure and the chief executive officer.

**1.5.2.2.2 Personnel.**

**1.5.2.2.2.1** Personnel of the testing laboratory shall have the appropriate education, vocational and special training, qualification and experience required for performing activity in the area indicated in the request.

The testing laboratory is responsible for the qualification and vocational training of its personnel. The personnel of the testing laboratory shall have the work experience of at least 2 years.

**1.5.2.2.2.2** The testing laboratory shall have documents on the personnel containing the following information:

- .1 functional duties;
- .2 education;
- .3 experience;
- .4 personnel training and its terms of validity;
- .5 certification and terms of its performance.

**1.5.2.2.2.3** The testing laboratory shall have the regular staff of specialists.

**1.5.2.2.2.4** The testing laboratory shall have and adhere to the plans for:

- .1 training and re-training of the personnel;
- .2 refresher training of the personnel;
- .3 certification of the personnel with respect to carrying out certain tests.

**1.5.2.2.3 Technique.**

**1.5.2.2.3.1** The technique of the testing laboratory shall comply with the test procedures used for carrying out the tests specified in the Register requirements for items of technical supervision.

**1.5.2.2.3.2** Tests shall be carried out according to the appropriate test procedures considering also the environmental conditions corresponding to each type of tests in the area indicated in the request. Use shall be made of:

- .1 measuring instruments checked (calibrated) in accordance with the established procedure;
- .2 certified testing equipment;
- .3 ancillary equipment;
- .4 references and type specimens for maintenance and measurement assurance of measuring instruments;
- .5 appropriate consumables (chemicals, substances, etc.).

**1.5.2.2.3.3** The testing laboratory shall have valid contracts for rented testing and measuring instruments.

**1.5.2.2.3.4** The testing laboratory shall have the lists of:

- .1 measuring instruments including that for certification of testing equipment;
- .2 testing and ancillary equipment;
- .3 references and standard specimens.

**1.5.2.2.3.5** The testing laboratory shall have and adhere to the schedules for:

- .1 maintenance of measuring and testing equipment;
- .2 checking (calibration) of measuring equipment;
- .3 certification of testing equipment.

**1.5.2.2.3.6** The maintenance of measuring and testing equipment shall be carried out in compliance with their operating and maintenance documentation.

**1.5.2.2.4 Files of the testing laboratory documents.**

The testing laboratory shall have valid normative and technical documents necessary to carry out tests in the area indicated in the request, including:

- .1 valid test procedures for testing items of technical supervision with the required accuracy;
- .2 documents containing requirements for testing items of technical supervision, including the Register Rules;
- .3 technical documentation on items of technical supervision;
- .4 list of the activities performed (area of recognition);
- .5 Quality Manual or another similar document;

- .6 duty regulations;
- .7 operating and maintenance documentation on measuring and testing equipment;
- .8 documents on records keeping and archives maintenance.

The documentation shall be available for the testing laboratory personnel where necessary.

**1.5.2.2.5 Reporting.**

**1.5.2.2.5.1** The form and content of reports on the activity indicated in the request shall be acceptable for the Register and shall include:

- .1 name of the testing laboratory;
- .2 identification of the test report (e.g. number);
- .3 name and address of the customer;
- .4 reference to the documents in compliance with which the tests were carried out;
- .5 reference to the Sampling Report, if applicable;
- .6 description (name) of the item the activity was aimed at;
- .7 location of test performance;
- .8 date of test performance;
- .9 particulars on conditions of test performance;
- .10 particulars on departures from the requirements of the documents in compliance with which the tests were performed;
- .11 full name, position and signature of the person who approved the report;
- .12 number of every page and the total number of pages in the report;
- .13 test results with indication of units of measurements in accordance with test procedures and verification (calibration) of measuring equipment;
- .14 indication that the test results are valid only for the products tested;
- .15 entry that the tests were witnessed by the Register representative.

**1.5.2.2.5.2** Sampling reports, where applicable, shall contain:

- .1 date of specimens selection (sampling);
- .2 information allowing unambiguous identification of specimens (samples) selected;
- .3 location of specimens selection (sampling);
- .4 information on conditions of specimens selection (sampling);
- .5 reference to the documents in compliance with which the specimens (samples) were selected.

**1.5.2.2.5.3** Data (documents) confirming test performance (sampling reports, test reports, etc.) shall be kept at the testing laboratory for not less than five years on a confidentiality basis. This requirement shall be specified in the testing laboratory's documents.

**1.5.2.2.6** Checking and control.

The testing laboratory shall conduct checking and control over the performance of tests and their results.

The personnel of the testing laboratory responsible for checking (control) shall have the work experience of at least two years as a performer in the area of activity indicated in the request.

The testing laboratory shall conduct check tests in compliance with the area of recognition indicated in the request witnessed by the Register representative.

**1.5.2.2.7** Conditions of selection, transport and storage of specimens (if applicable).

The conditions of selection, transport and storage of specimens shall meet the requirements of test procedures.

The testing laboratory shall identify the specimens.

**1.5.2.2.8** Subcontractors.

**1.5.2.2.8.1** The subcontractors recruited by the testing laboratory for activity in the area indicated in the request shall meet the requirements of the present Chapter.

**1.5.2.2.8.2** The testing laboratory shall provide the audit of subcontractors' activity in the area indicated in the request.

**1.5.2.2.8.3** The testing laboratory shall have agreements with subcontractors in the area indicated in the request.



**1.5.2.3** Special requirements for testing laboratories engaged in dye penetrant examination, radiographic examination, ultrasonic examination, magnetic particle examination of welds quality and thickness measurements of tank materials.

**1.5.2.3.1** Reporting.

**1.5.2.3.1.1** The testing laboratory shall have and maintain test logs (data bases).

**1.5.2.3.1.2** The Statement (Test Report), in addition to the specified in 1.5.2.2.5.1, and test logs shall contain:

**.1** reference to the Register rules or another normative document on agreement with RHO regarding the application of criteria for assessing the quality of welds at radiographic examination;

**.2** reference to normative documents regarding the application of criteria for assessing the quality of welds at ultrasonic examination, dye penetrant examination and magnetic particle examination;

**.3** thicknesses of components at ultrasonic examination and radiographic examination, and at thickness measurements;

**.4** description of defects in accordance with applicable national or international standards.

**1.5.2.3.1.3** The designation of controlled lengths at duplicating radiographic examination shall correspond to the designation of controlled lengths at ultrasonic examination.

**1.5.2.3.2** Files of the testing laboratory documents.

**1.5.2.3.2.1** The testing laboratory shall have instructions on performing assessment of the welds quality and thickness measurements considering the Register requirements.

**1.6 VERIFICATION OF DESIGN AND ENGINEERING MANUFACTURERS OF CONTAINERS AND ASSOCIATED PRODUCTS**

**1.6.1 General.**

Verification of conformity of design and engineering manufacturers of containers and products operating in accordance with code 40000007 is carried out on a voluntary basis. The verification includes consideration of documents confirming that design and engineering manufacturers are in compliance with the requirements of the Register and design and engineering manufacturers' certification.

Compliance of such manufacturers with the established requirements is confirmed by a Certificate of Manufacturer Conformity (CCП).

The design and engineering manufacturer shall submit for review:

**.1** documents or their copies confirming compliance with the requirements of 1.4.2.1;

**.2** information and documents confirming the education, experience and qualifications of the personnel involved in designing;

**.3** lists of current regulatory documents;

**.4** information on software products used in design;

**.5** information on subcontractors (if any).

**1.6.2 Requirements.**

**1.6.2.1 Personnel.**

**1.6.2.1.1** The manufacturer shall have documents on the personnel containing the following information:

**.1** functional duties,

**.2** training and its terms of validity.

**1.6.2.1.2** The design and engineering manufacturer shall have permanent staff, have and adhere to the plans (schedules) for training and retraining of personnel.

**1.6.2.1.3** Personnel of the design and engineering manufacturer shall demonstrate knowledge of the regulatory requirements for the equipment designed, knowledge of the principles of the unified system of design documentation, knowledge of software products used in the design and drawing up of documentation in the electronic format. If any subcontractors are involved in designing and engineering (e.g. for calculations), the design and engineering manufacturer shall report on the terms of cooperation with such organizations.

**1.6.2.2** Files of documents.

**1.6.2.1** The design and engineering manufacturer shall have valid (updated) normative documents legally acquired, other necessary reference books, dictionaries, etc. necessary for the implementation of activities, have documents on records management and archive maintenance.

## 2 GENERAL TECHNICAL DATA

### 2.1 DIMENSIONS AND MASS

**2.1.1** The dimensions and mass as well as the specific structural details of containers shall preferably comply with the international standards or national standards recognized by the Register.

**2.1.2** External dimensions and tolerances as well as the maximum gross mass  $R$  of ISO series 1 containers are shown in Table 2.1.2. The dimensions and tolerances cited correspond to the measurements obtained at a temperature of 20 °C. If the measurements are taken at another temperature an appropriate tolerance shall be introduced.

**2.1.3** No element of the container structure shall protrude over the external dimensions.

Table 2.1.2

Dimension	Height $H$ , mm	Width $W$ , mm	Length $L$ , mm	Maximum gross mass $R$ , kg	Distance between centres of apertures in fittings, mm (reference)			$k_{1\max}$ , mm	$k_{2\max}$ , mm
					$S$ corner fittings	$S_1$ (intermediate fittings)	$P$		
1EEE	2869 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	13716 <sup>0</sup> <sub>-10</sub>	30480	13509 <sup>±6,5</sup>	11985,5 <sup>±6,5</sup>	2259 <sup>±4</sup>	19	10
1EE	2591 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	13716 <sup>0</sup> <sub>-10</sub>	30480	13509 <sup>±6,5</sup>	11985,5 <sup>±6,5</sup>	2259 <sup>±4</sup>	19	10
1AAA	2869 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	12192 <sup>0</sup> <sub>-10</sub>	30480	11985,5 <sup>±6,5</sup>	—	2259 <sup>±4</sup>	19	10
1AA	2591 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	12192 <sup>0</sup> <sub>-10</sub>	30480	11985,5 <sup>±6,5</sup>	—	2259 <sup>±4</sup>	19	10
1A	2438 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	12192 <sup>0</sup> <sub>-10</sub>	30480	11985,5 <sup>±6,5</sup>	—	2259 <sup>±4</sup>	19	10
1AX	<2438	2438 <sup>0</sup> <sub>-5</sub>	12192 <sup>0</sup> <sub>-10</sub>	30480	11985,5 <sup>±6,5</sup>	—	2259 <sup>±4</sup>	19	10
1BBB	2896 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	9215 <sup>0</sup> <sub>-10</sub>	30480	8918,5 <sup>±6,5</sup>	—	2259 <sup>±4</sup>	16	10
1BB	2591 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	9215 <sup>0</sup> <sub>-10</sub>	30480	8918,5 <sup>±6,5</sup>	—	2259 <sup>±4</sup>	16	10
1B	2438 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	9215 <sup>0</sup> <sub>-10</sub>	30480	8918,5 <sup>±6,5</sup>	—	2259 <sup>±4</sup>	16	10
1BX	<2438	2438 <sup>0</sup> <sub>-5</sub>	9215 <sup>0</sup> <sub>-10</sub>	30480	8918,5 <sup>±6,5</sup>	—	2259 <sup>±4</sup>	16	10
1CCC	2896 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	6058 <sup>0</sup> <sub>-6</sub>	30480	5853,5 <sup>±4,5</sup>	—	2259 <sup>±4</sup>	13	10
1CC	2591 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	6058 <sup>0</sup> <sub>-6</sub>	30480	5853,5 <sup>±4,5</sup>	—	2259 <sup>±4</sup>	13	10
1C	2438 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	6058 <sup>0</sup> <sub>-6</sub>	30480	5853,5 <sup>±4,5</sup>	—	2259 <sup>±4</sup>	13	10
1CX	<2438	2438 <sup>0</sup> <sub>-5</sub>	6058 <sup>0</sup> <sub>-6</sub>	30480	5853,5 <sup>±4,5</sup>	—	2259 <sup>±4</sup>	13	10
1D	2438 <sup>0</sup> <sub>-5</sub>	2438 <sup>0</sup> <sub>-5</sub>	2991 <sup>0</sup> <sub>-6</sub>	10160	2787 <sup>±4</sup>	—	2259 <sup>±4</sup>	10	10
1DX	<2438	2438 <sup>0</sup> <sub>-5</sub>	2991 <sup>0</sup> <sub>-6</sub>	10160	2787 <sup>±4</sup>	—	2259 <sup>±4</sup>	10	10

Notes: 1 ISO series 1 containers with a gross mass exceeding that indicated in the table, but not more than 36 000 kg are ISO containers. Such containers shall be properly labeled and properly tested.

2. Attention shall be given to the required accurate adherence to the reference dimensions  $S$  and  $P$  (see Figs. 2.2.1-5 and 2.2.1 6). The tolerances applied to  $S$  and  $P$  are determined by the tolerances specified for the total length and width of a container in ISO 1161.

## **2.2 FITTINGS**

**2.2.1** The dimensions and tolerances of corner and intermediate fittings for ISO series 1 containers shall comply with the valid ISO 1161 standard and positional relationship of the container fittings shall comply with the valid ISO 668 . These parameters are given in Figs. 2.2.1-1 — 2.2.1-6 and in Table 2.1.2.

Fittings other than those above are subject to special consideration by the Register.

**2.2.2** Fittings shall be designed and manufactured considering the requirements of valid standards such as ISO 1161 and ISO series 1496, so that they are capable to withstand loads arising during operation within the specified range of temperature and during testing.

*Note.* Requirements to technical supervision during manufacture of fittings are given in Appendix 1 to the Rules for Technical Supervision during Manufacture of Containers.

**2.2.3** The upper faces of top corner fittings shall protrude above the top of the container by a minimum of 6 mm. By the top of the container the highest point of the container roof is meant with no allowance made for thickness of doubler plates of top rails and the roof.

**2.2.4** Each fitting manufactured under the Register technical supervision shall have, as a minimum, the following marking: the manufacturer's mark, heat number, and abbreviation of the fitting position on the container as well as the RS stamp at fittings tested under RS technical supervision . Marking and branding shall be located so that it is clearly visible after assembly of the fitting on the container and will not be damaged during the container handling and securing.

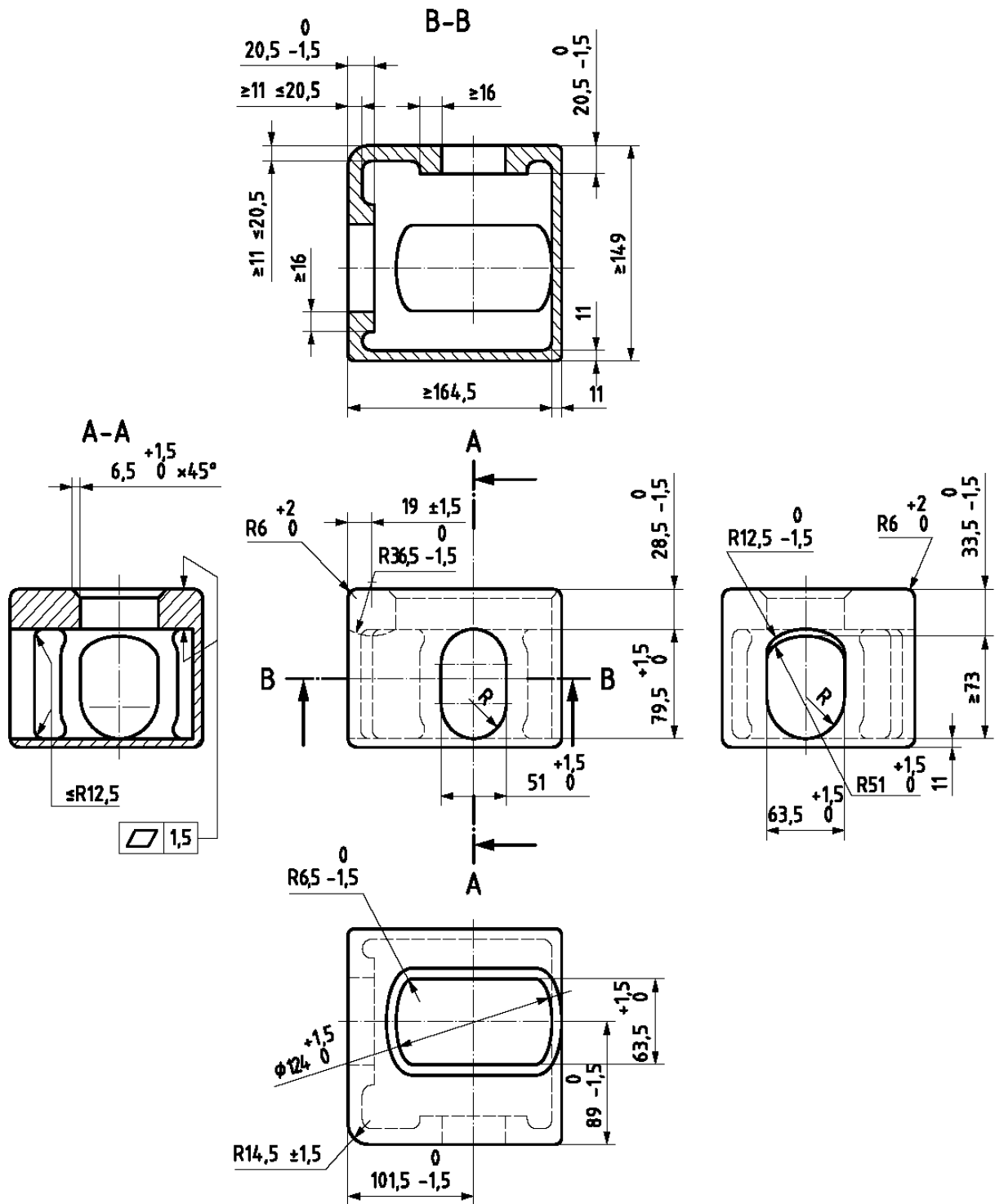


Fig. 2.2.1-1 Top corner fitting, mm:

——, ———— surfaces and contours which shall be physically duplicated in the fitting;  
 - - - - - optional walls which may be used to develop a box-shaped fitting. The outer and inner edge radii, where sharp corners are shown, shall not exceed 3 mm except as noted in the figures

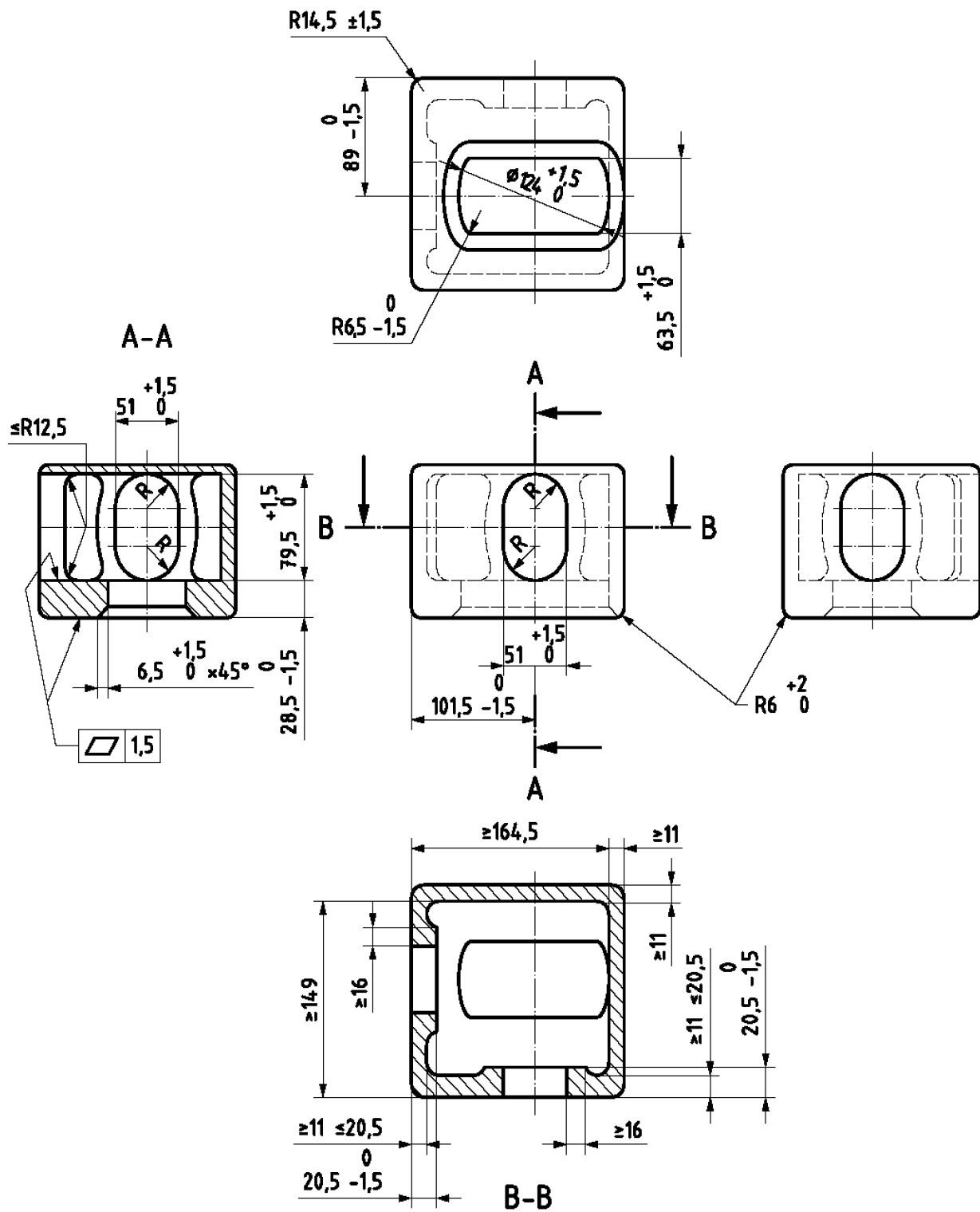


Fig. 2.2.1-2 Bottom corner fitting, mm:

—, ———— surfaces and contours which shall be physically duplicated in the fitting; - - - - - optional walls which may be used to develop a box-shaped fitting. The outer and inner edge radii, where sharp corners are shown, shall not exceed 3 mm except as noted in the figures

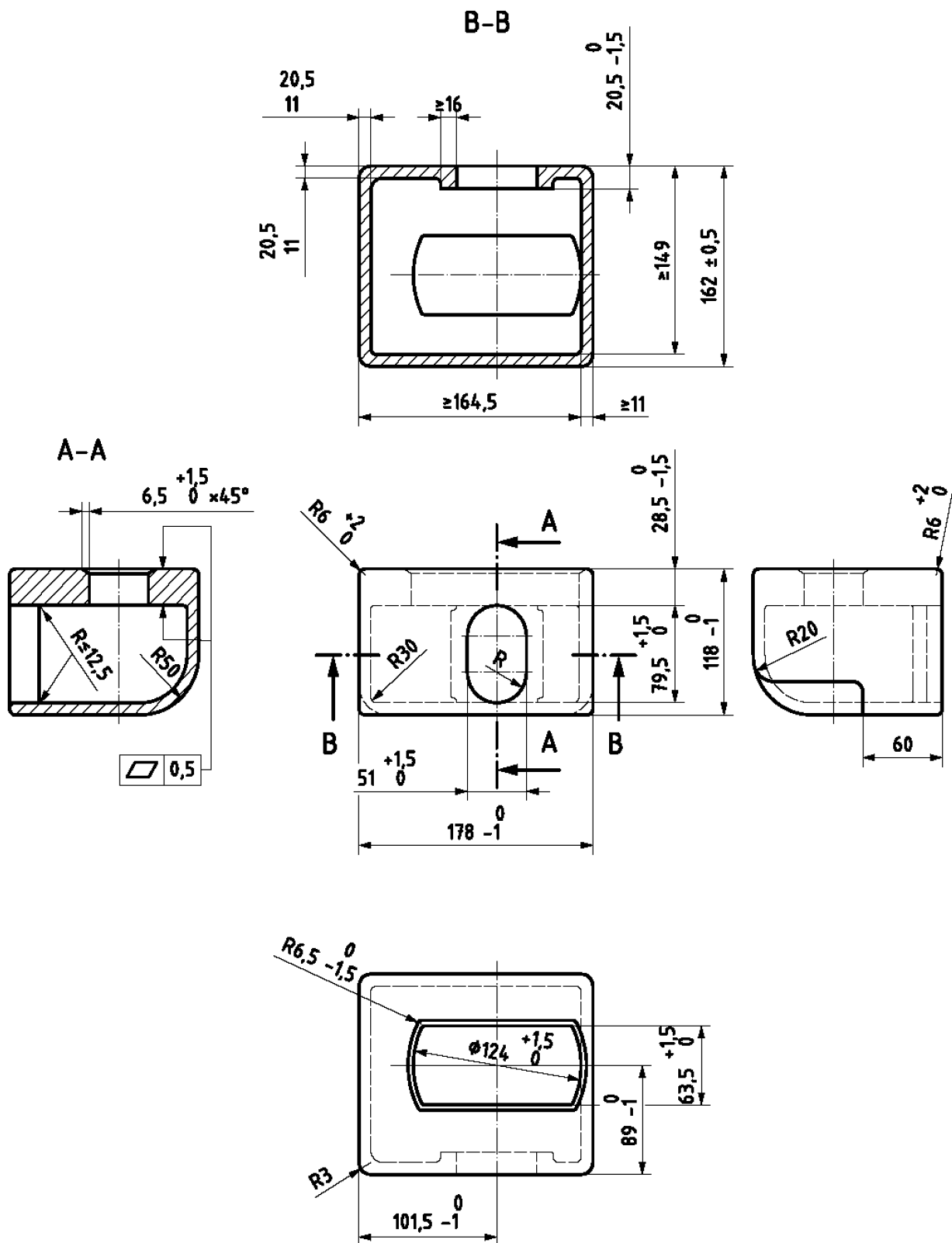


Fig. 2.2.1-3 Top intermediate fitting, mm

Required surfaces: top surface, outer side surface, outer surface directed to the nearest container end

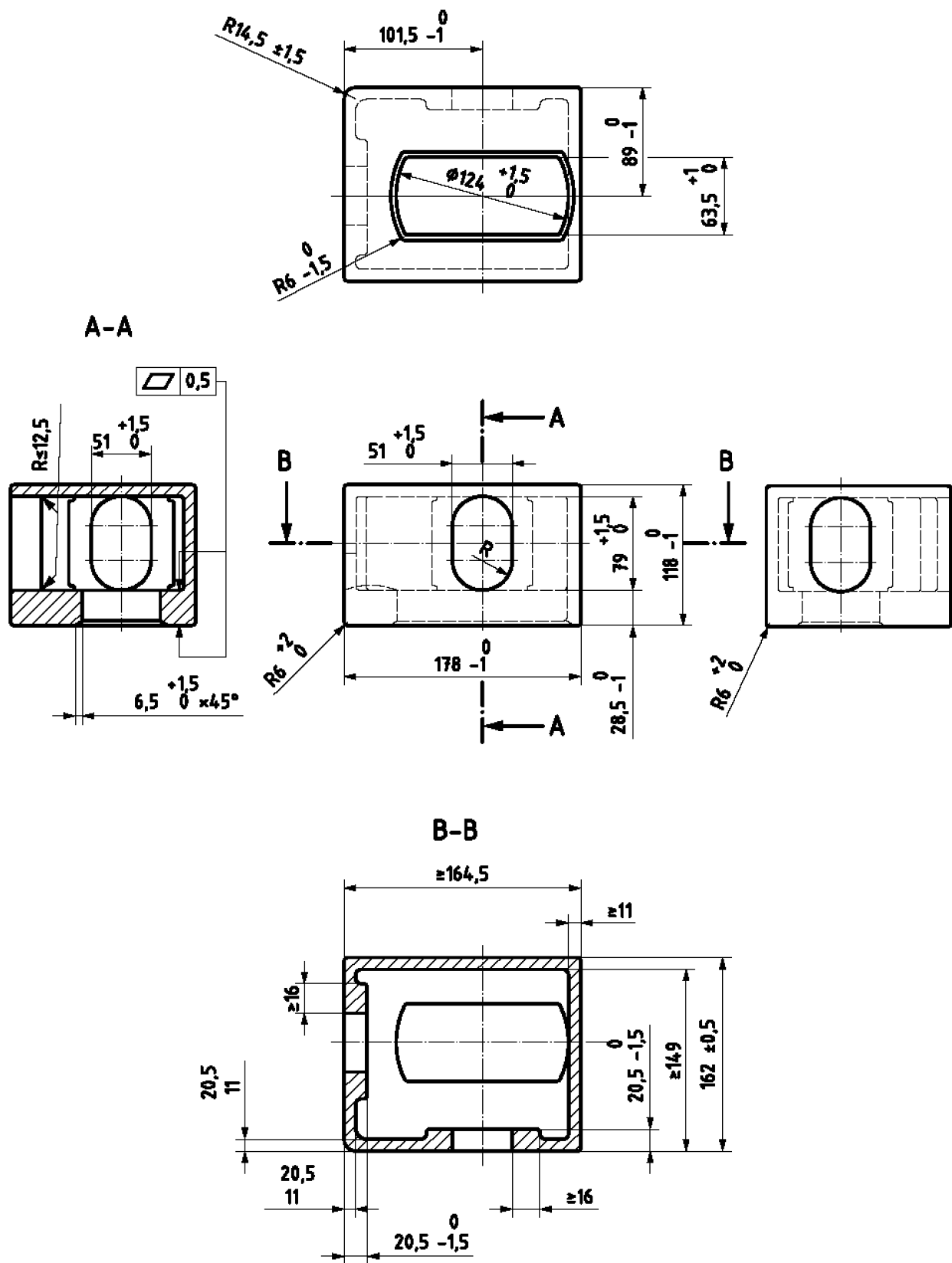


Fig. 2.2.1-4 Bottom intermediate fitting, mm

Required surfaces: bottom surface, outer side surface, outer surface directed to the nearest container end



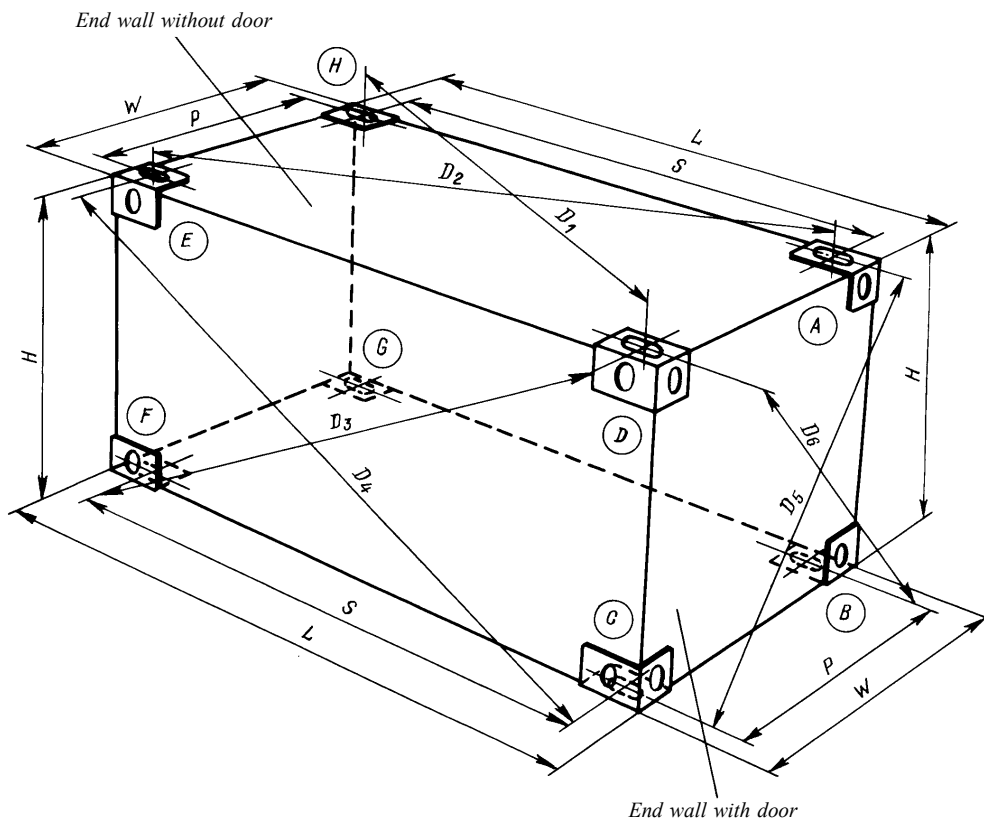


Fig. 2.2.1-5 Assembled corner fittings position:

$L$  — external length of the container;  $W$  — external width of the container;  $H$  — overall height;  $S$  — length between centres of apertures in corner fittings;  $P$  — width between centres of apertures in corner fittings;  $D$  — distance between centres of apertures (or projected reference points therefrom) of diagonally opposite corner fittings resulting in six measurements:  $D_1, D_2, D_3, D_4, D_5, D_6$ ;  $K_1$  — difference between  $D_1$  and  $D_2$  or between  $D_3$  and  $D_4$  (i.e.  $K_1 = D_1 - D_2$  or  $K_1 = D_3 - D_4$ );  $K_2$  — difference between  $D_5$  and  $D_6$  (i.e.  $K_2 = D_5 - D_6$ ).

Letters shown in circles serve for reference when dealing with documentation

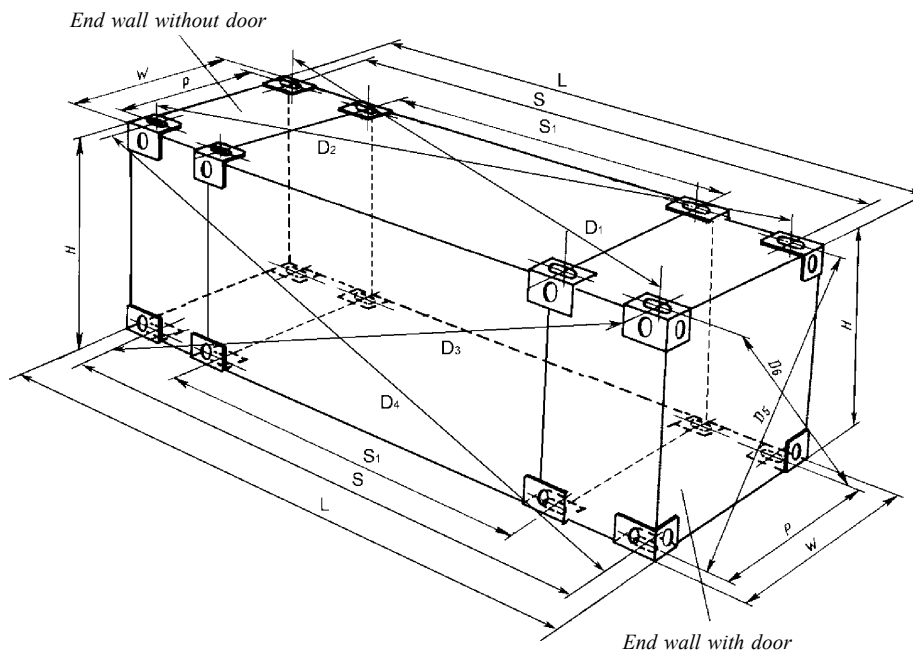


Fig. 2.2.1-6 Positional relationship of 1EEE and 1EE container fittings.

Refer to symbols in Fig. 2.2.1-5.  $S_1$  = length between centres of apertures in intermediate fittings

## 2.3 BASE STRUCTURE

**2.3.1** Under conditions of dynamic and static tests with the container having a uniformly distributed internal load such that the combined mass of the container and test load is equal to  $1,8R$ , no part of the base shall deflect by more than 6 mm below the base plane (bottom faces of bottom corner fittings). Under conditions of static loads with the container having a uniformly distributed internal load  $P$ , no part of its base shall protrude beyond the plane formed by bottom faces of bottom corner fittings.

**2.3.2** Containers IEEE, 1EE, 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CCC, 1CC, 1C and 1CX shall have load transfer areas in their base structure in the same plane, to permit vertical load transfer when carried on chassis.

**2.3.2.1** The distances between the plane formed by lower faces of load transfer areas and the base plane (bottom faces of the bottom corner fittings) shall be  $12,5 + 5 - 1,5$  mm.

**2.3.2.2** Apart from bottom fittings and bottom side rails, no part of the container shall project below the level of load transfer areas. However, doubler plates may be provided in the vicinity of bottom corner fittings to afford protection to the understructure.

Such plates shall not extend for more than 550 mm from the outer end for more than 470 mm from the side faces of bottom fittings, and their lower faces shall be at least 5 mm above the lower faces of the bottom fittings of the container.

**2.3.2.3** Load transfer areas of the end and intermediate transverse members in base structures of containers (except for tank containers) shall cover zones of not less than 375 mm in width, not less than 25 mm in length and be located as shown in Fig. 2.3.2.3.

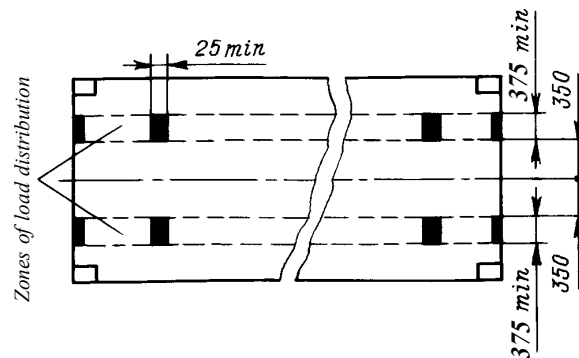


Fig. 2.3.2.3 Zones of load distribution, mm

**2.3.2.4** Load transfer areas of tank containers shall be at least 250 mm wide, laterally — not less than 75 mm which are assumed to lie within zones defined in Fig. 2.3.2.3.

**2.3.2.5** At the containers having over 4 pairs of load transfer areas, the latter shall be separated, as far as practicable, evenly along the length of the container. The load transfer areas shall be so arranged as to provide sufficient contact with chassis at:

**1** bottom end rails and cross-members spaced 1000 mm and less apart, at least, as shown in Figs. 2.3.2.5.1-1 — 2.3.2.5.1-4;

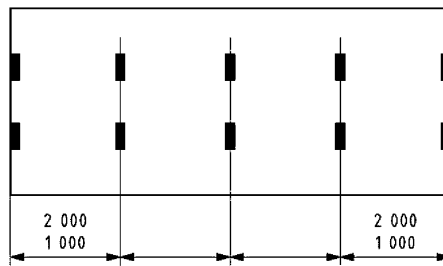


Fig. 2.3.2.5.1-1 Load transfer areas of ICC, IC and ICX containers with 5 pairs of load transfer areas

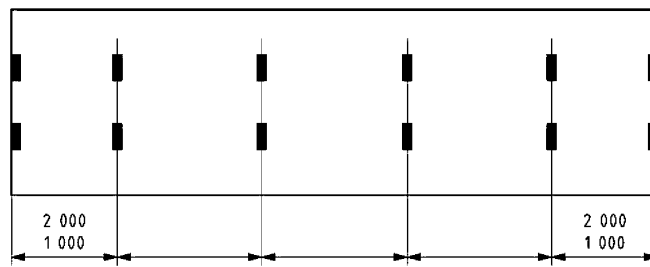


Fig. 2.3.2.5.1-2 Load transfer areas of 1BBB, 1BB, 1B, 1BX and 1CCC containers with 6 pairs of load transfer areas

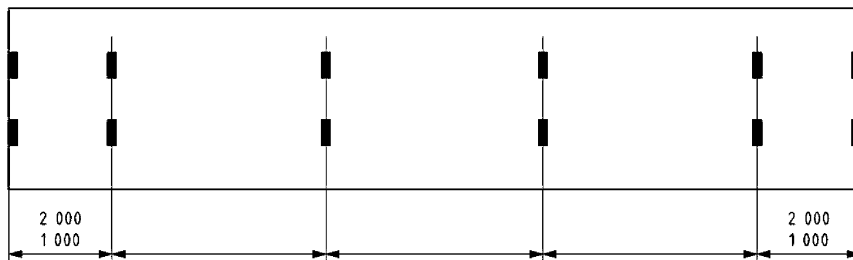


Fig. 2.3.2.5.1-3 Load transfer areas of 1EE, 1AA, 1A and 1AX containers without gooseneck tunnel with 6 pairs of load transfer areas

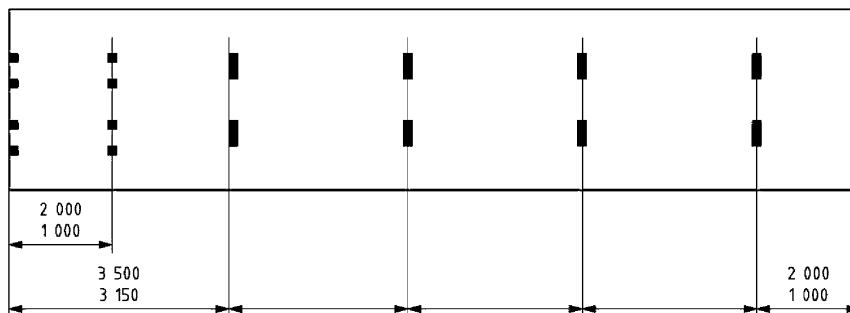


Fig. 2.3.2.5.1-4 Load transfer areas of 1EEE, 1EE, 1AAA, 1AA, 1A and 1AX containers with 7 pairs of load transfer areas

.2 bottom end rails and base cross-members, as well as at gooseneck tunnel at least as shown in Figs. 2.3.2.5.2-1 — 2.3.2.5.2-4.

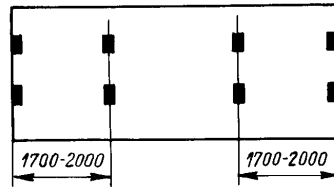


Fig. 2.3.2.5.2-1 Load transfer areas (in 1CCC, 1CC, 1C and 1CX containers)

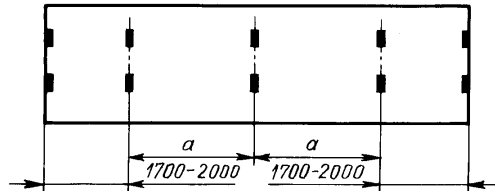


Fig. 2.3.2.5.2-2 Load transfer areas (in 1BBB, 1BB, 1B and 1BX containers)

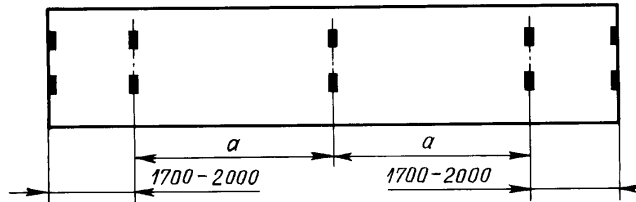


Fig. 2.3.2.5.2-3 Load transfer areas (in 1EE, 1AA, 1A and 1AX containers without gooseneck tunnel)

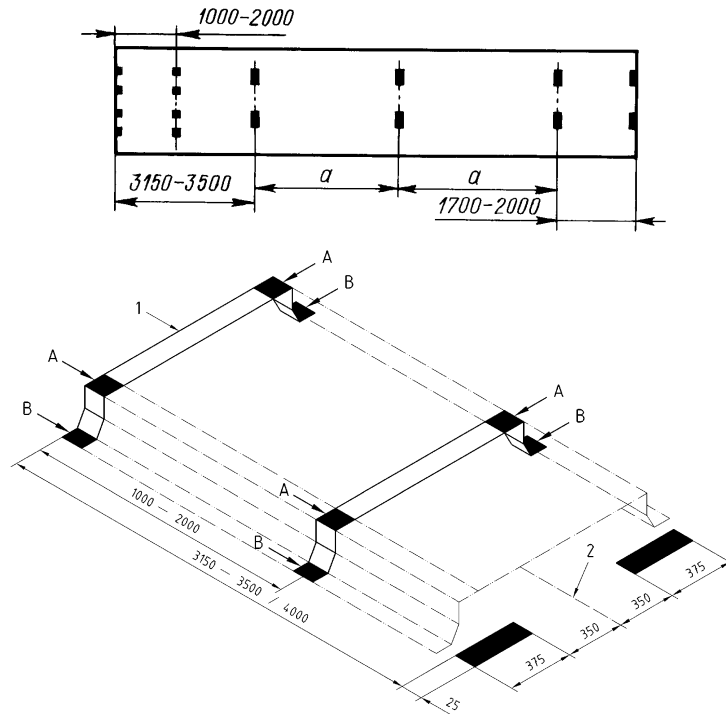


Fig. 2.3.2.5.2-4 Load transfer areas (1EEE, 1EE, 1AAA, 1AA, 1A and 1AX containers with gooseneck tunnel):  
1 — front of container; 2 — central axis of symmetry of container

**Note.** Each load transfer area at the tunnel has 2 components: an upper component A and a lower component B. This paired set, A and B, shall be taken as one load transfer area and the sum of the two components, A + B, being equal to or greater than 1250 mm<sup>2</sup>. Where continuous tunnel side members are provided, forming the internal dimensions (including height) specified in 2.6.3, load transfer areas between 3150 and 3500 mm (between 3150 and 4000 mm for 1EEE and 1EE containers) from the end of the container may be omitted.

**2.3.3** All containers shall be constructed so that they can rest only on the bottom corner and/or intermediate fittings for containers IEE and 1EE.

**2.3.4** IEE, 1EE, 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CCC, 1CC, 1C and 1CX containers shall be, moreover, so constructed that they can rest only on the load transfer area in their base structure when carried on chassis.

**3.2.5** IEE and 1EE containers shall have recesses in the longitudinal members of the base structure directed from intermediate fittings towards corner fittings. These recesses shall extend vertically for not less than 76 mm above the plane of bottom faces of intermediate fittings, shall extend longitudinally for not less than 254 mm from the centre of the bottom aperture in intermediate fittings directed towards corner fittings, and shall extend laterally for not less than 154 mm inboard from the external side face of the intermediate fitting (refer to Fig. 2.3.5).

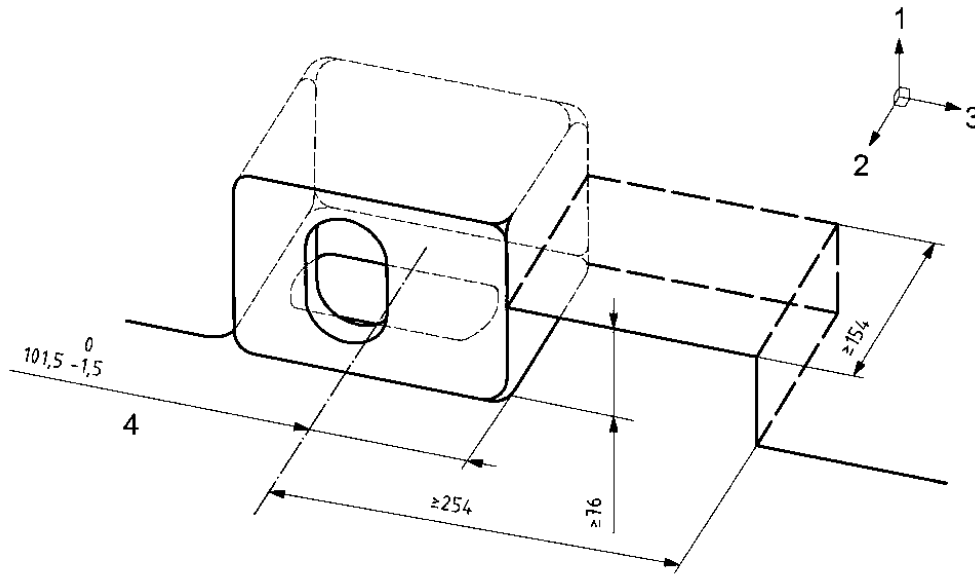


Fig. 2.3.5:

1 — top; 2 — outboard; 3 — end of container and corner fitting;  
4 — axis of symmetry of the intermediate fitting bottom aperture

## 2.4 END STRUCTURE

**2.4.1** For 1EEE, 1EE, 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CCC, 1CC, 1C and 1CX containers sideways deflection of the top with respect to the bottom of container while under full transverse racking test condition shall not cause the sum of the changes in length of diagonals  $D_5$  and  $D_6$  (refer to Fig. 2.2.1 5), to exceed 60 mm.

## 2.5 SIDE STRUCTURE

**2.5.1** For 1EEE, 1EE, 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CCC, 1CC, 1C and 1CX containers the longitudinal deflection of the top with respect to the bottom of container while under full longitudinal racking test condition shall not exceed 25 mm.

## 2.6 OPTIONAL STRUCTURES

### 2.6.1 Fork lift pockets.

**2.6.1.1** Fork lift pockets may be provided for 1CCC, 1CC, 1C, 1CX, 1D and 1DX containers; no pockets shall be provided for tank containers.

Position and dimensions of pockets are shown in Fig. 2.6.1.1.

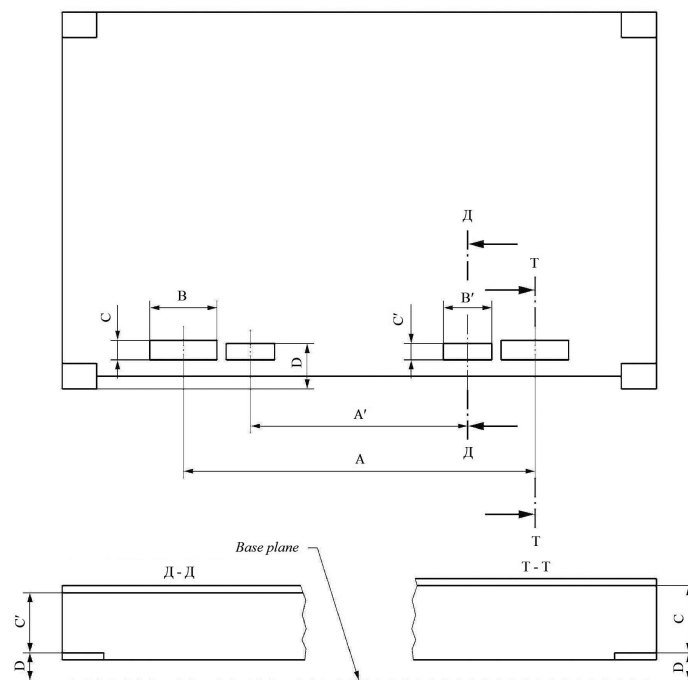


Fig. 2.6.1.1 Position and dimensions of fork lift pockets

Table 2.6.1.1

Dimension	Dimensions and tolerances, mm						
	Pockets for loaded and empty container				Pockets for only empty container		
	A	B	C	D	A'	B'	C'
1CCC, 1CC, 1C, 1CX 1D, 1DX	2050 ± 50 900 ± 50	355 min. 305 min.	115 min. 102 min.	20 min. 20 min.	900 ± 50	305 min.	102 min.

**2.6.1.2** The fork pockets shall be cut in the bottom side rails from either side. The length of pocket shall be equal to the width of container.

### 2.6.2 Areas for grappler arms and similar devices.

Areas for grappler arms or similar devices may be provided for all containers. Position of lifting areas, dimensions and structure of areas for grappler arms are shown in Fig. 2.6.2.

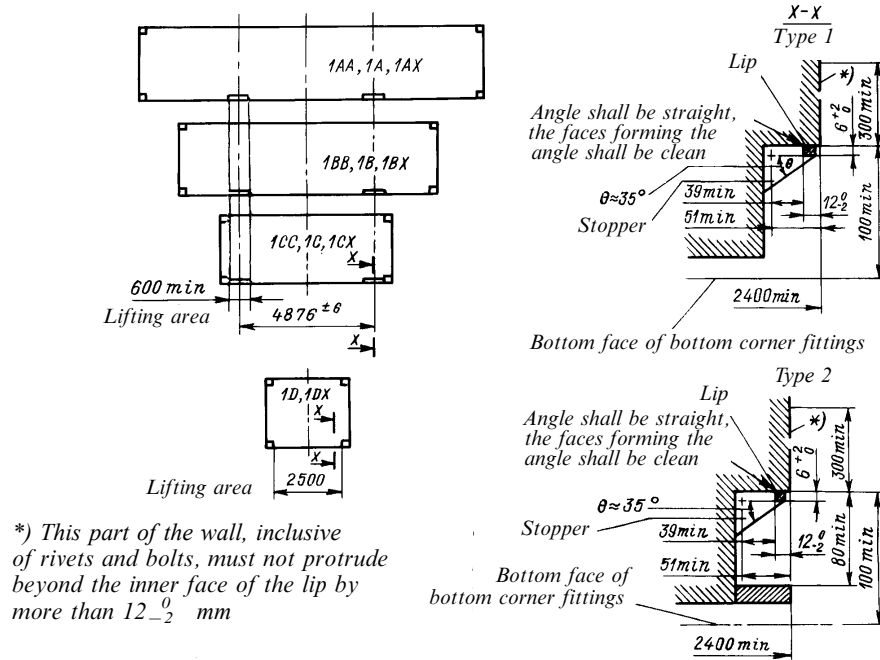


Fig. 2.6.2 Position of grappler arm lifting areas, dimensions, in mm, and design of grappler arm platforms

### 2.6.3 Gooseneck tunnel.

Gooseneck tunnel may be provided only for IEEE, 1EE, 1AAA, 1AA, 1AX, 1BBB, 1BB and 1BX containers. For IEEE and 1AAA containers "gooseneck" tunnel is mandatory. The tunnel structure may be formed by continuous tunnel side members given for the thick lines in Fig. 2.6.3, view A and having the specified internal dimensions or single components provided at the positions highlighted in solid color in Fig. 2.3.2.5.2-4.

Position and dimensions of the tunnel are shown in Fig. 2.6.3. The provision of tunnel shall not preclude fulfillment of requirements specified for the base structure under 2.3.

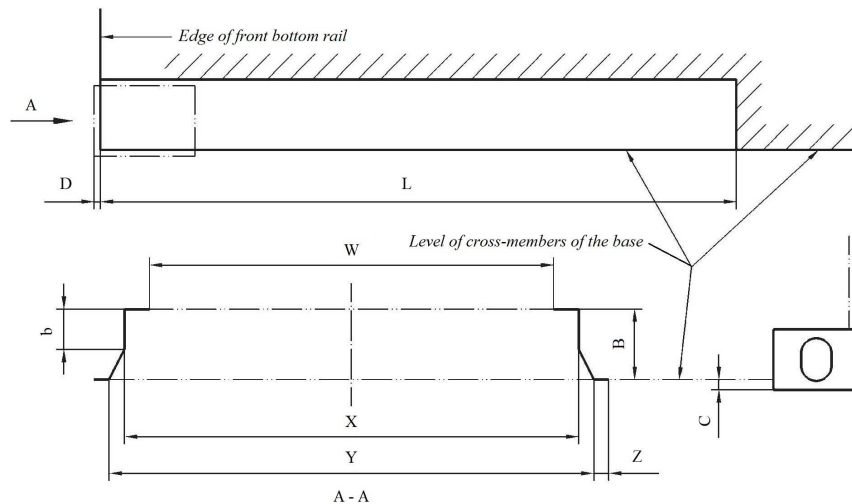


Fig. 2.6.3 Position and dimensions of gooseneck tunnel

Table 2.3.6

Length	$L$	3150 — 3500 (3150 – 4000 mm for IEEE, 1EE containers)
	$d$	$6^{+1}_{-2}$
Width	$W$	930 max
	$X$	$1029^{+3}_0$
	$Z$	25 min
	$Y$	1070 min
		1130 max
Height	$B^1$	$120^{+0}_{-3}$
	$b$	35 min
		70 max
	$c$	$12,5^{+5}_{-1,5}$
<sup>1</sup> The $B$ tolerance shall be measured in the rear part of the tunnel on a length of about 600 mm.		

#### 2.6.4 Cargo securing devices.

Devices for securing container cargo may be used in the container in addition to props and struts to prevent cargo shifting within the container when transported. Cargo securing devices may be placed both on the base structure itself and above it. Number of devices placed on the base frame shall be as follows:

16 for IEEE, 1EE, 1AAA, 1AA, 1A and 1AX containers;

12 for 1BBB, 1B and 1BX containers;

10 for 1CCC, 1CC, 1C and 1CX containers;

8 for IDH and 1DX containers.

Provision of the cargo securing devices shall not be regarded as a ground for reducing the minimum dimensions of the door openings in the container.

#### 2.6.5 Automatic electronic identification (AEI) equipment.

In case of a container fitted with automatic electronic identification (AEI) equipment, this equipment shall comply with the requirements of ISO 10374.



### 3 MATERIALS AND WELDING

#### 3.1 GENERAL

**3.1.1** Materials used for the manufacture of containers shall meet the requirements of these Rules, approved by the Register technical documentation, and applicable national and/or international standards.

**3.1.2** The materials used shall have assured properties (strength, toughness, weldability, resistance to corrosion failures etc.) to ensure failure-free performance of the structure under service conditions specified in the technical documentation approved by the Register.

**3.1.3** When selecting composition of material for bearing structures of a container, it is required to take into account a range of working temperatures (ambient temperatures) likely to be encountered on the operational routes in areas with the most unfavourable conditions. In any case, the resistance of the material to brittle and corrosion failures within the temperature range from  $-40\text{ }^{\circ}\text{C}$  to  $50\text{ }^{\circ}\text{C}$  shall be assured.

Other ranges of the operating temperatures, depending on the climatic version of construction specified in the design, may be adopted subject to agreement with the Register.

**3.1.4** In the course of operation, the container owner is responsible for the use of container in the specified climatic zone.

**3.1.5** Where stated in the appropriate parts of these Rules, the materials used for manufacture of containers shall be manufactured under the Register technical supervision.

**3.1.6** Special requirements specifying mechanical characteristics and selection of the material depending on operating conditions, design type of the container and kind of the cargo carried are set forth in the appropriate parts of these Rules and International Maritime Dangerous Goods Code.

**3.1.7** Materials used in manufacture of containers shall not have a mutually adverse effect and shall be adequately insulated, if necessary.

#### 3.2 MATERIALS FOR BEARING STRUCTURAL ELEMENTS

**3.2.1** Corner fittings shall be manufactured by casting or other technique approved by the Register.

**3.2.2** The corner fittings shall be manufactured by companies audited by the Register in compliance with 1.4.1, Part I "Basic Requirements", as applied to the manufacture of fittings.

**3.2.3** Requirements for the procedure for survey of the manufacturers of fittings, test extent in the course of technical supervision during series production as well as for approval of manufacture techniques other than casting and material compositions other than those indicated below are set forth in the appropriate section of the Rules for Technical Supervision during Manufacture of Containers.

**3.2.4** The material of the corner fittings manufactured by casting shall meet the following requirements:

**.1** chemical composition of steel shall comply with the requirements of Table 3.2.4.1. The Register may consider it possible to use other chemical compositions of steel without destroying steel weldability and mechanical properties.

**.2** mechanical properties of the castings after heat treatment according to procedures given in the

Table 3.2.4.1

Chemical composition on the results of ladle analysis

C, max	Mn	Si, max	P, max	S, max	Cr, max	Ni, max	Cu, max	Mo, max	Al, min	Cr+Ni+Cu+Mo, max
0,20	0,90 — 1,50	0,50	0,035	0,035	0,25	0,30	0,20	0,08	0,015	0,70

Notes: 1. Castings shall be manufactured in electric furnaces or by oxygen-converter or other process subject to agreement with the Register, and steel shall be killed.  
 2. The carbon equivalent calculated by the formula  $C_{eq} = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15 \leq 0,45\%$ .  
 3. Aluminum may be partially or totally replaced by other grain refining elements according to approved specification.

documentation approved by the Register shall comply with the requirements of Table 3.2.4.2. Test specimens shall be taken either from the cast corner fitting or from a separately cast sample;

**3.2.5** To manufacture bearing structural elements (rails, cross-members, including base, stands, tank

Table 3.2.4.2

Mechanical properties					
Yield stress $R_e$ , MPa, min	Tensile strength $R_m$ , MPa, min	Elongation $A_5$ , %, min	Reduction of area $Z$ , %, min	Impact energy $KV^1$ , J, min, at temperature, °C	
				–20	–40 <sup>2</sup>
275	480	25	40	27	21
<sup>1</sup> Average value obtained at testing of three sharp-notch specimens in accordance with 2.2.3, Part XIII "Materials" of the Rules for Classification and Construction of Sea-Going Ships. The value of impact energy determined on one test specimen may be assumed less than that given one in the Table, but in any case it shall not be less than 70 % of this value.					
<sup>2</sup> Test at a lower temperature may be carried out at the request of the customer with due regard for the climatic design version of the product.					

container vessel supports, and pad eyes), carbon steel, carbon-manganese steel, silicon-manganese steel and low-alloy steel complying with the requirements of Table 3.2.7 shall be used.

**3.2.6** Chemical composition, heat treatment and weldability of the materials shall meet the requirements of valid national and/or international standards as well as correspond to the operation conditions determined when designing a container.

**3.2.7** Mechanical properties shall comply with the requirements specified in Table 3.2.7.

Table 3.2.7

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
265	265	430	21	27	20
295	295	430	21	29	21
315	315	450	21	31	22
345	345	490	21	33	23
355	355	490	20	34	24
390	390	510	19	39	26
Note. Impact tests of material of 6 mm in thickness and less are not required.					

**3.2.8** When selecting material for the bearing structure elements, the requirements set out in 3.1.3 shall be considered to provide an assured impact energy value at the working temperature that shall be not lower than the average value specified in Table 3.2.7 for each strength grade obtained when testing three standard cross-section specimens measuring  $10 \times 10$  mm with a sharp V-notch to be cut parallel to the final direction of rolling of the material used. If the thicknesses of the material under test are less than 10 mm, the following average values of impact energy are taken:

for specimens with dimensions of  $10 \times 7,5$  mm —  $E_{7,5} = 5E/6$ ;

for specimens with dimensions of  $10 \times 5,0$  mm —  $E_{5,0} = 2E/3$ ,

where  $E$  is the average value of impact energy obtained in standard specimens with dimensions of  $10 \times 10$  mm.

Notes: 1. Sampling shall be carried out in compliance with 3.2.5, Part XIII "Materials" of the Rules for the Classification and Construction of Sea-Going Ships.

2. Sampling and material tests shall be carried out in compliance with Section 2, Part XIII "Materials" of the Rules for the Classification and Construction of Sea-Going Ships.

**3.2.9** Use of other materials for manufacture of the container bearing structure as well as the testing scope thereof are subject to special consideration by the Register.

**3.2.10** Additional requirements for materials of the load bearing structure of offshore containers are given in Part VII "Offshore Containers" of these Rules.

### **3.3 MATERIALS FOR TANK CONTAINER VESSELS**

**3.3.1** Materials used in the manufacture of tank container vessels, piping, manholes and their covers, flanges, fittings, safety devices along with the materials used for their attachment, shall withstand the temperatures, the pressure produced by the goods carried and their vapours under the operating conditions, and be immune to attack by the goods transported and their vapours, with regard to the corrosion allowances (if applicable), or shall be passivated or neutralized by chemical reaction, or lined with corrosion-resistant material.

**3.3.2** Depending on the type of tank container, kind of cargo carried and operating conditions, use may be made of carbon-manganese steel, silicon-manganese steel, alloy steel, acid-resistant steel, austenitic steel, aluminum alloys.

**3.3.3** Chemical composition of the materials, their mechanical properties, scope and methods of testing shall meet the requirements of valid national and/or international standards applied to rolled steel products for pressure vessels.

Use of other materials for manufacture of vessels as well as the testing scope thereof is subject to special consideration by the Register.

**3.3.4** The minimum value of impact energy obtained during testing of V-notched specimens at the minimum operating temperature shall not be less than 27 J for transverse specimens and 41 J for longitudinal specimens. If the thickness of material is less than 6 mm, the said tests are not required.

*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.

**3.3.5** Rolled steel products shall be supplied together with the documents of the Register.

Delivery of rolled steel products certified by another classification society or an authorized competent body is permitted.

*Note.* Based on the sufficiency of the submitted documents to check the compliance of rolled steel products with the approved technical documentation, the Register defines the possibility to recognize the survey results in each particular case.

**3.3.6** Steels used for the manufacture of tank container vessels intended for the transportation of dangerous goods, as well as welded-in flanges, manholes and their covers, shall have a yield strength/tensile strength ratio of not more than 0,85.

### **3.4 WOOD**

**3.4.1** Sawn timber shall be of sufficient strength, with no sap, cracks or loose knots, and with moisture content not over 18 %.

**3.4.2** The veneers of plywood shall be glued together throughout by efficient waterproof adhesives resistant to ageing affects so that laminations will not occur if wetted.

**3.4.3** Preserving means used for treatment and impregnation of timber shall have no adverse effect on the cargoes carried in containers.

### **3.5 PLASTICS**

**3.5.1** The plastics used for the construction of containers shall be specially considered by the Register in each particular case.

### **3.6 SEALING MATERIALS**

**3.6.1** Rubber and other sealing materials used for the sealing of doors shall be elastic, durable and stable to mechanical wear under changes of ambient temperature encountered in service conditions of a container, and shall be also resistant to deteriorative action of sea water.

### **3.7 WELDING**

**3.7.1** The welding consumables used for construction of containers shall be approved by the Register, comply with the requirements of valid national and/or international standards and supplied with the Certificate of Approval for Welding Consumables (COCM) (form 6.5.33) in compliance with the requirements of Section 4, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships.

In particular cases, while performing work on welding consumables approval, the requirements of 4.1.8, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships shall be complied with.

*Note.* The decision on recognition of test results (reports on approval) of the welding consumables 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 compliance of the welding consumables with the requirements of Section 4, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships.

**3.7.2** The technological procedures of welding used during manufacture of containers shall be approved by the Register, upon completion of which Welding Procedure Approval Test Certificates of a due form are issued. (form 7.1.33).

For the approval of welding procedures, the requirements of Section 6, Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

*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 Section 6, Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

**3.7.3** Welding operations at the works manufacturing the containers shall be performed by certified welders having a Welder Approval Test Certificate of a due form (form 7.1.30).

*Notes:* 1. A possibility of recognition of welder's qualification records issued by another classification society or duly authorized competent authority shall be determined in each particular case by the RS Branch Office to an extent sufficient to confirm their compliance with the requirements of Section 4, of Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships. The results of considering the above mentioned documents and confirmation of possible admission for welders shall be issued as a Report (form 6.3.29).

2. Upon agreement with the RS Branch Office, the welders who passed approval tests in compliance with the international (ISO 9606, ASME Sec. IX, ANSI/AWS D1.1) and/or national standards are permitted to perform welding operations.

**3.7.4** For welding of bearing structures of the framework and for welding of a tank, use shall be made of welding consumables with controllable diffusible hydrogen content according to 4.2.3, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships.

**3.7.5** Welded joints of the vessel shell with manholes, branches and heads shall be made with full penetration.

*Note.* The deviations from the above requirement are subject to special consideration by the Register.

**3.7.6** Inspection of welded joints of the containers, including vessels of the tank containers, shall meet the requirements of Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships, the national and/or international standards agreed with and recognized by the Register, as well as the technical documentation approved by the Register.

## 4 MARKING

### 4.1 CSC PLATE

**4.1.1** The CSC Plate shall be permanently affixed to every container of the approved design type-series or to a container approved individually.

**4.1.2** The CSC Plate shall bear the following particulars in the English language (refer to Fig. 4.1.2):

CSC SAFETY APPROVAL				
...				
DATE MANUFACTURED: ...				
IDENTIFICATION No. ...				
MAXIMUM OPERATING GROSS MASS:		...	kg	...
ALLOWABLE STACKING LOAD FOR 1,8g:		...	kg	...
TRANSVERSE RACKING TEST FORCE: ...				newtons
...				
...				

Fig. 4.1.2 The CSC Plate

Notes: 1. Number of Certificate of Approval issued by the Register.

2. The date of manufacture is the month and year of manufacture.

3. The identification number is the number assigned to the container by the manufacturer (manufacturer's serial number).

4. Maximum operating gross mass  $R$  is the maximum allowable gross mass  $R$ .

5. Allowable stacking load at acceleration for 1,8g.

6. Transverse racking test force is transverse racking test load.

7. End wall strength is indicated on the plate only if the end walls are designed to withstand a force of less or greater than  $0,4Pg$  (example of particulars: END-WALL STRENGTH  $0,6P$ ).

8. Side wall strength is indicated on the plate only if the side walls are designed to withstand a force of less or greater than  $0,6Pg$  (example of particulars: SIDE-WALL STRENGTH  $0,5P$ ).

9. A blank space for indication of examination dates is for date (month and year) of the first special survey after the container manufacture, as well as the dates (month and year) of subsequent surveys if plate is used for this purpose.

10. Allowable one door off stacking load to be indicated on plate only if the container is designed and tested for one door off operation. The marking shall show — "ALLOWABLE STACKING LOAD ONE DOOR OFF FOR 1,8g (kg lb)". This marking shall be displayed immediately near the words "ALLOWABLE STACKING LOAD FOR 1,8g".

11. One door off transverse racking test force to be indicated on the plate only if the container is designed and tested for one door off operation. The marking shall show — "TRANSVERSE RACKING TEST FORCE ONE DOOR OFF (newtons)". This marking shall be displayed immediately near the words "TRANSVERSE RACKING TEST FORCE".

12. Permissible mass(masses) for various stacking modes at 1,8g the container is designed for, is(are) additionally indicated for IEEE and IEE containers.

**4.1.3** The CSC Plate shall be a plate of rectangular shape measuring at least  $200 \times 100$  mm. The height of letters for the title (refer to Fig. 4.1.2) of the Plate shall be at least 8 mm. The height of all other letters and figures shall be not less than 5 mm.

The title and particulars of the CSC Plate shall be stamped into, embossed on, or indicated on its surface in any other permanent and legible way.

Any letters and figures placed on the plate to those already available shall be of a minimum height 5 mm, stamped into, embossed on, or indicated in any other permanent and legible way.

**4.1.4** The CSC Plate shall be made of durable, noncorrosive and fire-proof material providing legible impression of the Register brand and survey date.

**4.1.5** The CSC Plate shall be permanently affixed to the container at a readily visible place where it would not be easily damaged.

**4.1.6** Consolidated Data Plate (refer to Fig. 4.1.6) bearing, as a minimum, particulars in accordance with 4.1.2 of this Section, 4.3.1 of Part IV "Tank Containers" of these Rules and 3.1.2 of the Rules for the Approval of Containers for the Transportation of Goods Under Customs Seal, as well as particulars in accordance with other international and national requirements may be used instead of several individual plates.

CSC SAFETY APPROVAL				
... DATE MANUFACTURED: ... IDENTIFICATION No....				
MAXIMUM OPERATING GROSS MASS:		...	kg	...
ALLOWABLE STACKING LOAD FOR 1,8g:		...	kg	...
TRANSVERSE RACKING TEST FORCE: ...		lb newtons		
...				
...				
(CSC Plate)				
(Plate with particulars of manufacturer, owner, particulars of the tank for tank containers)				

Fig. 4.1.6 Consolidated Data Plate

## 4.2 MANDATORY MARKING

**4.2.1** In addition to the CSC Plate, the container, manufactured in accordance with the documentation approved by the Register and under the Register technical supervision, shall bear the Register emblem, as well as, as a minimum, the following symbols and signs:

- .1** the code of container type and size in compliance with ISO 6346;
- .2** the warning symbol of the risk of electric shock (for the containers fitted with ladders);
- .3** the code of the owner, the number, given by the owner and reference number;
- .4** gross mass and tare mass of the container. The gross mass shall correspond to that indicated on the CSC Plate and the tare mass — to the actual mass obtained by weighing of the prototype container, unless otherwise stated in these Rules;
- .5** symbols of the container height and alternate black and yellow stripes in the area of top corner fittings (for the containers over 2,6 m in height);
- .6** marking containing the "ACEP" index and the program registration number, assigned by the Register, if the container is operated under the Approved Continuous Examination Program;
- .7** manufacturer's serial number in the right bottom back corner fitting.

**4.2.2** The inscriptions indicated in 4.2.1 shall be painted or applied by means of material with a glue film in a colour well contrasting with the painting of a container. The letters and figures shall be not less than 100 mm in height and not less than 10 mm in width, except that the gross mass and tare mass shall have the figures of not less than 50 mm in height.

Location of inscriptions and signs as well as the size of signs shall comply with the requirements of ISO 6346.

**4.2.3** If a container is fitted with special arrangements intended for use solely when the container is empty (e.g. fork lift pockets used for lifting and transporting an empty container) or if the container is designed for the lesser stacking loads than those specified in Section 3, Part II "General Freight Containers", or if special methods of handling are required for the container, then relevant inscriptions and signs notifying of these restrictions shall be applied.

The inscriptions shall be made in the English language; inscriptions in other languages are also permitted.

**4.2.4** For special-purpose containers, requirements for the additional marking are, moreover, set forth in the relevant parts of these Rules.



## PART II. GENERAL FREIGHT CONTAINERS

### 1 GENERAL

#### 1.1 APPLICATION

**1.1.1** The requirements of this Part apply to general freight containers.

**1.1.2** The general freight containers shall comply with the requirements of Part I "Basic Requirements" and the requirements of this Part.

**1.1.3** The general freight containers differing in design and dimensions from requirements set out in Section 2, including swap bodies, are subject to special consideration by the Register in each particular case.

**1.1.4** Technical requirements for platform containers are set forth in the appropriate part of the Rules.

#### 1.2 DEFINITIONS AND EXPLANATIONS

**1.2.1** The definitions and explanations relating to the general terminology of these Rules are given in Part I "Basic Requirements".

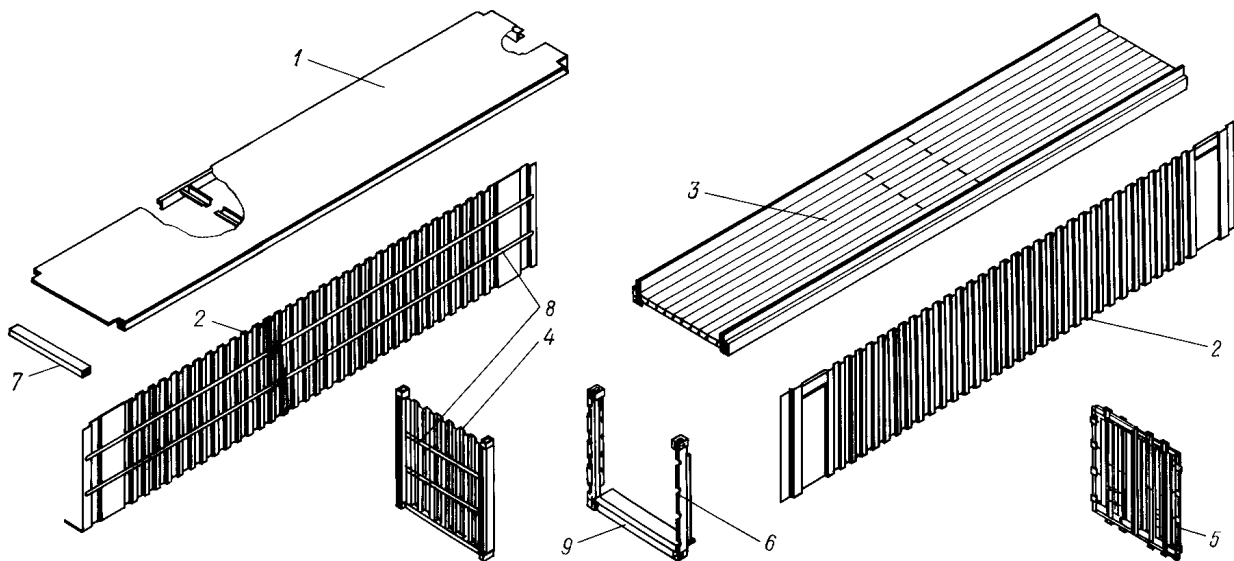


Fig. 1.2.1-1 Structural elements of general cargo containers:  
1 — roof; 2 — side wall; 3 — base; 4 — front wall; 5 — door; 6 — rear corner post; 7 — rear top rail;  
8 — cargo securing arrangements; 9 — rear bottom rail

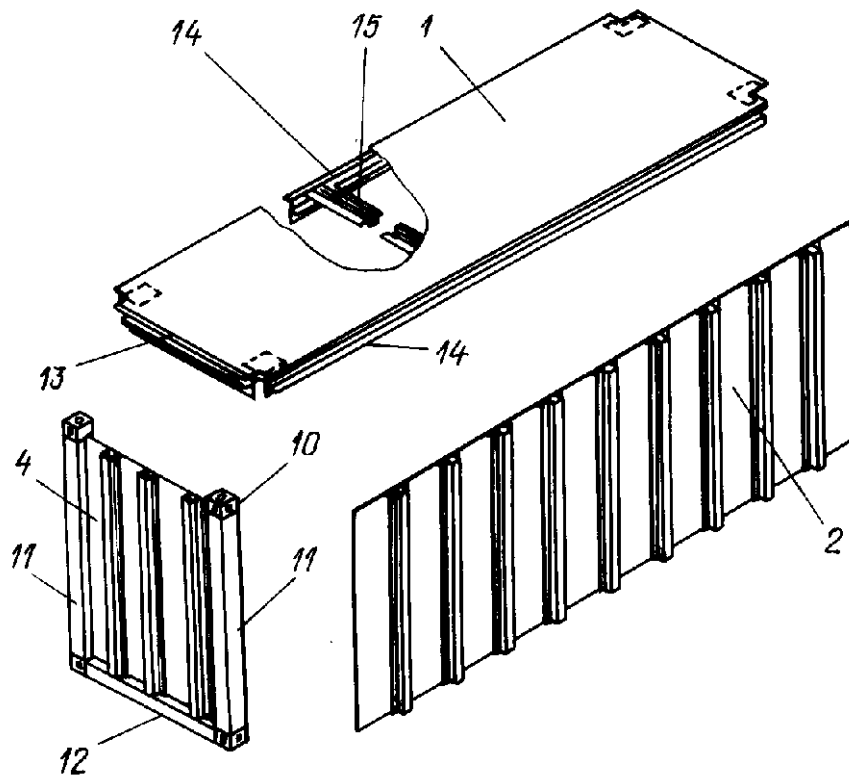


Fig. 1.2.1-2 Structural elements of general cargo containers:  
1, 2, 4 — refer to Fig. 1.2.1-1; 10 — corner fitting; 11 — front corner post; 12 — front bottom rail;  
13 — front top rail; 14 — top side rail; 15 — roof cross member

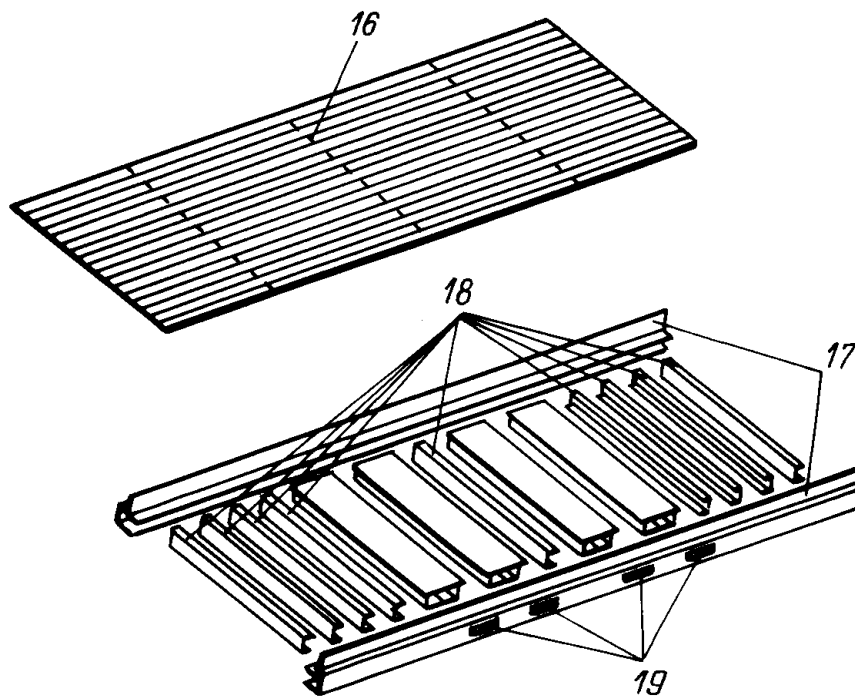


Fig. 1.2.1-3 Structural elements of general cargo containers:  
16 — floor; 17 — bottom side rail; 18 — bottom cross-member; 19 — fork lift pockets

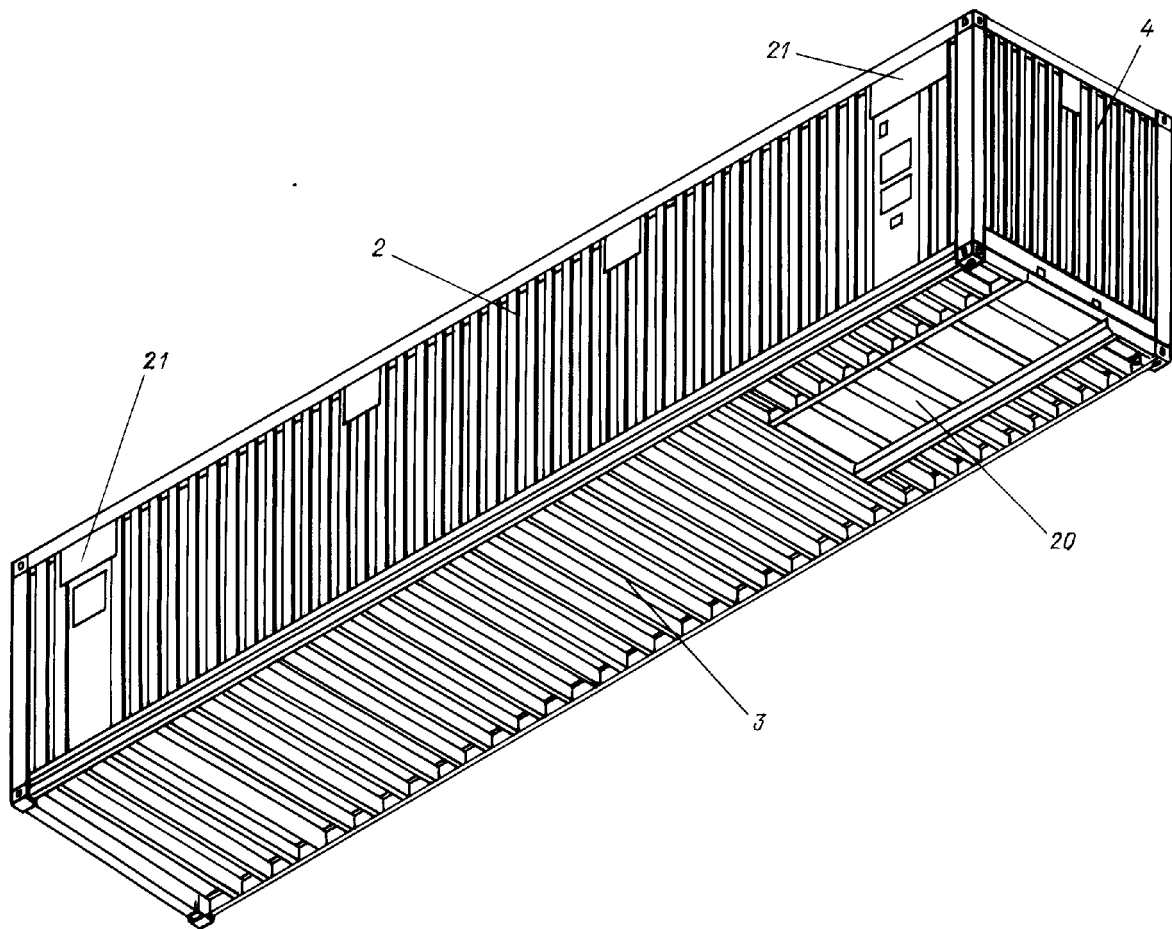


Fig. 1.2.1-4 Structural elements of general cargo containers:  
2, 3, 4 — refer to Fig. 1.2.1-1; 20 — gooseneck tunnel; 21 — ventilation unit

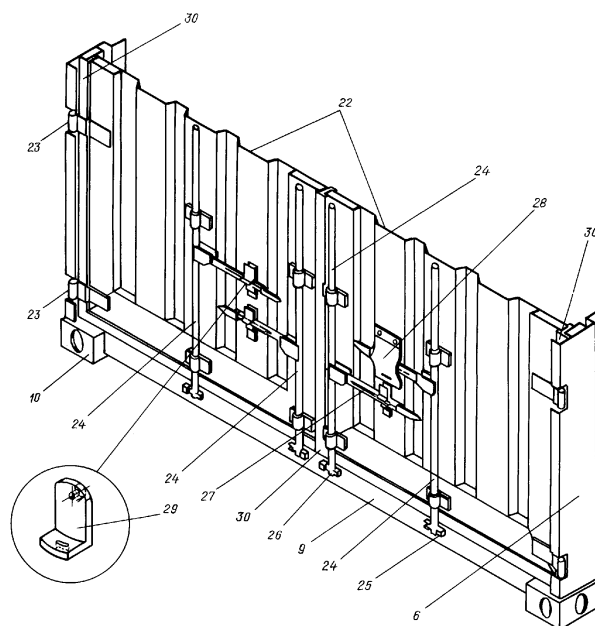


Fig. 1.2.1-5 Structural elements of general cargo containers (door):  
6, 9 — refer to Fig. 1.2.1-1; 10 — refer to Fig. 1.2.1-2; 22 — door panel; 23 — hinge; 24 — door locking bar;  
25 — cam retainer; 26 — cam; 27 — door locking handle; 28 — Customs seal protection cover (allowed not to be fitted);  
29 — device for affixing the Customs seal; 30 — door gasket

### **1.3 SCOPE OF TECHNICAL SUPERVISION**

#### **1.3.1** Technical supervision of the Register shall cover:

framework (bearing structure);  
walls, floor and roof;  
corner fittings; doors;  
covers for open top containers.

### **1.4 TECHNICAL DOCUMENTATION**

**1.4.1** For general freight containers, the technical documentation stated in 1.3.4, Part I "Basic Requirements", shall comprise:

- .1** technical conditions (technical specifications for foreign residents);
- .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;
- .4** drawings of the following parts, assemblies and general views, inclusive of all the specified dimensions:
  - .4.1** corner fittings (during manufacture at the containers manufacturer's works);
  - .4.2** door locks;
  - .4.3** ventilation arrangements;
  - .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;
  - .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** the CSC Plate and Customs Approval Plate for Containers (hereinafter referred to as "CCC Plate");
  - .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.

*Note.* Requirements of 1.4.1.4.14 through 1.4.1.4.16 are applicable only to general freight containers with the open top. The extent of the above documentation is the minimum required.

## 2 TECHNICAL REQUIREMENTS

### 2.1 INTERNAL DIMENSIONS

**2.1.1** Closed containers are to have internal dimensions not less than given in Table 2.1.1.

Table 2.1.1

Minimum internal dimensions of containers, mm			
Dimensions	Minimum height	Minimum width, mm	Minimum length, mm
1EEE	Rated height of the external part of a container minus 214 mm	2330	13 542
1EE			13 542
1AAA			11 998
1AA			11 998
1A			11 998
1BBB			8 931
1BB			8 931
1B			8 931
1CCC			5 867
1CC			5 867
1C			5 867
1D			5 867

### 2.1 DOOR OPENING

**2.2.1** Containers shall be provided with a door opening at least at one end.

**2.2.2** Closed 1A, 1B, 1C and 1D containers shall have a door opening preferably having dimensions equal to those of the internal cross-section of the container and in any case not less than 2134 mm high and 2286 mm wide; while for 1EE, 1AA, 1BB and 1CC containers the door opening shall be not less than 2261 mm high and 2286 mm wide and for 1EEE, 1AAA, 1BBB, 1CCC containers – not less than 2566 mm high and 2286 mm wide.

### 2.3 DOORS

**2.3.1** All doors shall open and close freely. The closing shall provide tightness. The angle of opening of each end door shall be 270°, and that of a side door shall be 180°. Suitable stop devices shall be provided to keep the doors open.

### 3 TESTING

#### 3.1 GENERAL

**3.1.1** Irrespective of the design, size and material used for the manufacture, the ISO series 1 general freight containers shall be subjected to test loadings and testing procedures set forth in 3.2 through 3.16, while the specified dimensions and tare mass shall be determined in accordance with the requirements of 3.17.

The container may be designed for other loads as regards tests specified in 3.7, 3.10, 3.13 and 3.14 which are subject to special consideration by the Register.

**3.1.2** The test devices for creating the required test loadings shall not interfere with free deflection of container sections under test.

**3.1.3** Upon completion of each test the container shall show neither permanent deformations nor abnormalities which could render it incapable of being used for its designed purpose.

No part of the container upon completion of strength tests of end and side walls shall project beyond the container external dimensions. Requirements of 2.3.1 and 2.3.2.1, Part I "Basic Requirements" shall be also complied with.

**3.1.4** The order of tests is not mandatory, except that the test under 3.15 shall be made last and be applied to each container.

#### 3.2 LIFTING BY TOP CORNER FITTINGS

**3.2.1** The container having the prescribed internal loading shall be carefully lifted in such a way that no significant acceleration forces are applied.

After lifting, the container shall be suspended for 5 min and then carefully lowered to the supports.

**3.2.2** The container shall have a uniformly distributed loading such that the combined mass of the container and test load is equal to  $2R$ .

**3.2.3** The external forces applied to the container shall be such as to permit lifting a combined mass of  $2R$ , by the following methods:

for 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CCC, 1CC, 1C and 1CX containers, vertically at all four fittings (refer to Fig. 3.2.3, *a*);

for 1D and 1DX containers, at all four corner fittings, so that the angle between each lifting device and the vertical is  $30^\circ$  (refer to Fig. 3.2.3, *b*);

for 1EEE and 1EE containers, vertically at four corner fittings and separately at four intermediate fittings.

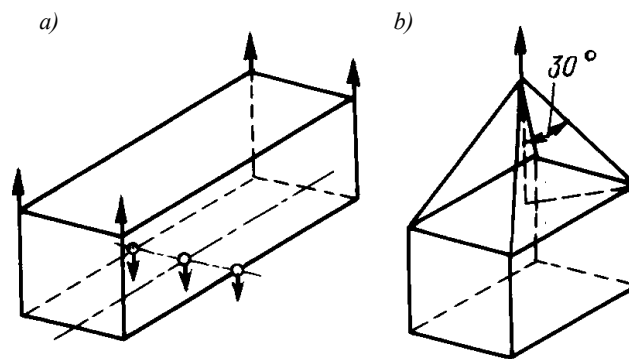


Fig. 3.2.3 Lifting by top corner fittings

**3.2.4** When lifting by the top corner fittings, the measurements shall be taken to determine:

- .1 deflection at the lowest points of side rails and at longitudinal centre line of the base while the container is loaded and supported by bottom corner fittings;
- .2 maximum elastic deformations during lifting;
- .3 permanent set remaining on removal of the load.

### 3.3 LIFTING BY BOTTOM CORNER FITTINGS

**3.3.1** The container having the prescribed loading shall be carefully lifted in such a way that no significant acceleration forces are applied.

After lifting, the container shall be suspended for 5 minutes.

**3.3.2** The container has a uniformly distributed loading such that the combined mass of the container and test load is equal to  $2R$ .

**3.3.3** The external forces applied to the container shall be such as to permit lifting a combined mass of  $2R$ , by the following method:

the lifting devices shall be secured through the side apertures of the bottom corner fittings so that the lines of action of the lifting forces and the outer faces of corner fittings shall be no farther apart than 38 mm, with the lifting forces applied at an angle to the horizontal (refer to Fig. 3.3.3) of:

30°, for 1EEE, 1EE, 1AAA, 1AA, 1A and 1AX containers;

37°, for 1BBB, 1BB, 1B and 1BX containers;

45°, for 1CCC, 1CC, 1C and 1CX containers;

60°, for 1D and 1DX containers.

1EEE and 1EE containers shall be additionally lifted by the bottom intermediate fittings using the same lifting devices and at the same angle to the horizontal of the forces applied as in case of lifting by corner fittings.

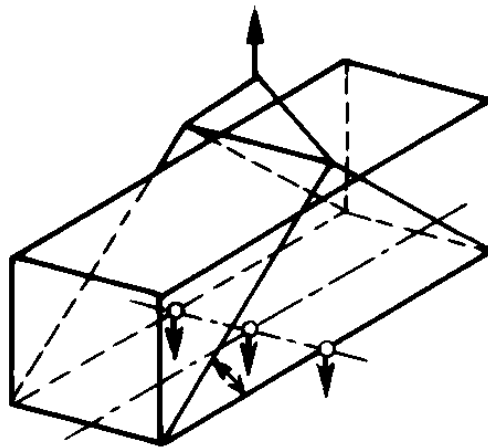


Fig. 3.3.3 Lifting by the bottom corner fittings

**3.3.4** When lifting by the bottom corner fittings the measurements shall be taken to determine the maximum elastic deformations during lifting and the permanent set of the container base.

### **3.4 LIFTING BY FORK LIFT POCKETS**

**3.4.1** Tests are carried out for 1CC, 1C, 1CX, 1D and 1DX containers having fork lift pockets.

The container having the prescribed loading shall be carefully lifted in such a way that no significant acceleration forces are applied.

After lifting, the container shall be suspended for 5 min.

**3.4.2** The container shall have a uniformly distributed internal loading such that the combined mass of the container and test load is equal to  $1,6R$ .

**3.4.3** The external forces applied to the container shall be such as to permit lifting of a combined mass of  $1,6R$ , in which case the container shall be placed on two bars which are in the same horizontal plane, one bar being centered within each fork lift pocket. The bars shall be of the same width as the forks intended to be used for handling the container, but not less than 200 mm, and shall project into the fork pocket for a distance of  $1828 + 3$  mm, measured from the outer face of the container side.

**3.4.4** In case of containers having four fork lift pockets on each side, tests under 3.4.3 shall be carried out for the most widely spaced pockets (outer), which are used for lifting a loaded container.

For pockets (inner) spaced at the least intervals which are used for lifting an empty container, the test procedure is similar to that outlined in 3.4.3, except that the external force applied shall be equal to  $0,625R$ .

**3.4.5** When lifting by fork lift pockets the measurements shall be taken to determine the maximum elastic deformations during lifting and permanent set of the container base.

### **3.5 LIFTING WITH THE USE OF GRAPPLER ARMS**

**3.5.1** Tests are carried out for containers provided with grapple arm lifting areas.

The container having the prescribed internal loading shall be carefully lifted in such a way that no significant acceleration forces are applied. After lifting, the container shall be suspended for 5 min and then carefully lowered.

**3.5.2** The container has a uniformly distributed internal loading such that the combined mass of the container and test load is equal to  $1,25R$ .

**3.5.3** Where areas are provided for lifting by grapple arms, the container shall be placed on four pads in the same horizontal plane, one under each grapple arm area. These pads shall be of the same dimensions as the lifting area of the grapple arms intended to be used for handling the container, but not less than  $32 \times 254$  mm.

**3.5.4** When lifting with the use of grapple arms the measurements shall be taken to determine the maximum elastic deformations during lifting and permanent set remaining on removal of the internal load.

### **3.6 ADDITIONAL LIFTING METHODS**

**3.6.1** Where containers are designed to be lifted in the loaded condition by any other additional method not covered by 3.2, 3.3 and 3.5, they shall also be tested with internal loading and externally applied forces representative of the acceleration conditions appropriate to the method.

**3.6.2** When carrying out the tests, the measurements shall be taken to determine the maximum elastic deformations during lifting and permanent set remaining on removal of the load.



### 3.7 STACKING

**3.7.1** The test shall be carried out to prove the ability of the loaded container to withstand the mass of the stacked containers. The stacked containers shall be of the same length (except 1EEE and 1EE containers) and loaded to the gross mass  $R$  each, taking into account the possible relative eccentricities between containers (refer to Fig. 3.7.1).

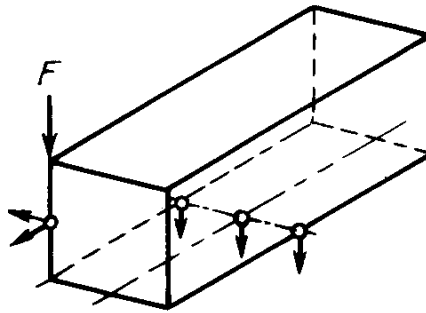


Fig. 3.7.1 Stacking test

**3.7.2** A container having a uniformly distributed internal loading, such that the total mass of the test load and the container is equal to  $1,8R$ , shall be placed on four or (in case of 1EEE and 1EE containers at a corresponding variant of loading (refer to 3.7.4)) eight level pads, which, in their turn, rest on a rigid horizontal surface. The pads shall be centered under each corner and in case of 1EEE and 1EE containers intermediate fitting and be of approximately the same dimensions as the fittings.

**3.7.3** The external forces shall be simultaneously applied to each of the four or eight (in case of 1EE and 1EEE containers) top fittings through corresponding test fittings or pads of the same dimensions as the container fittings. In this case, the external forces may be simultaneously applied to each pair of end fittings for 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CCC, 1CC, 1C, 1CX, 1D and 1DX containers. The test fittings or pads shall be placed in relation to the top fittings so as to cover all the potential positions of their offset by 25,4 mm laterally and 38 mm longitudinally. The container shall be exposed to the externally applied forces during 5 min.

**3.7.4** The external forces shall be simultaneously applied to each of the four or eight, in case of 1EEE and 1EE containers, top fittings through corresponding test fittings or pads of the same dimensions as the container fittings. In this case, the external forces may be simultaneously applied to each pair of end fittings for 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CC, 1C, 1CX, 1D and 1DX containers. The test fittings or pads shall be placed in relation to the top fittings so as to cover all the potential positions of their offset by 25,4 mm laterally and 38 mm longitudinally. The container shall be exposed to the externally applied forces during 5 min.

**3.7.5** The external forces applied to each top fitting shall be equal to:

942 kN, for 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CCC, 1CC, 1C and 1CX containers. These values are calculated on the assumption that the containers are stacked in eight tiers, mass  $R=30480$  kg and acceleration =  $1,8g$ ;

224 kN, for 1D and 1DX containers. These values are calculated on the assumption that the containers are stacked in six tiers, mass  $R=10160$  kg and acceleration =  $1,8g$ .

In case when the external forces are applied to each pair of the top corner fittings the above values shall be doubled.

Notes: 1. The forces applied in testing of the 1EEE and 1EE containers at the various stacking modes are subject to special consideration by the Register. The following stacking modes are specified for 1EEE, 1EE containers: 1EEE, 1EE on 1EEE, 1EE; 1AAA, 1AA, 1A, 1AX on 1EEE, 1EE; 1EEE, 1EE on 1AAA, 1AA, 1A, 1AX; 1AAA, 1AA, 1A, 1AX on 1EEE, 1EE, placed on 1AAA, 1AA, 1A, 1AX.

2. Forces applied during the container test to each of the top corner fittings to a vertical downward for equal to  $0,25 \times 1,8g \times$  the mass of the allowable superimposed static stacking load.

**3.7.6** In the course of testing measurements shall be taken to determine:

- .1 deflections at the lowest points of side rails and at the longitudinal centre line of the base;
- .2 deflections both longitudinally and laterally at mid-height of corner posts or at any point of maximum deflection of the corner posts;
- .3 permanent set remaining on removal of the load.

### 3.8 ROOF STRENGTH

**3.8.1** No internal loading is provided. The externally applied force which is a load of 3 kN uniformly distributed over an area of  $600 \times 300$  mm, shall be applied vertically downwards to the outer surface at the weakest point of the roof (refer to Fig. 3.8.1).

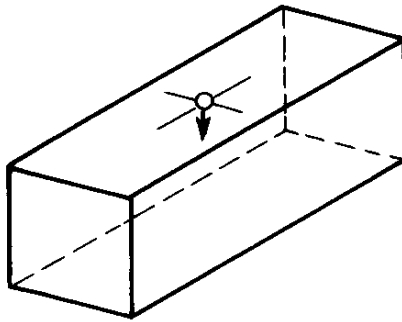


Fig. 3.8.1 Roof strength test

**3.8.2** In the course of testing the measurements shall be taken to determine the maximum deflection of the roof section under test and permanent set.

### 3.9 FLOOR STRENGTH

**3.9.1** The container shall be placed on four level supports under its four bottom corners in such a way that the base structure of the container is free to deflect (refer to Fig. 3.9.1).

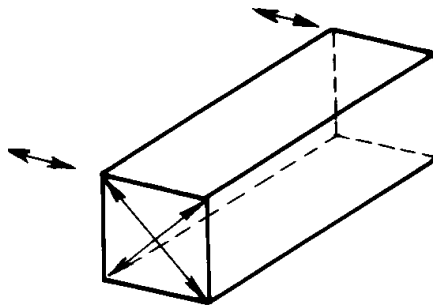


Fig. 3.9.1 Floor strength test

**3.9.2** A truck loaded to an axle weight of 71,2 kN that is 35,6 kN on each of two wheels, is used as internal concentrated load applied to the floor. The contact area of the wheels shall be 284 cm<sup>2</sup> when loaded, that is 142 cm<sup>2</sup> on each wheel, the wheel width being 180 mm and the distance between centres of the wheels is 760 mm; all contact points are to be within a rectangle of 185 mm (parallel to the wheel axle) and 100 mm in size. The truck shall manoeuvre over the entire floor area of the container. No external forces are applied to the container.

*Note.* For the purpose of compliance with the International Convention for Safe Containers, the axle load for the truck may be assumed 53,6 kN.

**3.9.3** In the course of testing the measurements shall be taken to determine deflection of the base at three locations of the truck and permanent set.

### 3.10 TRANSVERSE RACKING

**3.10.1** The 1EEE, 1EE, 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CCC, 1CC, 1C and 1CX containers shall be capable of withstanding the transverse racking forces.

**3.10.2** A container with no internal loading shall be placed on four level supports, one under each of the four bottom corner fittings (refer to Fig. 3.10.2-1).

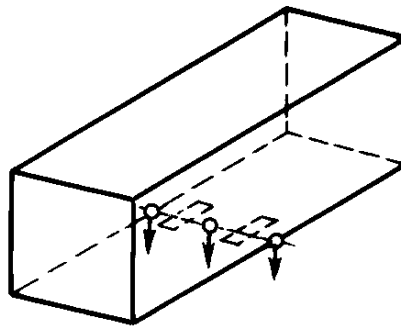


Fig. 3.10.2-1 Transverse racking test

The container shall be restrained against vertical movement by means of anchor device through the bottom apertures of bottom corner fittings, and lateral restraint is provided by means of anchor device acting alternately through the side apertures of bottom corner fittings diagonally opposite to those at which the forces are applied. External forces equal to 150 kN shall be applied either separately or simultaneously to each of the top corner fittings on one side of the container in lines parallel both to the base and to the planes of the end walls. The forces are applied first towards and then away from the top corner fittings. If the end walls of the container are symmetrical about their own vertical centre lines, one side only need be tested. With asymmetric ends, the forces shall be applied to both sides.

The changes in lengths of the diagonals D5 and D6 (refer to Fig. 2.2.1-5, Part I "Basic Requirements") shall be measured in the course of testing. The sum of these changes shall not exceed 60 mm.

- Notes: 1. The 1EEE and 1EE containers shall be tested with loads applied according to Figs. 3.10.2-2 — 3.10.2-9.  
2. Forces applied during the tests of containers designed for one door off operation shall be specified in the design.

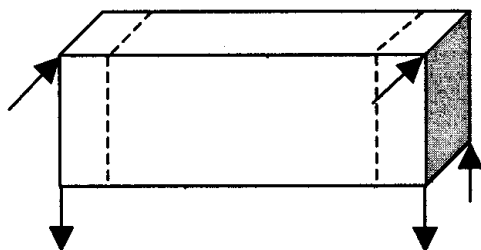


Fig. 3.10.2-2

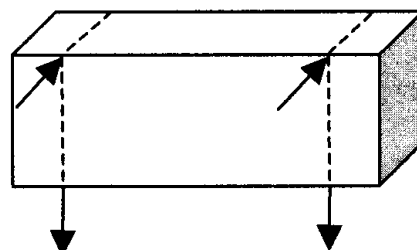


Fig. 3.10.2-3

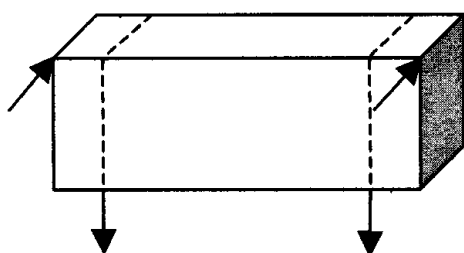


Fig. 3.10.2-4

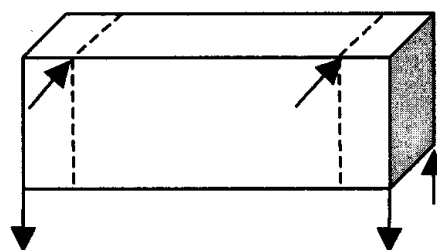


Fig. 3.10.2-5

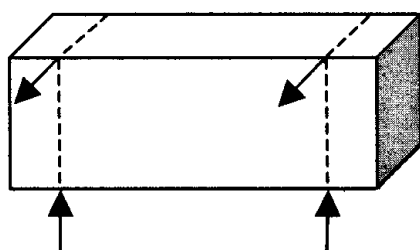


Fig. 3.10.2-6

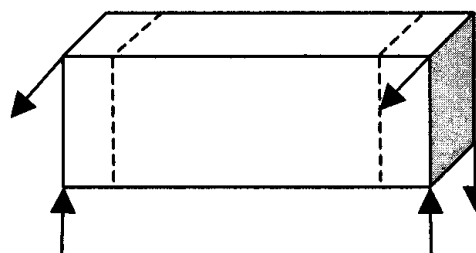


Fig. 3.10.2-7

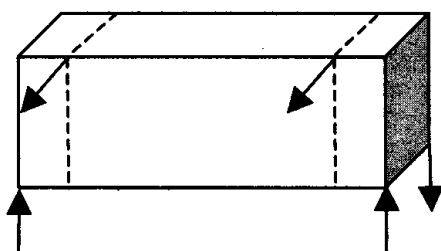


Fig. 3.10.2-8

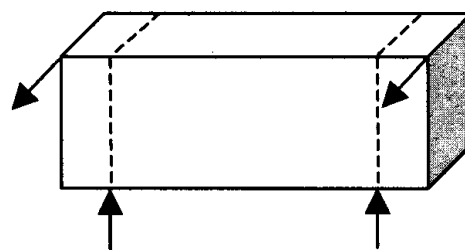


Fig. 3.10.2-9

### 3.11 LONGITUDINAL RACKING

**3.11.1** The 1EEE, 1EE, 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1BX, 1CCC, 1CC, 1C and 1CX containers shall be capable of withstanding the longitudinal racking forces.

**3.11.2** A container with no internal loading shall be placed on four level supports, one under each of the four bottom corner fittings (refer to Fig. 3.11.2-1). The container shall be restrained against vertical movement by means of an anchor device acting through the bottom apertures of bottom corner fittings. Longitudinal restraint is provided by means of the anchor device acting alternately through the end apertures of bottom corner fittings diagonally opposite to those at which the forces are applied.

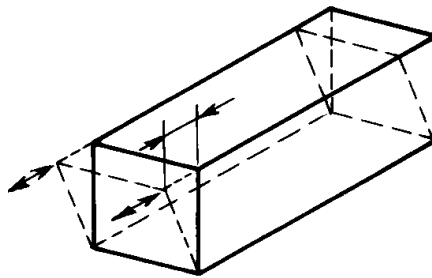


Fig. 3.11.2-1 Longitudinal racking test

External forces equal to 75 kN shall be applied separately or simultaneously to each of the top corner fittings on one end of the container in lines parallel both to the base and the planes of the sides. The forces are applied first towards and then away from the top corner fittings.

If the sides of the container are symmetrical about their own vertical centre lines and are also of similar construction, one end only shall be tested. Where the sides are asymmetrical and of a differing construction as many tests shall be carried out as are necessary to cover all possible modifications. Longitudinal displacement of top side rails shall be measured during the test. The value of displacement shall not exceed 25 mm.

*Note.* The 1EEE and 1EE containers shall be tested with loads applied according to Figs. 3.11.2-2 — 3.11.2-5.

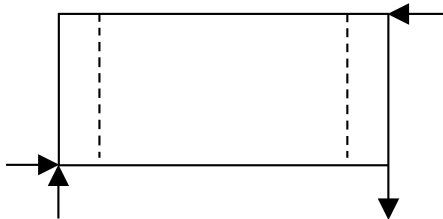


Fig. 3.11.2-2

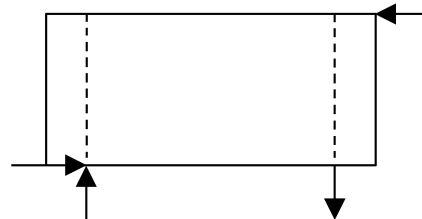


Fig. 3.11.2-3

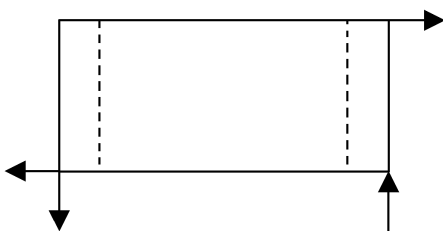


Fig. 3.11.2-4

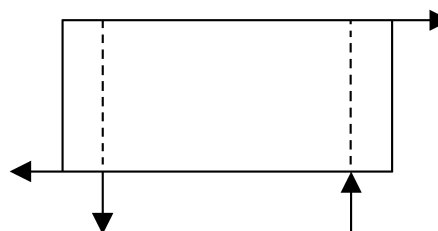


Fig. 3.11.2-5

### 3.12 LONGITUDINAL RESTRAINT (STATIC TEST)

**3.12.1** A container having a uniformly distributed internal loading such that the combined mass of the container and test load is equal to  $R$ , shall be restrained longitudinally by securing the bottom corner fittings (through the bottom apertures) at one end of the container to suitable anchor points (refer to Fig. 3.12.1-1). Two external forces, each equal to  $Rg$ , shall be applied horizontally to both unsecured bottom corner fittings through the bottom apertures, first towards and then away from the anchor points so that the base of the container is subjected to the action of a combined force of  $2Rg$ .

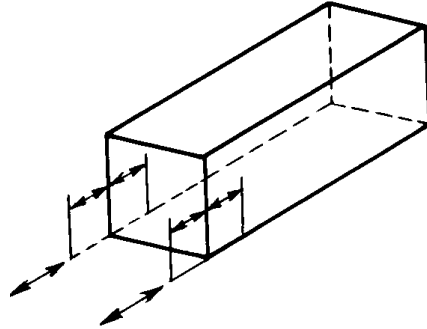


Fig. 3.12.1-1 Longitudinal restraint

In the course of testing the change in length of each bottom side rail shall be measured in both directions.

*Note.* The 1EEE and 1EE containers shall additionally be tested with loads applied to intermediate fittings according to Figs. 3.12.1-2 — 3.12.1-3.

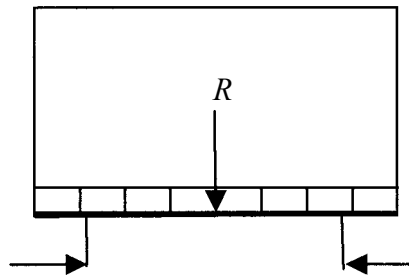


Fig. 3.12.1-2

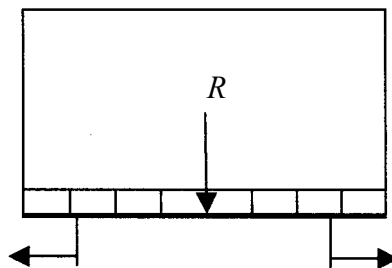


Fig. 3.12.1-3

### 3.13 STRENGTH OF END WALLS

**3.13.1** The end wall shall be capable of withstanding an internal loading equal to  $0,4Pg$ . The container may, however, be tested by a loading lesser or greater than  $0,4Pg$  if container end walls are designed to withstand such loads.

The load of  $0,4Pg$  (or any other loading to which the wall is designed) is uniformly distributed over the internal surface in such a way as to allow free deflection of the wall (refer to Fig. 3.13.1).

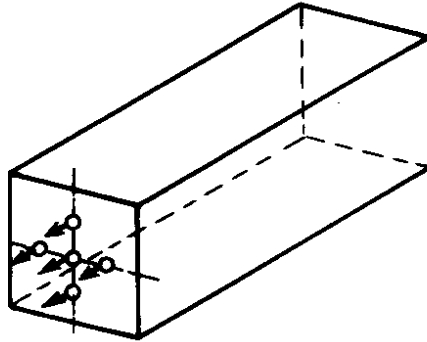


Fig. 3.13.1 End wall strength test

No external forces are applied to the container.

Both end walls shall be tested. However, only one wall shall be tested when both are similar in structure.

In the course of testing, the measurements shall be taken to determine the deflection at the centre and at least in two other points of the wall, and permanent set at the same locations.

### 3.14 STRENGTH OF SIDE WALLS

**3.14.1** The side walls shall be capable of withstanding an internal loading of  $0,6Pg$ . The container may, however, be tested by a loading lesser or greater than  $0,6Pg$ , if the side walls have been designed to withstand such loading.

The inner surface of the side wall shall be subjected to a loading of  $0,6Pg$  (or any other loading to which the wall is designed) uniformly distributed over the whole surface in such a way as to allow the side wall and its top and bottom side rails to deflect freely. The loading shall be applied separately to each side wall (refer to Fig. 3.14.1). No external forces are applied to the container.

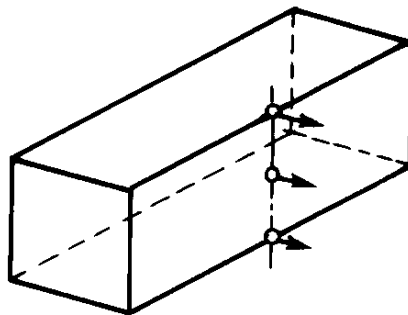


Fig. 3.14.1 Side wall strength test

Both side walls shall be tested. However, only one wall shall be tested when both are similar in structure. In the course of testing the measurements shall be taken to determine deflection at the centre of the wall and at mid-length of the top and bottom side rails, as well as permanent set at the same locations.

### **3.15 WEATHERTIGHTNESS**

**3.15.1** All outer surfaces, connections and seams of the container shall be subjected to a stream of water, providing that:

- .1 nozzle diameter is 12,5 mm;
- .2 water pressure measured at the nozzle outlet is 0,1 MPa;
- .3 distance from the nozzle to the surface under test is 1,5 m;
- .4 nozzle directed to the surface is at an angle of 90°;
- .5 speed of stream is 100 mm/s.

Several nozzles may be used for testing provided that the above requirements are fulfilled as for a single nozzle.

Upon completion of the test the inner surfaces of the container shall be dry. The weathertightness test may be performed by any other method approved by the Register.

### **3.16 STRENGTH OF CARGO SECURING DEVICES**

**3.16.1** The test shall be carried out for containers fitted with cargo securing devices.

**3.16.2** The cargo securing devices shall be capable of withstanding a loading which is 1,5 times higher than the design loading. The lines of action of the forces applied are directed:

for arrangements fitted on the base structure, at right angles to the centre line of the structural elements and at an angle of 45° to the horizontal plane;

for arrangements fitted above the base structure, at an angle of 45° upwards and downwards (where applicable) in respect to the horizontal plane;

for arrangements fitted on top beams of the container, at an angle of 45° downwards to the horizontal plane.

**3.16.3** The minimum design loading for the arrangements fitted on the floor is equal to 1000 kg, for other arrangements it is 500 kg. The arrangements shall be subjected to the loading for at least 5 min.

In the course of testing, the measurements shall be taken to determine permanent set of devices and structural elements of the containers at the points where they are fastened.

### **3.17 INSPECTIONS**

**3.17.1** Inspections comprise visual inspection, verification of specified dimensions and weighing of the container.

Visual examination shall be conducted during the manufacture of the container and/or upon completion of works, to ascertain that the container design, materials and workmanship comply with the requirements of these Rules. Visual examination shall include checking of the opening and closing of the doors.

The specified dimensions shall be verified before commencement and upon completion of the tests.

A container shall be weighed upon completion of all works including painting.



## **PART III. THERMAL CONTAINERS**

### **1 GENERAL**

#### **1.1 APPLICATION**

**1.1.1** The requirements of this Part apply to thermal containers.

**1.1.2** The requirements of this Part also apply to offshore thermal containers and to thermal containers of the swap body type, where applicable.

**1.1.3** Thermal containers shall comply with the requirements of Part I "Basic Requirements", and with the requirements of this Part.

**1.1.4** Thermal containers differing in design and dimensions from those defined in this Part are subject to special consideration by the Register in each particular case.

#### **1.2 DEFINITIONS AND EXPLANATIONS**

**1.2.1** The definitions and explanations relating to the general terminology of these Rules are given in Part I "Basic Requirements". For the purpose of this Part the following definitions and explanations have been adopted.

**Floor air duct** is a passage or passages located beneath the freight support surface for air circulation.

**Ceiling duct** is a passage or passages located in the proximity to the ceiling to the direct air flow.

**Batten** is a structural element of the container protruding from the inside walls and/or roof, built integral with, or fastened to the walls or roof, or installed during cargo loading to create a clearance between cargo and wall and/or roof for air circulation.

**Drainage system** is a system intended to drain liquid from defrosting internal surfaces of the container and to relieve internal pressure, and which comprises trays, pipes, drain openings and appropriate closures.

**Thermal container** is a container, the walls, doors, floor and roof of which are insulated to limit heat exchange between the inside and outside of the container.

The thermal containers include the following container types:

**heated container** is a thermal container with a heating plant;

**refrigerated and heated container** is a thermal container served by a refrigerating plant or using an expandable refrigerant and heating plant;

**mechanically refrigerated container** is a thermal container served by a refrigerating plant (e. g. compression or absorption type, etc.);

**refrigerated container with expendable refrigerant** is a thermal container using a source of cold (such as ice, dry ice with or without sublimation control, liquefied gases with or without evaporation control) and requiring no external power supply;

**insulated container** is a thermal container without the use of permanently attached devices for cooling and/or heating.

**New thermal container** is a thermal container manufactured within 7 days before its survey and having the maximum heat transfer value  $U_{\max}$  in accordance with Table 2.5.1.

**Old thermal container** is a thermal container having the maximum heat transfer value  $U_{\max}$  exceeding the value  $U_{\max}$  by 20 % due to change in insulation properties (see Table 2.5.1).

**Removable equipment** means power generating unit or other equipment designed to be attached or detached from thermal containers when transfer for other types of transport:

**internal equipment** is the equipment arranged within the overall dimensions of the container as per ISO 668;

**external equipment** is the equipment fully or partially arranged outside the overall dimensions of the container as per ISO 668.

**Note.** It is assumed that the external equipment shall be removable or folding to facilitate its transportation using various transport means.

### **1.3 TECHNICAL SUPERVISION**

**1.3.1** Technical supervision of the Register shall cover:

- .1** framework (bearing structure including the walls, insulation, floor and roof);
- .2** corner fittings;
- .3** doors and door locks;
- .4** stationary refrigerating and/or heating plants of the container;
- .5** electrical equipment;
- .6** electric power source with its prime mover.

**1.3.2** In the course of manufacture components, assemblies, plants and equipment, specified in 1.3.1 shall comply with the requirements of these Rules.

### **1.4 TECHNICAL DOCUMENTATION**

**1.4.1** For approval by the Register of a thermal container by design type or individually, the following technical documentation shall accompany the application for approval, in addition to the technical documentation specified in 1.3.4, Part I "Basic Requirements":

- .1** specification and drawings of thermal insulation;
- .2** thermal calculations (except for insulated containers);
- .3** information of the manufacturer, model and characteristics of the refrigerating and/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** test program for type-series containers;
- .6** documentation in compliance with 1.4.2, when the refrigerating and/or heating plants are approved together with the container.

**1.4.2** For approval of the refrigerating and/or heating plants the following documentation shall be attached to the request:

- .1** technical conditions (technical specification), drawings of cooling circuit and drawings of the refrigerating and/or heating plants with indication of thermal, mechanical and other characteristics;
- .2** specification of electrical equipment with parameters of circuit breakers, control and indication facilities, drawings of plug and socket connections, operating diagrams;
- .3** specification, diagrams and drawings of electrical power source with its prime mover;
- .4** test program for a prototype and type-series refrigerating and/or heating plants.

## 2 TECHNICAL REQUIREMENTS

In addition to the requirements contained in this Section, the thermal containers shall meet the requirements of Section 2, Part I "Basic Requirements".

### 2.1 INTERNAL DIMENSIONS

**2.1.1** The minimum internal dimensions of thermal containers are given in Table 2.1.1.

Table 2.1.1

Detailed type code (ISO 6346)	Minimum length <sup>1,2</sup> = nominal external containers length minus	Minimum width <sup>2</sup> = nominal external containers width minus	Minimum height <sup>1,2</sup> (without gooseneck tunnel) = nominal external container height minus	Minimum height <sup>1,2</sup> (with "gooseneck" tunnel)= nominal external container height minus
H0/HA, R0/RA, R1/RB, R5/RM, R7/RW	690	220	345	385
H1/HB, R2/RD, R3/RG, R8/RX	990			
H0/HA	440			
<sup>1</sup> Some of the length and height dimensions specified will necessarily be used for air circulation. <sup>2</sup> Containers internal dimensions can deviate from above minimums due to operational or other requirements.				

### 2.2 DOOR OPENING

**2.2.1** Each container shall be provided with a door opening at least at one end.

**2.2.2** The usable width shall correspond with the appropriate minimum internal dimension given in Table 2.1.1.

**2.2.3** The usable height shall be as close as practicable to the appropriate minimum internal dimension given in Table 2.1.1.

### 2.3 DOORS

**2.2.3** Requirements to the doors are outlined in 2.2, Part II "General Freight Containers".

### 2.4 FLOOR

**2.4.1** Thermal containers with the air circulation system shall have a method for distributing air in the floor, including the T-floor. The floor shall have a minimum height as indicated in Table 2.4.1.

Table 2.4.1

Minimum floor height, mm	Container designation			
55	1EEE	1EE	—	—
55	1AAA	1AA	1A	1AX
45	1BBB	1BB	1B	1BX
35	1CCC	1CC	1C	1CX
30	—	1DD	1D	1DX

**2.4.2** Mechanical refrigerating unit (MRU) air circulation shall be capable of at least 50 container volume air changes each hour whilst operating on a 50 Hz power supply, taking the container volume from Table 2.1.1. It is not a requirement for fan operation to be continuous.

Airflow measurement should comply with the provisions of ISO 5801.

## 2.5 THERMAL CHARACTERISTICS

**2.5.1** Thermal containers shall be so designed as to provide thermal characteristics indicated in Table 2.5.1, applicable to new containers.

Table 2.5.1

Detailed type code (ISO 6346)	Description	Maximum heat transfer <sup>1</sup> for new thermal containers $U_{\max}$ W/K									Operational <sup>2,3,4</sup> temperatures	
		1D, 1DD	1C, 1CC	1CCC	1B, 1BB	1BBB	1A, 1AA	1AAA	1EE	1EEE	inside °C	outside °C
H5/HM	Refrigerated (expendable refrigerant)	13	22	24	31	33	40	42	44	46	−30	+50
H8/HX	Eutectic, remote mechanical refrigeration	13	22	24	31	33	40	42	44	46	+30	−30
R0/RA	Mechanically refrigerated	13	22	24	31	33	40	42	44	46	−30	+50
R1/RB	Mechanically refrigerated and heated	13	22	24	31	33	40	42	44	46	+30	−30
R7/RW	Heated	13	22	24	31	33	40	42	44	46	−30	+50
R5/RM	Front mechanically refrigerated and heated	13	22	24	31	33	40	42	44	46	+30	−30
R2/RD	Mechanically refrigerated, self-powered	13	22	24	31	33	40	42	44	46	−30	+50
R3/RG	Refrigerated and heated, self-powered	13	22	24	31	33	40	42	44	46	+30	−30
R8/RX	Heated, self-powered	13	22	24	31	33	40	42	44	46	−30	+50
H0/HA	Refrigerated and/or heated, with removable equipment, unit located externally	13	22	24	31	33	40	42	44	46	+30	−30
H1/HB	Refrigerated and/or heated, with removable equipment, unit located internally	13	22	24	31	33	40	42	44	46		

<sup>1</sup>The values of  $U_{\max}$  for containers with insulation (type 1AAA) correspond to heat transfer coefficient  $\leq 0,4 \text{ W}/(\text{m}^2\cdot\text{K})$ .  
<sup>2</sup>Enclosed electrical components in the control box unit shall not fail up to a temperature of + 85°C.  
<sup>3</sup>Materials shall be capable of withstanding surface temperatures −30 °C to +80 °C.  
<sup>4</sup>In case MRU is not designed for −30 °C, the lowest design temperature specified by the manufacturer may be selected instead.

**2.5.2** The heat transfer values are determined upon the test results of the prototype container in compliance with 3.5. If necessary, for containers in service the heat transfer value shall be confirmed.

## **2.6 REQUIREMENTS FOR ADDITIONAL (OPTIONAL) EQUIPMENT**

### **2.6.1 Drainage system.**

**2.6.1.1** The bottom portion of the container may be fitted with drainage system complying with the following requirements:

.1 the drainage system, if required to operate when carrying cargo, shall have suitable fittings with a sealing mechanism, which open automatically above normal internal operating pressure;

.2 if required for cleaning of the interior of the container, the drainage system fittings shall ensure water drainage from the container upon its cleaning and shall be provided with manual opening-closure;

.3 the design of the draining system shall comply with the requirements of the Rules for the Approval of Containers for the Transportation of Goods Under Customs Seal.

### **2.6.2 Water cooling system.**

**2.6.2.1** For equipment requiring water cooling, inlet and outlet connections shall be in accordance with the requirements of ISO 1496-2.

**2.6.2.2** Such equipment shall be provided with drainage facilities to prevent water from freezing when draining the container.

**2.6.2.3** Inlet and outlet connection of the water cooling system shall be so located at the machinery end of the container that they appear in the lower right-hand quarter to an observer facing that end.

### **2.6.3 Ventilation system.**

**2.6.3.1** Air openings for the ventilation of the internal volume of a container shall have closures readily accessible from outside.

**2.6.3.2** The air circulation openings of 1AA, 1CC and 1C containers, where removable equipment is used for refrigerating or heating of the container, shall comply with the following requirements (refer to Fig. 2.6.3.2):

.1 the bosses for holes shall be minimum 457 mm in diameter or square for 1CC and 1C containers and minimum 550 mm for 1AA containers;

.2 the face of bosses shall be smooth with a tolerance of 0,25 mm on the parallel plane of the front faces of corner fittings;

.3 a clearance of 3 to 6 mm shall be provided between the plane of the front faces of corner fittings and the face of bosses;

.4 the bore of the hole shall be not less than 254 mm in diameter for 1CC and 1C containers and not less than 350 mm for 1AA containers;

.5 the holes shall have closures that comply with the requirements of the Rules for the Approval of Containers for the Transportation of Goods Under Customs Seal.

The size of openings and their location for containers of other designations shall be specially considered by the Register in each particular case.

**2.6.3.3** Each inlet of the ventilation system shall be correspondingly and clearly marked.

### **2.6.4 Additional sockets for removable equipment.**

**2.6.4.1** If the containers are designed for removable equipment, the sockets for it shall be designed and located as shown in Fig. 2.6.4.1 (the example for a container size of 9'6").

**2.6.4.2** Each socket for attaching a removable power generator set shall be designed to withstand the load of 17,8 kN applied in the vertical and horizontal directions in compliance with ISO 1496-2.

**2.6.4.3** Installation of removable equipment for diesel generator shall not interfere with lifting of a container.

### **2.6.5 Equipment for hanging cargo.**

**2.6.5.1** The equipment for hanging cargo shall withstand the loads indicated in 3.2.2.

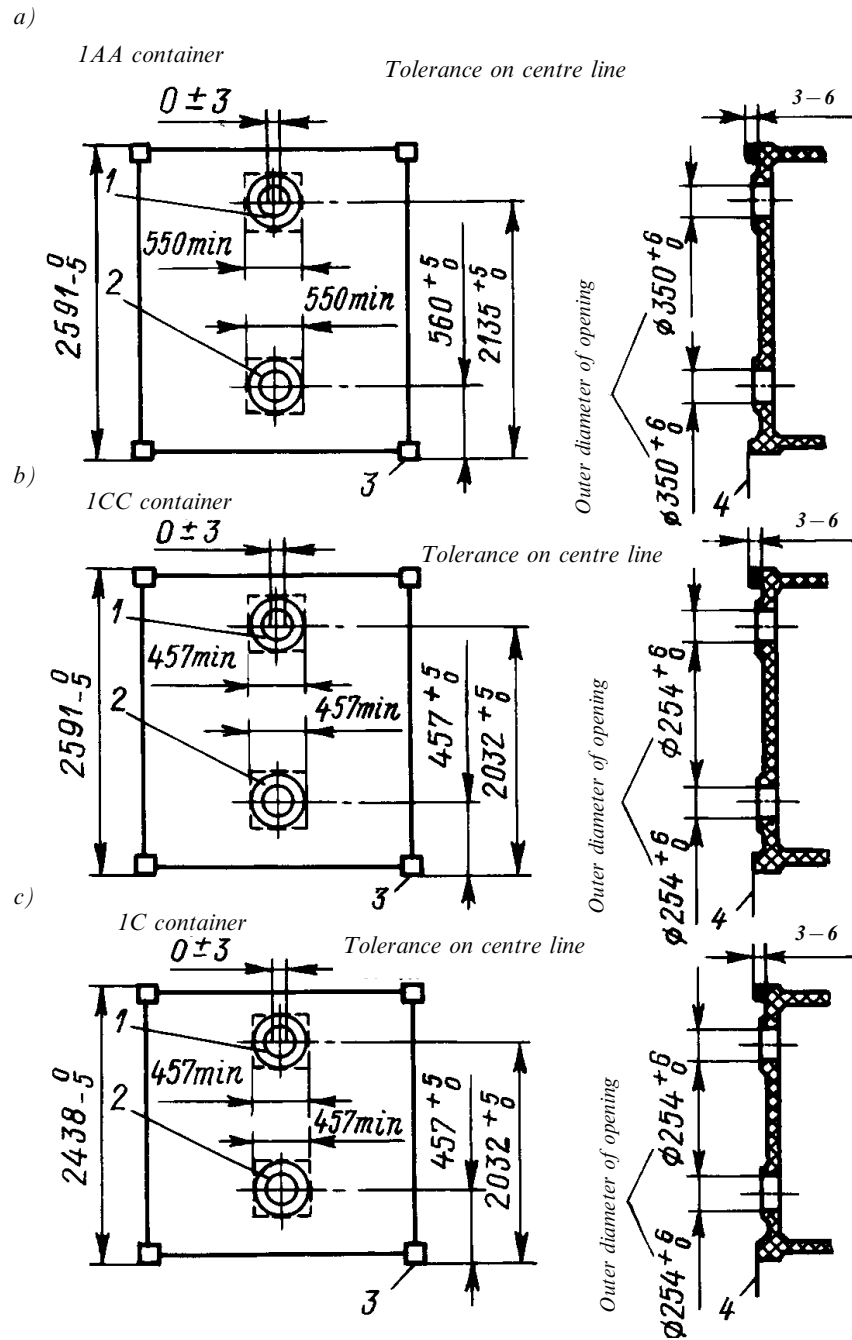


Fig. 2.6.3.2 Air openings in end wall (front and lateral view) of 1AA, 1CC and 1C containers, mm:

1 — air outlet hole; 2 — air inlet hole; 3 — bottom face of bottom corner fitting; 4 — front face of bottom corner fitting

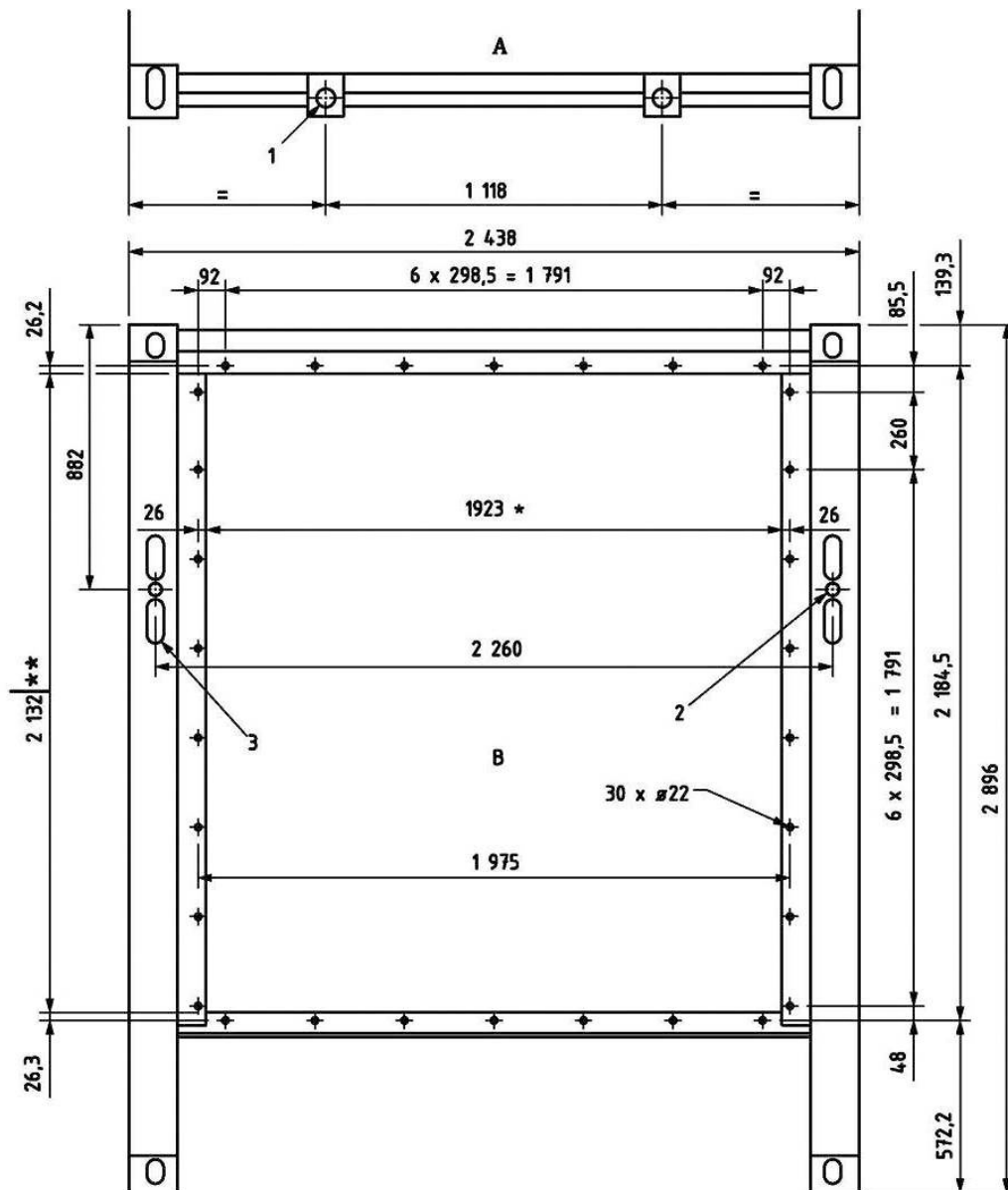


Fig. 2.6.4.1:

1 — diesel generator set mounts; 2 — diesel generator set nuts; 3 — 4 raised of diesel generator spacers;  
A — top view; B — end view; \* — opening width; \*\* — opening height

## **2.7 MATERIALS**

**2.7.1** Materials used for manufacture of the bearing structure of a container shall meet the requirements of Section 3.2, Part I "Basic Requirements".

**2.7.2** Materials used for manufacture of a container, as well as its refrigerating and heating equipment shall not have an adverse effect on the cargo carried (especially, on the foodstuffs).

**2.7.3** The inner surface of the thermal container shall meet the following requirements:

- .1** the inner surfaces, as far as practicable, shall be plane and shall not permit moisture to accumulate;
- .2** the inner surfaces shall be resistant to steam, detergents and disinfectants;
- .3** the inner surfaces shall be fully accessible to normal cleaning and disinfecting procedures.

**2.7.4** Thermal containers shall have their outer and inner surfaces light-coloured (white, light-grey, silvery, etc.).

**2.7.5** The insulating materials of a container shall ensure heat conductivity determined from Table 2.4.1, be non-hygroscopic, as far as practicable, and have physical and chemical resistance, remaining at the same time neutral to the materials with which they are in contact.

**2.7.6** The insulation of a container shall be covered with a lining of adequate strength to protect the insulation during container handling operations.

## **2.8 REFRIGERATING AND HEATING PLANTS**

**2.8.1** The requirements of this Chapter cover the refrigerating plants employing refrigerating compressor working on R134A or R404 refrigerants. The use of refrigerating plants of other designs or compressors with refrigerants other than stated above is subject to special consideration by the Register in each particular case.

Toxic, flammable and aggressive refrigerants shall not be used in refrigerating plants of containers.

**2.8.2** The refrigerating plant of a container:

- .1** shall be fitted with a hermetically or semi-hermetically sealed compressor;
- .2** shall be air cooled;
- .3** shall be designed for continuous running and have a capability sufficient to maintain the working temperature inside the container at the maximum outside temperature specified in Table 2.5.1, when running not more than 18 h a day;
- .4** shall have all the equipment fully automated, inclusive of defrosting devices;
- .5** shall have reliable overpressure protection with the pressure-relief devices located outside the internal volume of the container;
- .6** shall include precautions to prevent freezing of the elements of the automatic control devices;
- .7** shall be fitted with hand controls operable from a readily accessible position;
- .8** shall withstand vibration and impacts during conveyance by different modes of transport.

**2.8.3** Provision shall be made in the container for fitting of at least one thermometer to control the operation of refrigerating plant and also for measurements to be taken by a test thermometer.

**2.8.4** If the internal combustion engine is used as a refrigeration plant prime mover, the following conditions shall be met:

- .1** the engine shall run on fuel with a flash point not less than 55 °C;
- .2** the fuel tank shall be provided with draining arrangements and a level gauge;
- .3** the air pipe shall be fitted with a flameproof head;
- .4** to prevent restarting the engine shall be shut down automatically when the fuel level in tank is minimum;
- .5** the exhaust pipe of the engine shall be fitted with a spark arrester;
- .6** the engine shall be started up freely at least at a temperature of – 10 °C.



**2.8.5** A refrigerated container with expendable refrigerant shall be fitted with arrangements for draining the rest of refrigerant after consumption.

**2.8.6** A heating plant shall meet the requirements applicable to a refrigerating plant with respect to capacity, operation and safety.

## **2.9 ELECTRICAL EQUIPMENT**

### **2.9.1 Electrically powered equipment.**

It is permissible to use in containers such equipment which is operating from electrical power sources with characteristics as follows:

3-phase current with voltage of 360 to 460 V at a frequency of 50 Hz;

3-phase current with voltage of 400 to 500 V at a frequency of 60 Hz.

### **2.9.2 General requirements.**

**2.9.2.1** The electrical equipment shall operate reliably at frequency variations from nominal values within +2,5 %.

**2.9.2.2** The total power of electrical equipment under rated operating conditions shall not exceed 15 kW (18,75 kVA).

**2.9.2.3** Equipment shall be provided with means for protecting the temperature-control apparatus against electrical overloads.

**2.9.2.4** The plugs and metallic casings of current carrying equipment shall be earthed. All current-carrying parts shall be shielded against accidental contact. The insulation resistance of the electrical equipment shall be not less than 1 MOhm.

**2.9.2.5** All electrically live metal parts shall be protected from accidental contact.

**2.9.2.6** All non-current-carrying metallic components in a plug assembly shall be earthed.

Cable connections to live pins of the plug shall be protected against abrasion, strain and twisting. The protection shall be designed in such a way that the live pins cannot touch accessible metal parts of the plug case.

**2.9.2.7** A wiring diagram shall be mounted on the equipment in a readily accessible place.

All wires shall be identified by marking (for example, colour coding) to correspond with information on the wiring diagram.

**2.9.2.8** The equipment shall be provided with a nameplate including the following data as a minimum requirement:

3-phase current voltage, V;

frequency, Hz;

rated current, A;

total starting current, A.

### **2.9.3 Cables.**

**2.9.3.1** A flexible power cable of adequate cross-section area shall be provided to supply the equipment of the container from an external source of electrical power, which shall be permanently attached to the refrigeration and/or heating plant at one end and shall have a male plug at the other end. A minimum cable length or extension cable length shall be 18 m.

**2.9.3.2** The equipment shall be provided with a 32 A four-pin (three poles plus earth) male plug.

The plug connection design shall ensure IP 67 protection.

**2.9.3.3** The plug shall be sealed to the power cable by suitable means so as to prevent moisture ingress under service conditions.

**2.9.3.4** A flexible power cable shall be stored in a well ventilated space used solely for this purpose.

**2.9.3.5** Electrical equipment of the container when supplied from an external source of power shall operate with clockwise phase rotation A(R), B(S), C(T), according to a scheme presented in Fig. 2.9.3.5.

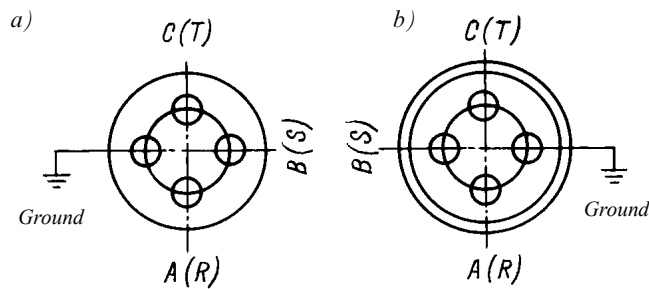


Fig. 2.9.3.5 Phase connections to container plugs and sockets (front view):  
*a* — plug; *b* — socket

#### 2.9.4 Plug and socket connections.

The design and dimensions of plugs and sockets shall comply with accepted national and international standards.

#### 2.9.5 Switch gear, control and protection devices.

**2.9.5.1** The equipment controls shall be located in accessible positions, be easy for operation and be adequately protected against mechanical damage.

**2.9.5.2** Controls shall include an easily accessible and clearly marked ON/OFF switch on the outside of the equipment which prevents operation of the unit when in the OFF position. Whenever the unit's ON/OFF switch is in the ON position, an indicating light shall be illuminated which shall be different in colour from other unit's lights.

**2.9.5.3** With the switch in ON position the electrical equipment shall operate automatically under cooling or heating conditions.

**2.9.5.4** The control devices and electric motors shall be so designed that the total starting current is as low as possible and it shall in any case not exceed 150 A. The peak starting current shall be defined as the instantaneous mean of the sum of the currents of switched-on electric motors and the current taken by non-rotating elements. It is permissible for the total starting current of the multimotor equipment to be limited to the specified value to use sequence controls permitting the sequence starting of several motors.

**2.9.5.5** The starting current shall decay to 125 % of the rated operating current in not more than 1 s.

**2.9.5.6** The switch gear shall be fitted with protective devices against overloads and short circuits.

### **3 TESTING**

#### **3.1 GENERAL**

**3.1.1** Irrespective of the design, dimension and material chosen for manufacture of a thermal container, all types of thermal containers shall be subjected to test loads and testing procedures outlined in 3.1.5 and 3.2 through 3.7, with prescribed dimensions and tare mass to be determined according to 3.17, Part II "General Freight Containers".

**3.1.2** Refrigerated and/or heated containers may be tested without cooling and/or heating plants unless otherwise specified for particular tests. In this case, the capability of the framework and other components of cooling and/or heating plants to withstand loads and accelerations arising in operation of containers shall be confirmed separately.

**3.1.3** Where refrigerated and/or heated containers are subjected to strength tests without the cooling and/or heating plant, the latter shall be substituted by the appliance of an equivalent mass and strength characteristics not exceeding the strength of the missing equipment and attached in the same way.

**3.1.4** Upon completion of each test, the container shall show neither permanent deformation nor abnormalities which may render it unsuitable for the designed purpose.

**3.1.5** The test loads and testing procedures for thermal container lifting, stacking, floor strength, racking, longitudinal restraint (static test), strength of end and side walls, lifting by fork lift pockets are specified in Section 3, Part II "General Freight Containers".

Thermal containers shall be tested ready-assembled with insulation and ventilation equipment (if applicable).

**3.1.6** The measuring equipment used in tests shall be certified by a competent authority and shall have percentage error not exceeding the values specified in 4.2.3 of the Rules for Technical Supervision during Manufacture of Containers.

**3.1.7** For refrigerated containers with expendable refrigerant, as well as for containers fitted with a refrigerating plant and seats for clip-on equipment, additional tests are required: for checking the operating characteristics of the container with the running refrigerating plant at below zero and increased ambient temperatures, for checking the operating characteristics of the container with expendable refrigerant, for checking the strength of seats for clip-on equipment. The tests shall be carried out in compliance with the requirements of ISO 1496-2.

#### **3.2 STRENGTH OF THE ROOF AND EQUIPMENT FOR HANGING CARGO**

**3.2.1** The roof testing procedure is outlined in Part II "General Freight Containers".

**3.2.2** Where equipment for hanging cargo is used in a thermal container, it shall withstand an internal test loading of 30 kN per 1 m of the internal useful length of the container, or a double operating load per 1 m of the internal useful length, whichever is greater.

On completion of testing, the equipment for hanging cargo shall have no damages and deformations affecting its safe use.

### **3.3 WEATHERTIGHTNESS**

**3.3.1** The container subjected to testing shall be fitted with full number of equipment prescribed in specifications. The testing procedure and characteristics of the water stream are set out in 3.15, Part II "General Freight Containers". The test shall be carried out on door gaskets, external flanged connections, opening fitted with closing devices, as well as refrigerating plants and their attachments to a container. Upon completion of the test the inner surfaces of the container shall be dry.

### **3.4 AIRTIGHTNESS**

**3.4.1** The airtightness test shall be carried out after completion of the tests stated in 3.1.5, 3.2 and 3.3, and prior to thermal test.

**3.4.2** The test shall be performed at the temperatures outside and inside the container within the range of 15 to 25 °C under the standard atmospheric conditions.

**3.4.3** During testing the outside and inside temperatures shall be stabilized within 3 °C of one another.

**3.4.4** The container shall be fully fitted with the equipment in compliance with the container specification. The refrigerating and/or heating unit shall be fitted in proper location. Where the container is intended for use with removable equipment, the latter shall be removed and all connecting ports shall be closed. Doors, ventilation, drain and other openings shall also be closed.

**3.4.5** The air duct to the container shall be fitted with a calibrated metering device to control the air supply, a pressure gauge and a flowmeter. The pressure gauge shall be connected to the container itself, outside the air supply system.

**3.4.6** An excessive internal pressure equal to  $250 \pm 10$  Pa shall be produced in the container.

**3.4.7** After the pressure in the container reaches a steady-state value, the air flow required to maintain this pressure shall be recorded.

**3.4.8** Measurement of air flow shall be taken during 30 min.

**3.4.9** For all the thermal containers, with the exception of containers provided with additional door openings, determined for the standard atmospheric conditions, the air leakage shall not exceed 5 m<sup>3</sup>/h. For each additional door opening (e.g. for side doors), provision shall be made for an additional air leakage equal to 5 m<sup>3</sup>/h.

### **3.5 THERMAL TEST**

**3.5.1** The thermal test shall be carried out after completion of the airtightness test of the container (refer to 3.4). It shall be performed with the refrigeration and/or heating equipment in place, with all openings closed. Where the thermal container is designed for use with removable equipment and the container has closures at the interface(s), the equipment may not be in position and the closures shall be shut.

**3.5.2** The heat transfer required to make up heat balance shall be determined only by internal heating method. A heating device shall be placed inside the (insulated) body of the container and thermal equilibrium shall be established between the power of the heating device(s) and associated fan(s), and the heat flowing out through the insulation. All instruments and devices shall record automatically. The power measuring device shall be of a continuously integrating type.

**3.5.3** The heat transfer shall be determined as a total heat transfer to be derived by the formula

$$U_t = Q / (t_{in} - t_{out}) \quad (3.5.3)$$

where

$U_t$  = total heat transfer, W/K;

$t$  = mean average wall temperature, K;

$t = (t_{in} + t_{out}) / 2$ ;

$Q$  = power dissipated by the operation of internal heaters and fans, W;

$t_{in}$  = average temperature calculated as the arithmetic mean of the temperatures measured at least at 12 points inside the container (refer to Fig. 3.5.3-1) at the end of each test period, K (refer to 3.5.4);

$t_{out}$  = average temperature calculated as the arithmetic mean of the temperatures measured at least at 12 points outside the container (refer to Fig. 3.5.3-2) at the end of each test period, K (refer to 3.5.4).

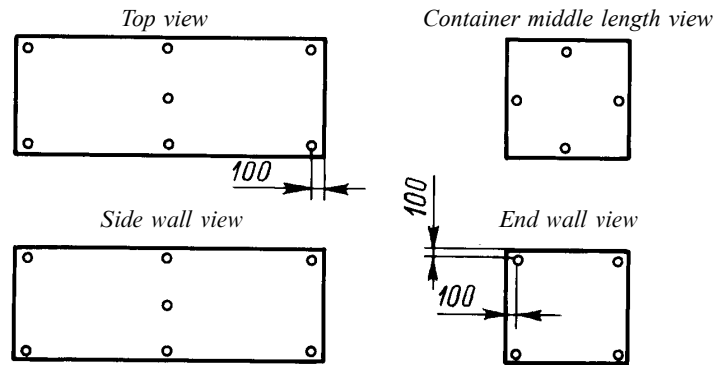


Fig. 3.5.3-1 Inside air temperature measurement points:  
o — measurement point

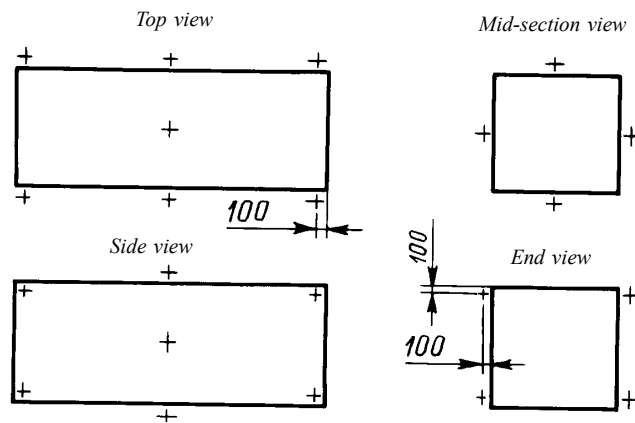


Fig. 3.5.3-2 Outside air temperature measurement points:  
+ — measurement point

**3.5.4** Measurements to determine the heat transfer of a container shall be taken uninterruptedly during 12 h and the following conditions shall be met:

- .1** mean wall temperature shall be within a range of  $293 \pm 0,5$  K ( $20 \pm 0,5$  °C) and the difference between the inside and outside air temperatures ( $t_{in} - t_{out}$ ) shall be not less than  $25 \pm 2$  K ( $25 \pm 2$  °C);
- .2** the maximum difference between the highest and the lowest temperatures at any one time shall not exceed 2 K (2 °C) both for the outside and inside temperatures;
- .3** the maximum difference between any two mean air temperatures inside and outside the container taken over a steady state period of 12 h shall not vary by more than  $\pm 0,3$  K, and these temperatures shall not vary by more than  $\pm 1,0$  K during the preceding 6 h;
- .4** the mean inside and outside temperatures at the beginning and at the end of the calculation period of at least 6 h shall not differ by more than 0,2 K;
- .5** the difference between heating power measured over two periods of not less than 3 h at the start and at the end of the steady state period, and separated by at least 6 h, shall be less than 3 %.

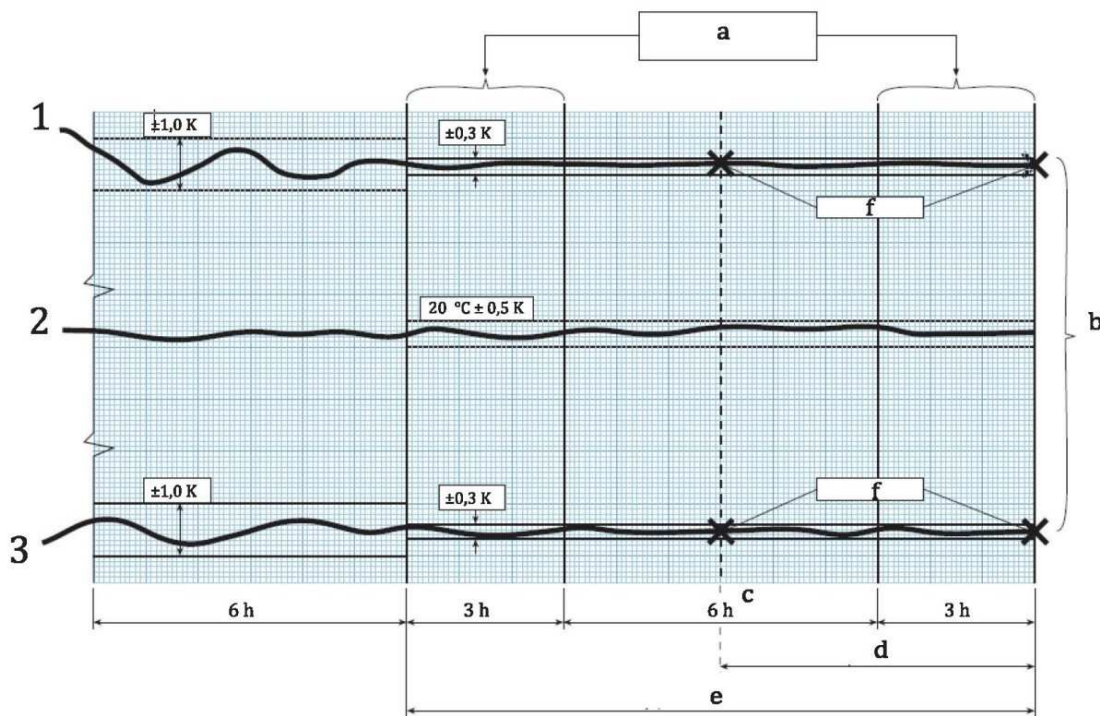


Fig. 3.5.4 Example of steady state conditions for heat leakage test

- 1 — mean internal temperature; 2 — mean wall temperature; 3 — mean external temperature;  
 a — difference of heating power to be within 3 %; b —  $\Delta T$  to be  $(25 \pm 2)$  °C for the steady period;  
 c — at least; d — calculation period at least 6 hours; e — steady period at least 12 h; f — within 0,2 K

Notes: 1. The internal air flow shall ensure 40 — 70 air changes in the container per hour.  
 2. The external air flow shall be 1 — 2 m/s.  
 3. The maximum difference between temperatures at any 2 of 12 points internally or externally shall be  $\leq 2$  K during steady state period.

**3.5.5** All the gauges and devices shall ensure accuracy of measurements indicated in 3.1.6 and the measurements shall be taken at not more than 15 min intervals.

**3.5.6** Air current shall flow over the container surface with a speed of 1 — 2 m/s measured at points located approximately 100 mm away from the middle of container side walls and roof.

**3.5.7** All temperature gauges fitted inside and outside the container shall be protected from radiation heat.

**3.5.8** The heat transfer  $U$ , W/K shall be calculated as the arithmetic mean of the heat transfer values measured within at least 12 h under thermal equilibrium conditions, by the formula

$$U = \frac{1}{n} \sum_{i=1}^n U_i \quad (3.5.8)$$

where  $n$  = number of measurement points;  $n \geq 25$ .

The heat transfer value shall be recorded simultaneously with the mean wall temperature values obtained in the course of testing. The heat transfer value corrected for the standard mean wall temperature of 293 K (20 °C) shall also be recorded. The correction shall be made using a curve relating heat transfer to mean wall temperature relation. The heat transfer shall not exceed values given in Table 2.5.1.

**3.5.9** Heat transfer coefficient, W/(m<sup>2</sup>·K) shall be calculated by the formula

$$k = U/S \quad (3.5.9)$$

where

$S = \sqrt{(S_{in} S_{out})}$  is the geometric mean of the container surface area, m<sup>2</sup>.  
 $S_{in}$  is the inner surface area without corrugations, m<sup>2</sup>.  
 $S_{out}$  is the outside surface area without corrugations, m<sup>2</sup>.

### 3.6 CHECKING OF OPERATING CHARACTERISTICS OF MECHANICAL REFRIGERATING UNIT (MRU)

**3.6.1** Where the thermal test shows positive results (refer to 3.5), the container fitted with permanent or removable mechanical refrigerating unit (MRU) shall be placed in a room with an air temperature consistent with this type of container (refer to Table 2.5.1).

**3.6.2** After starting the refrigerating plant shall reduce the temperature inside the container to the temperature specified for that type of container (at outside temperature given in Table 2.5.1) and then maintain this temperature within 8 h provided that the heat load passes through the container walls and roof.

**3.6.3** With the thermal stabilization period completed according to 3.6.2, the container heater (heaters) and fan (fans) fitted inside the container shall be turned on to produce additional heat load,  $W$ , equal to

$$Q = 0,35 U_f (t_{in} - t_{out}) \quad (3.6.3)$$

where  $U_f$ ,  $t_{in}$ ,  $t_{out}$  — refer to Formula (3.5.3).

**3.6.4** In joint operation of the refrigerating plant and the equipment specified in 3.6.3, after restabilization of operating conditions, the temperature required in 3.6.2 shall be maintained inside the container within at least 4 hours.

**3.6.5** During testing, the container shall be fitted with gauges to measure:

- 1** air temperature at 12 points outside and inside the container (refer to Figs. 3.5.3-1 and 3.5.3-2);
- 2** air inlet and outlet temperatures (dry bulb temperature sensor) inside the container (at least four sensors on each side);
- 3** refrigerant temperature at the inlet of the outside air cooled condenser;
- 4** power consumed by MRU, and separately by a heater inside the container;
- 5** external air current at the midpoint of one of the side walls.

**3.6.6** With the operating conditions of the refrigerating plant reached the steady state, the inside and outside temperatures, as well as the power consumed by the heater and fan shall be recorded at not more than 15 min intervals.

**3.6.7** The temperature values shall meet the requirements of 3.5.4 and the heat transfer shall be determined by Formula (3.5.3).

**3.6.8** On agreement with the Register, the above test of the refrigerating unit may be carried out separately from the container provided that the requirements of this Chapter are met.

### **3.7 CHECKING OF OPERATIONAL CHARACTERISTICS OF CONTAINERS AT HIGH TEMPERATURES USING MECHANICAL REFRIGERATING UNIT**

**3.7.1** This test determines the ability to preserve the operational characteristics of a container with installed MRU at an outside temperature of 50 °C. The container shall be fitted with measuring instruments in compliance with 3.6.5.

**3.7.2** The test shall be carried out with an old (or simulated aged) container with a total heat transfer,  $U$ , of not less than the value determined by the formula

$$U = 1,2U_{\max} \quad (3.7.2)$$

where the value of  $U_{\max}$  is taken from Table 2.5.1 for the type of the container.

**3.7.3** The temperature outside the thermal container throughout the test may be below 50 °C, but shall be compensated to 50 °C by additional internal thermal load.

**3.7.4** The inside temperature shall be set at two temperature levels, 12 °C and –30 °C.

*Note.* In case MRU is not designed for –30 °C, the lowest design temperature specified by the manufacturer may be selected instead.

**3.7.5** The inside temperature set point shall be +12 °C and the air temperature at condenser inlet shall be maintained at +50 °C. These temperatures shall be maintained at steady state condition for a period of not less than 8 h and the following conditions shall be met:

**.1** the inside air velocity shall be as produced by the evaporator fans at the speed designated for the set point temperatures;

**.2** the T-floor shall be covered from the machinery side by 2/3 of the T-floor length;

**.3** floor drains, defrost drains (where fitted) and vacuum valves shall be in their normal operational states, vent devices shall be closed.

**3.7.5** The inside temperature set point shall then be set to –30 °C (refer to 3.7.4) and the air temperature at condenser inlet shall be maintained at 50 °C. Once these temperatures are established the evaporator shall be defrosted. Thereafter steady state condition shall be re-established and then maintained at steady state condition for a period of not less than 8 h.

**3.7.6** During the period of steady state condition the inside and outside temperatures, the temperatures at the condenser air inlet side and the internal heater(s) and fan(s) power consumption shall be recorded at intervals not exceeding 15 min.

**3.7.7** During the periods of steady state condition the MRU shall be capable of being operated without functional restrictions or disruptions.



### **3.8 CHECKING OF CONTAINER POWER CONSUMPTION AT DEFINED TEMPERATURES USING MECHANICAL REFRIGERATING UNIT**

**3.8.1** This test determines the ability to preserve the operating characteristics of a container with installed MRU at a determined outside temperature. The test is carried out with additional heat load to simulate passage of additional heat through the walls of the container.

**3.8.2** The test shall be carried out using an aged(or simulated aged) container with a total heat transfer,  $U$ , of not less than the value determined by Formula (3.7.1).

**3.8.3** The container shall be fitted with measuring instruments in compliance with 3.6.5.

**3.8.4** The inside test temperature at set points of the refrigeration machinery controller shall be at a setpoint of three different levels: 14 °C, 0 °C and –18 °C:

at a temperature of 14 °C, the additional heat load is 1000 W;

at a temperature of 0 °C, the additional heat load is 200 W;

at a temperature of –18 °C, there is no additional heat load.

**3.8.5** These temperatures shall be maintained in steady state condition for a period of not less than 4 h.

**3.8.6** When testing, the following conditions shall be met:

**.1** the average air temperature at condenser inlet shall be 25 °C for the duration of the test;

**.2** outside temperatures of the thermal container during the test may be below 25 °C but shall be compensated to 25 °C by additional internal heat load;

**.3** the conditions specified in 3.7.5.

**3.8.7** During the period of steady state condition the power consumed by the MRU, the heater(s) and fan(s) shall be recorded at intervals not exceeding 15 min.

## **4 MARKING**

### **4.1 MANDATORY MARKING**

**4.1.1** Thermal containers shall be marked in accordance with the requirements set out in Section 4, Part I "Basic Requirements".

**4.1.2** If a thermal container is fitted with equipment for hanging cargo, the maximum carrying capacity of that equipment shall be legibly marked inside the container.

**4.1.3** Thermal containers designed for use with the variable air inside the container, which may be hazardous for health until the complete ventilation of a cargo space, shall have the corresponding marks of the oxygen deficiency danger in way of each place of access inside the container. Identification marking symbols are given in ISO 7010.

**4.1.4** If the thermal container has an automatic ventilation control system, the corresponding mark shall be placed at air inlets.

**4.1.5** Thermal containers with an air circulation system should have a load line clearly marked to ensure return of air to the MRU. It is recommended that the load line be at least 100 mm from the roof for 40' container and 70 mm for a 20' container.

### **4.2 IDENTIFICATION PLATE WITH PLANT'S DATA**

**4.2.1** The refrigerating and/or heating plants shall bear at a conspicuous place a plate containing technical particulars of the plant.

### **4.3 INSTRUCTIONS**

**4.3.1** In immediate proximity to the switches, controls and indicating devices of the refrigerating and/or heating plants, there shall be posted the operation instructions so arranged and fastened as to make them fit for continuous use. These instructions shall be written both in the national and the English languages.

## **PART IV. TANK CONTAINERS**

### **1 GENERAL**

#### **1.1 APPLICATION**

**1.1.1** The requirements of this Part apply to tank containers designed for the transportation of pressurized liquids, liquefied gases and dry bulk cargoes with test pressure above 0,045 MPa.

**1.1.2** The requirements of this Part also apply to offshore tank containers handled in open seas and to tank containers of the swap body type, and tank containers with a fiber-reinforced plastic (FRP) shell, where applicable.

**1.1.3** Tank containers shall comply with the requirements of Part I "Basic Requirements", and with the requirements of this Part.

**1.1.4** Tank containers differing in design and dimensions from those defined in this Part are subject to special consideration by the Register in each case.

**1.1.5** Additional international and national requirements specified by competent authorities may apply to tank containers used for the transportation of dangerous goods.

#### **1.2 DEFINITIONS AND EXPLANATIONS**

**1.2.1** The definitions and explanations relating to the general terminology of these Rules are given in Part I "Basic Requirements". For the purpose of this Part the following definitions and explanations have been adopted.

**Holding time** means the time that will elapse from the establishment of the initial filling condition until the pressure has risen due to heat influx to the lowest set pressure of the pressure-limiting device(s).

**Gas** means a substance that:

at 50 °C, has a vaporization pressure of more than 0,3 MPa;

at 20 °C and normal pressure of 0,101 MPa, is absolutely gaseous.

**Liquid** means a substance, which:

at 50 °C, has a pressure of saturated vapours of not more than 0,3 MPa;

at 20 °C and a pressure of 0,101 MPa is not absolutely gaseous;

at pressure of 0,101 MPa has a melting temperature or thaw point of 20 °C or below.

**Test pressure** is the inside gauge pressure that is built up in the tank in the course of hydraulic tests. The test pressure is measured in the top part of the tank.

**Tank container** means a freight container that includes the framework (frame members) and a tank or tanks completed with service equipment in compliance with the requirements of this Part either for gravity or pressure loading and discharge.

**Note.** Tank container is covered by the definition "Portable tank" when its structure meets the requirements of 6.7 of the UN and IMDG Code Type Regulations.

**Maximum allowable working pressure (MAWP)** means a pressure (gauge) to be defined as the highest pressure of the following values:

the maximum allowable filling or draining pressure;

the maximum pressure which can be built up in the tank under the effect of the cargo contained in the tank (including foreign gases which can be present therein).

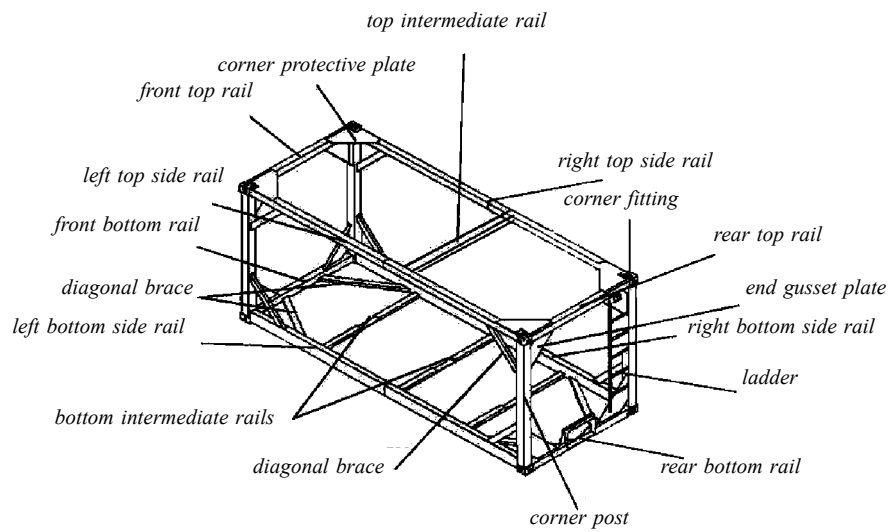


Fig. 1.2-1 Structural elements of the tank container frame

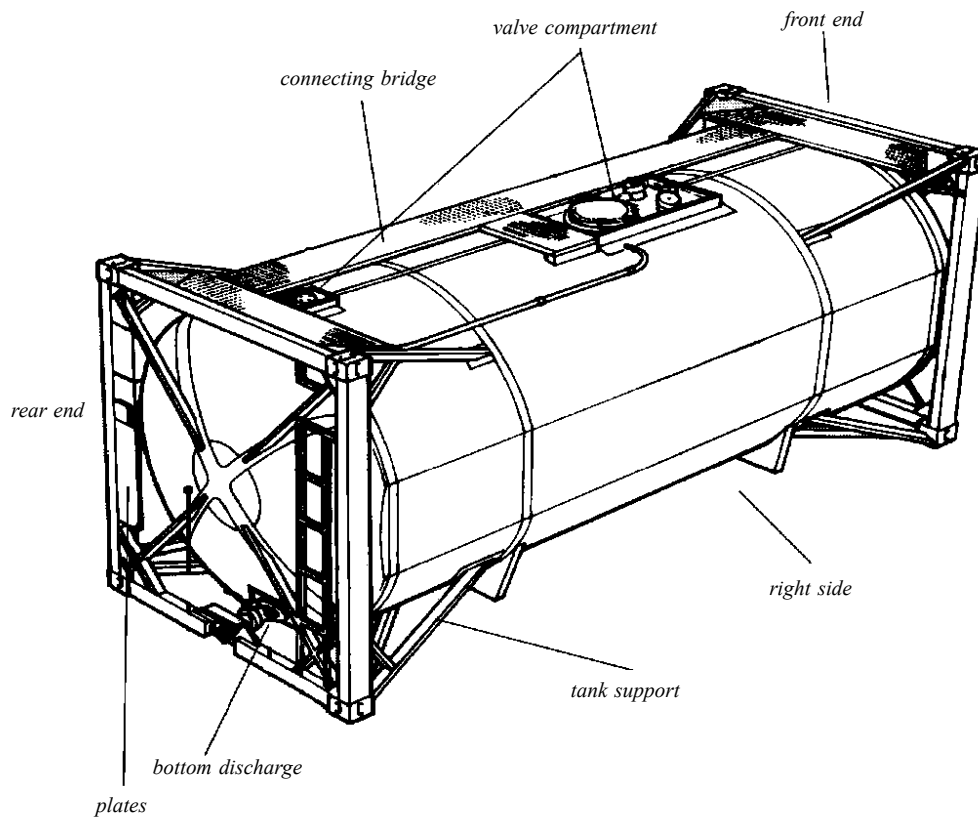


Fig. 1.2-2 Beam tank container structure

**Minimum design temperature** (for tank containers intended for transportation of refrigerated liquefied gases) means the temperature that is used for the design and manufacture of the tank shell not higher than the lowest (coldest) temperature (service temperature) of the contents during normal conditions of filling, discharge and transport.

**Ullage** means the portion of the total capacity of the tank not occupied by its cargo, expressed as a percentage value of the total capacity.

**Non-dangerous goods** are those substances which are not covered by the Code of the UN Committee of Experts on the Transportation of Dangerous Goods and/or national normative documents.

**Total capacity** means that volume of water which will completely fill the tank at 20 °C.

**Dangerous goods** are those substances which are covered by the Code of the UN Committee of Experts on the Transportation of Dangerous Goods and/or the national normative documents.

**Compartment** means a fluid tight section of the tank formed by the shell, ends and/or tight partitions.

**Liquefied refrigerated gas** means a gas pressurized for transport, which is partially liquid at reduced or cryogenic temperatures.

**Design pressure** is the pressure used for the vessel strength calculation.

**Design temperature range for the tank shell** means a temperature interval from –40 °C to 50 °C for substances transported at ambient temperatures. For substances transported at high temperatures, the design temperature shall be not less than the maximum temperature of the substance during filling, discharge or transportation. More severe design temperatures shall be considered for tank containers operated at temperature below –40 °C.

**Jacket** means the outer insulation cover or cladding of tank container intended for transportation of refrigerated liquefied gases, which may be part of the insulation system.

**Service equipment** means measuring instruments, filling, discharge, ventilation, safety, heating and thermal insulation devices.

**Liquefied gas** means a gas pressurized for transportation, which is partially liquid at temperatures above minus 50 °C.

**Design reference temperature** (for tank containers intended for transportation of non-refrigerated liquefied gases) means the temperature, at which the vapour pressure of the contents of the tank is determined for the purpose of calculating maximum allowable working pressure.

Design reference temperature shall be less than the critical temperature of the non-refrigerated liquefied gas intended to be transported to ensure that the gas is liquefied at all times.

**Reference steel** means steel with fixed minimum guaranteed tensile strength  $R_m$ , equal to 370 MPa and minimum guaranteed elongation  $A$ , equal to 27 %. Mechanical properties of the reference steel are used only for calculations by Formula (2.2.8).

**Vessel** is an integral part of a portable tank (tank container), which contains substance intended for the transportation, including openings and their closures, but not including service equipment or external structural equipment.

**Portable UN tank** is a tank with a capacity above 450 l designed for multi-modal transportation of Class 1 — 9 hazardous substances. A portable tank consists of a vessel with service equipment and structural equipment necessary for the transportation of hazardous substances. The design of a portable tank shall provide the possibility of its filling and emptying without removal of its structural equipment. The tank shall possess stabilizing members external to the tank, and shall be capable of being lifted when full. It shall be designed primarily for loading onto a vehicle or a ship and shall be equipped with skids, mountings or accessories to facilitate mechanized handling.

### **1.3 SCOPE OF TECHNICAL SUPERVISION**

**1.3.1** Technical supervision of the Register shall cover:

- .1** framework, frame members (bearing structure);
- .2** corner fittings;
- .3** tank and tank outer shell, if any;
- .4** pressure units, cooling and heating appliances for cargo, if provided;
- .5** safety devices (pressure-relief valves, frangible disks, fusible elements and vacuum valves);
- .6** piping;
- .7** stop valves;
- .8** liquid level indicators;
- .9** materials for the manufacture of tank, shell, framework and fastening elements to frame.

### **1.4 TECHNICAL DOCUMENTATION**

**1.4.1** As far as tank containers are concerned, the technical documentation specified in 1.3, Part I "Basic Requirements" shall comprise:

**.1** technical conditions (technical specification) with indication of its type and purpose (cargoes carried in compliance 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;

**.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 3.8 of this Part, 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 3.8 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.

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 (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:

- corner fittings (during manufacture of containers at the manufacturer's works);
- framework (corner posts, attachments of the tank to the framework, top and bottom side and end rails, walkways and ladders);
- tank or tanks;
- hatch and manhole covers;
- piping;
- cargo refrigerating and/or heating systems;
- items covered by the CCC requirements;
- CSC and CCC Plates;

plate bearing the particulars of tank;

general views of the container and its marking;

**.7** summary table of welded joint types and their structural elements;

**.8** chart and table for welded joint quality inspection.

The extent of the above documentation is the minimum required.

## 2 TECHNICAL REQUIREMENTS

### 2.1 BASE STRUCTURE

**2.1.1** When the tank container is loaded to its gross mass  $R$ , no part of the tank vessel and its associated shell fittings shall project downwards below a plane that is 25 mm above the base plane (bottom faces of the bottom corner fittings).

This requirement does not apply to load-transfer areas if they are located on the tank vessel.

**2.1.2** All tank containers, other than 1CCC, 1CC, 1C, 1CX, 1D and 1DX, shall have load-transfer areas in their base structure to permit vertical load transfer when carried on chassis. 1CCC, 1CC, 1C and 1CX tank containers may have load-transfer areas in their base structure as an optional feature. If so, these tank containers shall meet the requirements of 2.3, Part I "Basic Requirements".

### 2.2 TANKS

**2.2.1** The tanks shall be designed and constructed in accordance with the national and/or international standards and these Rules. The tank strength shall be calculated in compliance with the requirements of national and/or international standards and rules.

**2.2.2** A tank or tanks shall be firmly secured to structural elements of the tank framework. Supports and attachments of the tank to the framework shall be such as not to cause dangerous local stress concentrations in the tank shell.

**2.2.3** The tank, supports and attachments when loaded to the maximum allowable gross mass  $R$ , shall withstand the following static forces applied separately:

**.1** in the moving direction: doubled gross mass  $R$  multiplied by the acceleration of gravity  $g$  ( $2Rg$ ). In design of tank containers for dangerous goods, the static forces in the longitudinal direction shall be equal to  $4Rg$ ;

**.2** horizontally at a right angle to the moving direction: doubled gross mass  $R$  multiplied by the acceleration of gravity  $g$  ( $Rg$ );

**.3** vertically upwards: gross mass  $R$  multiplied by the acceleration of gravity  $g$  ( $Rg$ );

**.4** vertically downwards: doubled gross mass  $R$  multiplied by the acceleration of gravity  $g$  ( $2Rg$ ).

**2.2.4** The following safety factors used for determining of allowable stress shall be provided at each of the above loadings:

for metals with a distinct yield plateau: safety factor of 1,5 with respect to the guaranteed minimum yield point  $R_e$ ;

for metals with a non-distinct yield plateau: safety factor of 1,5 with respect to the guaranteed conventional yield point  $R_{p1}$  for steels of austenitic class or  $R_{p0,2}$  for steels of other classes.

At the loading of  $4g$ , the safety factor used for determining of allowable stress shall be taken equal to 1 with respect to the minimum assured yield point or  $R_{p1}$ ,  $R_{p0,2}$ .

**2.2.5** The minimum thickness of shell and heads of a tank for reference steel shall be not less than 5 mm with  $D_{ins.} < 1800$  mm and 6 mm with  $D_{ins.} > 1800$  mm ( $D_{ins.}$  = inside diameter of the tank).

**2.2.6** If a provision is made for an additional tank protection and hydraulic test pressure is less than 0,265 MPa, the minimum thickness of the shell and heads in a tank constructed of standard steel may be reduced but shall not be less than 3 mm at  $D_{ins.} < 1800$  mm and 4 mm with  $> 1800$  mm. The additional protection may be afforded by:

continuous outer multiply protection of "sandwich" type;

double-wall construction of the tank;

mounting of the tank in a full scantling framework.



**2.2.7** The equivalent metal thickness other than the value specified for reference steel in 2.2.5 and 2.2.6 shall be determined by the formula:

$$e_1 = \frac{21,4 \times e_0}{\sqrt[3]{R_{m1} \times A_1}} \quad (2.2.7)$$

where  $e_1$  = minimum equivalent thickness of the steel to be used, mm;  
 $e_0$  = minimum thickness for reference steel, mm;  
 $R_{m1}$  = guaranteed minimum tensile strength of the material used at the tensile test, MPa;  
 $A_1$  = guaranteed minimum elongation of the metal used at the tensile test in compliance with the national and international standards, %.

**2.2.8** For certain types of UN tanks, regardless of the size of the internal diameter of the vessel  $D_{ins}$ , the minimum thickness of the walls and bottoms for reference steel shall be as follows:

6 mm for UN tanks that comply with UN T9 — UN T10, UN T13 — UN T14 and UN T17 — UN T19 instructions;

8 mm for UN portable tanks those comply with UN T20 instructions;

10 mm for portable UN tanks that comply with UN T21 — UN T22 the instructions.

In this case, the equivalent value of the thickness of the metal used shall be determined by the formula

$$e_1 = \frac{21,4 \times e_0 \times d_1}{1,8 \sqrt[3]{R_{m1} \times A_1}} \quad (2.2.8)$$

where  $e_1$  = minimum equivalent thickness of the steel to be used, mm;  
 $e_0$  = minimum thickness for standard steel, mm;  
 $d_1$  — case diameter (in m), but not less than 1,8 m;  
 $R_{m1}$  = guaranteed minimum tensile strength of the material used at the tensile test, MPa;  
 $A_1$  = guaranteed minimum elongation of the metal used at the tensile test in compliance with the national and international standards, %.

**2.2.9** In any case, the minimum thickness of shell and heads in a tank shall be not less than 3 mm, regardless of the material used for its construction.

**2.2.10** Corrosion allowances shall be accepted in accordance with the requirements of the national and/or international standards.

**2.2.11** The materials used for the manufacture of components parts and assemblies which are in contact, or may come in contact, with the cargo carried in the tank container shall be resistant to the effects of that cargo.

**2.2.12** Vessel shell may be manufactured from fiber-reinforced plastic (FRP). Requirements for tank containers with FRP shells are given in Part VIII "Tank Container with a Fiber-Reinforced Plastic (FRP) shell".

**2.2.13** Tanks or tank compartments with no vacuum relief devices shall be so constructed as to withstand an external pressure of at least 0,04 MPa above the internal pressure without permanent deformation and abnormalities that could render the tank container unfit for the designed purpose.

If tanks of tank containers intended for transportation of non-refrigerated liquefied gases shall be exposed to high external pressure before filling or during discharge, they shall be designed to withstand external gauge pressure exceeding internal pressure not less than by 0,09 MPa and shall be tested by this pressure.

**2.2.14** The ullage of a tank for liquids is to be determined depending on the kind of cargo carried; it shall, however, be minimum 2,5 % of total capacity at the ambient temperature of 50 °C. In no case the tank shall be fully filled at an ambient temperature of 55 °C.

For tanks intended for the transportation of gases, the maximum mass of liquefied gas per liter of a tank capacity shall not exceed the density of the liquefied gas at 50 °C multiplied by 0,95. Furthermore, the tank shall not be fully filled in at 60 °C.

Initial filling rate of tank containers intended for transportation of non-refrigerated liquefied gases shall be so that if a temperature increases to the level at which a saturated vapour pressure is equal to the maximum allowable working pressure, then the volume occupied by the liquid does not exceed 98 %.

**2.2.15** Tanks intended for the transportation of liquids with kinematic viscosity not exceeding 2680 mm<sup>2</sup>/s at a temperature of 20 °C shall be subdivided by baffle plates into sections with maximal capacity not exceeding 7500 l if the tank is filled by more than 20 %, but less than 80 % of its total capacity.

**2.2.16** Tanks designed for the transportation of specific dangerous goods shall have no openings located below the level of cargo.

**2.2.17** Weld joints of tanks shall be inspected by radiographic examination or some other method approved by the Register, to the extent agreed with the Register.

## **2.3 ARRANGEMENT OF SERVICE EQUIPMENT**

**2.3.1** The service equipment (stop valves, safety devices, manholes, instruments etc.) shall be so arranged as to prevent it from being broken away or damaged while in use, as well as take into consideration the serviceability and maintainability. Leakproofness of the service equipment shall be maintained even if the tank container is tipped over.

### **2.3.2 Safety devices of tanks for dangerous goods.**

**2.3.2.1** Each tank or tank compartment shall be provided with at least one spring type pressure-relief valve and may be additionally fitted with a frangible disk or a fusible element arranged in parallel to the spring pressure-relief valve, with the exception of cases specified in 2.3.2.6 and for tanks intended for the transportation of non-refrigerated liquefied gases. The safety devices shall be arranged in the vapour space in the top of the tank as near as possible to the tank's mid-length.

Each tank intended for transportation of non-refrigerated liquefied gases shall have at least two independent spring-type safety valves.

Tank intended for transportation of refrigerated non-combustible liquefied gases and hydrogen may be additionally fitted with frangible disks together with spring-type valves.

**2.3.2.2** The pressure at which the spring pressure relief valve begins opening shall be at least 100 % and at most 125 % of the maximum allowable working pressure and shall be subject to special consideration by the Register in each case. Upon release of pressure the spring pressure-relief valve shall close at a pressure of at least 10 % below the pressure at which the valve begins opening and shall remain closed under all lower pressures.

**2.3.2.3** Frangible disks arranged parallel to the spring pressure-relief valves shall rupture at a pressure equal to the hydraulic test pressure.

**2.3.2.4** Fusible elements shall melt within the temperature range from 110 to 149 °C provided that the pressure which is built up in the tank at the melting temperature of the fusible element shall not exceed the test pressure. A fusible element shall have no thermal insulation or screen.

**2.3.2.5** The total discharge capacity of the safety devices of a tank for liquid shall be such that under no conditions the pressure in tank exceeds the pressure at which the safety device comes into action by more than 20 %. The total discharge capacity of the spring pressure-relief valves of a tank for gases shall be such that under no conditions the pressure in tank exceeds the maximum allowable working pressure by more than 20 %.

The calculation of the discharge capacity and discharge area will be specially considered by the Register in each particular case.

**2.3.2.6** Tanks intended for the transportation of specific dangerous goods shall be provided with safety devices including frangible disk located ahead of the spring type pressure-relief valve. A pressure gauge or another indicator of the disk integrity shall be arranged between the frangible disk and the valve. The frangible disk in this case shall rupture at a pressure by 10 % greater than the pressure at which the pressure-relief valve begins opening. Use of such devices shall be a matter of special consideration by the Register in each particular case.

**2.3.2.7** Stop valves shall not be installed between the safety device and the tank.

**2.3.2.8** Safety devices shall be so constructed as to prevent any change of their setting without the knowledge of authorized persons.

**2.3.3 Pressure-relief valves of tanks intended for non-dangerous goods.**

**2.3.3.1** The tank containers intended for the transportation of non-dangerous goods may be provided with a safety device consisting of one frangible disk.

**2.3.3.2** The pressure-relief valves shall be so designed as to begin opening at maximum allowable working pressure and to be fully open at a pressure exceeding the pressure at which the valves begin opening, by not more than 10 %.

**2.3.3.3** The pressure-relief valves shall have a clear area of discharge, when fully open, sufficient to provide the minimum pressure relief capacity according to Table 2.3.3.3.

Table 2.3.3.3

Minimum pressure-relief capacity	Designation of tank-container				
	1AA	1A, 1AX	1BB, 1B, 1BX	1CC, 1C, 1CX	1D, 1DX
dm <sup>3</sup> /s	106	95	80	63	47
m <sup>3</sup> /min	6,4	5,7	4,8	3,8	2,8

**2.3.4 Vacuum safety valves.**

**2.3.4.1** Vacuum valves shall be constructed in a way as to permit being set to internal pressure considering the kind of cargo carried, but in any case not below 0,021 MPa. If flammable Class 3 substances are carried, the vacuum valves shall be fitted with flame trap.

**2.3.5 Closing fittings and additional service equipment.**

**2.3.5.1** All the tank openings for the tank loading and discharge (cargo and air lines) shall be fitted with manually operated stop valves located as close to the tank as possible. The stop valves with screwed spindles shall be manually operated and closed by the clockwise motion of a handwheel. The "Open/Closed" position and the closing direction for other valves shall be clearly indicated. Other openings, except those for safety devices, ventilation arrangements, thermometers, instruments and inspection holes, shall be provided with stop valves or other tight closure.

*Note.* Outlet flanges of stop valves shall be fitted with liquid-tight removable blinds (bolted flange or screw cap).

**2.3.5.2** The tank containers with bottom discharge for the dangerous goods specified in valid normative documents, shall be equipped, as a minimum, with two shut-off devices arranged independently of one another and in series, namely:

- .1 an external stop valve fitted as close to the tank as reasonably practicable;
- .2 shut-off device impermeable for liquid on the end of drainage pipe, which may be a bolted blank flange or screwed cover.

**2.3.5.3** The tank containers with bottom discharge for the solid, crystallizing or high viscosity dangerous goods specified in valid normative documents shall be equipped with three shut-off devices arranged independently of one another and in series, namely:

- .1 a self-closing internal stop valve within the tank or within a flange welded to the tank or within a union being a part of the tank. The valve shall remain closed (operable) when subjected to impact or other inadvertent act. The valve may be operable both from above and below; the "Open/Closed" position shall be controlled, whenever possible, from below. Moreover, it shall be possible to close the valve from an accessible position of the tank container that is remote from the valve itself;
- .2 an external stop valve;
- .3 a shut-off device in accordance with 2.3.5.2.2.

**2.3.5.4** The discharge (filling) openings for specific dangerous goods shall be located above the load level. Design, number and mutual arrangement of these shut-off devices shall comply with the national and international requirements applied to tank containers intended for transportation of dangerous goods.

**2.3.5.5** Tank containers may be fitted with cargo level indicators. Tank containers for the carriage of liquefied gases shall be fitted with cargo level indicators. The construction of cargo level indicators shall

comply with the applicable requirements of Part VIII "Instrumentation" of the Rules for the Classification and Construction of Ships Carrying Liquefied Gases in Bulk.

**2.3.5.6** To permit inspection, repair and other works, the tanks shall have manholes not less than 500 mm in diameter. The covers of manholes shall be secured in an effective manner. The tightness shall be ensured by gaskets resistant to effects of the cargo carried and climatic conditions.

No inspection opening is needed in the vacuum insulated tanks.

*Note.* In justified cases, for special containers different in structure from those complying with ISO 1496-3, the installation of hatches of at least 450 mm is permitted.

**2.3.5.7** The internal burst pressure of all piping and fittings shall be not less than the maximum of two following values: four times the maximum allowable working pressure of the tank or four times the pressure, to which it may be subjected during operation with working pump or other devices (except pressure-relief valves). Piping shall not be damaged due to vibration, impacts, cargo and environment temperature influence.

Pipe joints, which may be shut-off from two sides and which may contain liquid, shall be fitted with safety devices in order to avoid increased pressure in the closed pipe section.

**2.3.5.8** All valves and fittings shall be located as near the tank as practicable and shall have additional external protection from mechanical damage and shall be grouped in a minimum number of positions on the tank.

**2.3.5.9** The tanks and framework shall be adequately earthed.

**2.3.5.10** When a tank container or each compartment of a tank container is equipped with the pressure gauges connected with the vapour space of the tank or compartments, the pressure gauges shall be of vibration-proof version and comply with the tank container design on the climatic version and test pressure. A stop valve shall be fitted between the pressure gauge and tank.

**2.3.5.11** The tank container jackets with vacuum insulation shall be fitted with a branch pipe for vacuum-gauge.

#### **2.3.6 Materials.**

**2.3.6.1** The materials used for manufacture of parts and fittings units, as well as service equipment, which contact or may contact the cargo, shall be chemical-resistant to its effect within the temperature range specified in the technical documentation for the container.

**2.3.6.2** The materials used for sealing fittings hatches and service equipment shall be chemical resistant to the cargoes carried, elastic (where needed), durable and resistant to mechanical wear within the temperature range specified in the technical documentation for the container.

## **2.4 THERMAL INSULATION**

**2.4.1** Material of thermal insulation shall be, where possible, non-hygroscopic and physically and chemically resistant.

**2.4.2** Thermal insulation shall not obstruct the service equipment.

**2.4.3** Thermal insulation shall be protected to prevent the ingress of moisture and damage under normal operational conditions.

**2.4.4** Thermal insulation directly in contact with the tank intended for substances transported at elevated temperature shall have the ignition temperature of at least 50 °C higher than the maximum design temperature of the tank.

**2.4.5** Thermal insulation systems intended for reduction of the minimal emergency capacity of pressure-relief devices are subject to the special consideration by the Register and they shall, at least:

remain effective at all temperatures below 649 °C;

be jacketed with the material having a melting point of 700 °C or greater.

**2.4.6** Thermal insulation of tank containers intended for transportation of non-refrigerated liquefied gases shall comply, among others, with the following requirements:

**.1** in case a sun screen is used, it shall cover not less than the third but not more than the upper half of the tank surface and shall be separated from the tank surface by 40 mm across the whole area;

**.2** in case a complete cladding of insulating materials is applied, it shall provide heat transfer coefficient of not more than 0,67 W/m<sup>2</sup> K);

**.3** in case the thermal insulation is gas-tight, a device shall be provided to prevent any dangerous pressure from developing in the insulating layer in the event of inadequate gas-tightness of the tank or its items of equipment.

**2.4.7** The insulation systems of tank containers intended for transportation of refrigerated liquefied gases shall comply with the applicable national and international requirements and are subject to special consideration by the Register in each case.

## **2.5 ADDITIONAL UNITS**

**2.5.1** The refrigerating and/or heating plants, if provided for tank containers, shall conform to the requirements of Part III "Thermal Containers".

### **3 TESTING**

#### **3.1 GENERAL**

**3.1.1** The requirements of this Section apply to tank containers of all dimensions, irrespective of their construction and material involved.

**3.1.2** To achieve the specified test loadings, the tank shall be loaded with a suitable liquid. If the test loading cannot be met or the liquid is undesirable for use, the tank shall be loaded with another liquid with application of a supplementary loading so that the specified value of test loading is reached. The non-uniformity in distribution of test loading shall not exceed 20 %.

**3.1.3** On completion of each test, the tank container shall show neither permanent deformation nor abnormalities which may render it unsuitable for the designed purpose.

**3.1.4** Test loadings and testing procedures for lifting, stacking (except requirements for total mass of container), racking, and longitudinal restraint are specified in Section 3, Part II "General Freight Containers". When carrying out the stacking test, the internal test load mass shall be achieved only by filling the tank completely with water and the external forces applied to each of four top corner fittings of the container shall be as follows:

942 kN: for 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CC, 1C and 1CX containers;

224 kN: for 1D and 1DX containers.

#### **3.2 WALKWAYS STRENGTH**

**3.2.1** The tank container has no internal loading. The test is carried out by the application of external force represented by a concentrated load of 3 kN and uniformly distributed in the area of  $600 \times 300$  mm. This load shall be applied vertically downwards to the outer surface of each walkway in its weakest part.

#### **3.3 LADDER STRENGTH**

**3.3.1** The tank container has no internal loading. The test is carried out by the application of external force represented by a concentrated load of 2 kN. This load shall be applied vertically downwards to the middle of each step.

#### **3.4 LATERAL INERTIA TEST**

**3.4.1** The tank container having a uniformly distributed internal loading so that the combined mass of the container and test load is equal to  $R$ , shall be positioned with its transverse axis vertical.

*Note.* The internal loading may be applied to the tank container after it is in lateral position. This test is not required for containers without longitudinal frames.

One pair of the bottom corner fittings at the lower side shall be restrained in this position against lateral and vertical shifting. The other pair of fittings at the upper side shall be restrained against lateral shifting only.

Depending on construction of the tank container, subject to agreement with the Register, other container positioning scheme may be used.

For testing of the opposite side, the tank container shall be turned to  $180^\circ$  about its vertical axis so that the pair of bottom corner fittings that were at the upper side, are at the lower side.

Restraint of the tank container is provided in similar manner.

The tank container is held in this position, for each side, for at least 5 min (refer to Fig. 3.4.1).

During the test and after unloading the damages, elastic and permanent deformations of the tank, its fittings and framework shall be identified.

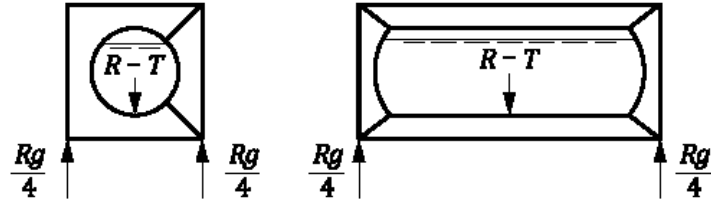


Fig. 3.4.1 Lateral inertia test

### 3.5 LOAD-TRANSFER AREA TEST

**3.5.1** A tank container filled with water to a mass  $2R-T$  shall be placed on four supports in such a way that two supports are against the external contact areas and two — against the internal ones (refer to 3.5.1). Each of the supports shall have a bearing surface of  $150 \times 150$  mm. The container shall be under load during 5 min. An identical test shall be carried out for the second pair of contact areas. In case where the load-transfer areas of a tank container are arranged symmetrically only one pair of contact areas shall be subjected to the test. During the test and after unloading the damages, elastic and permanent deformations of the tank, its fittings and framework shall be identified.

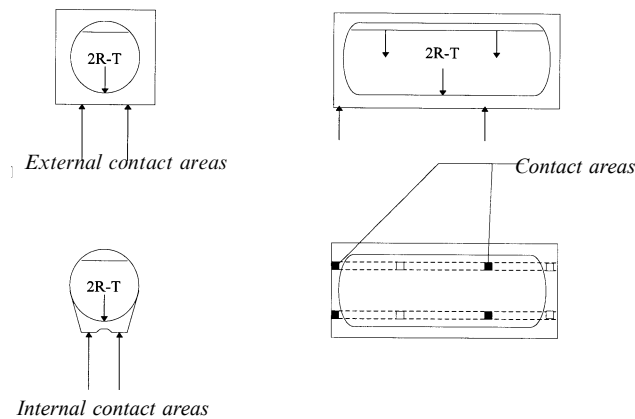


Fig. 3.5.1 Load-transfer area test

### **3.6 DYNAMIC LONGITUDINAL IMPACT TEST**

**3.6.1** A tank container filled to its gross mass  $R$  shall be tested for a dynamic longitudinal impact with an overload of at least 4g for dangerous goods and 2g for non-dangerous goods within the time period representative for the impulses typical for the railway transport.

The procedure for impact tests shall comply with the requirements of Section 41, Part IV of the UN Manual of Tests and Criteria.

After the test, the damages and deformations of the tank, its fittings and frame shall be identified.

### **3.7 PRESSURE AND LEAKPROOFNESS TESTS**

**3.7.1** The pressure test shall be carried out after the completion of the test described in 3.1 — 3.6.

**3.7.2** Each tank container shall be subjected to pressure test before shot-blasting or other tank surface treatment, installation of thermal insulation and protective covering (if provided).

**3.7.3** Pressure and vacuum relief valves shall be removed prior to beginning the pressure test.

**3.7.4** Tank containers intended for transportation of non-dangerous goods with maximum allowable working pressure not more than 0,07 MPa shall be subjected to pressure test by not less than 1,5 maximum allowable working pressure but not less than 0,045 MPa.

Tank containers intended for transportation of Class 3 — 9 dangerous goods shall be subjected to pressure test, which shall be not less than 1,5 design pressure.

Tank containers intended for transportation of non-liquefied gases shall be subjected to pressure test, which shall be not less than 1,3 design pressure.

Tank containers intended for transportation of refrigerated liquefied gases shall be subjected to pressure test, which shall be not less than 1,3 maximum allowable working pressure. For tank containers with vacuum insulation, pressure at hydraulic tests shall exceed not less than 1,3 times the sum of the maximum allowable working pressure and 0,1 MPa. The test pressure shall be maintained for the period of time necessary to enable a complete inspection of the tank and its fittings to be made but not less than 30 min. The tank testing procedure different from that set forth in this paragraph shall be subject to a special consideration by the Register.

**3.7.5** Where the tank is provided with compartments, each compartment shall be tested. In this case compartments adjacent thereto shall be empty and the pressure in the compartments shall correspond to the atmospheric.

**3.7.6** The test pressure shall be measured at the top of the tank or compartment; with the tank in its normal operational position.

**3.7.7** The main membrane stresses arising in shell and heads of the tank under pressure test shall not exceed  $0,75R_e(0,75R_{p0,2}; R_{p1})$  or  $0,5R_m$ , whichever is lesser.

Note.  $0,75R_e(0,75R_{p0,2}; R_{p1})$  and  $0,5R_m$  — refer to 2.2.

For metals characterized only by the minimum assured tensile strength, stresses shall not exceed  $0,315R_m$ .

**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. 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.



**3.7.9** The refrigerating and/or heating systems, if provided for the tank container, shall be tested by pressure equal to 1,5 times the working pressure of the system. Duration of the test shall be such as is necessary for the system to be thoroughly inspected.

**3.7.10** Other test procedures may be used if approved by the Register.

### **3.8 THERMOTECHNICAL TESTS OF TANK CONTAINERS INTENDED FOR THE TRANSPORTATION OF REFRIGERATED LIQUEFIED GASES**

**3.8.1** Thermotechnical tests shall be carried out after the tests specified in 3.1 – 3.7.

**3.8.2** Thermotechnical tests shall consist of two stages:

.1 check of effectiveness of insulation system (heat influx in W);

.2 check of reference holding time for each refrigerated liquefied gas intended for the transportation in tank container.

**3.8.3** Check of insulation system effectiveness may be carried out by two procedures:

.1 constant pressure test (for instance, at atmospheric pressure) when loss of refrigerated liquefied gas is measured during the given period of time;

.2 closed system test when an increase of pressure in casing is measured during the given period of time.

When the tests are run at constant pressure, change of atmospheric pressure shall be considered. A correction for any change of ambient temperature shall be made during both tests assuming that ambient temperature is equal to 30 °C.

**3.8.4** Reference holding time is checked for each refrigerated liquefied gas on the basis of the following data:

.1 effectiveness of the insulation system determined in accordance with 3.8.3;

.2 the lowest pressure, for which safety devices are adjusted;

.3 initial filling conditions (filling temperature and pressure);

.4 estimated ambient temperature is taken equal to 30 °C;

.5 physical properties of specific refrigerated liquefied gas intended for transport.

**3.8.5** Test procedure shall be approved by the Register.

### **3.9 TESTING OF PRESSURE-RELIEF AND VACUUM VALVES**

**3.9.1** During testing of the pressure-relief valves the following parameters shall be determined:

.1 opening pressure of the valve;

.2 discharge capacity with the valve being fully open (at the prototype test);

.3 closing pressure of the valve.

**3.9.2** The vacuum valves shall be tested for opening pressure.

### **3.10 INSPECTIONS**

**3.10.1** A tank container shall be subjected to inspections according to 3.17, Part II "General Freight Containers".

**3.10.2** After completion of tests all service equipment shall be tested in operation.

## **4 MARKING**

### **4.1 MANDATORY MARKING**


**4.1.1** Tank containers shall be marked in accordance with the requirements set forth in Section 4, Part I "Basic Requirements".

### **4.2 TARE MASS**

**4.2.1** Tare mass to be marked on each tank container during manufacture shall be obtained by weighing each tank container as a complete unit after it has been painted. The actual tare mass shall lie within the limit of tolerances stated in the approved technical documentation.

### **4.3 IDENTIFICATION PLATE WITH TANK DATA**

**4.3.1** In addition to CSC and CCC Plates the tank identification plate shall be firmly attached to the tank container frame in compliance with the requirements of applicable national and international documents. The tank identification plate of tank containers for the transportation of dangerous cargoes shall be made in English and contain at least the following data:

1. Owner's registration number.
2. Manufacturing information:
  - 2.1. Country of manufacture;
  - 2.2. Year of manufacture;
  - 2.3. Manufacturer's name or mark;
  - 2.4. Manufacturer's serial number;
  - 2.5. Letters of the design model.
3. Approval information:
  - 3.1. The United Nations packaging symbol;  

  - 3.2. Portable tank instruction (determined in accordance with 4.2.5.2.6 of the UN Model Regulations);
  - 3.3. Approval country;
  - 3.4. Authorized body for the design approval — Russian Maritime Register of Shipping;
  - 3.5. Design approval number;
  - 3.6. Letters "AA", if the design was approved under alternative arrangements (see 6.7.1.2 of IMDG Code);
  - 3.7. Pressure-vessel design code.
4. Pressures:
  - 4.1. MAWP (in bar or MPa\*);
  - 4.2. Test pressure (in bar or MPa\*);
  - 4.3. Initial pressure test date (month and year) and Register stamp;
  - 4.4. External design pressure, bar/MPa\*;
  - 4.5. MAWP for heating/cooling system, bar/MPa\*.

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\* Gauge pressure.

5. Temperatures:

5.1. Design temperature range in °C.

6. Materials:

6.1. Shell material(s) and material standard reference(s);

6.2. Nominal thickness of the shell and heads, mm;

6.3. Equivalent thickness in reference steel, mm;

6.4. Lining material (when applicable).

7. Capacity:

7.1. Water capacity at 20 °C, l. This indication shall be followed by symbol "S" when the tank is subdivided by baffle plates into compartments of not more than 7500 l in capacity;

7.2. Water capacity of each compartment at 20 °C (if any), l. This indication shall be followed by symbol "S" when the compartments is subdivided by baffle plates into sections of not more than 7500 l in capacity.

8. Periodic inspections and tests:

8.1. Type of the most recent periodic test (2,5-year, 5-year or exceptional);

8.2. Date of the most recent periodic test (month and year);

8.3. Test pressure, bar/MPa\* of the most recent periodic test (if applicable);

8.4. Identification mark of the authorized body that performed or witnessed the most recent test.

An example of a plate for portable UN T1 — UN T23 tanks is shown in Fig. 6.7.2.20.1 of the IMDG Code;

An example of a plate for portable UN T50 tanks (non-refrigerated liquefied gases) is shown in Fig. 6.7.3.16.1 of the IMDG Code;

An example of a plate for portable UN T75 tanks (refrigerated liquefied gases) is shown in Fig. 6.7.4.15.1 of the IMDG Code;

An example of a label for multiple-element gas containers (MEGC) is shown in Fig. 6.7.5.13.1 of the IMDG Code.

Notes: 1. In addition to the text in English it is allowed to give text in Russian or other language upon customer's request.

2. Design reference temperature, °C, shall be specified on the identification plate of tank containers intended for transportation of non-refrigerated liquefied gases; indication of protective covering and insulation is not required.

3. The following information shall be additionally specified on the identification plate of tank containers intended for transportation of refrigerated liquefied gases.

3.1 Minimum design temperature, °C.

3.2 Full name of the gases allowed for transportation.

3.3 Type of the insulation ("thermally insulated" or "vacuum insulated").

3.4 Effectiveness of the insulation system (heat influx) watts (W).

3.5 Reference holding time, days or hours.

3.6 Initial pressure, bar/MPa\*.

3.7 Degree of filling for every refrigerated liquefied gas approved for transportation.

4. If the tank container is approved for handling at sea, then the following inscription shall be written on the plate: "OFFSHORE PORTABLE TANK".

**4.3.2** A blank space shall be provided on the plate for entering the dates of subsequent hydraulic tests, as well as for putting the Register brand.

**4.3.3** The data marked on the plate shall be embossed on, or indicated on its surface in any other conspicuous way.

**4.3.4** The plates shall be manufactured of corrosion-resistant and incombustible material. The letters shall be not less than 3 mm in height.

**4.3.5** The identification plate shall be fixed as near as possible to the CSC and CCC Plates (refer to 4.1, Part I "Basic Requirements").

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\* Gauge pressure.

#### **4.4 SERVICE EQUIPMENT**

**4.4.1** All the valves shall have inscriptions showing their intended purpose.

**4.4.2 Marking of pressure relief devices.**

**4.4.2.1** Each pressure relief device shall be clearly and permanently marked with the following:

.1 the pressure at which the valve is set to discharge (MPa or bar) or a temperature (°C) of the device actuation;

.2 the allowable tolerance at the discharge pressure for spring-loaded devices or the actuation pressure for frangible disks;

.3 reference temperature corresponding to the rated actuation pressure for frangible disks;

.4 temperature tolerance for fusible elements;

.5 the rated flow capacity of spring-loaded pressure relief devices, frangible discs or fusible elements under normal conditions (external pressure is 1 bar and ambient temperature is 0 °C) in standard (normal) cubic meters of air per second, nm<sup>3</sup>/s;

.6 cross-sectional area of spring-loaded pressure relief devices, frangible discs and fusible elements, mm<sup>2</sup>;

.7 name of manufacturer, serial number and relevant catalogue number (model);

.8 valve body material brand.

**4.4.3** Each branch pipe of tank container shall have clear marking of its purpose.

**4.4.4** Stop devices shall be marked as follows:

.1 name or manufacturer's trademark;

.2 designation of the stop device model or number by catalogue;

.3 nominal diameter, mm;

.4 conditional pressure, MPa (it is permitted to indicate the maximum allowable working pressure and the permissible temperature);

.5 direction of medium flow;

.6 brand of body material.

## **PART V. PLATFORM CONTAINERS**

### **1 GENERAL**

#### **1.1 APPLICATION**

**1.1.1** The provisions of this Part apply to 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CCC, 1CC, 1C, 1CX platform containers.

**1.1.2** Platform containers shall comply with requirements of Part I "Basic Requirements" as applied to the platform containers, and with requirements of this Part.

#### **1.2 DEFINITIONS AND EXPLANATIONS**

**1.2.1** The definitions and explanations relating to the general terminology of these Rules are given in Part I "Basic Requirements". For the purpose of this Part the following definitions and explanations have been adopted.

Platform (platform container) means a container having only a base with floor and equipped with top and bottom corner fittings.

Platform-based container (platform container) is a:

platform-based container with incomplete superstructure and fixed ends; it is a container having a base with floor and non-folding ends equipped with top corner fittings; top longitudinal members are not provided;

platform-based container with incomplete superstructure and folding ends is a container having a base with floor and folding ends equipped with top corner fittings; top longitudinal members are not provided;

platform-based container with complete superstructure is a container having a base with floor, top side rails and the ends equipped with top corner fittings, roof or open top.

Folding ends of a platform-based container mean the structures which may be laid on the floor for the purpose of transportation or stowage of empty containers.

Interlocking devices of platform-based container with folding ends are devices securing the end structure in vertical position, as well as those interconnecting empty containers in folded condition to form an interlocked pile (module).

Module of folding containers is a certain number of identical platform-containers or platform-based containers with a folding end structure, folded into a single pile (module).

#### **1.3 SCOPE OF TECHNICAL SUPERVISION**

**1.3.1** Technical supervision of the Register shall cover:

- .1** base structure with floor;
- .2** corner fittings;
- .3** end structure of platform-based containers;
- .4** locking devices of end structure;
- .5** framework.

## **1.4 TECHNICAL DOCUMENTATION**

**1.4.1** For platform containers, the technical documentation stated in 1.3.3, Part I "Basic Requirements", shall comprise:

- .1** technical conditions (technical specifications for foreign residents);
  - .2** test program and test procedure for the containers;
  - .3** State Health Authorities approval of the coverings, the floor material with antiseptic impregnation, and the sealants;
  - .4** drawings of the following parts, assemblies and general views, inclusive of the specified dimensions:
    - corner fittings;
    - bottom side rails;
    - bottom end rails;
    - corner posts, if any;
    - base structure with corner fittings, and the "gooseneck" tunnels;
    - end walls, if provided;
    - hinges and locking devices of end walls, in case of folding end structure;
    - interlocking devices connecting empty containers to form a pile (module) — only for platforms (containers) without end structure and platform-based containers with folding ends;
    - securing devices for cargo;
    - floor (fastening, caulking, size of panels and boards, construction of planking);
    - CSC Plates;
    - framework;
    - general views and markings of platform containers.
- The extent of the above documentation is the minimum required.

## 2 TECHNICAL REQUIREMENTS

### 2.1 DIMENSIONS

**2.1.1** The dimensions of the base (width  $W$  and length  $L$ ) for platform containers of all types are to comply with those shown in Table 2.1.2, Part I "Basic Requirements".

**2.1.2** The length  $L$  of empty platform-based containers with fixed and folding ends, taken between the top corner fittings of the ends in erected position, may coincide with the figures shown in Table 2.1.2.

Table 2.1.2

Designation	Length $L_{\max}$ of empty container, mm	Length $L_{\min}$ of container loaded to gross mass, $R$ , mm
1AAA, 1AA, 1A, 1AX	12202	12172
1BBB, 1BB, 1B, 1BX	9135	9105
1CC, 1C, 1CX	6068	6042
Note. Using $L_{\max}$ and $L_{\min}$ is not recommended.		

**2.1.3** No part of the container shall project beyond the external dimensions given in Table 2.1.2 for platform containers with incomplete superstructure and in Table 2.1.2, Part I "Basic Requirements" for the rest of platform containers.

A module made of platform containers or platform-based containers with folded ends shall comply with the dimensions specified in Table 2.1.2 of Part I "Basic Requirements" and those established in ISO 668, and its height shall not exceed 2591 mm.

**2.1.4** Series 1 platform containers with the ends of a height other than specified in Table 2.1.2, Part I "Basic Requirements" shall be specially considered by the Register in each particular case.

### 2.2 END STRUCTURE

**2.2.1** The ends of platform-based containers with fixed or folding ends may be interconnected by top rails or be constructed with no top rails as freestanding posts.

**2.2.2** The ends designed with a top rail between them may be constructed as end walls.

**2.2.3** Platform-based containers with folding ends shall be equipped with appropriate devices securing the top corner fittings at each end in folded condition to permit stacking, as well as with interlocking devices connecting empty containers with folded ends to form a module; the face supporting the upper container when stacking or forming a module shall protrude minimum 6 mm above the top of container in folded condition.

**2.2.4** Any extending parts of the platform-based containers which in service may cause a dangerous situation to occur shall be equipped with fixing devices with external indication of the fixed position.

### 2.3 BASE STRUCTURE

**2.3.1** The base structure shall be equipped with devices for securing the cargo (hooks, shackles, rings, etc.) so arranged as not to protrude above the face of floor and beyond the overall dimensions of the platform container. These devices shall be capable of withstanding the forces induced by longitudinal and lateral loads, unless other means of securing the cargo are provided.

**2.3.2** The distance between the face of floor and the plane formed by upper faces of top corner fittings shall be not less than 6 mm.

**2.3.3** Structural deflection in the base of unladen container is permitted.

## **2.4 OPTIONAL STRUCTURES**

**2.4.1** Fork-lift pockets for handling containers in the loaded or unloaded condition may be provided as optional features.

**2.4.2** Where a set of fork-lift pockets has been fitted as in 2.4.1, a second set of fork-lift pockets may, in addition, be provided on 1CC, 1C and 1CX containers for empty handling only.

**2.4.3** Fork-lift pockets may be provided on 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX containers for empty handling only. Appropriate caution decals shall be applied near the pockets to indicate operators that these pockets are only for empty handling.

**2.4.4** The fork-lift pockets, where provided, shall meet the dimensional requirements specified in ISO 1496 5. The fork-lift pockets at the base need not be closed along the full width of the container but shall be closed near each end of the fork-lift pockets.



### **3 TESTING**

#### **3.1 GENERAL**

**3.1.1** The requirements of this Section apply to platform containers specified in 1.1, irrespective of their construction and material involved.

**3.1.2** Upon completion of each test, the platform containers shall show neither permanent deformations nor abnormalities which may render them unsuitable for the designed purpose.

**3.1.3** A platform-based container with incomplete superstructure and folding ends shall have the ends in erected (service) condition.

#### **3.2 STACKING**

**3.2.1** The test load and the stacking test procedure for platform containers are set out in 3.7, Part II "General Freight Containers". The platforms shall be tested without internal loading while the platform-based containers shall have uniformly distributed internal loading such that the combined mass of the container and the test load is equal to 1,8R.

#### **3.3 LIFTING**

**3.3.1** The platform container under test shall have a uniformly distributed internal loading such that the combined mass of the container and test load is equal to 2R.

**3.3.2** When the container is lifted by the top corner fittings, the lifting devices shall be secured through the side apertures in such a way that the line of action of the lifting force is upright.

After lifting the container shall be suspended for 5 min and then carefully lowered to the ground.

**3.3.3** When the container is lifted by the bottom corner fittings, the lifting devices shall be secured in such a way that the line of action of the lifting force and the outer face of the corner fitting shall be no further apart than 38 mm, with the lifting force applied at an angle to the horizontal of:

30°, for 1AAA, 1AA, 1A and 1AX containers;

37°, for 1BBB, 1BB, 1B and 1BX containers;

45°, 1CCC, 1CC, 1C and 1CX containers. After lifting the container shall be suspended for 5 min and then carefully lowered to the ground.

#### **3.4 RACKING**

**3.4.1** A platform container shall not be subjected to racking test.

**3.4.2** The test load and racking test procedure for platform-based containers with incomplete structure and fixed or folded ends, as well as for containers with complete superstructure, are set out in 3.10 and 3.11, Part II "General Freight Containers".

**3.4.3** When testing for longitudinal racking of platform-based containers with incomplete superstructure, external forces equal to 150 kN shall be distributed in the ratio 2:1 (75 and 50 kN) between each of the top corner fittings: at first, towards and then away from the corner fittings. The lesser force shall be applied to the side of vertical restraint.

During the test the measurements shall be taken to determine vertical movement of the top with respect to the base, which shall not exceed 42 mm.

**3.4.4** Prior to testing for transverse racking of platform containers with incomplete superstructure and fixed and folding ends constructed as corner posts, the top corner fittings at each end may be interconnected by a top rail used for this test only. In such case, external forces equal to 150 kN shall be applied simultaneously to each of the top corner fittings on one side of the container.

If the corner posts are not interconnected by the top rail, external forces equal to 75 kN shall be applied separately to each top corner fitting.

In the course of testing the changes in lengths of the diagonals, the sum of which shall not exceed 60 mm, shall be measured.

### **3.5 END WALL STRENGTH (WHERE PROVIDED)**

**3.5.1** Subject to this test are the platform containers with complete superstructure, as well as those having incomplete superstructure and fixed and folding ends constructed as end walls.

**3.5.2** The test load and the procedure of testing for end wall strength are set out in 3.13, Part II "General Freight Containers".

### **3.6 ROOF STRENGTH (WHERE PROVIDED)**

**3.6.1** Rigid roof containers shall be tested.

**3.6.2** A load of 300 kg shall be uniformly distributed over an area of 600 × 300 mm located at the weakest area of the rigid roof of the container.

### **3.7 LONGITUDINAL RESTRAINT (STATIC TEST)**

**3.7.1** The test load and the procedure of testing for longitudinal restraint of platform containers of the specified types are set out in 3.12, Part II "General Freight Containers".

### **3.8 FLOOR STRENGTH**

**3.8.1** The test load and the procedure of testing for floor strength of platform containers are set out in 3.9, Part II "General Freight Containers".

### **3.9 LIFTING BY FORK LIFT POCKETS (WHERE PROVIDED)**

**3.8.1** All types of containers fitted with fork lift pockets shall be tested.

**3.8.2** The test load and the procedure of testing for lifting by fork lift pockets are specified in 3.4, Part II "General Freight Containers".

### **3.10 WEATHERTIGHTNESS (WHERE PROVIDED)**

**3.10.1** Weather tightness tests shall be carried out upon completion of the all set of tests.

**3.10.2** Testing procedure is outlined in 3.15, Part II "General Freight Containers".

### **3.11 ADDITIONAL TESTS FOR PLATFORM CONTAINERS WITH INCOMPLETE SUPERSTRUCTURE AND FOLDING ENDS**

#### **3.11.1 Stacking of containers in folded condition.**

**3.11.1.1** The test shall be carried out to prove the ability of a platform container with folded ends to support under acceleration conditions the total mass of stacked containers of the same length as the platform container, loaded each to the mass  $R$ , account being taken of the relative eccentricities between the containers due to clearances.

**3.11.1.1** External forces mentioned in 3.7, Part II "General Freight Containers" shall be applied vertically and simultaneously to each of the four top corner fittings through test corner fittings or pads of the same plan dimensions as the top corner fittings of the container. The test corner fittings or pads shall be placed in such a way with respect to the top corner fittings as to cover all positions of their offset by 25 mm laterally and 38 mm longitudinally.

#### **3.11.2 Lifting by the top.**

**3.11.2.1** The test shall be carried out to prove the ability of the platform container and its interlocking devices (refer to 2.2.3) to withstand the action of vertically applied forces when forming a modular groups of folded empty containers.

**3.11.2.2** The platform container with folded ends shall be subjected to a loading equal to  $(2N - 1)T$  for each interlocking device (where  $N$  is a number of containers in modular group,  $T$  is tare mass, kg) and shall be carefully lifted by all four top corners in a way as to avoid significant acceleration forces being created.

### **3.12 INSPECTIONS**

**3.12.1** The platform containers of the specified types shall undergo the inspections stated in 3.17, Part II "General Freight Containers" insofar as these inspections are applicable.

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

### **1 GENERAL**

#### **1.1 APPLICATION**

**1.1.1** The provisions of this Part apply to containers for the non-pressurized solid bulk cargoes.

**1.1.2** Non-pressurized bulk containers shall comply with requirements of Part I "Basic Requirements" and with requirements of this Part.

**1.1.3** Containers intended for the transportation of dangerous solids in bulk are subject to special consideration by the Register in each case.

#### **1.2 DEFINITIONS AND EXPLANATIONS**

**1.2.1** The definitions and explanations relating to the general terminology of these Rules are given in Part I "Basic Requirements". For the purpose of this Part the following definitions and explanations have been adopted.

**Cargo capacity (body)** means the space within the container bounded by the end and side walls, bottom and roof or within a soft cover (tarpaulin, plastics, etc.) in case of non-hermetic containers.

**Non-pressurized bulk container** means a container used for the transportation and storage of unpackaged solid bulk cargoes, equipped with devices for gravity loading and discharge.

**Non-pressurized bulk container of "box" type** means a container with rectangular cargo space, provided with a door opening at least in one end wall and with gravity discharge. Such container may be used as a general freight container.

**Non-pressurized bulk container of "hopper" type** means a container without door openings and having discharge devices arranged in horizontal plane.

**Bulk density** is the mass per unit volume of dry bulk solids.

**Dry solids in bulk** mean assemblies of separate solid particles normally in contact with one another and capable of fluid flow.

#### **1.3 SCOPE OF TECHNICAL SUPERVISION**

**1.3.1** Technical supervision of the Register shall cover:

- .1** framework (bearing structure);
- .2** walls, floor, roof, doors and door locks for the "box" type containers;
- .3** corner fittings;
- .4** walls, floor, roof, loading/discharge devices for "hopper" type containers.

#### **1.4 TECHNICAL DOCUMENTATION**

**1.4.1** For bulk containers, the technical documentation specified in 1.3.3, Part I "Basic Requirements", shall comprise:

- .1** technical conditions (technical specifications for foreign residents);
- .2** test program and test procedure for the container;
- .3** State Health Authorities approval of the floor material with antiseptic impregnation, covering and materials;

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

- corner fittings;
- door locks, closures of manholes and discharge openings;
- walls;
- corner posts;
- top and bottom side rails;
- top and bottom end rails;
- roof and manholes, if provided;
- base structure with bottom corner fittings and gooseneck tunnel, if provided;
- floor (fastening, caulking, size of panels and boards, construction of planking);
- doors with their gaskets, locks and manholes, if provided;
- items covered by CCC requirements;
- CSC and CCC Plates;
- general views and markings of the container.

The extent of the above documentation is minimum required.

## **2 TECHNICAL REQUIREMENTS**

### **2.1 "BOX" TYPE CONTAINER**

**2.1.1** No part of the side structure of the "box" type container, when test load is applied to its side walls, shall deflect by more than 40 mm beyond a plane formed by the side faces of corner fittings.

### **2.2 "HOPPER" TYPE CONTAINER**

**2.2.1** The walls of the "hopper" type container shall be firmly connected to the structural elements of the container. Supports and attachments of the cargo body to the framework shall not cause dangerous local stress concentration in the structure.

**2.2.2** The container shall be capable of withstanding the inertia forces of the cargo, resulting from the motion of the vehicle.

**2.2.3** When designing the "hopper" type container the forces of inertia shall be taken to be equivalent to forces of  $2R_g$  longitudinally and vertically and  $R_g$  laterally. The loads corresponding to these forces may be considered to act individually; they shall be evenly distributed and act through the geometric centre of the cargo body.

**2.2.4** With the "hopper" type container being fully laden under transverse restraint test, no part of side structure shall deflect by more than 50 mm beyond a plane formed by the outer faces of corner fittings.

### **2.3 ADDITIONAL STRUCTURES**

**2.3.1** The bulk containers may be provided with fork lift pockets, grappler arm lifting areas, "gooseneck" tunnel, as well as with ladders and walkways.

**2.3.2** The container may be provided with one or several fumigation openings fitted with flanges.

**2.3.3** The "hopper" type containers shall have manholes minimum 500 mm in diameter for the purpose of inspection, repair and other works.

**2.3.4** The bulk containers shall have one or more loading openings, the number, construction and arrangement of which shall be such as to permit even distribution of cargo in the cargo body. Recommended arrangement of loading openings is shown in Fig. 2.3.4.

**2.3.5** The bulk containers shall have one or more discharge openings, the number, structure and arrangement of which shall be such as to permit complete discharge of cargo by gravity or with the use of discharge devices that produce no vacuum within the cargo body.

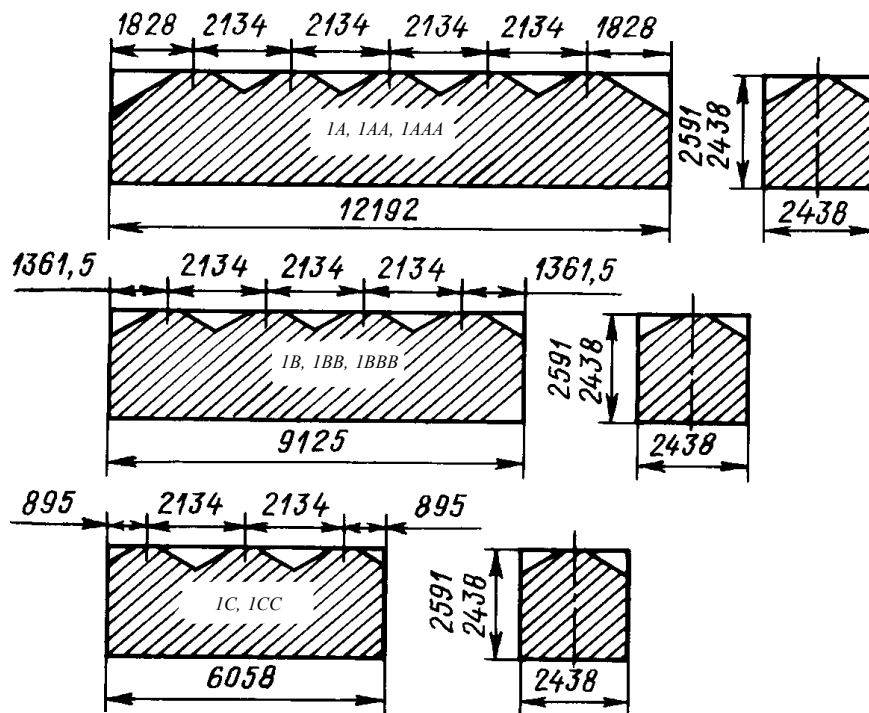


Fig. 2.3.4 Arrangement of loading openings

### **3 TESTING**

#### **3.1 GENERAL**

**3.1.1** The requirements of this Section apply to bulk containers of all dimensions, irrespective of their construction and materials involved.

**3.1.2** To achieve the specified test loading, the container shall be loaded with suitable cargo. If the test loading cannot be met or the cargo is undesirable for use, the container shall be loaded with another cargo, with application of a supplementary loading so that the specified value of test loading is reached.

**3.1.3** On completion of each test, the container shall show neither permanent deformations nor abnormalities which may render it unsuitable for the designed purpose.

**3.1.4** Test loadings and test procedures for lifting, stacking, strength of roof (if any), strength of floor, racking, strength of side walls, longitudinal restraint and weathertightness of "box" type containers are set out in Section 3, Part II "General Freight Containers".

Test loadings during end wall strength test for 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B и 1BX containers shall be equal to  $0,4Pg$ , while those for 1CCC, 1CC, 1C, 1CX, 1D and 1DX containers shall be equal to  $0,6Pg$ .

**3.1.5** Test loadings and procedures for walkways and ladder strength tests are set out in Section 3, Part IV "Tank Containers".

**3.1.6** Test loadings and procedures for "hopper" type containers are set out in Section 3, Part IV "Tank Containers", exclusive of 3.8.

#### **3.2 AIRTIGHTNESS TEST**

**3.2.1** This test shall be carried out after completion of the tests stated in 3.1.4 or 3.1.6.

**3.2.2** The container shall be in operating condition. Doorways, manholes and other openings shall be closed in the normal manner.

**3.2.3** Air shall be supplied to the container through a connection precluding air leakage. A pressure gauge shall be connected to the container itself. The measuring equipment used in testing shall be verified by a competent body and have an accuracy within the values specified in 4.2.3 of the Rules for Technical Supervision during Manufacture of Containers.

**3.2.4** A positive pressure equal to  $250 \pm 10$  Pa shall be produced in the container. The air supplied to the container shall maintain the said pressure. The air leakage from the container shall not exceed the following values:

for 1AAA, 1AA, 1A, 1AX containers  $30 \text{ m}^3/\text{h}$ ;

for 1BBB, 1BB, 1B, 1BX containers  $25 \text{ m}^3/\text{h}$ ;

for 1CCC, 1CC, 1C, 1X containers  $20 \text{ m}^3/\text{h}$ ;

for 1D, 1DX containers —  $15 \text{ m}^3/\text{h}$ .

**3.2.5** This test shall be carried out, if considered necessary.

#### **3.3 INSPECTIONS**

**3.3.1** A bulk container shall be subjected to inspections according to 3.17, Part II "General Freight Containers".



## **4 MARKING**

### **4.1 GENERAL**

**4.1.1** The rear surface of a "hopper" type container shall bear inscription showing capacity of the container in m<sup>3</sup>.

If considered necessary, a plate with operation instructions made so as to be fit for continuous use shall be attached to the container at a readily visible place, in immediate proximity to the discharge area. The instructions shall be written both in the national and the English languages.

## **PART VII. OFFSHORE CONTAINERS**

### **1 GENERAL**

#### **1.1 APPLICATION**

**1.1.1** The requirements of this Part apply to offshore containers with maximum gross mass not exceeding 25 000 kg.

**1.1.2** The offshore containers shall comply with the applicable requirements of Part I "Basic Requirements", and with the requirements of this Part. The containers intended for the transportation of dangerous goods shall additionally comply with the requirements of the International Maritime Code for Dangerous Goods Code.

**1.1.3** The offshore containers differing in design and dimensions from those defined in this Part are subject to special consideration by the Register in each particular case.

#### **1.2 DEFINITIONS AND EXPLANATIONS**

**1.2.1** The definitions and explanations related to the general terminology of these Rules are given in Part I "Basic Requirements". For the purpose of this Part, the following definitions and explanations have been adopted.

**Offshore freight container** means a closed container with doors for the transportation of general freight cargoes.

**Offshore open top container** means a container with an open top for general cargoes or special cargoes.

**Offshore tank container** means a removable tank (tank container) for the transportation of dangerous or non-dangerous goods.

**Offshore tank bulk container** means a container designed to transport bulk cargoes.

**Specialized offshore container** means a container designed and intended for the transportation of specialized cargoes.

**Offshore waste container** means an enclosed or open container designed for the transportation and temporary storage of wastes.

**Offshore service container** means an offshore container designed and equipped for special service tasks, usually as a temporary installation (laboratories, workshops, stores, control stations, etc.).

**Note.** Not intended for permanent installation on ships and mobile offshore drilling units/fixed offshore platforms.

**Maximum gross mass,  $R$ , of the offshore container, kg** means the maximum gross mass of the container including permanent equipment and its cargo, but excluding the lifting set.

**Mass,  $T$ , of offshore container, kg** means the mass of an empty container including any permanent equipment excluding cargo and lifting set.

**$S$**  means the mass of the lifting set, kg.

**Container payload,  $P$ , kg** means the maximum permissible mass of cargo that can be safely transported in a container.

Bearing structure means elements of the frame and panel of the container perceiving loads. The bearing structure includes:

main bearing structure means the main structural elements of the container that transfer the load created by the cargo to the container lifting equipment hook. The main bearing structure includes, as a minimum, the following elements: top and bottom side rails, top and bottom end rails, corner posts, pad eyes, fork lift pockets, corner fittings (if applicable).

Note. Other elements of the bearing structure can also be attributed to the main bearing structure;

secondary bearing structure means other structural elements which do not fall under the definition of main bearing structure (floor plates, intermediate bottom rails, components for vessel fastening to the frame, protective frame members, etc.).

Note. Side and end panels, as well as the roof panels, are not considered to be part of the secondary bearing structure.

Secondary structure means container parts, which do not transfer the load to the lifting equipment hook. The secondary structure includes: side and end panels, roof panels, doors, panel stiffeners, structural components used for protection of tank container vessels and cargo securing arrangements.

Lifting set means items of integrated lifting equipment used to connect the container to the lifting appliance (shackles, hooks, swivels, chains, rings, ropes, etc.).

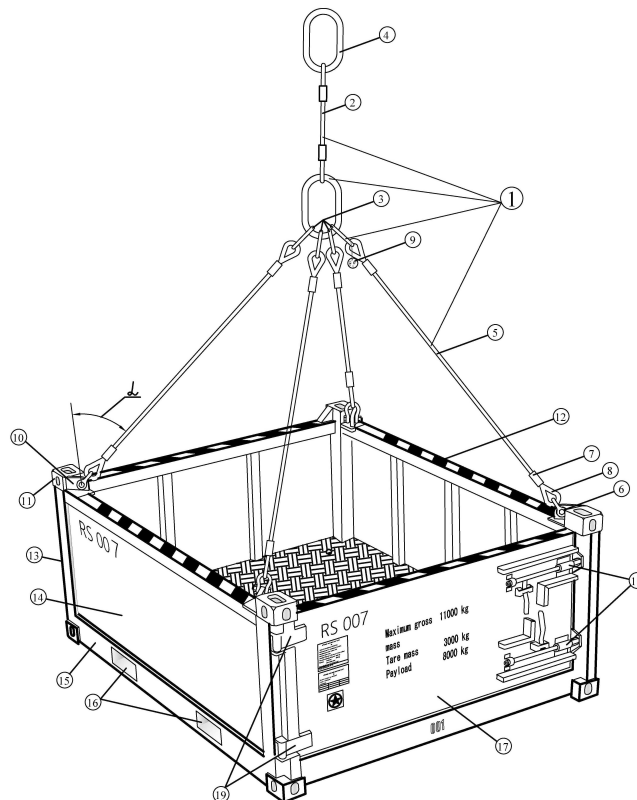


Fig. 1.2.1 Offshore container

1 — lifting set; 2 — fore runner; 3 — master link + intermediate links; 4 — master link; 5 — sling; 6 — shackle; 7 — bush; 8 — thimble; 9 — marking plate of lifting set; 10 — pad eye; 11 — ISO corner fitting; 12 — top side rail; 13 — corner post; 14 — left wall; 15 — bottom side rail; 16 — fork lift pockets; 17 — door; 18 — door locks; 19 — door hinges

### **1.3 SCOPE OF TECHNICAL SUPERVISION**

**1.3.1** Technical supervision of the Register shall cover the following container elements:

- .1** main bearing structure (including material);
- .2** secondary bearing structure;
- .3** tank (including material);
- .4** pressure units, cooling and heating appliances;
- .5** safety devices (safety valves, frangible discs, melting plugs and vacuum valves), piping, stop valves, cargo level control devices;
- .6** stationary refrigeration and/or heating installations, electrical equipment;
- .7** floor, loading and discharge devices (for bulk containers);
- .8** driving ramp;
- .9** lifting set.

### **1.4 TECHNICAL DOCUMENTATION**

**1.4.1** The technical documentation submitted to the Register for approval shall comprise:

- .1** technical conditions (technical specifications for foreign residents);
- .2** operation manual;
- .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 calculations;
- .6** drawings of parts, assemblies, general views, marking and plates, including materials and thickness, welding procedures and welded joints dimensions;
- .7** welding joints examination card.

The extent of the above documentation is the minimum required.

## **2 TECHNICAL REQUIREMENTS**

### **2.1 GENERAL**

**2.1.1** A container shall have sufficient strength to allow loading and unloading from vessels offshore operating in a sea state with significant wave heights of 6 m.

**2.1.2** To prevent the containers from overturning (tipping) on a moving deck, they shall be designed to withstand tilting of 30° in any direction, without overturning when loaded at its maximum gross mass, with the centre of gravity considered to be at the half height of the container.

*Note.* For tank containers and specialized containers, the centre of gravity shall be taken as the actual centre of gravity.

**2.1.3** Protruding parts on the outside of the offshore container that may catch other containers or structures shall be avoided. In any case, door handles, hatch cleats, or other protruding parts shall be so placed and so protected that they do not catch the lifting set.

**2.1.4** Where containers are designed for stacking, the top corners of the container shall be raised to sufficient height above the roof and the top frame to prevent damage to the lifting set.

As a rule, it is permitted to stack the loaded containers ashore or at the drilling rig stacked in two layers, which shall be confirmed by calculations or other method agreed by the Register.

Stacking the trapezoidal waste containers is only permitted in unloaded condition. Stacking of containers during the transportation on supply vessels is not permitted. For the carriage on containerships in stack, containers shall comply with the CSC and ISO 1496 series requirements.

**2.1.5** Top and bottom corner fittings complying with the requirements of Part I "Basic Requirements" may be mounted to the containers. Containers shall not be lifted offshore with shackles in these corner fittings.

*Note.* It is recommended not to mount the top corner fittings on containers that have dimensions other than those specified in ISO 668.

**2.1.6** The design of the floor of the open top or open walls container, which may be exposed to water, shall have appropriate drainage devices.

**2.1.7** Doorways and manholes including hinges and locking devices shall be designed for at least the same horizontal loads as the primary structure. Locking devices shall prevent the opening of doors during transport or lifting of a container. Double-leaf doors shall have at least one such locking device on each door, locks, which shall be located on the upper and lower frame of the container. Locking devices and door hinges shall be protected against movement and damage due to impacts.

**2.1.8** Doors shall be fitted with locking devices in the open position. If container weathertightness is required, the doors shall be equipped with seals.

**2.1.9** The container shall be made of corrosion resistant materials and/or with the use of corrosion and paint protection. All offshore container roofs, including those constructed from checker plates, shall have a non-slip coating.

**2.1.10** Other structural elements: cargo securing devices in the container, fork lift pockets, intermediate cargo decks and driving ramps shall be designed in compliance with the requirements of ISO 10855 and withstand the loads specified therein.

**2.1.11** When available, the electrical equipment shall comply with the applicable requirements of Part X "Electrical Equipment" of the Rules for the Classification, Construction and Equipment of Mobile Offshore Drilling Units (MODU) and Fixed Offshore Platforms (FOP).

**2.1.12** If there are requirements for fire protection of the container, the requirements of Part VI "Fire Protection" of the Rules for the Classification, Construction and Equipment of MODU/FOP, Part VI "Fire Protection" of the Rules for the Classification and Construction of Sea-Going Ships, Part 3 of the International Code for Application of Fire Test Procedures.

**2.1.13** The design of the container shall be designed to meet the requirements of Section 9.

**2.1.14** Open frame containers (containers without walls and roofs) and all open top containers with permanent fasteners and equipment (i.e. in case of a risk of crane or lifting device hooking inside the container) shall be supplied with protection on the top.

*Note.* Other types of containers with an open top (open top containers with temporary bolted equipment) are not subject to the requirements hereof, since in such cases the risk of hooking can be promptly eliminated.

**2.1.15** Top protection may be fixed, removable or hinged and shall be capable of being securely fitted to the container. Top protection shall be either rigid or flexible; and be made from a robust material (e.g., plates, grating, glass-reinforced plastic, tarpaulin, net/mesh, polyester webbing).

**2.1.16** Grating or other rigid top protection of the top part of the container, shall have opening size not more than  $1500 \text{ mm}^2$ . Nets and webbing shall have an opening size not more than  $(50 \times 50) \text{ mm}$ .

**2.1.17** Rigid top protection shall have a non-slip surface and be designed for a load of 3 kN uniformly distributed over an area of  $600 \times 300 \text{ mm}$ .

**2.1.18** Flexible top protection shall be capable of supporting a central load equal to  $0,03R_g$ . In this case, the design load shall be 1 — 3 kN. The strength of the top protection shall be documented.

*Note.* Flexible top protection shall be able to support the above mass, without making contact with internal fittings or equipment.

**2.1.19** The top protection shall be located as high up as practical, normally not lower than the lower range of the top frame members. Fixtures for the top protection shall be such that they do not cause a snagging hazard.

**2.1.20** Where possible, the top protection shall cover the entire roof of the container. Small openings may be incorporated, e.g. for correct operation of the lifting set when a pad eye is located below the top protection.

## 2.2 PAD EYES

**2.2.1** General view of a pad eye is shown in Fig. 2.2.1.

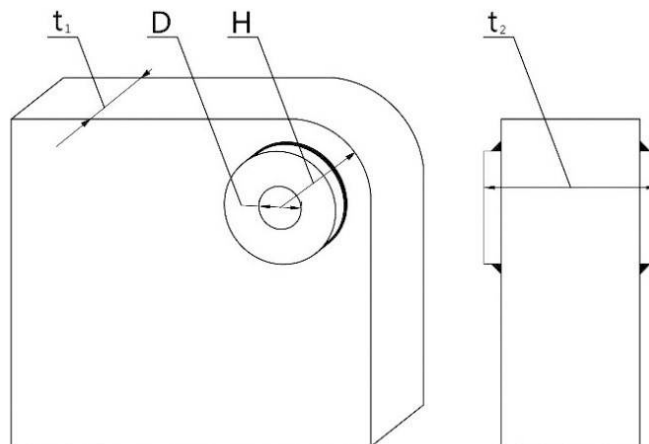


Fig. 2.2.1. Pad eye

**2.2.2** Pad eyes shall be designed for a total vertical force of  $3Rg$ . To determine the design resultant force on the pad eyes, it is necessary to use the formula:

$$F = 3Rg / ((n - 1) \cos \alpha) \quad (2.2.2)$$

where  $F$  is the resultant sling force, in N;  
 $g$  is gravitational acceleration ( $9,80665 \text{ m/s}^2$ );  
 $n$  is the number of pad eyes (not more than 4 and not less than 2);  
 $\alpha$  is the angle between the lifting sling and the vertical, in deg. (shall not exceed  $45^\circ$ ).

*Note.* For containers with only one pad eye, that pad eye shall be designed for a total vertical force of  $5Rg$ .

**2.2.3** Pad eyes shall be designed so as to withstand the tensile stress

$$R_e \geq (3 \cdot F) / (2 \cdot H \cdot t_1 - D_H t_1) \quad (2.2.3)$$

where  $R_e$  is the yield strength of the pad eye material, in MPa;  
 $F$  is the resultant force, in N;  
 $H$  is the shortest distance from the centre of the shackle hole in the pad eye to the edge of the pad eye, mm;  
 $t_1$  is the thickness of the pad eye, mm. The thickness of coupling rings (if any) is not considered;  
 $D_H$  is the diameter of the hole in the pad eye, mm.

**2.2.4** Pad eyes shall be designed so as to withstand the contact stress

$$R_e \geq 23,7 \sqrt{F / (D_H t_2)} \quad (2.2.4)$$

where  $R_e$  is the yield strength of the pad eye material, in MPa;  
 $F$  is the resultant force, in N;  
 $t_2$  is the thickness of the pad eye considering coupling rings (if any), in mm;  
 $D_H$  is the diameter of the hole in the pad eye, in mm.

**2.2.5** In order to prevent lateral bending moments on pad eyes, they shall be aligned together with the attached lifting set slings to the centre of lift, with a maximum deviation of  $\pm 2,5^\circ$ . The pad eyes set vertically and aligned to the centre of lift allow to vary an angle of the lifting set slings to the vertical by means of the lifting sets with slings of different length taking into account that this angle shall be equal to or less than  $45^\circ$ . Containers with pad eyes set at an angle to the vertical shall be provided with the lifting set which has the slings of the length precisely calculated for this angle.

**2.2.6** Any difference in the diagonal measurements between lifting point centres shall not exceed 0,2 % of the length of a diagonal, or 5 mm, whichever is the greater.

**2.2.7** Pad eye hole diameter shall not exceed more than 6 % of the nominal lifting set shackle diameter.

**2.2.8** The thickness of the pad eye near the shackle hole shall not be less than 75 % of the rated internal width of the shackle. It is also required to consider the requirement of 9.4.3.

Inside width of a shackle shall not exceed 25 % of the width of the pad eye near the hole.

**2.2.9** Pad eyes shall be welded to the frame with full penetration welds. If the lifting force is transferred perpendicularly to rolled steel surface of the pad eyes, steel with specified through thickness properties shall be used (Z-steel).

Pad eyes with a thickness of less than 15 mm shall be made of high strength structural steel with specified through thickness properties (Z-steel).

*Note.* It is recommended to weld the pad eyes to the main bearing structure of the container.

### 3 STRUCTURAL STRENGTH

#### 3.1 GENERAL

**3.1.1** The following minimum material thickness requirements shall apply to container structural members made of steel:

.1 for external parts of corner posts and bottom rails for rails for  $R \geq 1000$  kg and more — 6 mm, for  $R < 1000$  kg — 4 mm;

.2 for other parts of the primary structure — 4 mm;

.3 for parts of the secondary structure — 2 mm.

**3.1.2** The container shall be designed to withstand loads in compliance with the requirements of ISO 10855-1.

The calculation shall include, at least, the following calculation conditions:

.1 lifting with a lifting set;

.2 horizontal impact;

.3 vertical impact.

If the container is fitted with: fork lift pockets, walls, doors and intermediate decks, top protection, they shall also be designed considering the loads specified in ISO 10855-1.

**3.1.3** For steel, the allowable stress for calculation conditions for lifting a container using a lifting set and forklift pockets shall be  $0,85R_e$ .

The allowable stress for other calculation conditions shall be  $R_e$  for steel.

The value of equivalent stresses for containers made of other materials is subject to special consideration by the Register.

**3.1.4** Deflections when designing corner posts and bottom side rails for horizontal shock loads shall not exceed  $l_n/250$ , where  $l_n$  is the length of the post or rail, in mm.

The deflections when designing other structural members of the container for horizontal shock loads shall not exceed  $l_n/250$ , where  $l_n$  is the length of the shortest element involved in design calculation, in mm.

Deflections in the calculation of the side and end rails of the container structure for vertical shock loads shall not exceed  $l_n/250$ , where  $l_n$  = the length of the rail, in mm.

**3.1.5** The strength of the container is determined by calculation and is confirmed by testing, the scope of which is specified in Section 8.

**3.1.6** Equipment for containers handled in open seas shall be designed and installed to withstand the dynamic loading and other forces to which it may be exposed in service.

**3.1.7** The following factors shall be used for equipment design:

.1 dynamic factor  $\Psi = 3$ ;

.2 design factor against breaking (safety factor)  $k = 2$ .

**3.1.8** Equipment permanently installed on a container is considered to be part of the container for certification purposes.



## **4 TANK CONTAINERS, BULK CONTAINERS AND THERMAL CONTAINERS**

### **4.1 GENERAL**

**4.1.1** In addition to the requirements of this Part, the tank container frame shall be designed to protect the vessel and service equipment.

**4.1.2** Tank containers designed for the transportation of liquids and non-refrigerated and refrigerated liquefied gases shall also comply with the applicable requirements of Part IV "Tank Containers".

**4.1.3** Pressurized bulk tank containers shall also comply with the applicable requirements of Part IV "Tank Containers".

**4.1.4** Non-pressurized bulk containers shall comply with the applicable requirements of Part VI "Non-Pressurized Bulk Containers".

**4.1.5** Thermal containers shall also meet the applicable requirements of Part III "Thermal Containers".

**4.1.6** Tank containers for dangerous goods shall additionally comply with the following requirements:

- .1** the top of the vessel and its fittings shall be protected by beams, plates or grating;
- .2** no part of the vessel or its fittings shall extend to within 100 mm of the top of the framework;
- .3** it shall not be possible for any part of the lifting set to foul fittings, manhole cleats or other protrusions on the vessel;
- .4** protective beams shall be placed at or near the location where the vessel shell is nearest to the outer plane of the sides. Beams shall be spaced sufficiently close together to give the necessary protection;
- .5** at the maximum design elastic deflection of any side member, the residual clearance between the member and any part of the vessel shell shall be at least 10 mm;
- .6** no part of the vessel, the bottom valves, or other fittings, shall extend below a level 150 mm above the bottom of the framework. Any such part extending to within 300 mm of the bottom of the framework shall be protected by beams or other equivalent means.

## **5 WELDING**

### **5.1 GENERAL**

**5.1.1** Welding shall be carried out in accordance with the requirements of 3.7, Part I of these Rules, the requirements of this Section taking into account the Rules for Technical Supervision during the Manufacture of Containers.

**5.1.2** Main bearing structural members shall be welded with full penetration welds. For other primary structure parts, welding without full penetration welds (fillet welds) may be used subject to special consideration by the Register, having regard to the design and calculations. Intermittent fillet welding of secondary structure is acceptable. Fork lift pockets shall be welded to bottom side rails with full penetration welds.

## **6 MATERIALS**

### **6.1 GENERAL**

**6.1.1** Extra high strength steels, with yield stress above 500 N/mm<sup>2</sup> shall not be used in the container structure.

When materials of different galvanic potential are joined together, the design shall be such that galvanic corrosion is avoided.

**6.1.2** The steels used for manufacturing the primary structure shall comply with the requirements of Section 3, Part I "Basic Requirements", be deoxidized and meet the following requirements:

samples impact test temperature for primary structure materials of 12 mm and below in thickness shall be 10 °C above than the minimum operating temperature of the container;

samples impact test for primary structure materials of above 12 mm and below 25 mm in thickness shall be carried out at the minimum operating temperature of the container;

samples impact test for primary structure materials of above 25 mm in thickness shall be 20 °C lower the minimum operating temperature of the container.

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

2. Impact tests for steels of 6 mm of thickness or less shall not be performed.

**6.1.3** Traceability and certificates of primary structure materials shall be provided.

**6.1.4** Where other materials are used, they shall comply with the requirements of ISO 10855 1 standard and are subject to special consideration by the Register.

**6.1.5** Rubber and other materials used to seal the opening elements of containers shall comply with the requirements of 3.6, Part I "Basic Requirements".

## **7 MARKING**

### **7.1 SAFETY MARKING**

**7.1.1** The tops of closed containers and the top rails of fully open containers shall be marked as follows:

**.1** closed containers shall be marked with a band of solid contrasting colour 100 mm wide round the roof perimeter using a contrasts colour to the container colour. If the roof of the container is recessed below the top perimeter rails, at least the top surface of the top rail shall be marked;

**.2** open and framed containers shall be marked on the top surface of the top rails with hatching of a contrasting colour.

**7.1.2** Where the container is fitted with fork pockets for handling the container only when empty, the "Empty lift only" marking shall be displayed near each pair of pockets. The letters shall be not less than 50 mm high.

*Note.* The marking may be in the national language if required by the customer.

**7.1.3** Side surfaces of aluminum containers shall be additionally marked as follows: "ALUMINIUM CONTAINER". The height of the characters shall be at least 75 mm.

### **7.2 IDENTIFICATION MARKING**

**7.2.1** Each container shall have the manufacturer's serial number welded on in characters at least 50 mm.

*Note.* It is recommended to place the serial number on the rear bottom end rail of the container. The rear side of the container is a wall with a gate.

**7.2.2** Each container shall be marked with the number of the owner. The number of the owner is applied to all the sides of the container with paint or material with an adhesive layer that contrasts with the container colour. The characters shall be not less than 75 mm. If the container has a roof, the container number shall be displayed marked on it in characters 300 mm high or more.

If the marking of the specified height is impossible due to the roof construction, the marking of the greatest possible height shall be applied. The marking shall be carried out in such a way as to avoid incorrect interpretation, e.g. underlining. Where applicable, the marking shall be positioned near the side of the container in which the door is located.

**7.2.3** On each pad eye there shall be a stamped or engraved marking of the pad eye metal heat number.

### **7.3 INFORMATION MARKING**

**7.3.1** Each container shall be marked as follows:

**.1** maximum gross mass, in kg;

**.2** tare mass, in kg;

**.3** payload, in kg.

The characters shall be not less than 50 mm high.

*Note.* Marking shall be made in English. Additionally, marking may be made in the national language.

#### **7.4 ADDITIONAL MARKING**

**7.4.1** If the container is fitted with an intermediate cargo deck, the payload of the deck shall be displayed on the inside of the container in a position where it is clearly visible at all times, using paint or by means of a material with an adhesive layer that contrasts with the colour of the container. The characters shall be not less than 50 mm high.

**7.4.2** If applicable, the container shall be marked in accordance with the requirements of Part VI "Fire Protection" and Part X "Electrical Equipment" of the Rules for the Classification, Construction and Equipment of Mobile Offshore Drilling Units (MODU) and Fixed Offshore Platforms (FOP), Part VI "Fire Protection" of the Rules for the Classification and Construction of Sea-Going Ships, applicable international documents upon customer's request, danger signs of electric shock hazard and earthing signs.

**7.4.3** If the container is intended for the transportation of dangerous goods, the requirements of IMDG Code regarding marking shall be also met.

**7.4.4** General freight containers shall be marked in accordance with the requirements of Section 4, Part I, "Basic Requirements".

**7.4.5** Thermal containers shall be additionally marked in compliance with the requirements of Section 4, Part III, "Thermal Containers".

**7.4.6** Tank containers shall be additionally marked in compliance with the requirements of Section 4, Part IV "Tank Containers".

**7.4.7** Non-pressurized bulk containers shall be marked in compliance with the requirements of Section 4, Part VI "Non-Pressurized Bulk Containers".

**7.4.8** A Register emblem of the approved type shall be marked on a container manufactured under the Register's technical supervision.

**7.4.9** If the container is fitted with a driving ramp, the ramp shall be clearly marked with the maximum permissible axle load, the value of which shall be 0,8 of the test load.

**7.4.10** Additional markings may be applied on the container upon the customer's request (such as owner's name, etc.). Additional marking shall be kept to a minimum.

#### **7.5 PLATES**

**7.5.1** Each container shall be fitted with at least two plates, the information plate and the inspection plate. The data may be combined onto a single plate, the information plate therewith shall be supplemented with the information required for the inspection plate.

Plates shall be made of corrosion resistant material and fitted to a door, or, on containers with no doors, in a prominent position, in a manner designed to avoid unauthorized removal or damage. Aluminium rivets shall not be used for fixing the plates.

All the information on the plates shall be in the English language. In addition to that, provision for a national language may be made.

The text shall be permanently and legibly marked on the plates. The characters shall be not less than 4 mm high.

##### **7.5.2 Information plate.**

A recommended format for the plate is shown in Fig. 7.5.2.

The plate shall contain the following information:

- .1** identification tag of the container handled in open seas, RS;
- .2** serial number;
- .3** month and year of manufacture;
- .4** maximum gross mass excluding lifting set at the design sling angle, in kg;
- .5** tare mass excluding lifting set, in kg;
- .6** payload and intermediate deck payload (if applicable), in kg;

OFFSHORE CONTAINER DATA PLATE RS		
Date of manufacture:		
Manufacturer's No.:		
Maximum gross mass excluding lifting set:	kg at	°from vertical
Tare mass excluding lifting set:	kg	
Payload:		
Container	kg	
Intermediate deck	kg	
Certificate No.:		
Design temperature:	°C	

Fig. 7.5.2. Information plate

Note. Title of a name plate may be as follows: "OFFSHORE CONTAINER DATE PLATE RS/ISO 10855-1".

.7 number of the RS Type Approval Certificate for Offshore Container;

.8 minimum container operating temperature.

### 7.5.3 Inspection plate.

A recommended format of a plate is shown in Fig. 7.5.3

OFFSHORE CONTAINER INSPECTION PLATE RS		
Owner's container No:		
Owner:		
Inspections:		

Fig. 7.5.3. Inspection plate

The plate shall contain the following information:

.1 offshore container inspection plate, RS;

.2 owner's container number;

.3 owner's name;

.4 dates of inspections.

Provision shall be made on the plate to facilitate permanent marking to record a minimum of nine inspections.

Note. The requirements for the periodicity of inspections and the markings on the plate are specified in the relevant sections of the Rules for Technical Supervision of Containers in Service.

## 8 TESTING

### 8.1 GENERAL

**8.1.1** The tests described in 8.2 to 8.3 are required for all offshore container types.

**8.1.2** The test loads shall be evenly distributed over the container floor. If it is not possible to place all the test loads inside the container, some of it may be placed outside or under the container, provided that this gives a loading on the structure similar to the distribution of the container loading in operating condition.

*Note.* Loads used in the tests shall comply with the requirements of ISO 10855-1.

**8.1.3** If the container has an additional cargo deck, the test load shall be evenly divided between the floor and the cargo deck.

**8.1.4** The test devices for creating the required test loadings shall not interfere with free deflection of container sections under test.

**8.1.5** On completion of each test, the container shall show neither permanent deformation nor abnormalities which may render it unsuitable for the designed purpose.

**8.1.6** The Register may require inspecting of the most loaded welds on completion of the nondestructive testing agreed with the Register.

**8.1.7** Auxiliary containers may be tested without insulation and equipment installed.

**8.1.8** The minimum number of containers from the batch subject to testing in case of series manufacture is specified in Table 8.1.8.

Table 8.1.8

Batch size	Number of containers*
1 — 5	1
6 — 10	2
11 — 20	3
21 — 40	4
> 40	10 %
* — the number is specified with due account for container prototype testing.	

### 8.2 LIFTING

#### 8.2.1 Basic requirements.

The container shall be carefully lifted in such a way that no significant acceleration forces occur. After lifting the container shall be suspended for at least 5 min. The container shall be lifted by a lifting set with an angle to the vertical equal to the design angle. The lifting set normally fitted to the container during operation shall not be used at tests.

#### 8.2.2 All-point lifting.

**8.2.2.1** The container shall have a uniformly distributed load such that the combined mass of the container and test load is equal to  $2,5R$  and be lifted using all the pad eyes.

**8.2.2.2** Elastic deflections during testing shall not be greater than  $1/300$  of the length of any member.

#### 8.2.3 Two-point lifting.

A container fitted with four pad eyes shall be lifted using two pad eyes located diagonally opposite each other. The container shall have a uniformly distributed load such that the combined mass of the container and test load is equal to  $1,5/R$ .

*Note.* For containers with a non-symmetrical design, a two-point lift test shall be carried out for each pair of pad eyes.

### **8.3 VERTICAL IMPACT TEST**

**8.3.1** The container, loaded to its gross mass  $R$  with a load secured inside the container, shall be either lowered or dropped on to a rigid floor.

*Notes:* 1. This floor may be covered with a sheathing of wooden planks with a thickness not exceeding 50 mm.  
2. If the container is tested by lowering, the lowering speed shall be as high as practicable.

**8.3.2** In both cases, the container shall be so inclined that each of the bottom side and end rails connected to the lowest corner forms an angle of not less than  $5^\circ$  with the floor on to which the container is lowered or dropped. However, the greatest height difference between the floor and the highest and lowest point of the underside of the container corners shall not be more than 400 mm.

**8.3.3** The impacting corner shall be the one expected to have the lowest rigidity. On closed general freight containers with doors this will normally be at the door end.

**8.3.4** No permanent deformation shall occur during the tests, which could render the container incapable of being used for its designed purpose. There may be minor cracks in welds and minor deformations which may be repaired.

**8.3.5 The following test procedures may be used.**

**8.3.5.1** Drop test.

At drop test, the container shall be suspended from a quick release hook. When released, the container, inclined as per 8.3.2, shall drop freely for at least 50 mm to give it a speed at initial impact of at least 1 m/s.

**8.3.5.2** Lowering test.

At lowering test, the container shall be lowered at a speed of not less than 1,5 m/s.

### **8.4 OTHER TESTS**

**8.4.1** Container with fork pockets designed for loaded lifting shall be loaded to a total mass of  $1,6(R+S)$  with regard for the lifting set mass and lifted using the fork pockets. No deflections during testing shall be greater than  $l/300$  of the length of any member. The container shall show no permanent deformation or other damage after testing.

**8.4.2** The tank of tank containers and its equipment shall be subjected to the applicable tests in compliance with the requirements of Part IV "Tank Containers".

**8.4.3** Thermal containers shall be subjected to the applicable tests in compliance with the requirements of Part III "Thermal Containers".

**8.4.4** Load securing devices of general freight containers shall be tested in compliance with 3.16, Part II "General Freight Containers" with due regard for the design load of 10 kN.

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

It is permitted not to test the closed containers for weathertightness, provided that the technical documentation includes a mark that this container is non-hermetic.

*Note.* The container prototype and 10 % of the manufactured batch are subject to testing.

**8.4.6** Driving ramp approach shall be tested in compliance with ISO 10855-1.

**8.4.7** The Register may require to carry out additional tests depending on the type and design of the container.



## **9 LIFTING SET**

### **9.1 GENERAL**

#### **9.1.1 Application.**

The requirements of this Section apply to the lifting sets and their items used on offshore containers.

#### **9.1.2 Technical documentation.**

The technical documentation to be submitted for approval shall contain the following:

##### **9.1.2.1** For ready-assembled lifting sets:

.1 technical conditions (technical specification for foreign residents) of a lifting set with the data on the standards it complies with, grades of materials, operating temperature range, dimensions, working load limits, test loads, breaking force, intervals and ways of in service tests, safe conditions assessment criteria;

.2 assembly drawings of the lifting set, drawings of components and parts;

.3 a marking drawing;

.4 a list of lifting set items suppliers;

.5 a test program for a prototype and serial products;

.6 copies of certificates for materials.

The extent of the documentation is the minimum required.

##### **9.1.2.2** For lifting set items:

.1 technical conditions (technical specification) with the data on the standards it complies with, grades of materials, operating temperature range, dimensions, working load limits, test loads, breaking forces;

.2 drawing of each component;

.3 list of suppliers, if applicable;

.4 test program for a prototype and serial products.

The extent of the documentation is the minimum required.

### **9.2 TECHNICAL REQUIREMENTS**

**9.2.1** The lifting set shall be designed for use on offshore containers. The lifting set shall not be withdrawn from the container in use unless for repairs or replacement.

*Note.* Lifting set of an auxiliary offshore container may, in justified cases, be removed from the container for the period of long-term stay ashore or on the drilling rig.

**9.2.2** The lifting set slings (wire ropes or chains) shall be fastened to pad eyes using shackles complying with 9.4.

**9.2.3** Slings shall be designed for use at a certain angle to the vertical of 45° and less.

**9.2.4** In order to facilitate container handling and enhance safety, the lifting sets fitted with an additional fore runner and a master (top) link are recommended. The master (top) link shall have dimensions adequate for hooking on cargo handling hooks. The master (top) links of inner dimensions shall be at least 270 × 140 mm.

**9.2.5** Hinge joints for lifting sets are not permitted.

**9.2.6** For easy handling of containers the lifting set slings shall be of sufficient length to ensure the master (top) link being at a height of no more than 1,3 m above the container bottom with the slings hanging over the longest side of the container.

**9.3 STRENGTH**

**9.3.1** In order to determine the characteristics and dimensions of lifting sets and items thereof, the required minimum working load limits ( $WLL_{\min}$ ), specified in Table 9.3.1 shall be used. To allow for the dynamic amplification that will be experienced when lifting the containers handled in open seas, the maximum gross mass of containers specified in Table 9.3.1 shall be multiplied by a corresponding enhancement factor.

Table 9.3.1

Maximum gross mass, $R$ , kg	Enhancement factor	Minimum required working load limit ( $WLL_{\min}$ ), tonnes
500	—	7,00
1000	—	7,00
1500	—	7,00
2000	3,500	7,00
2500	2,80	7,20
3000	2,600	7,80
3500	2,403	8,41
4000	2,207	8,83
4500	2,067	9,30
5000	1,960	9,80
5500	1,873	10,30
6000	1,766	10,60
6500	1,733	11,26
7000	1,700	11,90
7500	1,666	12,50
8000	1,633	13,07
8500	1,600	13,60
9000	1,567	14,10
9500	1,534	14,57
10000	1,501	15,01
10500	1,479	15,53
11000	1,457	16,02
11500	1,435	16,50
12000	1,413	16,95
12500	1,391	17,38
13000	1,368	17,79
13500	1,346	18,18
14000	1,324	18,54
14500	1,302	18,88
15000	1,280	19,20
15500	1,267	19,64
16000	1,254	20,06
16500	1,240	20,47
17000	1,227	20,86
17500	1,214	21,24
18000	1,201	21,61
18500	1,188	21,97
19000	1,174	22,31
19500	1,161	22,64
20000	1,148	22,96
20500	1,143	23,44
21000	1,139	23,92
21500	1,135	24,39
22000	1,130	24,86
22500	1,126	25,33
23000	1,121	25,79
23500	1,117	26,25
24000	1,112	26,70
24500	1,108	27,15
25000	1,104	27,59

**9.3.2** The minimum required working load limit for the lifting set items (chains, ropes, links, shackles) shall be determined by Table 9.3.2

Table 9.3.2

Minimum required working load limits for the lifting set items ( $WLL_{s_{min}}$ )

Four-leg sling	Two-leg sling	One-leg sling
$WLL_{min}/3\cos\alpha$	$WLL_{min}/2\cos\alpha$	$WLL_{min}$
Note. $\alpha$ is an angle between the lifting set sling and the vertical.		

**9.3.3** For additional fore runners and master (top) links:  $WLL_{s_{min}} = WLL_{min}$ .

**9.3.4** The lifting set items shall be selected considering the  $WLL_{s_{min}}$  values calculated according to recognized standards.

## 9.4 LIFTING SETS ITEMS

**9.4.1** The lifting set items like chains, ropes, shackles, connecting, intermediate and master links shall comply with the requirements of these Rules. Lifting sets items manufactured in compliance with the requirements of standards which differ from those specified in this Part of the Rules are subject to special consideration by the Register.

**9.4.2** Chain slings shall comply with EN 818-4.

**9.4.3** Rope slings shall comply with EN 13414-1 with due regard to the requirements of this Part of the Rules. Ropes shall be of steel wire and may have a steel or fiber core. The ropes shall be of marking group 1770 or 1960 and shall be of type  $6 \times 19$  or  $6 \times 36$ . The sling ends shall terminate with a thimble by pressing in bush or socket and shall comply with EN 13411-3.

End terminations pressed in bush which permit the tail end of the rope to be visible are recommended. The thimbles shall comply with EN 13411-1 or OST 5.2313-79.

**9.4.4** The shackles shall be Grade 6 or 8 and shall comply with EN 13889 or EN 1677-1 or ABNT NBR 13545 with due regard to the requirements of this Part of the Rules.

The shackle pins shall be with hexagon head, hexagon nut and split cotter pin. The tolerance on the nominal diameter of the shackle pin shall be  $0 + 3\%$ .

## 9.5 MATERIALS

**9.5.1** The materials used for manufacture of the lifting set items shall meet the requirements of the standards specified in 9.4, additional requirements of this Part of the Rules, possess sufficient ductility at low temperatures and withstand dynamic loads.

**9.5.2** The steels used for manufacture of the lifting set items shall be impact tested in accordance with the requirements of 3.2.8, Part I "Basic Requirements" at the minimum working temperature. The minimum average impact energy in testing shall be not less than 42 J. Testing of materials for manufacture of ropes, bushes and thimbles may be exempted.

**9.5.3** For welded lifting set items (chains links, rings, etc.), it shall be sufficient only to take impact test samples in the weld with the V-notch centred in the weld line. The weld line shall be accurately identified by etching with a suitable reagent before cutting the notches. The minimum average impact energy obtained during testing shall be not less than 27 J. For the lifting set components subject to heat treatment, the test specimens shall be heat-treated prior to testing as per the modes complying with the heat treatment of finished products or the lifting set in assembly, according to the approved technical documentation.

**9.5.4** Galvanizing of lifting sets items shall be carried out in accordance with ISO 10855-2.

## **9.6 TESTING**

**9.6.1** Materials shall be tested in compliance with 9.5.

**9.6.2** Tests of the assembled lifting set prototypes and the items thereof, as well as tests in serial production shall be conducted at the manufacturer or at the laboratory recognized by the Register in the presence of the Register surveyor.

**9.6.3** The scope of tests of the lifting set items shall comply with the requirements of the standards listed in 9.4, as well as of the approved technical documentation.

**9.6.4** During manufacture of rope lifting sets from ropes supplied without the Register documents the overall rupture strength of the rope shall be tested at one specimen of each rope tier after end termination. If the rope is supplied with the Register documents this test is not required.

**9.6.5** Rope lifting sets shall be tested in operation for a load equal to  $2 \times WLL$ .

**9.6.6** The test shall be carried out using a correspondingly tared testing machine or by hanging a load of a certain mass. The guaranteed accuracy of testing machines shall be  $\pm 2 \%$  that shall be supported by the relevant document.

**9.6.7** The test load is applied statically, and the holding time under load shall be at least 5 min.

**9.6.8** Testing of the prototypes and type-series of chain lifting sets are carried out in accordance with the requirements of EN 818-4.

**9.6.9** No permanent deformations and damages preventing the safe use of the lifting set and its items according to their purpose shall be detected after testing.

## **9.7 MARKING**

**9.7.1** The lifting set items shall be marked in accordance with the requirements of applicable standards and this Chapter.

**9.7.2** Shackles shall be indelibly marked with a unique identification. The symbols shall be at least 5 mm in height. The shackle areas with the minimum material stresses shall be marked.

**9.7.3** For a rope lifting set, an indelible marking shall be applied to the serial number of the lifting set on one of the bushes in the area of the master link, in a manner agreed with the Register. The symbols shall be at least 5 mm in height. Marking shall be applied before testing.

**9.7.4** For a chain lifting set, one of the upper rings of the leg shall be marked indelibly with the serial number of the lifting set in a manner agreed with the Register. The symbols shall be at least 5 mm in height. Marking shall be applied before testing.

**9.7.5** The lifting set shall be fitted with a metal identification tag attached to its top part. The identification tag shall be 8-sided for chains and round for ropes. The tags can be of two types.

9.7.6 The identification tag (Type 1, Fig. 9.7.6) shall include:

- .1 RS abbreviation;
- .2 number of slings; caliber of chain or diameter of rope slings, including optional top leg (where fitted);
- .3 manufacturer's mark
- .4 maximum sling angle to the vertical;
- .5 working load limit ( $WLL_s$ ) of shackles, in tonnes;
- .6 working load limit ( $WLL_{off}$ ) of the lifting set, in tonnes, which shall correspond to the maximum gross mass of the offshore container where a lifting set can be used with a set angle to the vertical.

Note. The value of the lifting set working load limit may vary from maximum gross mass of the offshore container, to which it is fitted;

- .7 mass of the lifting set, in kg;
- .8 Register certificate number in the format XX.XXXXXX.XXX;
- .9 lifting set serial number;
- .10 survey type mark (in compliance with the Rules for Technical Supervision of Containers in Service), mark of the survey body and the survey date in YY-MM-DD format;
- .11 identification numbers of shackles;
- .12 additionally, upon the customer's request, the lifting set owner's name may be applied.

Note. If the lifting device complies with the requirements of ISO 10855-2 standard, the plate title can be: RS/ISO 10855-2.

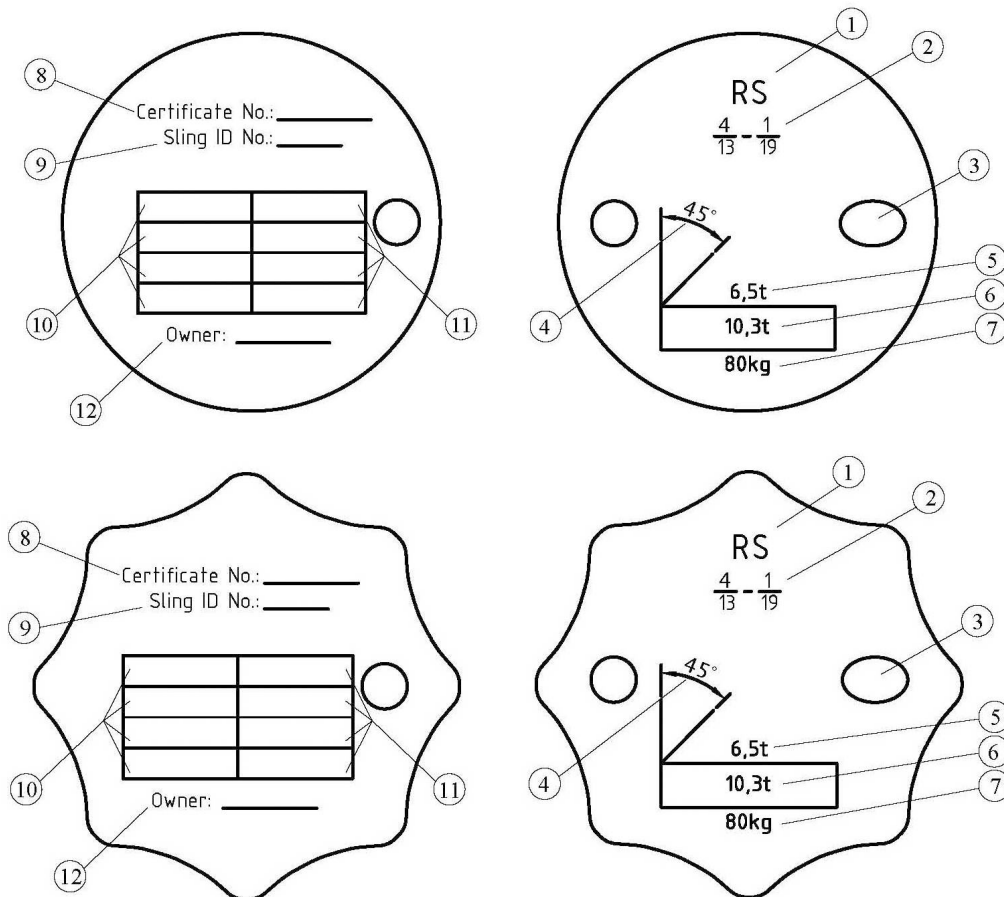


Fig. 9.7.6 Example of identification plate (Type 1)

- 1 — RS abbreviation; 2 — the number and thickness of slings (13 mm for main slings and 19 mm for additional one);  
 3 — manufacturer's mark; 4 — maximum sling angle to the vertical; 5 — working load limit of shackles, in tonnes;  
 6 — working load limit of the lifting set in tonnes; 7 — mass of the lifting set, in kg; 8 — number of the Register certificate;  
 9 — the serial number of the lifting set; 10 — mark of the survey type, the mark of the survey body that conducted the survey  
 and the survey date in YYYY-MM-DD format; 11 — identification numbers of shackles; 12 — lifting set owner's name

9.7.7 The identification plate marking (Type 2, Fig. 9.7.7) shall include:

- .1 RS abbreviation;
- .2 QR code of the Register certificate;
- .3 Register certificate number in the format XX.XXXXXX.XXX;
- .4 lifting set serial number;
- .5 survey type mark (in compliance with the Rules for Technical Supervision of Containers in Service), mark of the survey body and the survey date in YYYY-MM-DD format;
- .6 identification numbers of shackles;
- .7 additionally, upon the customer's request, the lifting set owner's name may be applied.

Note. If the lifting set complies with the requirements of ISO 10855-2 standard, the tag title can be: RS/ISO 10855-2.

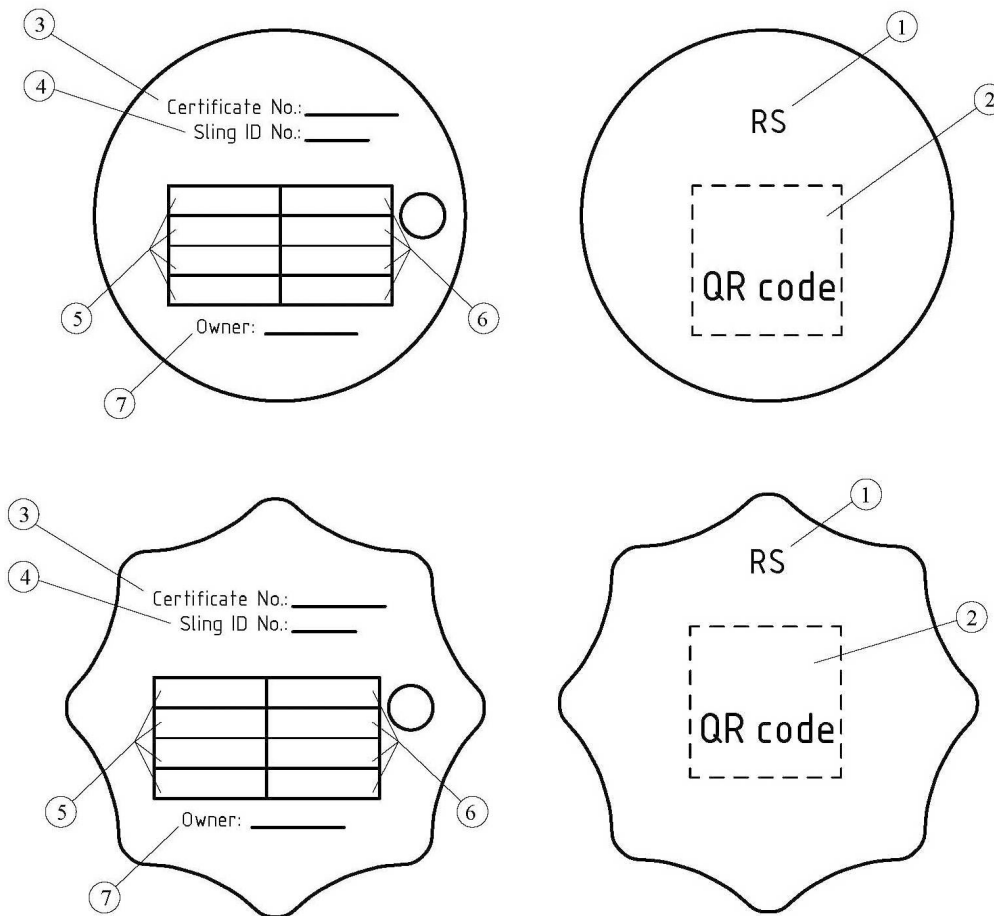


Fig. 9.7.7 An example of identification tag (Type 2)

1 — RS abbreviation; 2 — QR code of the Register certificate; 3 — number of the Register certificate; 4 — the serial number of the lifting set; 5 — mark of the survey type, mark of the survey body that conducted the survey, and the date of survey in the format YY.MM.DD; 6 — identification numbers of shackles; 7 — the lifting set owner's name

## **PART VIII. TANK CONTAINERS WITH FIBER-REINFORCED PLASTICS (FRP) SHELL**

### **1 GENERAL**

#### **1.1 APPLICATION**

**1.1.1** The requirements of this Part apply to tank containers with fiber-reinforced plastics (FRP) shell designed for the transportation of goods of classes 3, 5.1, 6.1, 6.2, 8 and 9 by several modes of transport.

**1.1.2** Tank containers with a FRP shell shall meet the requirements of Part I "Basic Requirements", the requirements of Part IV "Tank Containers", except for the requirements applicable to non-refrigerated and refrigerated liquefied gases, to metal materials for the production of tank container shell, as well as the requirements of this Part.

**1.1.3** Additional international and national requirements may apply to tank containers with FRP shell used for the transportation of dangerous goods.

#### **1.2 DEFINITIONS AND EXPLANATIONS**

**1.2.1** The definitions and explanations relating to the general terminology of these Rules are given in Part I "Basic Requirements". Definitions and explanations relating to terminology regarding tank containers are given in Part IV "Tank Containers".

For the purpose of this Part the following definitions and explanations have been adopted.

**Veil** means thin mate, as usual of 0,18 — 0,51 mm thickness with high absorbency used in FRP product plies where polymeric matrix surplus fraction content is required (surface evenness, chemical resistance, leakage-proof, etc.).

**FRP components** mean reinforcing fibers (filler), plastic binder (matrix), adhesives, and aggregates.

**Structural layers** are unidirectional or bidirectional FRP layers in the design of a multi-layer vessel shell that perceive loads during the operation of a tank container.

**Reference sample** is a sample cut out of a vessel to define the identity of series products to the test/prototype sample.

**Liner** means a closed part consisting of a chemically resistant layer and FRP layers supporting it.

**Mate** means fiber reinforcement made of randomly chopped or twisted fibers.

**Witness sample** means a specimen fabricated as per the procedure identical to production process of the corresponding part of FRP shell.

**Flame protection layer** means a layer on the outer surface of a tank shell that ensures its protection from external fire.

**Fiber-reinforced plastic (FRP)** means a structural material that consists of reinforcing fibers (filler), polymer binder (matrix) and is formed directly during the manufacture of a FRP container and its elements.

**Design characteristics** are the characteristics of FRP structures strength and rigidity obtained by testing coupon-samples with consideration of normative requirements to strength and rigidity factors, and strength criteria assumed for the design of the shell.

**Roving** is fiberglass harness produced by splicing several glass fibers together.

**FRP shell** means a closed cylindrical product with openings and their closures, but without service equipment or external structural equipment; it is intended for the storage and transportation of liquid substances including aggressive ones.

**Chemically resistant layer** means a layer on the inner surface of a multilayer shell of a FRP shell that protects the shell structural layer from the chemical effect of the transported cargo.

**Tank** means a FRP shell with service and external structural equipment installed on it.

**Coupon sample** means a FRP specimen manufactured and tested in accordance with national and/or international standards to determine design characteristics.

### **1.3 TECHNICAL SUPERVISION**

**1.3.1** In addition to the provisions of 1.3 of Part IV "Tank Containers", the following shall be subject to technical supervision of the Register:

- .1** the raw materials and materials used for the manufacture of FRP shells;
- .2** process procedures for the manufacture of FRP shells;
- .3** representative samples, coupon samples and witness samples.

### **1.4 TECHNICAL DOCUMENTATION**

**1.4.1** The technical documentation specified in 1.3.4 of Part I "Basic Requirements" in relation to tank containers with FRP shell shall include the following:

**.1** technical conditions (technical specification) with indication of its type and purpose (transported goods in accordance with 1.4.1.3), applicable normative documents, technical characteristics, materials of the bearing structure, (framework) and FRP shell and their strength characteristics including frame welding materials, types of welds and methods of their inspection;

**.2** strength calculations of the framework (frame elements) and tanks with a FRP container shell made in compliance with the requirements of 2.2.8, 2.2.9, 2.2.12, 2.2.13, 2.2.19 and 3.3.2 using the finite element method (FEM), and also calculations of safety devices, piping and ullage;

**.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.

*Note.* In addition, the Register may request the documents to verify the resistance of materials of a container, its fittings and seals to the transported goods;

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

**.5** operation manual (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:

corner fittings (during production at containers manufacturer's);

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

tanks with indicated orientation and reinforcement schemes of FRP structural layers the materials used;

hatch and manhole covers;

piping;

items covered by CCC requirements;

CSC and CCC Plates;

plate bearing the particulars of the tank;

general views of the container and its marking;

**.7** summary table of framework welded joint types and their structural elements;

**.8** chart and table for container frame elements welded joint quality inspection;



- .9 process specification for the manufacture of a FRP shell with an indication of the specifications of the materials used, components and method for monitoring technological defects;
  - .10 specifications of raw materials and components submitted by their manufacturers;
  - .11 program of incoming control of raw materials and components;
  - .12 technical conditions (technical specification) for FRP shells;
  - .13 instructions for FRP quality control and elimination of impermissible process defects;
  - .14 a list of permissible process defects and operational damage in compliance with the standards, the use of which has been agreed with the Register, or with the calculation and experimental procedures approved by the Register;
  - .15 test reports for coupon samples;
  - .16 methods for determining the design characteristics of FRP used in the shell structure.
- 1.4.2 The extent of the above documentation is the minimum required.

## **2 TECHNICAL REQUIREMENTS**

### **2.1 BASE STRUCTURE**

The base design of the tank containers with a FRP shell shall meet the requirements of 2.1, Part IV "Tank Containers".

### **2.2 TANKS**

**2.2.1** Tanks with a FRP shell shall be designed and manufactured by organizations that have a quality assurance system recognized by the Register, as well as in accordance with the Rules for FRP Pressure Vessels recognized by the Register, taking into account national and/or international standards.

**2.2.2** The tank with a FRP shell shall be rigidly connected to the elements of the container frame. Supports and fasteners of the tank to the framework shall not cause dangerous local stress concentrations in the FRP shell in compliance with the provisions specified in this Section.

**2.2.3** For tank containers with a FRP shell, the use of heating elements is not allowed.

**2.2.4** Components and materials compatible with the transported liquids at operating temperatures from  $-40\text{ }^{\circ}\text{C}$  to  $50\text{ }^{\circ}\text{C}$  shall be used for the manufacture of a FRP shell.

For tank containers operated in severe climatic conditions, the range of design temperatures shall be agreed with the Register.

**2.2.5** The multilayer FRP shell shall consist of the following three elements:

internal chemical resistant layer (liner);

construction layers;

outer layer.

**2.2.5.1** The inner chemical resistant layer (liner) shall be designed so that it is the main barrier layer providing long-term resistance to the chemical effect of the transported substances and preventing any dangerous reaction with the vessel contents or the formation of hazardous compounds, or any significant reduction in the strength of the structural layers of the vessel due to diffusion transported product through the inner layer (liner).

The inner layer (liner) may be made both of thermoactive FRP and thermoplastic FRP.

Thermoactive FRP liner shall include:

surface chemical resistant layer (gel-coating) consisting of resin and reinforced with a veil compatible with the resin and transported substances. This layer shall contain no more than 30 % of veil by weight and have a thickness of 0,25 — 0,6 mm;

reinforcing layer: one layer or several layers with a total thickness of at least 2 mm that contains at least  $900\text{ g/m}^2$  of glass mat or FRP randomly reinforced with chopped fibers with a mass fraction of fiberglass of at least 30 %, unless the equivalent level of safety is demonstrated for a lower fiberglass content.

A thermoplastic FRP liner shall consist of the sheets specified in 2.2.6.3 connected to the structural layers of the vessel.

*Note.* For the transportation of flammable liquids, in accordance with 2.2.24, additional measures may be required to prevent the accumulation of electric charges in the inner layer.

**2.2.5.2** The structural layers of the shell is the zone specially designed in accordance with the requirements of 2.2.8, 2.2.9, 2.2.12 and 3.3.2 to withstand design and mechanical stresses. This part of the vessel consists of several fiber-reinforced layers oriented in preset directions.

**2.2.5.3** The outer layer is part of the shell, which is directly exposed to the environment. It shall consist of a single layer with a high resin content, with a thickness of at least 0,2 mm. For a thickness greater than 0,5 mm, a mat shall be used. The mass content of fiberglass in such a layer shall not exceed 30 %.

This layer shall withstand the effects of transported substances in case of accidental contact with them (spillage, etc.). The resin of the outer layer shall contain fillers and additives that protect the structural layers of the vessel from damage when exposed to ultraviolet radiation and salt fog.

It is allowed to use other materials that provide equivalent protection of the shell wall against external factors, as mentioned above.

**2.2.6** Raw materials and components:

**.1** resins. When manufacturing a binder and/or mixtures based on original resins, the recommendations of the manufacturer shall be strictly followed.

In manufacturing FRP shells, the following types of resins may be used:

unsaturated polyester resins;

vinyl ester resins;

epoxy resins;

phenolic resins.

The heat distortion temperature (HDT) of the resin determined in accordance with ISO 75-1 shall be at least 20 °C higher than the maximum working temperature of the FRP shell and in all cases shall be at least 70 °C;

**.2** reinforcement fibers. Fiberglass of type E or ECR in accordance with ISO 2078 shall be used as reinforcement material of the structural layers of the vessel.

It is allowed to use reinforcing fibers of other types with the equivalent characteristics.

Type C fiberglass in accordance with ISO 2078 may be used for the inner surface of the liner. Thermoplastic veils can be used in the manufacture of the liner only if it is confirmed that they are compatible with the goods to be transported;

**.3** non-plasticized polyvinyl chloride (PVC-N), polypropylene (PP), polyvinylidene fluoride (PVDF), polytetrafluoroethylene (PTFE) may be used for the manufacture of a thermoplastic liner;

**.4** additives required for resin processing, such as catalysts, accelerators, hardeners and thixotropic substances, as well as materials used to improve vessel properties, such as fillers, dyes, pigments, etc., shall not cause a decrease in the strength of the vessel material taking into account the service life and operating temperatures for which this type of the tank container construction with a FRP shell is designed.

**2.2.7** The FRP shell, its fasteners, as well as service equipment shall be designed to withstand the loads specified in 2.2.8, 2.2.9, 2.2.12, 2.2.18 and 3.3.2 without loss of content (without taking into account the gas phase of the cargo coming through gas outlets) during the design service life.

**2.2.8** When loaded up to the maximum permissible gross mass  $R$ , a tank with a FRP shell, its supports and fasteners shall withstand the following separately acting statically applied forces:

**.1** in the moving direction: doubled gross mass  $R$  multiplied by the acceleration of gravity  $g$  ( $2Rg$ ). In design of tank containers for dangerous goods, the static forces in the longitudinal direction shall be equal to  $4Rg$ ;

**.2** horizontally at a right angle to the moving direction: gross mass  $R$  multiplied by the acceleration of gravity  $g$  ( $Rg$ ). If the direction of movement is not exactly determined, then the loads shall be taken equal to  $2Rg$ ;

**.3** vertically upwards: gross mass  $R$  multiplied by the acceleration of gravity  $g$  ( $Rg$ );

**.4** vertically downwards: doubled gross mass  $R$  multiplied by the acceleration of gravity  $g$  ( $2Rg$ ).

**2.2.9** For internal design pressure, external design pressure, statically applied loads specified in 2.2.8 and static gravity caused by the contents with the maximum density specified for this type of the tank container construction with a FRP shell, with the maximum degree of filling in each structural vessel layer shall meet the strength criterion expressed by the ratio:

$$F_1\sigma_{11} + F_2\sigma_{22} + F_{11}\sigma_{11}^2 + F_{22}\sigma_{22}^2 + F_{33}\sigma_{12}^2 + 2F_{12}\sigma_{11}\sigma_{22} < 1 \quad (2.2.9.1)$$

$$\text{where } F_1 = 1/\sigma_1^+ + 1/\sigma_1^-; F_2 = 1/\sigma_2^+ + 1/\sigma_2^-; F_{11} = 1/(\sigma_1^+\sigma_1^-), \quad (2.2.9.2)$$

$$F_{22} = 1/(\sigma_2^+\sigma_2^-); F_{33} = 1/\sigma_{12}^2; F_{12} = -1/2\sqrt{F_{11}F_{22}}, \quad (2.2.9.3)$$

$$\sigma_1^+ = \sigma_{1v}^+/K; \sigma_1^- = \sigma_{1v}^-/K; \sigma_2^+ = \sigma_{2v}^+/K, \quad (2.2.9.4)$$

$$\sigma_2^- = \sigma_{2v}^-/K; \sigma_{12v}^- = \sigma_{12v}^-/K, \quad (2.2.9.5)$$

- $K$  — safety factor;  
 $\sigma_{11}$  — stress applied along the fibers of a unidirectional FRP layer.  
 $\sigma_{22}$  — stress applied across the fibers of a unidirectional FRP layer.  
 $\sigma_{12}$  — effective shear stress of a unidirectional FRP layer.  
 $\sigma_{1v}^+$  — ultimate tensile strength of a lamina along the fibers determined as per ISO 527-5;  
 $\sigma_{1v}^-$  — ultimate compressive strength of a lamina along the fibers determined as per ISO 14126;  
 $\sigma_{2v}^+$  — ultimate tensile strength of a lamina across the fibers determined as per ISO 527-5;  
 $\sigma_{2v}^-$  — ultimate compressive strength of a lamina across the fibers determined as per ISO 14126;  
 $\sigma_{12v}$  — ultimate in-plane shear strength determined as per ISO 14129.

Tests to determine the design characteristics of the FRP  $\sigma_1^+$ ,  $\sigma_1^-$ ,  $\sigma_2^+$ ,  $\sigma_2^-$ ,  $\sigma_{12v}$  shall be carried out in accordance with the requirements of the specified ISO standards in at least six coupon samples characteristic of this type of vessel design and manufacturing technology.

The mass content of fibers in the test coupons shall be from 90 % to 100 % of the minimum mass content of fibers in the structural layers specified in the process specification for shell manufacture.

The calculation of the effective stress  $\sigma_{11}$ ,  $\sigma_{22}$  and  $\sigma_{12}$  in each structural layer of the FRP shell shall be carried out using the finite element method.

In justified cases, to confirm the strength of the FRP shell structure, it is allowed to use other ratios for the strength criterion as agreed with the Register.

The safety factor is calculated by the formula

$$K = K_0 \times K_1 \times K_2 \times K_3 \times K_4 \quad (2.2.9.6)$$

where  $K_0$  — strength factor. For general design tanks, the value  $K_0$  shall be at least 1.5. For tanks intended for the transportation of substances requiring a high degree of strength, the value  $K_0$  shall be multiplied by a factor of 2, if the shell is not provided with protection against damage, consisting of a full metal frame, including longitudinal and transverse structural elements;

$K_1$  — factor of deterioration of material properties due to creep or aging and as a result of the chemical effect of the substances transported. This ratio is calculated by the formula

$$K_1 = 1/\alpha\beta \quad (2.2.9.7)$$

where  $\alpha$  — creep factor;

$\beta$  — ageing factor determined as per EN 978 after the test carried out in accordance with EN 977.

Alternatively, it is permitted to use a conservative value  $K_1 = 2$ . To determine the values of  $\alpha$  and  $\beta$  factors, the value of the confidence interval shall be assumed  $2\sigma$ ;

$K_2$  — factor related to the service temperature and thermal properties of the resin, determined according to the following equation with a minimum value of 1:

$$K_2 = 1,25 - 0,0125(\text{HDT} - 70), \text{ where HDT is a heat distortion temperature of the resin, } ^\circ\text{C};$$

$K_3$  — fatigue ratio of material; the value  $K_3 = 1,75$  shall be used, unless a different value is approved by the competent authority. Under the action of loads specified in 2.2.8 (except for 4Rg in the longitudinal direction), a value of  $K_3$  equal to 1,1 is applied;

$K_4$  — curing factor with the following values:

1,1 — if curing is performed in accordance with the approved process;

1,5 — in other cases.

The minimum value of the safety factor  $K$  at the loads specified in 2.2.8 and 2.2.12 shall be at least 4.

**2.2.10** At any of the loads specified in 2.2.8 and 2.2.9, the elongation of the FRP shell shall not exceed the lesser of the following values in any direction: 0,2 % or 0,1 of the elongation of the resin at fracture determined in compliance with ISO 527-1.

**2.2.11** Under the test loads specified in Section 3 (static, dynamic and hydraulic tests), the maximum deformation of the shell in any direction shall not exceed the value of resin elongation at fracture.

**2.2.12** For external design pressure, the minimum safety factor for buckling of the shell shall be at least 5.

**2.2.13** The minimum thickness of the shell wall and heads shall be confirmed based on calibration calculations of the FRP shell strength, taking into account the strength requirements specified in 2.2.9, but in any case the minimum thickness of the structural layer shall not be less than 6 mm.

**2.2.14** A FRP shell shall withstand a drop ball impact test in accordance with the requirements of 3.3.3.

**2.2.15** The joints of the structural layers of the FRP shell including the connecting joints of the end heads and the cylindrical part of the vessel, as well as the connecting joints of the extinguishing bulkheads and partitions with the vessel shall withstand the loads indicated in 2.2.8, 2.2.9, 2.2.12 and 3.3.2. In order to avoid stress concentration in the area of joints, joints tapering shall be at least 1:6. The shear strength at the points of the specified joints shall be at least

$$\tau = Q/l \leq \tau_R/K \quad (2.2.15)$$

where  $\tau_R$  — joint bending shear strength in compliance with EN ISO 14125. If no measured values are available,  $\tau_R = 10 \text{ N/mm}^2$ ;  
 $Q$  — value of load per unit width of the joint under static and dynamic loads;  
 $K$  — safety factor determined in accordance with 2.2.9;  
 $l$  — the length of the overlap layers in the joint.

Other methods of calculating the joints areas of structural layers are allowed, considering the specific features of vessel design agreed with the Register.

**2.2.16** The openings in the shell shall be reinforced so that at least the same safety factors are ensured when exposed to the loads specified in 2.2.8, 2.2.9, 2.2.12, 3.3.2.2 and 3.3.2.3, as well as the for the FRP shell itself. A number of openings in the vessel shall be minimal. The axis ratio of the oval-shaped openings shall not exceed 2.

**2.2.17** When designing flanges and piping attached to the shell, the loads arising during handling operations and tightening of bolts shall also be taken into account.

**2.2.18** Strength calculations of a tank-container with a FRP shell in addition to the loads specified in 2.2.8, 2.2.9, 2.2.12, 3.3.2.2 and 3.3.2.3 are carried out for static test loads specified in Section 3 of Part II "General Freight Containers" and in 3.4 and 3.5 of Part IV "Tank Containers" (if there is a framework and/or contact pads).

**2.2.19** Verification strength calculations of a tank container with a FRP shell are carried out using finite element method simulating the shell layups, joints of shell layers to each other, joints of the shell to the container frame, areas of manholes, shut off valves and safety devices.

**2.2.20** The strength of bolted and bonded-and-bolted joints for installation of flanges of hatches and valves, and attachment points at the frame shall be confirmed during tests of the tank container prototype carried out in compliance with 3.3.2.

**2.2.21** The outer surface of the vessel shall have a flame protection coating. The flame retardant layer shall ensure the protection of the shell against flame in compliance with the test requirements specified in 3.3.4.

**2.2.22** Tanks with a FRP shell used for the transportation of flammable liquids of hazard class 3 with a flashpoint below 60 °C shall be designed to ensure the removal of static electricity from various components of the tank in order to avoid accumulation of dangerous electrostatic charges.

**2.2.22.1** Measured surface resistance on the inner and outer surfaces of the shell shall not exceed  $10^9 \text{ Ohm}$ . This may be achieved with additives to the resin or by installation of interlayer electrically conductive metal or carbon grids.

**2.2.22.2** Measured discharge-to-earth resistance shall not exceed  $10^7 \text{ Ohms}$ .

**2.2.22.3** All elements of the shell shall have electrical contact with each other, with the metal parts of the service and structural equipment of the tanks and with the vehicle. The resistance between the contacting elements and the equipment shall not exceed 10 Ohms.

**2.2.23** Tanks or tank compartments without vacuum relief valves shall be so constructed as to withstand an external pressure exceeding the internal pressure by at least 0,04 MPa; at the same time, the tank shall not have residual deformations or malfunctions, which may render the tank container unfit for the designed purpose.

**2.2.24** Ullage volume of a tank for liquids is to be determined depending on the kind of cargo transported; it shall, however, be minimum 2,5 % of total capacity at the ambient temperature of 50 °C. In no case shall the tank be completely filled at the ambient temperature of 55 °C.

**2.2.25** Tanks intended for the transportation of liquids with kinematic viscosity not exceeding 2680 mm<sup>2</sup>/s at a temperature of 20 °C shall be subdivided by baffle plates into sections with maximal capacity not exceeding 7500 liters if the tank is filled to more than 20 %, but less than to 80 % of its total capacity.

**2.2.26** Tanks designed for the transportation of specific dangerous goods shall have no openings located below the cargo level.

## **2.3 ARRANGEMENT OF SERVICE EQUIPMENT**

**2.3.1** Requirements for service equipment are specified in 2.3. Part IV "Tank Containers".

### 3 TESTING

#### 3.1 GENERAL

**3.1.1** When testing the tanks-containers with FRP shell, in addition to the requirements specified in this section, the requirements of Section 3 of Part IV "Tank Containers" (except for 3.8.7 and 3.9) shall be met. The requirements of this Section apply to tank containers with FRP shell of all sizes, regardless of design, materials and components used.

#### 3.2 TESTING MATERIALS AND COMPONENTS

**3.2.1** Resins. Tensile elongation of resin is determined in accordance with ISO 527-2, heat distortion temperature is in compliance with ISO 75-1.

**3.2.2** Reference samples. Prior to testing, all coatings are removed from the samples. If representative samples cannot be cut from the shell, witness samples may be used. During the test, the following parameters shall be determined:

- .1** thickness of the structural layers of the shell wall and heads;
- .2** mass content of fiberglass in compliance with ISO 1172, the orientation and arrangement of the reinforcing layers;
- .3** tensile strength, elongation at fracture and modulus of elasticity in accordance with ISO 527-4 or ISO 527-5 standards for samples cut in circumferential and longitudinal directions;
- .4** bending strength and deflection are determined by the creep test in compliance with ISO 14125 for 1000 hours in a sample of not less than 50 mm wide with a distance between the supports not less than 20 thicknesses of the structural shell of the vessel.

In addition, in accordance with EN 978 standard,  $\alpha$  — creep factor and  $\beta$  — ageing factor are determined during this test.

**.5** shear strength of interlayer joints (if any) is measured during testing of samples in accordance with ISO 14130.

**3.2.3** The creep factor  $\alpha$  and the ageing factor  $\beta$  are determined on samples cut from the vessel in accordance with the standards EN 978 and EN 977 for the subsequent calculation of the material deterioration factor  $K_1$  due to creep or ageing (2.2.9).

**3.2.4** The chemical compatibility of a FRP shell with the transported substances shall be demonstrated by one of the following methods. This demonstration shall account for all aspects of the compatibility of shell materials and equipment installed on it with the transported substances, including chemical degradation of the shell materials, the onset of critical reactions in the transported substance and hazardous reactions between both.

**3.2.4.1** Representative samples including those being a part of the liner (with welded joints if the liner is manufactured from thermoplastic FRP) are subjected to the chemical resistance test for 1000 hours at 50 °C in compliance with ISO 175. It is permitted to reduce the elastic modulus measured during the bending test in compliance with EN 978 by no more than 25 % in relation to the characteristics of the virgin samples. Cracks, bubbles, pitting corrosion, separation in structural layers, liner peeling and roughness are not permitted.

**3.2.4.2** Other methods to conform chemical compatibility after their justification are permitted.

### **3.3 TESTS OF TANK CONTAINERS**

**3.3.1** During the following tests, it is permitted to replace the regular service equipment of the tank with other equipment to ensure that the tests are carried out.

**3.3.2** A tank container with strain sensors installed in areas that require comparison of the results of FEM design calculation with test results shall be subjected to the following loads with strains recorded:

**.1** a tank container filled with water up to the maximum degree of filling;

**.2** a tank container filled with water up to 97 % of the total capacity subjected to dynamic longitudinal impact tests in accordance with the requirements of 3.7, Part IV "Tank Containers". The measured FRP shell deformations shall be compared with the design parameters;

**.3** a tank container filled with water subjected to internal test pressure in accordance with the requirements of 3.8 (except 3.8.7), Part IV "Tanks Containers. Under such load, the vessel shall have no visible damage or leakage of its contents.

**3.3.3** The tank shall be subjected to ball drop testing in compliance with EN 976-1. No visible damage is permitted inside or outside the tank.

**3.3.4** A prototype tank container with its service and structural equipment in place, filled with water up to 80 % of its maximum capacity, shall be subjected to full engulfment in flame for 30 min using an open reservoir filled with fuel oil or any other type of fuel with the same fire effect. The reservoir dimensions shall exceed those of the tank by at least 50 cm for each side, and the distance between the fuel level and the tank vessel shall be 50 to 80 cm. The rest of the tank below the liquid level, including openings and closures, shall remain leakproof, except for drips.

### **3.4 INSPECTIONS**

**3.4.1** Before being put into service, the tank container and its equipment shall be inspected in compliance with the requirements of 3.11, Part IV "Tank Containers".



## **4 MARKING**

### **4.1 MANDATORY MARKING**

**4.1.1** Tank containers with a FRP shell shall be marked in accordance with the requirements specified in Section 4, Part I "Basic Requirements" and Section 4, Part IV "Tank Containers".

**4.1.2** Requirements of 4.3, Part IV "Tank Containers" are applicable to FRP tank data identification plate with the following modifications:

4.3.1.3.1 is not applicable (the "U/N" sign shall be removed);

in 4.3.1.3.2 to specify the Tank Code in accordance with the applicable Rules, Conventions and Agreements;

4.3.1.4.5 and 4.3.1.6.3 are not applicable;

in 4.3.1.6.1, the material grade(s) (FRP) of the vessel shell and heads and Technical Specifications of Material (FRP) number shall be specified;

in the Notes, points 2 — 4 are not applicable.

**4.1.3** Upon agreement with the customer, a metal plate with description of the permissible operational damage to a FRP shell may be additionally installed.

**RULES FOR THE APPROVAL OF CONTAINERS  
FOR THE TRANSPORT OF GOODS UNDER  
CUSTOMS SEAL**

## **1 GENERAL**

### **1.1 APPLICATION**

**1.1.1** These Rules apply to containers with maximum gross mass of 10 t and more, intended for international transport of goods.

### **1.2 DEFINITIONS AND EXPLANATIONS**

**1.2.1** For the purpose of these Rules the following definition has been adopted.

**Container** is an article of transport equipment:

fully or partially enclosed to constitute compartment intended for containing goods;  
of a permanent character and accordingly strong enough to be suitable for repeated use;  
specially designed to facilitate the carriage of goods by one or more modes of transport, without intermediate reloading.

**Notes:** 1. The term "container" shall include accessories and equipment appropriate for the type concerned, provided that such accessories and equipment are carried with the container.

2. The term "container" shall not include vehicles, accessories or spare parts of vehicles, as well as packaging.

### **1.3 APPROVAL PROCEDURES**

#### **1.3.1 General.**

**1.3.1.1** The containers may be approved for the transport of goods under Customs seal:

- .1** at the manufacturing stage, by design type (approval at the manufacturing stage);
- .2** at any stage subsequent to manufacture, either individually or by batches of the same container type (approval at any stage subsequent to manufacture).

**1.3.1.2** If a container no longer complies with the technical conditions prescribed for its approval, before it can be used for the transport of goods under Customs seal it shall be restored to the condition which has justified its approval so as to comply again with the said technical conditions.

**1.3.1.3** If the essential characteristics of a container are changed, the container shall cease to be covered by the approval and shall be reapproved before it can be used for the transport of goods under Customs seal.

#### **1.3.2 Procedure for approval at the manufacturing stage.**

**1.3.2.1** Where the approval of containers for the transport of goods under Customs seal is desired at the manufacturing stage, the manufacturer shall submit to the Register an application in writing for approval by design type.

**1.3.2.2** The manufacturer shall state in his application the identification numbers and letters which he assigns to the design type of container covered by the application. The application shall be also accompanied by technical documentation (refer to 1.3.2.3) submitted for the approval and by an assurance in writing (refer to 1.3.2.5).

**1.3.2.3** The technical documentation for approval of container by design type shall at least include:

- .1** design specification of the container stating its construction, characteristics of materials involved, welding procedures, as well as the methods of assembling;
- .2** general arrangement plans, sectional views with scantlings, assemblies and elements, with indication of places for affixing Customs seals;
- .3** views of door locking devices with indication of materials involved, as well as places and methods of affixing Customs seals;

.4 sketches of the container sheet, if used, with indication of fastening methods and places for affixing Customs seals.

The above documentation shall be generally submitted in triplicate.

Any other additional documentation may be required by the Register, if considered necessary.

**1.3.2.4** If necessary, the Register may require that certain changes be introduced into the container design type submitted for the approval.

**1.3.2.5** The manufacturer shall assure in writing that he will:

.1 submit to the Register such containers of approved design type as he may wish to examine;

.2 permit the Register to examine further containers at any time during series production to the approved design type;

.3 advise the Register of any change, of whatever magnitude, in drawings or specifications, before proceeding with such change;

.4 affix to the container the CCC Plate with indication of all the required markings thereon (refer to 3.1);

.5 keep record of containers manufactured to the approved design type.

**1.3.2.6** One or more containers, manufactured according to approved technical documentation, shall be submitted to the Register for survey.

**1.3.2.7** If satisfied with the results of survey, the Register issues to the manufacturer a Certificate of Approval stating that the container design type concerned complies with technical conditions set out in Section 2.

The Certificate of Approval shall be issued as a single copy and is valid for all containers manufactured in conformity with technical documentation approved by the Register for the design type concerned.

The Certificate of Approval shall entitle the manufacturer to affix to every container manufactured to the approved design type, the CCC Plate.

**1.3.3 Procedure for approval at a stage subsequent to manufacture.**

**1.3.3.1** If approval of containers for the transport of goods under Customs seal is desired at any stage subsequent to manufacture, the owner of containers shall submit an application in writing to the Register.

The application shall state the manufacturer's number placed on each container.

The containers mentioned in the application shall be produced to the Register for survey individually or by batches of the same design type.

**1.3.3.2** If satisfied with the results of survey, the Register issues to the owner a Certificate of Approval stating that containers comply with technical conditions set out in Section 2.

The Certificate of Approval shall be issued as a single copy, and shall entitle the owner to affix to every container, approved according to this procedure, the CCC Plate.

## **2 TECHNICAL REQUIREMENTS**

### **2.1 GENERAL**

**2.1.1** Approval for the international transport of goods under Customs seal may be only granted to containers constructed and equipped in such a manner that:

- .1** no goods can be removed from, or introduced into, the sealed part of container without leaving visible traces of tampering or without breaking the Customs seal;
- .2** Customs seal can be simply and effectively affixed to them;
- .3** they contain no concealed spaces where goods may be hidden;
- .4** all spaces capable of holding goods are readily accessible for Customs inspection.

### **2.2 STRUCTURE OF CONTAINERS**

**2.2.1** The constituent parts of a container (sides, floor, doors, roof, uprights, frames, cross-pieces, etc.) shall be assembled either by means of devices which cannot be removed and replaced from the outside without leaving visible traces or by such methods as will produce a structure which cannot be modified without leaving visible traces.

When the sides, floor, doors and roof are made of various materials, these shall meet the outlined requirements and be of sufficient strength. Where joining devices (rivets, screws, bolts, nuts, etc.) are used, a sufficient number of such devices shall be inserted from outside, traverse the assembled constituent parts, protrude inside and there be firmly secured (e.g. riveted, welded, bushed, bolted, and riveted or welded on the nut). However, conventional rivets (i.e. rivets which placing requires handling from both sides of the assembly) may also be inserted from inside. Notwithstanding the above, container floors may be secured by means of self-tapping screws or self-drilling rivets or rivets inserted by means of an explosive charge or pins inserted pneumatically, when placed from inside and passing at right angles through the floor and metallic cross-pieces underneath, on condition, except in case of self-tapping screws, that their ends be flush with the level of the outside part of the cross-piece or be welded on to it.

The Register shall determine that the joining devices meet the above requirements and shall make sure that the constituent parts so assembled cannot be removed or replaced without leaving visible traces.

Joining devices which can be removed or replaced from one side without leaving visible traces, i.e. without requiring handling from both sides of the constituent parts to be assembled (e.g. expansion rivets, blind rivets and the like), shall not be allowed.

Where, due to technical reasons, it is not practicable to secure the constituent parts in the manner described above, they may be joined by means of devices which placing can be effected only from one side, provided that the joining devices used on the inner face of the wall are not accessible from outside.

**2.2.2** Doors and other closing systems, including stopcocks, manhole-covers, flanges, etc. shall be fitted with a device on which Customs seals can be fixed. This device shall be such that it cannot be removed and replaced from outside the container without leaving visible traces, or the door or fastening be opened without breaking the Customs seals.

The Customs seals shall be adequately protected.

Containers having a large number of such closures, as valves, stopcocks, manhole covers, flanges etc. shall be so constructed as to reduce the number of Customs seals to a minimum. To this end, neighbouring closures shall be joined together by a common device requiring only one Customs seal, or shall be provided with a cover meeting the same purpose.

**2.2.3** Containers with opening roofs shall be so constructed as to permit sealing with a minimum number of Customs seals.

**2.2.4** Butt-hinges, strap hinges, hinge-pins and other details for hanging doors and the like shall be secured by welding or riveting, by means of bushes, bolts, by riveting or welding on the nuts. Moreover, the various components of such devices (e.g. hinge-plates, pins or swivels) shall be so fitted that they cannot be removed or dismantled when the container is closed and sealed without leaving visible traces.

Where a door or closing device has more than two hinges, only those two hinges nearest to the extremities of the door need be fixed in conformity with requirements of this paragraph.

Exceptionally, in the case of thermal containers only, the Customs sealing device, the hinges and any fittings the removal of which would give access to the interior of the container or to spaces in which goods could be concealed, may be fixed to the doors of such containers by means of set bolts or set screws which are inserted from outside but which do not otherwise meet the requirements of 2.2.1, on condition that:

the tails of the set bolts or set screws are fixed to a tapping plate or similar device fitted behind the outer layer (layers) of the door structure;

the heads of an appropriate number of set bolts or set screws are so welded to the Customs sealing device, hinges, etc., that they are completely deformed and that the set bolts or set screws cannot be removed without leaving visible traces (refer to Fig. 2.2.4).

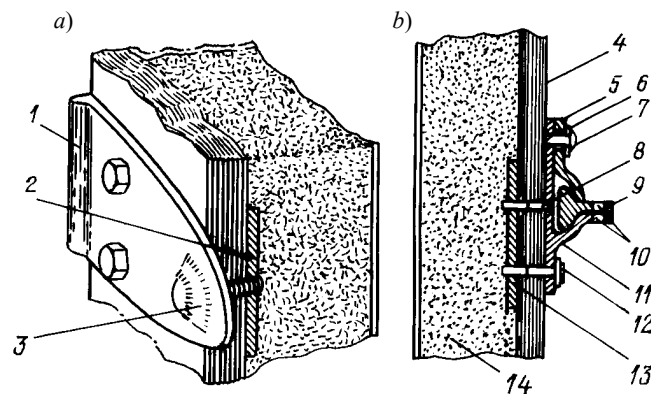


Fig. 2.2.4 Example of hinge (a) and Customs sealing device (b) on doors of thermal containers

- 1 — hinge blade; 2 — tapped metal plate; 3 — head of set bolt or screw fully welded and completely deformed;  
 4 — door; 5 — pivoting section; 6 — pivot bush; 7 — pivot; 8 — set screw head completely deformed by welding,  
 not accessible when door sealed; 9 — lever; 10 — holes for Customs seals; 11 — back plate;  
 12 — head of set bolt or set screw completely deformed by welding; 13 — tapped metal plate; 14 — insulating material

**2.2.5** The Customs sealing devices (refer to Figs. 2.2.5-1 and 2.2.5-2) shall:

- .1 incorporate holes of not less than 11 mm in diameter or slots of at least 11 mm in length and 3 mm in width;
- .2 be so designed that, once the container has been closed and sealed, the device cannot be removed without leaving visible traces;
- .3 be secured by welding.

The Customs sealing devices shown in Fig. 2.2.5-2 may also be fixed to doors of thermal containers. Such devices may be secured by means of at least two set bolts or set screws fixed into a metal tapped plate inserted behind the outer layer of the door. In such cases the heads of set bolts or set screws shall be so welded that they are completely deformed.

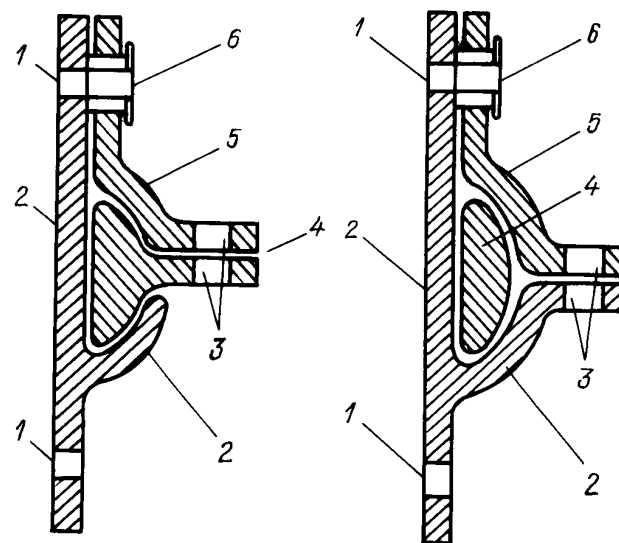


Fig. 2.2.5-1 Customs sealing device

- 1 — hole for rivet, screw, bolt, etc. (to be secured from inside of the door); 2 — back plate;  
3 — hole for Customs seal; 4 — lever; 5 — pivot section;  
6 — rivet, screw, bolt, etc. affixing pivot section

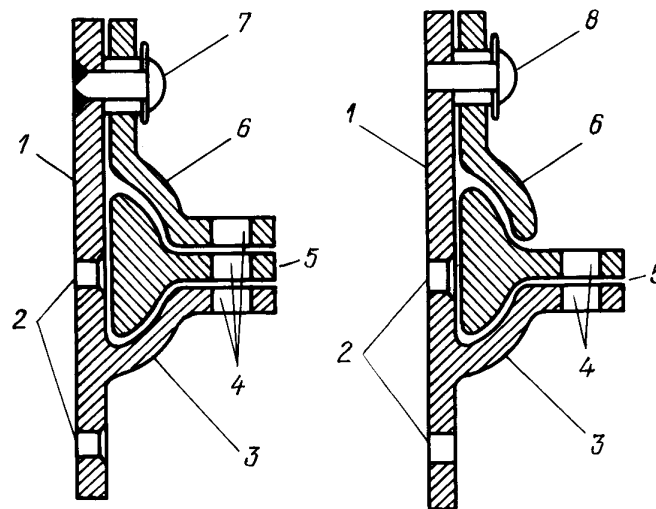


Fig. 2.2.5-2 Customs sealing device

- 1 — back plate; 2 — hole for rivet, screw, bolt, etc. (to be secured from the inside of the door);  
3 — lever retainer; 4 — hole for Customs seal; 5 — lever; 6 — pivoting section;  
7 — rivet welded to back plate; 8 — rivet, screw, bolt, etc. affixing pivoting section

**2.2.6** Ventilation and drainage apertures shall be provided with a device preventing access to the interior of the container. This device shall be such that it cannot be removed or replaced from outside without leaving visible traces. The maximum dimension of vent apertures shall not exceed 400 mm and that of drainage apertures shall not exceed 35 mm.

Ventilation and drainage apertures permitting access to the goods, shall be obstructed by means of wire gauze or perforated metal screen with maximum hole dimension 3 mm in both cases and shall be protected by a welded metal lattice work with maximum hole dimension 10 mm.

The ventilation apertures not permitting direct access to the goods (e.g. because of elbow or baffle-plate systems) shall be provided with devices outlined in the foregoing paragraph, the hole dimensions being, however, as much as 10 and 20 mm respectively.

For the drainage apertures, which do not permit direct access to the goods, the devices, mentioned in the foregoing paragraph, may be omitted, on condition that the apertures are provided with a reliable baffle system readily accessible for inspection from inside of the container.

If vent openings are made in sheets, the above mentioned blocking devices shall be provided. However, blocking devices in the form of a perforated metal screen, fitted outside, and wire or other gauze, fitted inside, are admissible.

Identical non-metal devices may be allowed provided that the holes are of requisite dimensions and the material used is strong enough to prevent the holes from being substantially enlarged without visible damage. In addition, it shall be impossible to replace the said devices by working from one side of the sheet only.

**2.2.7** Notwithstanding the requirement of 2.1.1.3, constituent part of the container which, for practical reasons, have to include empty spaces (for example, between the partitions of a double wall) shall be permitted. In order that the said spaces cannot be used to conceal goods, the lining inside the container shall be so fitted that it cannot be removed and replaced without leaving obvious traces; or the number of the said spaces shall be kept to a minimum and these spaces shall be readily accessible for Customs inspection.

## **2.3 CONTAINERS CAPABLE OF BEING FOLDED OR DISMANTLED**

**2.3.1** The containers capable of being folded or dismantled shall comply with requirements stated in 2.1 and 2.2.

In addition, such containers shall be fitted with a bolting system which locks the various parts together once the container has been erected. This bolting system shall be so designed as to enable sealing by Customs seals, if it is fitted on the outside of the container after assembly.

## **2.4 SHEETED CONTAINERS**

**2.4.1** Containers fitted with sheets shall comply with requirements stated in 2.1, 2.2 and 2.3 in so far as these requirements are applicable to such containers. The sheets of such containers shall comply with the requirements of 2.4.2 to 2.4.11.

**2.4.2** The sheet shall be either of strong canvas or of plastic-covered or rubberized cloth, which shall be of sufficient strength and unstretchable. It shall be in good condition and made up in such a way that once the closing device has been secured, it is impossible to gain access to the load compartment without leaving obvious traces.

**2.4.3** If the sheet is made up of several pieces, their edges shall be folded into one another and sewn together with two seams at least 15 mm apart (refer to Fig. 2.4.3-1). However, if for certain parts of the sheet (such as flaps at the rear or at reinforced corners) it is not possible to assemble the pieces in that way, it will be sufficient to fold the edge of the top portion and make the seams so as shown in Figs. 2.4.3-2 and 2.4.3-3. One of the seams shall be visible only from the inside and the



colour of the thread used for that seam shall be clearly different from the colour of the sheet itself and from the colour of the thread used for the other seam. All seams shall be machine-sewn.

The cloth of which pieces of the sheet are made shall meet the requirements of 2.4.2.

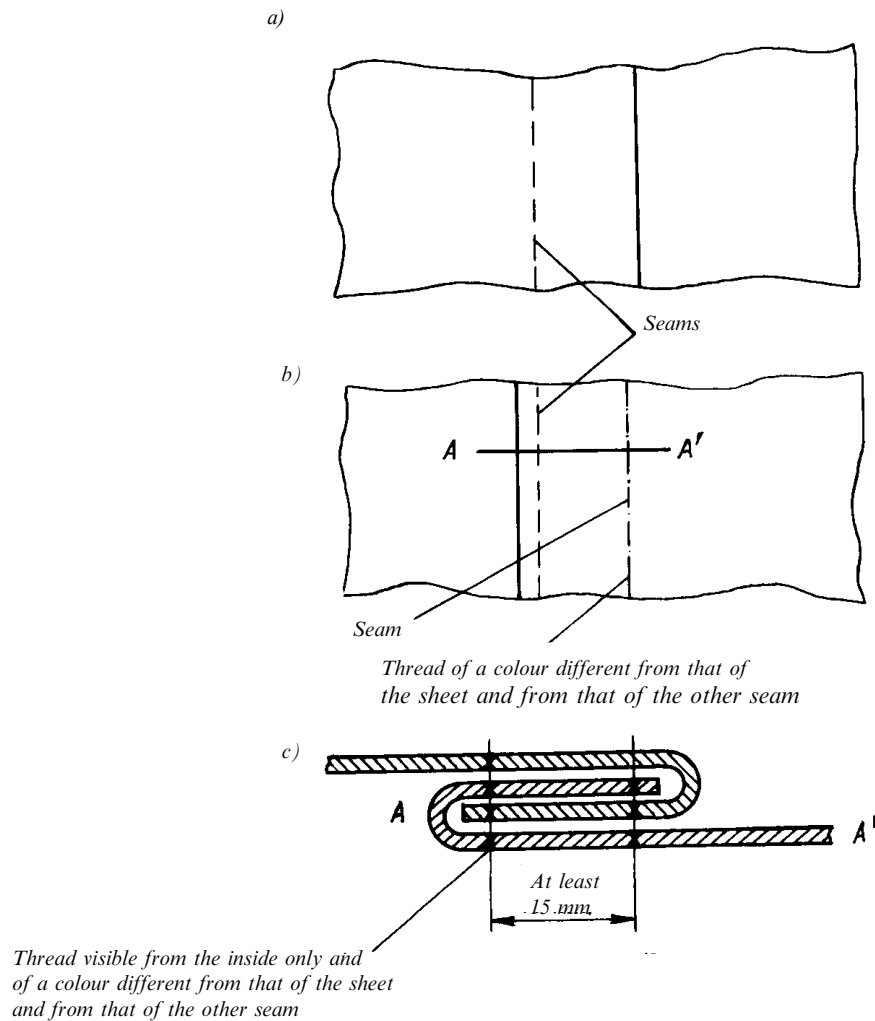


Fig. 2.4.3-1 Sheet made of several pieces of cloth sewn together by means of seams:  
a — outside view; b — inside view; c — section A-A' (double flat seam)

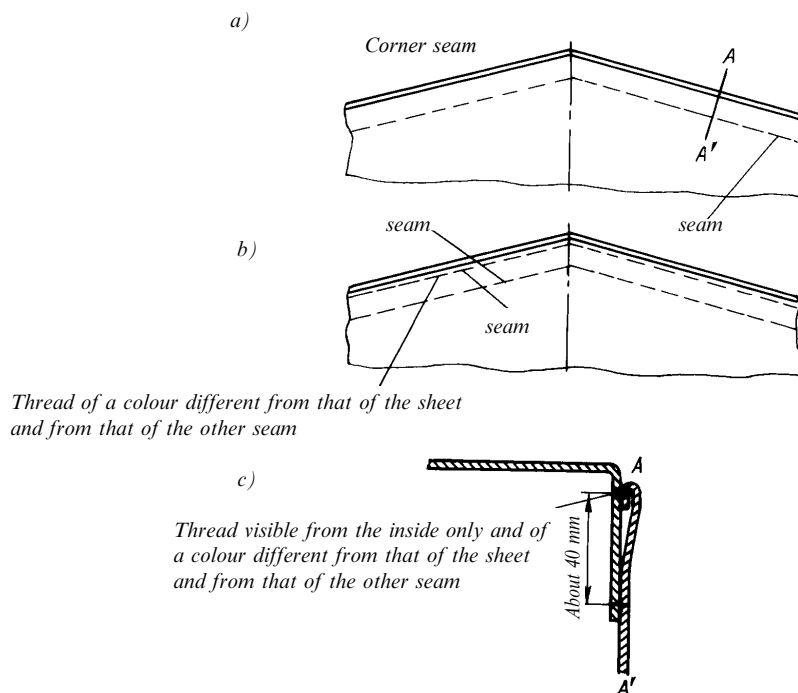


Fig. 2.4.3-2

Sheet made of several pieces of cloth:  
a — outside view; b — inside view; c — section A-A'

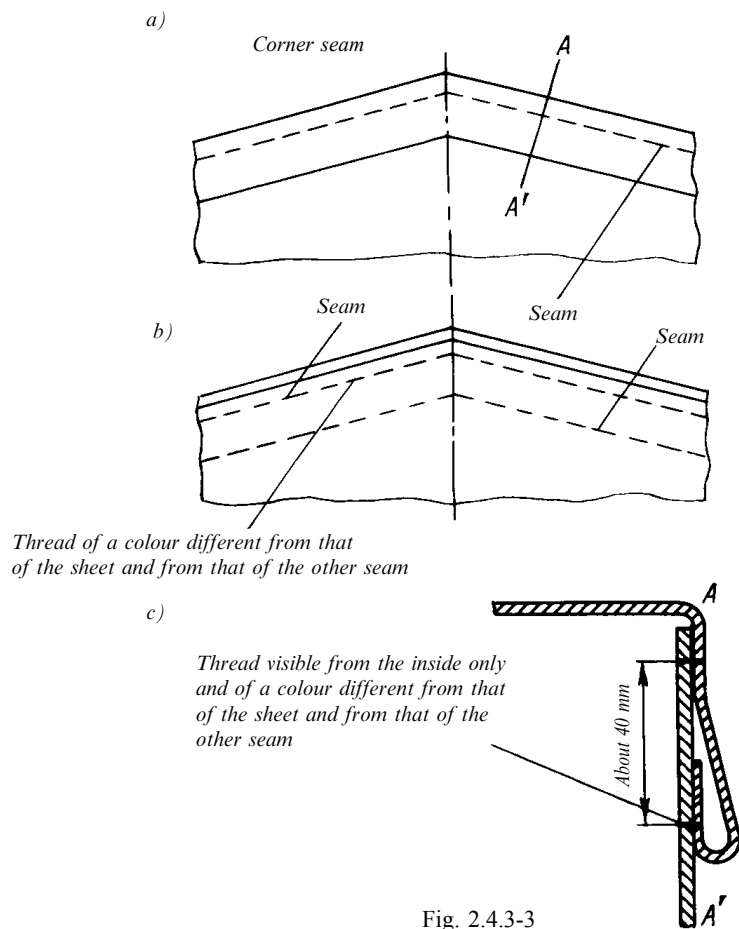


Fig. 2.4.3-3

Sheet made of several pieces of cloth:  
a — outside view; b — inside view; c — section A-A'

**2.4.4** If the sheet is made up of several pieces of plastic-covered cloth, the pieces shall be alternatively soldered together (refer to Fig. 2.4.4). The edges of the pieces shall overlap by at least 15 mm. The pieces shall be fused together over the whole width of the overlap. The edge of the outer sheet shall be covered with a band of plastic material of at least 7 mm wide, affixed by the same fusing process. The plastic band and a width of at least 3 mm on each side shall have a well-marked uniform relief stamped on it. The pieces shall be bound in such a way that they cannot be separated and rejoined without leaving visible traces.

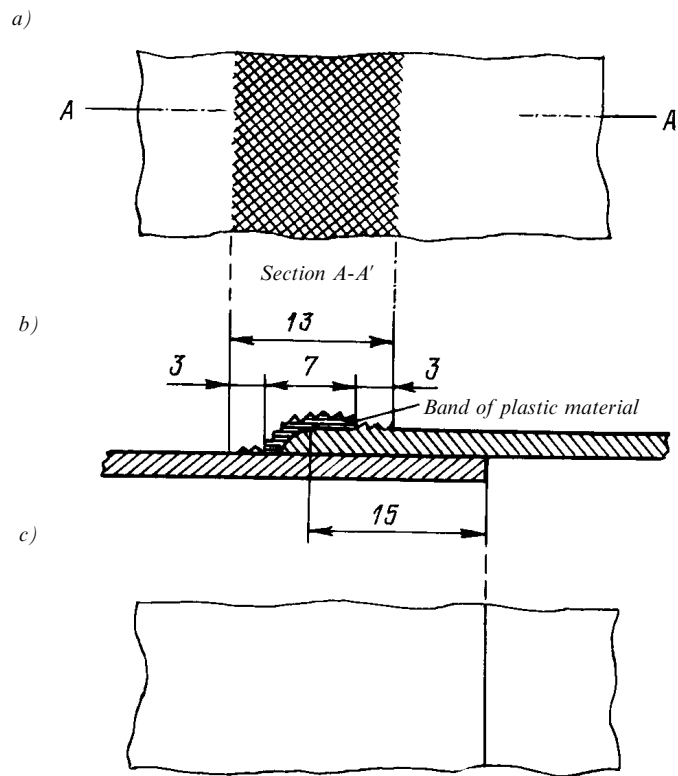


Fig. 2.4.4 Sheet made of several pieces soldered together (dimensions are shown in mm):  
a — outside view; b — section A-A'; c — inside view

**2.4.5** Any arrangement of pieces is permitted for making up a sheet, provided the pieces are assembled according to provisions of 2.4.3.

**2.4.6** The method for repairing the sheet is shown in Fig. 2.4.6. The edges to be sewn shall be folded into one another and sewn together with two clearly visible seams at least 15 mm apart; the colour of the thread visible from the inside shall be different from that of the thread visible from the outside and from the colour of the sheet itself. All seams shall be machine-sewn.

When a sheet which has been damaged near the edges is repaired by replacing the damaged part by a patch, the seam may also be made according to 2.4.3 and Fig. 2.4.3-1.

Sheets of plastic-covered cloth may alternatively be repaired by the method described in 2.4.4, but in that case the plastic band shall be affixed to both sides of the sheet, while the patch shall be fitted on the inside of the sheet.

**2.4.7** The sheet shall be affixed to the container according to provisions set forth in 2.1.1.1 and 2.1.1.2 by means of:

- metal rings fixed to the container;
- eyelets let into the edge of the sheet;
- a rope or a wire passing through the rings above the sheet and visible from the outside for its entire length.

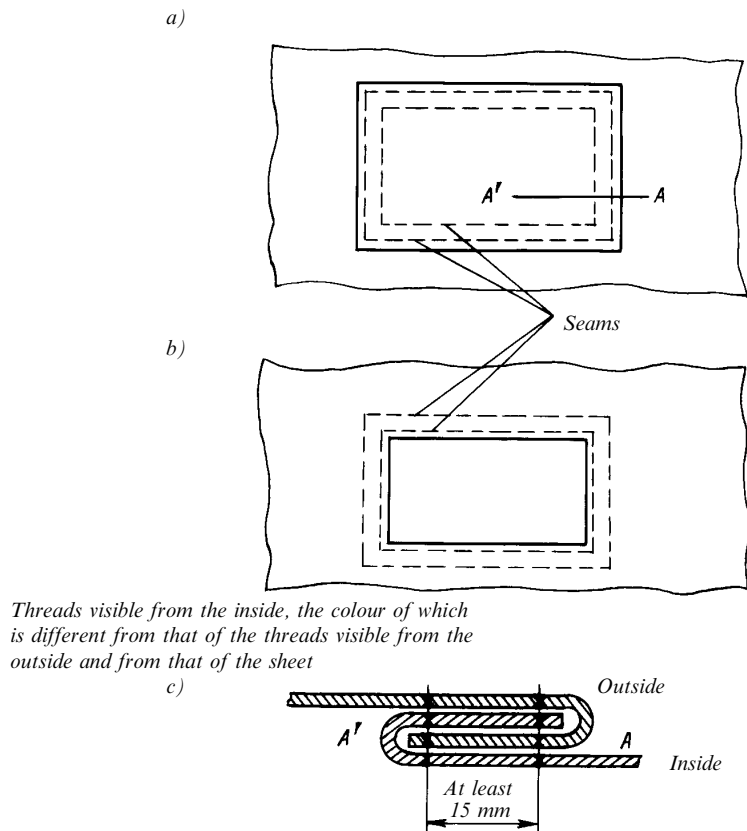


Fig. 2.4.6 Repair of the sheet  
a — outside view; b — inside view; c — section A-A'

Where the edges of the sheet shall be permanently attached to the body of the container, the sheet shall be held in place by one or more strips of metal secured to the body of the container by joining devices meeting the requirements of 2.2.4.

Examples of construction systems of affixing container sheet as well as the sheet around the container corners, acceptable from a Customs point of view, are shown in Figs. 2.4.7-1 and 2.4.7-2.

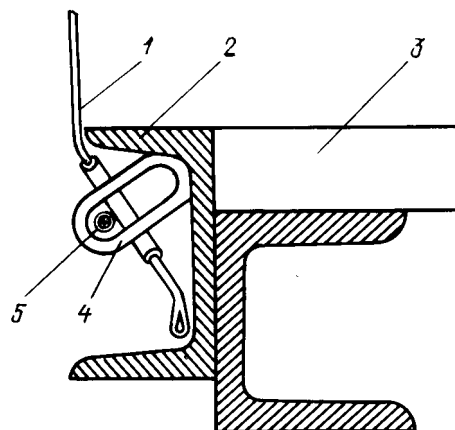


Fig. 2.4.7-1 Device for affixing the container sheet:  
1 — sheet; 2 — steel girder; 3 — floor; 4 — securing ring; 5 — sheet-retaining rope

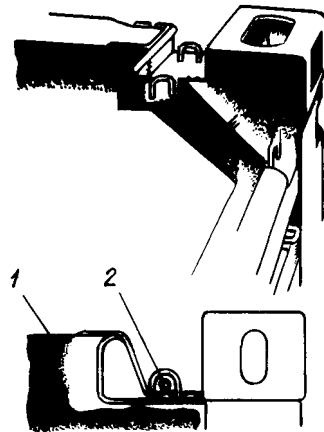


Fig. 2.4.7-2 Device for affixing the sheet around container corners:  
1 — sheet on the roof; 2 — sheet-retaining rope

**2.4.8** The fastenings of a sheet shall comply with the following requirements:

**.1** the spaces between the rings and the spaces between the eyelets shall not exceed 200 mm. The spaces may, however, be greater but shall not exceed 300 mm between rings and eyelets on either side of the upright if the construction of the container and the sheet is such as to prevent all access to the interior of the container. The eyelets shall be reinforced;

**.2** the space between the eyelets of the portion of the sheet overlapping the upright (cross-members of the roof) and the space between the corresponding rings on the container shall not exceed 300 mm, on condition that the rings are recessed in the side boards and the eyelets are oval and so small that they can just pass over the rings;

**.3** the steel wire rope shall be at least 3 mm in diameter. The wire rope may be encased in a transparent unstretchable plastic sheath;

**.4** a wire rope comprising a textile core surrounded by strands of steel wire shall also be at least 3 mm in diameter (exclusive of the transparent plastic sheath, if any);

**.5** the rope shall be of hemp or sisal of at least 8 mm in diameter, encased in a transparent unstretchable plastic sheath;

**.6** each cable or rope, whatever the material, shall be in one piece and have metal end-pieces at each end. The fastening arrangement of each metal end-piece shall include a hollow rivet passing through the cable or rope so as to allow the introduction of a thread or strap of the Customs seal. The rope or cable shall remain visible on either side of the hollow rivet so that it is possible to make sure that the rope or cable is in one piece. Fig. 2.4.8.6 shows a specimen of the end-piece;

**.7** metal securing rings sliding on metal bars (refer to Fig. 2.4.8.7) are acceptable provided that:  
the bars are affixed to the container at maximum spacings of 600 mm in such a manner that they cannot be removed and replaced without leaving obvious traces;

the rings are made with double hoop or equipped with a central bar and made in one piece without the use of welding;

the sheet is fixed to the container in accordance with requirements of 2.1.1.3.

**2.4.9** Where the sheet is provided with openings used for loading/unloading, the two edges of the sheet shall adequately overlap and be fastened by:

**.1** a flap sewn or soldered in accordance with 2.4.3 or 2.4.4 from the inside of the sheet. A flap may not be required if a special device (e.g. baffle plate, etc.) is fitted which prevents access to the goods. The flap is not required for containers with sliding sheets. Such device is shown in Fig. 2.4.9.1;

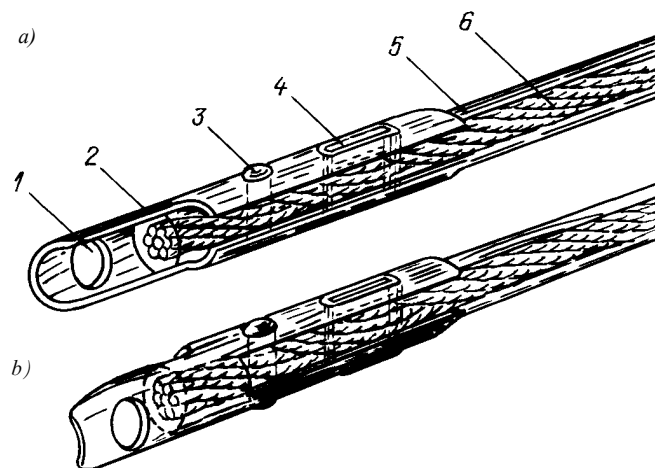


Fig. 2.4.8.6 Specimen of end-piece (side view):  
*a* — front; *b* — back; 1 — hole for closing by carrier; 2 — hard metal end-piece; 3 — solid rivet;  
 4 — hollow rivet for passing the thread or the strap of the Customs seal  
 (minimum dimensions of the hole: width — 3 mm, length — 11 mm);  
 5 — transparent plastic sheath; 6 — rope

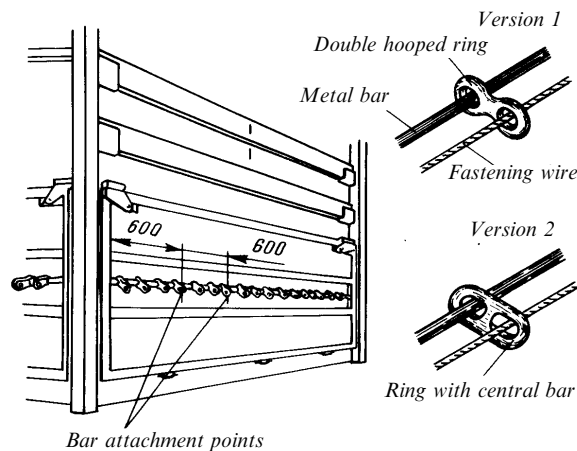


Fig. 2.4.8.7 Sheeted containers with sliding rings

.2 small individual flaps each pierced by one eyelet secured to the outside surface of the sheet and spaced at such distances as will permit an adequate tensioning of the sheet;

.3 rings and eyelets complying with requirements of 2.4.8;

.4 a thong made of appropriate unstretchable material, in one piece, at least 20 mm wide and 3 mm thick, passing through the rings and holding together the two edges of the sheet and the flap. The thong shall be secured inside the sheet and have an eyelet to take the cable or rope mentioned in 2.4.8.

The thongs may be manufactured of leather, unstretchable textile materials, including plastic-covered or rubberized cloth, provided that such materials cannot after severance be welded or reconstituted without leaving visible traces. Furthermore, the plastic material used to cover thongs shall be transparent and smooth-surfaced.

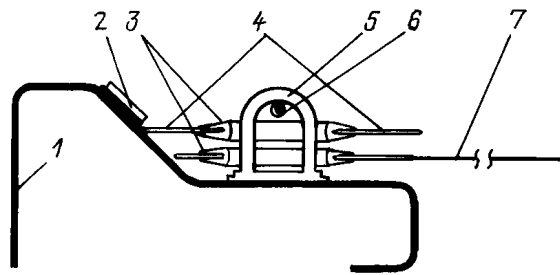


Fig. 2.4.9.1 Device for affixing container sheets:

1 — wall; 2 — metal bar, riveted; 3 — eyelets; 4 — flap; 5 — securing ring; 6 — sheet retaining rope; 7 — sheet

**2.4.10** The sheet shall overlap the solid part of the container by at least 250 mm, measured from the centre of securing rings, unless the construction of the container by itself prevents all access to the goods.

**2.4.11** In no case shall the sheet conceal the marking of container.

## 2.5 CONTAINERS WITH SLIDING SHEETS

**2.5.1** Containers with sliding sheets shall meet the requirements of 2.1 to 2.4, as far as applicable, and also the requirements of this Chapter.

**2.5.2** The sliding sheets, floor, doors and all other constituent parts of the container shall meet either the requirements of 2.4.7 to 2.4.9 or the requirements set forth below.

**2.5.2.1** The sliding sheets, floor, doors and all other constituent parts of the container shall be assembled in such a way that they cannot be opened or closed without leaving obvious traces.

**2.5.2.2** The sheet shall overlap the solid parts at the top of the container by at least  $\frac{1}{4}$  of the actual distance between the tensioning straps. The sheet shall overlap the solid parts at the bottom of the container by at least 50 mm. The horizontal opening between the sheet and the solid parts of the container measured perpendicular to the longitudinal axis of the container shall not exceed 10 mm at any place when the container is secured and sealed for the Customs purposes.

**2.5.2.3** The sliding sheet guidance and other movable parts shall be assembled in such a way that closed and the Customs-sealed doors and other movable parts cannot be opened or closed from the outside without leaving obvious traces. The sliding sheet guidance and the other movable parts shall be assembled in such a way that it is impossible to gain access to the container without leaving obvious traces. The like system is shown in Fig. 2.5.2.3.

**2.5.2.4** The horizontal distance between the rings, used for the Customs purposes, on the solid parts of the container shall not exceed 200 mm. The space may, however, be greater, but shall not exceed 300 mm between the rings on either side of the upright if the construction of the container and the sheets is such as preventing all access to the container. In any case, the conditions set forth in 2.5.2.2 shall be complied with.

**2.5.2.5** The distance between the tensioning straps shall not exceed 600 mm.

**2.5.2.6** The fastenings used to secure the sheets to the solid parts of the container shall meet the requirements of 2.4.8.3 to 2.4.8.6.

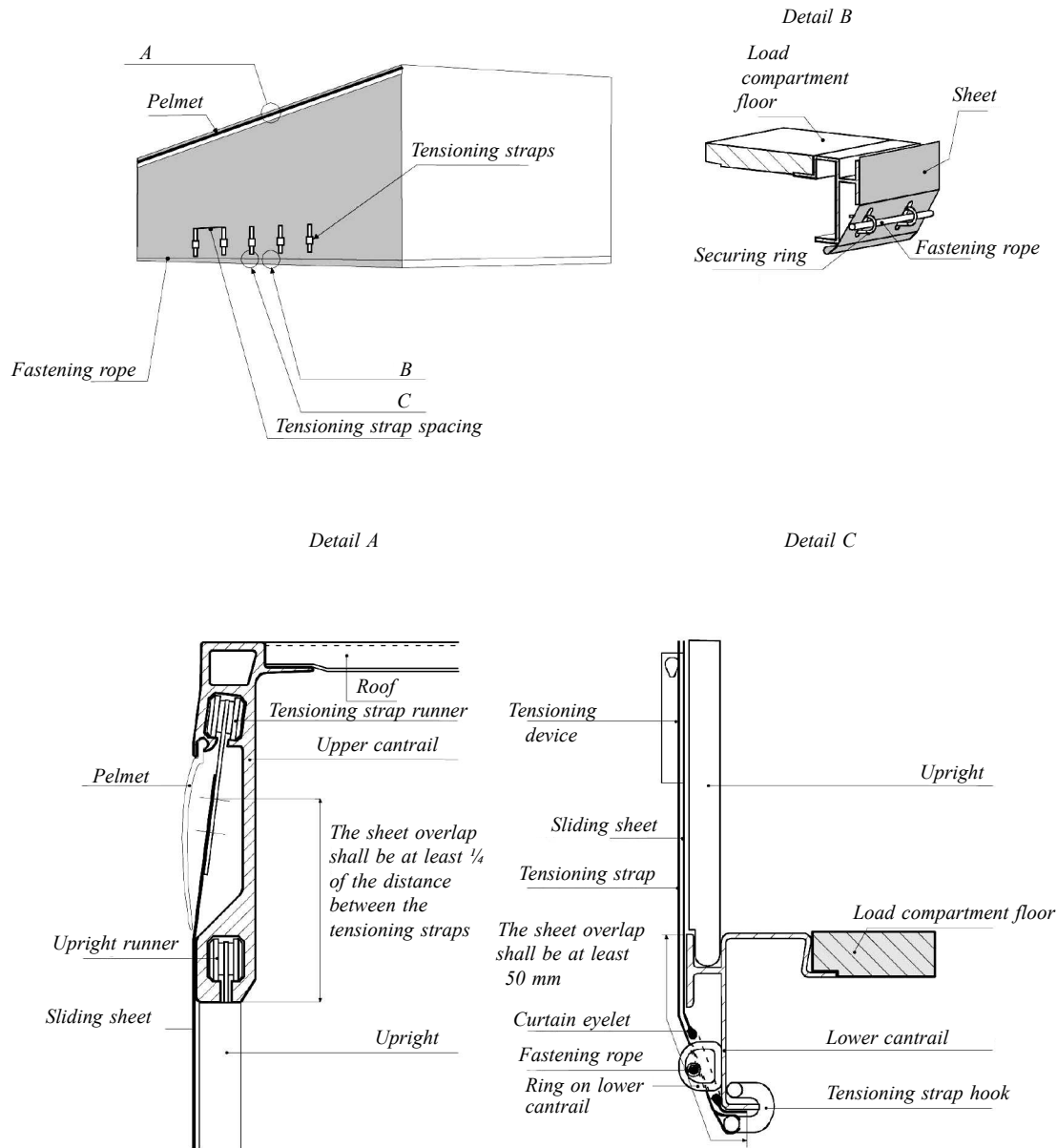


Fig. 2.5.2.3 Container with a sliding sheet



### 3 MARKING

#### 3.1 THE CCC PLATE

**3.1.1** The applicant to whom the Register has issued the Certificate of Approval (refer to 1.3.2.7 and 1.3.3.2) shall affix to every approved container the CCC Plate.

**3.1.2** The CCC Plate is a metal plate of rectangular shape measuring not less than  $200 \times 100$  mm, and bearing the following particulars in the English language (refer to Fig. 3.1.2):

- .1 "approved for transport of goods under Customs seal";
- .2 type;
- .3 manufacturer's No. of the container.

The height of letters for the title of the CCC Plate (refer to 3.1.2.1) shall be minimum 8 mm. The height of all other letters and figures shall be not less than 5 mm.

The title and the particulars on the plate shall be stamped into, embossed on, or indicated on its surface in any other permanent and legible way.

The CCC Plate shall be made of durable, non-corrosive and fire-proof material.

**3.1.3** The CCC Plate shall be permanently affixed to the container at a clearly visible place where it cannot be easily damaged.

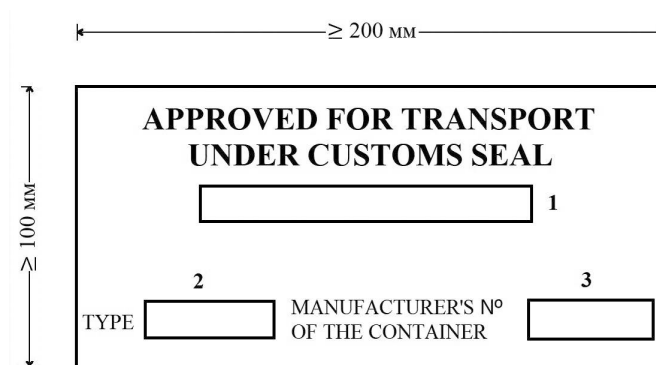


Fig. 3.1.2 The CCC Plate

- Notes :
- 1. There shall be indication of the number of the Certificate of Approval issued by the Register.
  - 2. Type means the identification numbers and letters (model of container) assigned to the design type of container by the manufacturer, and is indicated on the CCC Plate only if the container has been approved by design type.
  - 3. There shall be indicated the manufacture number assigned to the container by the manufacturer.

#### 3.2 CONTAINER MARKING

**3.2.1** The owner's code, owner's number and check digit of the container, and also the tare weight of the container shall be marked on the latter.

**3.2.2** The inscriptions and signs shall be arranged in compliance with 4.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

# **RULES FOR TECHNICAL SUPERVISION DURING MANUFACTURE OF CONTAINERS**

## **1 ORGANIZATIONAL 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 and materials and products for the said containers.

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

### **1.2 DEFINITIONS**

**1.2.1** For the purpose of these Rules the following definitions have been adopted.

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

**Prototype sample (prototype)** is a container or product, using which the Register checks and confirms its compliance with the requirements of the Rules and the feasibility of its intended use and its serial production at the enterprise (of the manufacturer).

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

**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.

**Normative documents** mean standards, regulations, technical requirements, norms, calculation procedures, instructions, guidelines and other documents, which specify structural, technical or process requirements for manufacture and testing of materials, products and containers.

**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.

### **1.3 GENERAL**

**1.3.1** The scope and procedure of surveys and tests of the items of the Register technical supervision carried out at the manufacturer's works are specified in the List of the Items of Technical Supervision (hereinafter referred to the List) given in Appendix 2.

**1.3.2** The manufactured items of technical supervision are surveyed by the Register at the final stage of production (finished products) or after completion of works upon submission thereof by the manufacturer's Inspection Department.

In particular cases, where it is motivated by the production process and/or design of the product, at the Register (surveyor) discretion, the surveys may be performed on a step-by-step basis and simultaneously with the manufacturer's control.

**1.3.3** During technical supervision the Register has the right to set forth:

- .1** additional requirements for the items of technical supervision;
- .2** requirements for the items not subject to technical supervision if it appears that application thereof has resulted or is likely to result in violation of the requirements of the Rules for the Manufacture of Containers.

**1.3.4** During technical supervision at the manufacturer's works the surveyor checks adherence to the conditions of issuance of the Recognition Certificates and/or Contracts on Technical Supervision.

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

**1.3.6** The issue of possible deviations from the RS requirements is resolved by RHO upon the recommendation of the RHO Location/RS Branch Office carrying out technical supervision.

**1.3.7** Materials and products subject to technical supervision of the Register in accordance with the RS Nomenclature are allowed for application with the Register documents or documents of another classification society (ACS) available.

The possibility of recognition of documents for materials and products manufactured under the technical supervision of another classification society is determined by the Register in each particular case, based on the sufficiency of the submitted documents to determine the conformity of materials and products to the approved technical documentation.

**1.3.8** 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 RS or ACS documents.

**1.3.9** Technical supervision of the manufacture of containers, materials and products shall determine their compliance with the requirements of the approved technical documentation and the Register 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.

**1.3.10** 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** The Register may perform the technical supervision activity at the firms involved in the manufacture of containers, materials and/or products in the form of:

- .1** the Register technical supervision;
- .2** technical supervision on behalf of the Register.

**1.4.2** Table 2.1.2 of the General Regulations for the Technical Supervision of Containers specifies the forms of documents issued or certified by the Register upon the technical supervision results. When selecting between the issuance of a certificate filled in and signed by the Register surveyor (C) and a certificate filled in by the manufacturer and certified by the Register surveyor (C3) preference is given to C; where the direct technical supervision is impossible or unreasonable (difficult), it is recommended to issue C3.

**1.4.3** Technical supervision on behalf of the Register is subject to special consideration by RHO in each particular case.

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

**1.5.1** The Register technical supervision activity at firms involved in the manufacture of containers and associated materials and products is based on contracts (contracts-applications) and written requests 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** When the firm is not a manufacturer of containers, materials and products for them, in addition to provisions of 1.5.1, it shall be authorized by the manufacturer (it shall be given documentary evidence):

- .1** to submit to RS for the review and approval or use the RS-approved technical documentation for a container, material or product;
- .2** to arrange carrying out a survey of the container, material or product in the scope required;
- .3** to perform testing of the container, material or product to the scope required or use the protocols of testing earlier conducted by the manufacturer;
- .4** shall supply the container, material or product and, where necessary, perform assembly and installation of the product.

**1.5.2** The request shall provide the information to an extent sufficient for review and execution thereof. When analyzing the application for technical supervision of the container manufacture, the material or product, and type of approval shall be determined: single or type approval.

**1.5.3** Upon reviewing the request 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 by the Register at the manufacturer's works specifies the items of technical supervision and regulates mutual relations, rights and responsibilities of the parties in the course of the Register technical supervision.

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.

**1.5.5** In justified cases, for certain items of technical supervision (C3 in Table 2.1.2 of the General Regulations for the Technical Supervision of Containers) the Register can entrust the manufacturer's technical personnel with performance of the check tests or part thereof, to which effect an Agreement on Survey (CO) is signed with the manufacturer.

For signing the CO use is made of the established form or the CO may be signed in a free form.

The CO is made based on survey of the manufacturer carried out to the extent and according to the procedure described in 1.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers and type approval of the material or product.

Rights and responsibilities of the manufacturer, responsibilities of the Register and terms of payment to the Register for technical supervision are stated in the CO.

In order to provide adherence to the Register requirements for products, to draw up covering documentation and to fulfill the terms and conditions of the CO, an official competent in production and quality control of the items of technical supervision shall be appointed at the manufacturer's.

Based on the CO concluded, items of technical supervision shall be delivered:

with C3 to be filled in and signed by the manufacturer's official and drawn up (certified) by the Register;

with a copy of CTO and the document of the firm (manufacturer) that shall include the following:

description, type, serial number of the item;

name and address of the manufacturer;

address of manufacture;

description of technical documentation for the item and the date of its approval by RS;

description of the document containing information on the inspections and tests of the item carried out by the firm (manufacturer);

number, date of issue and validity period of CTO;

manufacturer's statement on the compliance of the item with the approved type specified in CTO or in approved technical documentation;

signature of an authorized person of the firm (manufacturer).

**1.5.5.1** The CO comes into force from the date of signing and remains valid for at most 5 years subject to:

**.1** for items supplied with C3 and CTO, satisfactory results of survey of the item of technical supervision and the firm (manufacturer) in accordance with the requirements of 1.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers to be carried out not less than once a year (in justified cases, unless otherwise stated, being carried out not less than once every 2,5 year);

**.2** the validity of approval of the type item of technical supervision as certified by the Type Approval Certificate or the validity period of Recognition Certificate for Manufacturer (СПИ).

**1.5.5.2** The validity of the CO is extended for the next period not exceeding 5 years subject to compliance with the requirements set out in 1.5.6.1.

**1.5.5.3** The contract or agreement on technical supervision shall become void in cases of improper performance of obligations under the contract or agreement, including payments for the services of the Register, as well as in the following cases:

**.1** termination of the type approval of the material or product manufactured by the firm (manufacturer);

**.2** in case of non-compliance of the firm (manufacturer) with the survey conditions;

**.3** in case СП, СПИ, ССП become void in accordance with 1.4.10 of the General Regulations for the Technical Supervision of Containers;

**.4** contract or CO expiration;

**.5** contract or CO termination.

CO may be terminated at the request of the signing parties.

## **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 containers and associated materials and products are manufactured and tested;

safety of the surveyor during survey; availability of the officials authorized to present to the surveyor containers for survey and testing;

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 DOCUMENTS**

**1.7.1** During the Register technical supervision of the manufacture of containers and associated materials and products the documents provided for by the List of Documents of the Russian Maritime Register of Shipping to be Issued during Technical Supervision and specified in 1.4, the General Regulations for the Technical Supervision of Containers are drawn up.

## **1.8 TECHNICAL DOCUMENTATION**

**1.8.1** Prior to commencement of the technical supervision during the manufacture of containers, materials and products for them the surveyor shall make sure that the firm is provided with necessary and duly drawn up technical documentation meeting the requirements of Section 3 of the General Regulations for the Technical Supervision of Containers.

## **2 TECHNICAL SUPERVISION AT THE FIRMS INVOLVED IN THE MANUFACTURE OF PRODUCTS FOR CONTAINERS**

### **2.1 GENERAL**

**2.1.1** Technical supervision is aimed at the determination and ascertainment by the Register of the conformity of the manufactured products for containers with the approved technical documentation and requirements of the Register.

**2.1.2** The scope of the technical supervision includes:

- .1** control of the availability at the firm of a full set of technical documentation approved by the Register for an item of technical supervision;
- .2** familiarization with production process and quality system. The welding procedures shall be approved by the Register;
- .3** agreement upon of the List (refer to 1.3.1) and establishment of the Register technical supervision procedure;
- .4** survey and tests of the prototypes of items of technical supervision;
- .5** survey and tests of products at the established production in case where the Certificate C is issued.

### **2.2 TECHNICAL SUPERVISION OF THE USED MATERIALS AND COMPONENT PARTS FOR THE PRODUCTS**

**2.2.1** 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 1.3.7), when the materials or components are included in the list of items of technical supervision in Table 2.1.2 of General Regulations for the Technical Supervision of Containers) for conformity thereof with the requirements of the Register.

**2.2.2** 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 (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 1.5.2.1.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

**2.2.3** Where substantial defects are revealed, the results of survey are presented in the form of the Register Report (form 6.3.29); a copy of the Report is forwarded to the manufacturer.

**2.2.4** Where defects are detected, the product or equipment is not approved for use irrespective of the availability of the Inspection Department and the Register brands and the prescribed documents. In case of doubts on the quality of the products manufactured the necessary repeat surveys and tests shall be carried out.



## 2.3 TECHNICAL SUPERVISION DURING MANUFACTURE OF PRODUCTS

2.3.1 The minimum scope of surveys is specified in Tables 2.3.1 and 2.3.9.

Table 2.3.1

Item of supervision	Inspection of						Tests
	used materials	machining of parts	welding operations	manufacture of parts and assemblies	assembly of products	in operation	
Corner fittings	+	+	—	—	—	—	refer to Appendix 1
End frames	+	+	—	—	+	—	Refer to 3.3.2.6
Welded parts	+	—	+	—	—	—	—
Tanks	+	—	+	+	+	—	+
Vessel shells	+	+	+	—	—	—	thickness inspection
Heads	+	+	+	—	—	—	thickness inspection
Doors (including locks)	+	+	+	+	+	+	—
Manholes (hatches)	+	—	+	+	+	+	—
Lifting sets of offshore containers	+	+	visual and dimensional	+	+	—	+

**2.3.2** During survey of products, attention shall be given to the following:

- .1 necessary measurement assurance of the firm and observance of the dates of calibrating devices, tools, repeatedly used jigs (benches);
- .2 effective operation checking by the Inspection Department and identification of both rejected and manufactured products;
- .3 observance of the production process of the products manufacture and of the welding procedures approved by the Register;
- .4 availability of the Welder Approval Test Certificates issued by the Register to the welders involved in the manufacture of containers;
- .5 use of welding consumables approved by the Register.

**2.3.3** During survey of tanks, tank hatches; own heating appliances and cargo level gauges, it is necessary to check conformity thereof with the requirements of the Register and the approved technical documentation. Documents confirming such conformity shall be drawn up in accordance with Table 2.1.2 of the General Regulations for the Technical Supervision of Containers.

**2.3.4** During survey of the corner fittings batches, the Register conducts inspection of geometric dimensions of fittings chosen out of the batch, as well as of the results of radiographic examination, results of strength tests and results of other tests required by the Rules for the whole batch carried out by the manufacturer. In case of doubts on the thickness of the fitting walls or internal casting defects the Register may require additional radiographic or ultrasonic examination or inspection by other methods for the fittings chosen by it out of the submitted batch.

*Note.* Additional provisions for performance of technical supervision during manufacture of corner fittings — refer to Appendix 1.

**2.3.5** When presenting end frames with doors in assembly with locking devices, in addition to the provisions of Table 2.3.1, attention shall be given to the following:

- straightness of bars;
- installation of sealings;
- abutment of locking "cams" against the contact surface of the "pads" in position simulating closing of the door;
- overall dimensions.

**2.3.6** During survey of tanks, inspection of the assembly and welding of the tanks shall be conducted. In this case attention shall be given to:

observance by the manufacturer of welding procedures and used welding materials approved by the Register;

inspection results of all welds;

correctness of welding of the manholes, hatches, branch pipes, connecting flanges, heating/cooling piping, etc. to the tank;

geometric dimensions.

**2.3.7** During survey of assemblies and parts of frameworks of tank containers and similar structures, inspection of assembly and welding thereof shall be conducted. Along with that, attention is given to ensuring stability of work performance quality in jigs (benches), visual examination of welds and quality of welding of corner fittings and supports to the container. In case of doubts in welding quality, a surveyor of the Register may require non-destructive inspection of welds by methods agreed with the manufacturer.

**2.3.8** The minimum scope of technical supervision during manufacture of the tank fittings is given in Table 2.3.9.

**2.3.9** Technical supervision during manufacture of fittings shall include inspections of:

**.1** conformity of the material brand, its mechanical properties, chemical composition and other regulated parameters the requirements of the Register and the approved technical documentation;

**.2** certificates or other documents of the material manufacturer to verify the conformity of the material with the requirements of the approved technical documentation and its service life and applicability;

**.3** absence of surface defects (cracks, breaks, blowholes, etc.) or defects at connections to pipes;

**.4** operation of local and remote actuators, availability and correctness of installation of the "open/closed" position indicators;

**.5** availability of flame arresting meshes and fire curtains, if provided for;

**.6** compliance of the marking with the requirements of the Register and approved technical documentation;

**.7** results of hydraulic pressure tests according to 3.8, Part IV "Tank Containers" of the Rules for the Manufacture of Containers, for strength tests;

**.8** results of tests of valves assembled for pressure tightness in accordance with 3.8, Part IV "Tank Containers" of the Rules for the Manufacture of Containers.

Table 2.3.9

Item of technical supervision	Inspection of used materials	External examination	Inspection of welding procedures	Proof pressure test	Test in operation (adjustment)
Stop valves	+	+	+	+	+
Pressure-relief valves (spring-controlled)	+	+	+	+	+
Frangible disks	+	+	—	—	—
Sealing materials	+	+	—	—	—
Sections of pipes (with elements to be welded to) under pressure	+	+	+	+	—
Hatches	+	+	+	+	+

**2.3.10** The pressure-relief and measuring fittings are subject to test in operation to confirm the working characteristics specified in the technical documentation.

**2.3.11** During technical supervision of the prototypes of fittings, in addition to the above, it is necessary to check continuous operation thereof under vibration conditions, limiting values of temperatures and pressures, as well as under special conditions depending on the purpose of the fittings. In this case, it is essential to determine the maximum values of the working parameters which can be ensured by the fittings without failure of their single components.

**2.3.12** 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.

**2.3.13** Prototype and type-series lifting sets for offshore containers or their components (when approved separately) shall be tested in compliance with the requirements of standards listed in 9.4, Part VII "Offshore Containers" of the Rules for the Manufacture of Containers, as well as in accordance with the approved technical documentation.

## **2.4 TECHNICAL SUPERVISION DURING MANUFACTURE OF MATERIALS**

**2.4.1** The materials specified in the Nomenclature of Items of the Register Technical Supervision (refer to Table 2.1.2 of the General Regulations for the Technical Supervision of Containers) shall be manufactured under the Register technical supervision.

**2.4.2** Technical supervision during manufacture of materials is performed in accordance with the requirements of Part III "Technical Supervision During Manufacture of Materials" of the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships.

**2.4.3** The characteristics of the material shall comply with the requirements of technical documentation approved by the Register for a particular container model for the manufacture of which the material will be delivered.

## **2.5 TECHNICAL SUPERVISION DURING TESTS**

**2.5.1** Technical supervision during tests of products includes:

- .1** the surveyor participation in tests of prototypes and serial products at the established production;
- .2** the surveyor participation in tests of prototype products.

**2.5.2** Tests are conducted in accordance with programs approved by the Register.

## **2.6 DOCUMENTS AND BRANDING**

**2.6.1** Based on the results of surveys and tests the surveyor issues the appropriate Register documents for the items of technical supervision and in prescribed cases puts brands thereon (refer to Table 2.1.2 of the General Regulations for the Technical Supervision of Containers and 1.7).

**2.6.2** The following shall be attached to the documents:

**.1** tests results (test reports, chemical composition, strength characteristics for each heat) and nondestructive testing results (radiographic examination or examination by other methods) carried out on the samples of the batch presented;

**.2** data on thermal treatment performed if provided for in the technical documentation.

**2.6.3** Upon the satisfactory results of tank survey, the Register brand shall be put on the identification plate of the tank after the data on pressure and leakproofness tests.

**2.6.4** In case of satisfactory results of the survey of the lifting sets for offshore containers, the Register brand shall be placed in the vicinity of the date of manufacture on the lifting sets tested in the presence of the surveyor. Otherwise, only the date of manufacture shall be indicated on the identification plate.

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

#### **3.1 GENERAL**

**3.1.1** The purpose of the technical supervision is to determine and ascertain by the Register the conformity of the containers manufactured with the approved documentation with respect to:

- .1** specified dimensions;
- .2** strength and safety in service;
- .3** fulfillment of structural requirements imposed on containers for international transport of goods under customs seals.

**3.1.2** The scope of survey is specified in Appendix 2.

#### **3.2 TECHNICAL SUPERVISION DURING MANUFACTURE OF PROTOTYPE CONTAINERS**

**3.2.1** In order to survey the prototype container, the firm shall submit to the Register a request for technical supervision stating the prototype test program approved by the Register.

**3.2.2** During technical supervision the following shall be checked by the Register:

**.1** availability of documents (the manufacturer's certificates or the Register documents for items subject to technical supervision) for materials, products and equipment supplied under cooperation agreements and used during manufacture of containers, the Inspection Department documents for fittings, door locks and other products if they are manufactured by the firm in question;

**.2** availability of the Inspection Department reports indicating that the containers have passed satisfactorily the operation and acceptance checking by the Inspection Department and preliminary test with preparation of sheets of container measurement, as well as the results of weld inspection by non-destructive methods during manufacture of tank containers and offshore containers handled in open seas (refer to Table 3.2.2-1).

Notes: 1. All welds of tank containers shall be checked by visual examination, measurements, as well as radiographic or ultrasonic examination (depending on the applicability and provisions of the approved technical documentation). Depending on purpose, country of manufacture and area of operation of tank container, the scope of non-destructive testing may be changed subject to special consideration by the Register in each particular case. The requirements for the applicability of the methods and non-destructive testing are specified in 3.1 and 3.2, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships. Assessment of welded joints quality shall be carried out in compliance with 3.4, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships.

2. The scope of non-destructive testing of offshore container welded joints shall comply with Table 3.2.2-1. The requirements for non-destructive testing of offshore container welded joints by particular methods are specified in 3.2, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships. Assessment of quality of offshore container welded joints shall be carried out in compliance with Table 3.2.2-2.

3. Non-destructive testing and quality assessment of welded joints shall be performed by testing laboratories (centers) 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 Register surveyor prior to start of non-destructive testing;

**.3** conformity of all dimensions of containers with the dimensions specified in the Rules for the Manufacture of Containers;

**.4** quality of welds in compliance with 3.2.1, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships. Quality assessment of welded joints shall be carried out in compliance with 3.4, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships according to quality level C of ISO 5817, as well as with due regard of the above notes;

**.5** absence of cracks in the framework components, especially on corner posts, cross-members and rails of the base and roof;

Table 3.2.2-1

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.				

Table 3.2.2-2

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 1666 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.				

**.6** 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);

**.7** wood intended for the manufacture of containers — for absence of sap and other defects the number and size of which shall not exceed allowed values specified in normative documents;

**.8** documents on impregnation of the floorboards by wood preservatives;

**.9** workmanship of the floor — 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.

**Note.** 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 panels shall be revealed by illumination of the container bottom on the outside;

**.10** correct installation and attachment of tank in the framework (particular attention shall be given in this case to attachment of the tank in the framework supports so as not to cause local stresses in the supports and tank exceeding the allowed ones);

**.11** correct installation of fittings, piping, safety devices, vacuum valves, temperature, pressure and level gauges, own heating appliances and pressure units.

**Notes:** 1. Painting and/or application of thermal insulation shall be carried out only after the pressure test of the tank.  
 2. Internal coating inspection (rubber, polyurethane, enamel, etc.), if applicable, of the tank container shall be exercised by the method approved by the Register after the pressure test of the tank;

**.12** application of thermal insulation;

**.13** results of the internal coating inspection;

**.14** compliance with the requirements of the Rules for the Approval of Containers for the Transport of Goods under Customs Seal. During survey of containers, 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.).

According to the results of the technical supervision of the prototype container manufacture, a Report (form 6.3.29) shall be drawn up with a conclusion on the possibility of check tests for the container. Based on the results of technical supervision including technical supervision during tests, a Report (form 6.3.18) shall be issued.

**3.2.3** During technical supervision of the prototype which involves surveys at intermediate stages of the container manufacture, the provisions of 3.3.1 and 3.3.2 shall be met.

### **3.3 TECHNICAL SUPERVISION DURING MANUFACTURE OF CONTAINERS AT ESTABLISHED PRODUCTION**

**3.3.1** The Register technical supervision at the firms at established production of containers consists in survey of items of technical supervision at the intermediate stages of manufacture and in survey and tests of finished containers.

*Note.* When the manufacturer has a Recognition Certificate for manufacture (СПИ), the survey at the intermediate stages may not be carried out depending on the container structure and consistency of the product quality.

**3.3.2** During survey of items of technical supervision at the intermediate stages of manufacture, the inspection is exercised over the assembly and welding of containers, their assemblies and components. Subject to inspection are:

- .1** preparation of components and their edges for welding;
- .2** correctness of container assemblies for welding;
- .3** execution of welds;
- .4** correctness of inspection plates manufacture to check mechanical properties of welding seams of tank container vessels (where required);
- .5** manufacture of floors;
- .6** results of strength tests (when specified in the approved technical documentation) and their conformity with the approved documentation;
- .7** performance of operation checking by the Inspection Department.

**3.3.3** During survey of finished containers, the Register reviews the documents submitted by the firm on performance of operation checking and inspection of standard geometric dimensions of not less than 1 out of 10 containers of the batch presented in accordance with the approved procedure (during survey of tank containers, each container shall be subjected to operation checking and inspection of standard geometric dimensions), and checks:

**.1** conformity of standard geometric dimensions of containers, specified in the approved technical documentation in 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;
  - agreement of the method for measuring the standard dimensions with the Register;

**.2** compliance of materials and products with the approved technical documentation according to the Manufacturers certificates or RS certificates in compliance with 2.2;

- .3 correct application of marking;
  - .4 correct preparation, location and attachment of a Safety Approval Plate (CSC) and a Customs Approval Plate for Containers (CCC);
  - .5 results of testing of each container for weather tightness (except for tank containers);
  - .6 results of pressure and leakproofness tests of each tank container;
  - .7 of thermal containers for airtightness in accordance with 3.4, Part III "Thermal Containers" of the Rules for the Manufacture of Containers;
  - .8 results of testing of thermal containers 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;
  - .9 results of weighing of each tank container;
  - .10 welding seam quality by visual examination in compliance with 3.2.2;
  - .11 results of non-destructive testing of welds (refer to 3.2.2) and lifting tests of offshore containers, conducted in the presence of the surveyors to the Register (refer to 2.12 of Appendix 2).
- 3.3.4** Where during survey of containers or products violations of the requirements of normative documents or deviations from the technical documentation approved by the Register are revealed, the surveyor shall issue a Report (form 6.3.29) or an entry shall be made in the relevant check documentation (acceptance book, process sheet, etc.) specified in the Contract on Technical Supervision.

### **3.4 QUALIFICATION**

**3.4.1** Only certified welders having passed the tests under the programs prepared in compliance with the requirements of Section 5, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships and additional requirements set forth in Appendix 3, and having received the Welder Approval Test Certificate (form 7.1.30) shall be approved for performance of welding operations during manufacture of containers.

*Note.* The possibility of recognition of the documents to confirm the welders' qualification and being issued by another classification organization or an authorized competent body shall be determined by the Register in each particular case in the scope sufficient for confirmation of compliance of these documents with the requirements of the specified Section.

**3.4.2** During serial manufacture of tank containers intended for the carriage of dangerous goods, the managers and specialists engaged in design and manufacture shall be appropriately trained and certified.

### **3.5 TECHNICAL SUPERVISION OF USED MATERIALS AND PRODUCTS SUPPLIED UNDER COOPERATION AGREEMENTS**

**3.5.1** All the materials used in manufacture of containers shall comply with the technical documentation approved by the Register and be suitable for service at temperatures specified in the approved documentation.

**3.5.2** Technical supervision of the products and components supplied under cooperation agreements at the manufacturer's is performed by means of verification of documentation and availability of the Register brands in accordance with Table 2.1.2 of the General Regulations for the Technical Supervision of Containers or documents and brands of another classification society if authorized by the Register. The ACS documents may be recognized on consideration by the Register in each particular case.

**3.5.3** Spring-loaded safety valves shall be tested for opening/closing pressure in the amount of 10 % of the batch. If any non-conformities are identified, each safety valve is subject to inspection and testing.

**3.5.4** Frangible discs shall be checked for compliance of their labeling with the submitted certificates, as well as approved technical documentation on the tank containers. When said certificates are not available, frangible discs shall be checked for compliance with documents of the manufacturer verified by the RS surveyor.

### **3.6 TECHNICAL SUPERVISION OF WELDING CONSUMABLES**

**3.6.1** During technical supervision at the manufacturers', the welding consumables shall be checked for conformity with the requirements of 3.7.1, Part I "Basic Requirements" of the Rules for Manufacture of Containers and the technical documentation approved by the Register.

**3.6.2** Where necessary, the surveyor to the Register may require check tests of welding consumables.

### **3.7 PRODUCTION PROCESSES**

**3.7.1** Changes made in the production procedures for manufacture of containers followed by amendments or violations of the requirements 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.

**3.7.2** Standard welding procedures shall be approved in accordance with the requirements of Section 6, Part III "Technical Supervision during Manufacture of Materials" of the Rules for the Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships as applied to containers. The possibility to apply the welding procedure approved by another classification society or an authorized body is determined by the Register in each particular case on the basis of sufficiency of submitted documents for evaluation of the welding procedure compliance with the requirements of the Register and in case of no contradiction with the requirements of the Register.

**3.7.3** 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.

### **3.8 TECHNICAL SUPERVISION OF CONTAINER MARKING AND EXECUTION OF CSC AND CCC PLATES**

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

**.1** the Register emblem;

**.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 the ISO 6346;

**.3** code of type and code of size;

**.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;

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

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

**.8** marking of vacuum valves and safety devices.



**3.8.2** 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 the International Convention on Safe Containers, 1972 (refer to 4.1, Part I "Basic Requirements" of the Rules for the Manufacture of Containers) and the Customs Convention on Containers, 1972 (refer to Section 3 of the Rules for the Approval of Containers for the Transport of Goods under Customs Seal).

*Note.* The surveyor shall satisfy himself 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.

**3.8.3** 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 3.8.2.1 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.

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

**3.8.5** 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 and 9.7, Part VII "Offshore Containers" of the Rules for the Manufacture of Containers shall be checked.

### **3.9 NORMATIVE DOCUMENTS**

**3.9.1** Technical supervision during the manufacture of containers is performed having regard to the Procedure for the Application of the Register Rules and the Requirements Established by Administrations during Technical Supervision of Containers during Manufacture and in Service.

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

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

The requirements and definitions of Sections 1 — 6, with the exception of 2.4.2, apply to tank containers with a FRP shell.

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

**3.10.2** Technical supervision of raw materials and components.

**3.10.2.1** 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.

**3.10.2.2** 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 3.10.2.2;

Table 3.10.2.2

**Requirements to incoming inspection of resins used for shell fabrication**

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 2. Acid number 3. Specific density 4. Appearance	ISO 3104, ISO 3219, ISO 2555 ISO 2114  ISO 12185, ISO 2811, ISO 1675 Visual inspection	1. Viscosity 2. Gel time and exothermic reaction temperature during cure of binder 3. Specific density 4. Appearance	ISO 3104, ISO 3219, ISO 2555 ISO 2535  ISO 12185, ISO 2811, ISO 1675 Visual inspection
Epoxy resins			
1. Viscosity 2. Epoxy equivalent  3. Specific density 4. Appearance	ISO 3104, ISO 3219 ISO 3001  ISO 12185 Visual inspection	1. Viscosity 2. Gel time  3. Specific density 4. Appearance	ISO 3104, ISO 3219 Testing method shall be specified in the process specification on shell manufacture ISO 12185, ISO 1675 Visual inspection
Phenolic resins			
1. Viscosity 2. pH value 3. Volatile content 4. Specific density 5. Appearance	ISO 3104 ICO 8975 ISO 3251 ISO 12185 Visual inspection	1. Viscosity 2. Specific density 3. Appearance	ISO 3104, ISO 3219, ISO 2555 ISO 12185, ISO 1675 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.

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

**.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.

**3.10.2.3.2** The resin manufacturer shall specify characteristics (refer to Table 3.10.2.2) with tolerance intervals in the certificate for each resin batch.

**3.10.2.3.3** The shell manufacturer shall verify compliance of the resin characteristics specified in Table 3.10.2.2 with the values given in the process specification considering the tolerance intervals.

**3.10.2.3.4** 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.

**3.10.2.3.5** 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.

**3.10.3 Manufacture process for FRP shells.**

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

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

**.1** The weight content of the fiber reinforcement shall be within a tolerance of 10 % to 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.

**.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.

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

**3.10.3.3.1** Structural layers shall be winded 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.

**3.10.3.3.2** 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.

**3.10.3.3.3** 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.

**3.10.3.3.4** 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.

**3.10.3.4** 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.

**3.10.3.4.1** 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.

**3.10.3.5** 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.

**3.10.4 Technical supervision during manufacture of shells.**

**3.10.4.1** When manufacturing a prototype FRP shell, compliance with the manufacture methods in accordance with the requirements in 3.10.3 is subject to technical supervision.

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

**3.10.4.2.1** The state of structural layers shall comply with the criteria specified in Table 3.10.4.2.

**3.10.4.2.2** 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.

**3.10.4.3** Thickness and dimension inspection for the prototype and serial items.

**3.10.4.3.1** 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.

**3.10.4.3.2** 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.

Table 3.10.4.2

Criteria for permissible defects in shell's structural layers

No.	Defect description	Defect intensity and permissible sizes
1	Voids (air bubbles)	6 per 10 cm <sup>2</sup> , max. 3 mm in diameter
2	External blisters at shell's structural layers	15 per 10 cm <sup>2</sup> , max. 1,5 mm in diameter 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

#### 3.10.4.4 Hardness tests of the prototype and serial items.

**3.10.4.4.1** 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.

**3.10.4.5** 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.

**3.10.4.6** The prototype and type-series items are subject to internal test pressure according to 3.7 (except 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.

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

**3.10.4.7.1** 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.

**3.10.4.7.2** 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 hours.

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

## **4 TECHNICAL SUPERVISION DURING TESTS OF CONTAINERS**

### **4.1 SURVEY AND RECOGNITION OF TESTING LABORATORIES**

**4.1.1** Testing laboratories conducting tests of containers, materials and products for them shall be recognized in accordance with 1.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

**4.1.2** Testing benches for containers at the manufacturer of containers are surveyed as a part of the manufacturer's equipment, and no Recognition Certificate of Testing Laboratory is required in this case.

**4.1.3** Survey of testing benches is carried out during the tests contemplated in programs approved by the Register. Consideration in this case shall be given to:

**.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 Rules for the Manufacture of Containers and approved methods;

**.3** availability of documents on inspection of the equipment and devices of testing benches 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:

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);

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);

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);

dynamic test of tank containers; 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:

weighed, marked with the Inspection Department report issued;

checked by the Register 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.

*Note.* 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.

## **4.2 TECHNICAL SUPERVISION DURING TESTS**

**4.2.1** Tests of the prototype containers and containers at established production are conducted under the Register technical supervision in the laboratories recognized by the Register.

The scope and procedure of testing is specified in Appendix 2 to these Rules and in the Rules for the Manufacture of Containers.

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

- .1** fulfillment by the firm of the requirements of the Rules for the Manufacture of Containers and 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.

*Note.* 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.

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

- pressure gauges — accuracy rating 2,5;
- flow meters — accuracy rating 2;
- thermometers — accuracy rating 1;
- electrical measuring instruments — accuracy rating 2;
- tape measures — accuracy rating 2;
- mass measuring instruments — maximum percentage error is 2 %;
- dynamometer — accuracy rating 2.

## **4.3 EVALUATION OF TEST RESULTS**

**4.3.1** The container test report is drawn up by the testing laboratory or by the manufacturer in accordance with the form agreed with the Register, and shall be certified by the persons authorized to conduct tests and submitted to the Register for consideration.

**4.3.2** 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 tank containers are ensured;
- .4** regulated container dimensions as based on check measurements after all tests correspond to those given in the Rules for the Manufacture of Containers.

## **5 BRANDING**

**5.1.1** Each container which has been surveyed and tested with satisfactory results shall have the brand of the Register of approved type on the CSC Plate (adjacent to the date of the next survey) and on the Identification Plate with Tank Data for tank containers (adjacent to the date of testing).

**5.1.2** On offshore containers, the brand stamp shall be marked in the identification plate near the Certificate number of the Register.

**5.1.3** During the technical supervision of materials and products one shall be guided by the requirements of 2.6.

**5.1.4** 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.

## **6 KEEPING RECORDS OF CONTAINERS**

**6.1.1** The Register keeps records of containers in accordance with the Regulations for Keeping Record of Containers in the Register and Registration of the Code of Container Owner in the Bureau International des Containers.



## **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 demand, 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 — side and end faces;  
cast or stamped fittings with weldable plate (additional wall which develops box-shaped fitting as per ISO 1161).

**1.4** Where fittings shall be manufactured by series, the manufacturer shall submit the documentation to the Register for consideration in accordance with 1.4.1, Part I "Basic Requirements" of the Rules for the Manufacture of Containers, as applied to the manufacture of fittings, and shall be subjected to the procedure of the manufacturer survey by the Register surveyor including tests of fittings in accordance with the program approved by the Register. Where the results of consideration of the technical documentation and survey are satisfactory, the Register draws up the Report on Survey of the Manufacturer and concludes the Contract on Technical Supervision during Manufacture of Fittings.

**1.5** The manufacturer of fittings shall apply to the Register with a written request. Enclosed with the request shall be the specification 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 to castings.**

##### **2.1.1 Chemical analysis.**

Fittings shall be manufactured in electric furnaces or oxygen-converter or other process on agreement with the Register and steel shall be killed. Chemical composition of steel shall meet the requirements of Table 3.2.4.1, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

**2.1.2** Use of other material composition may be permitted subject to agreement with the Register, provided that they conform to the approved specifications and good weldability thereof in the process of the manufacture of containers is confirmed.

**2.1.3** The chemical composition of steel including grain refining elements is established by approved specification depending on mechanical properties given in Table 3.2.4.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers. Sensitivity to cold cracks (carbon equivalent  $C_{eq}$ ) when evaluating weldability shall be calculated from the data of the ladle analysis in accordance with the formula given in the note to Table 3.2.4.1, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

**2.1.4** Weldability shall be demonstrated by the manufacturer of fittings in the process of the production approval by the Register.

**2.1.5** 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 3.2.4.2, 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.

#### **2.1.6 Thermal treatment.**

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

#### **2.1.7 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 3.2.4.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

#### **2.1.8 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 General requirements.**

The serial product manufacturer shall either meet the requirements of 1.4 of Appendix 1, or submit each batch of fittings for survey by the Register surveyor.

#### **2.2.2 Chemical analysis.**

The manufacturer shall determine chemical composition of each heat (ladle analysis).

#### **2.2.3 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 3.2.4.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

#### **2.2.4 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 surveyor to the Register 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.

#### **2.2.5 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.

#### **2.2.6 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. Therewith, prior to testing, the compliance of the testing laboratory with the requirements specified in 1.5.2.2.2.1, 1.5.2.2.3.1, 1.5.2.2.3.2, 1.5.2.2.5.1, 1.5.2.2.5.2, 1.5.2.2.6, 1.5.2.2.7 and 1.5.2.3 of Part I "Basic Requirements" of the Rules for the Manufacture of Containers shall be verified.

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 fittings are subject to testing. Other methods to confirm the strength characteristics may be accepted subject to agreement with the 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 Register surveyor puts the Register brand on each inspected fitting. When issuing an affirmed Certificate, the brand may be put by a designated official, which shall be specified by the Agreement on Survey (refer to 1.5.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers).

### **2.4 Certificates.**

**2.4.1** For each batch the manufacturer shall submit to the Register 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 and chemical composition;
- 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.

### **3 FITTINGS MANUFACTURED WITH THE USE OF WELDING**

#### **3.1 Requirements for basic materials.**

**3.1.1** The built-up fittings shall be manufactured of the following material compositions:

carbon-manganese steel with chemical composition according to Table 3.2.4.1, Part I "Basic Requirements" of the Rules for the Manufacture of Containers, when manufactured by casting;

carbon-manganese micro-alloyed steels, low-alloyed steels when the fittings are rolled or stamped.

**3.1.2** Steel for fitting components manufactured of rolled products, stamping, castings with the use of welding shall be manufactured in accordance with the approved national standards and be delivered fully deoxidized, treated by grain refining elements and thermally treated.

**3.1.3** Content of chemical elements in steel shall consider the carbon equivalent  $C_{eq}$  according to 2.1.

**3.1.4** Minimum requirements for the mechanical properties of steel used for the components of built-up fittings despite the manufacturing method (casting, forging, rolling) shall comply with Table 3.2.4.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

**3.1.5** Steel which differs in mechanical properties is subject to special agreement with the Register.

#### **3.2 Requirements for welding consumables and welding.**

**3.2.1** Welding consumables intended for welding of built-up fittings shall be approved by the Register and meet the requirements of standards agreed with the Register.

**3.2.2** Welding consumables shall be selected with due regard for the mechanical characteristics and chemical composition of the base material and in this case the range of working temperatures shall be taken into account in the same manner as during selection of the base materials.

**3.2.3** The built-up fittings manufactured of cast, stamped and rolled elements shall be welded using welding consumables with controllable content of diffusible hydrogen. Use of austenitic welding consumables is allowed subject to agreement with the Register.

**3.2.4** Welded joints of components (walls, surfaces) of fittings bearing main loads shall be made with full penetration.

**3.2.5** The need for pre-heating before welding and thermal treatment after welding depends on chemical composition of the base material and welding consumables and the method of manufacture of welded fitting components (casting, forging, rolling).

**3.2.6** All the welding procedures used during manufacture of built-up corner fittings shall be approved by the Register, based on the results of tests conducted under the program approved by the Register, in the surveyor's presence.

**3.2.7** The welding procedures of the manufacturer shall comply with the requirements of the Register rules and national or international standards which shall be attested by the Register surveyor during certification of the welding procedure.

**3.2.8** All welding operations shall be performed by welders having Welder Approval Test Certificate (Form 7.1.30) in conformity with the welding procedures approved by the Register.

#### **3.3 Testing and inspection.**

**3.3.1** To check the quality of welds and manufacture of fittings of each type when starting production the following types of inspection are performed:

external examination and measurement of dimensions;

non-destructive testing (ultrasonic or X-ray radiographic examination, subject to agreement with the Register);

check of mechanical properties of the base metal and welded joints;

testing by working loads in accordance with the Rules for the Manufacture of Containers.

**3.3.2** Subject to external examination and measurement of dimensions are all the fittings or their welded joints, and the quality of welded joints is evaluated in conformity with the standards agreed with the Register.

**3.3.3** Subject to ultrasonic or X-ray radiographic examination are 2 % of fittings from each batch (in accordance with the definition of batch given in Appendix 2), but not less than three pieces. The quality

is assessed in accordance with national or international standards agreed with the Register. The welded joints shall be free from cracks and poor fusion. Where a quality control system approved by the Register is used by the manufacturer and also where the stable workmanship of fittings over a long period of time is confirmed, at the discretion of the Register surveyor, the scope of the radiographic (ultrasonic) examination may be reduced or the latter may be replaced by magnetic powder inspection or by penetrate inspection.

**3.3.4** Subject to check of mechanical properties of the base metal and welded joints of fittings are each charge or each batch of fittings numbering 400 pieces, and the following mechanical tests are carried out in this case:

tension test using three specimens of welded joints;

impact test (three specimens in the weld area and three specimens in the heat-affected area);

test to determine hardness of the heat-affected area of the fillet weld with full penetration on macrosection.

**3.3.5** Mechanical tests of welds shall be carried out in conformity with requirements of national or international standards agreed with the Register, and the ultimate breaking strength of the welded joint shall not be less than that for the base metal and shall comply with the value given in Table 3.2.4.2, Part I "Basic Requirements" of the Rules for the Manufacture of Containers. The impact energy during the test of the metal of weld and heat-affected area shall not be less than 27 J at the test temperature of  $-20^{\circ}\text{C}$ , hardness shall be not more than 350 HB.

**3.4 Marking and documentation.**

Marking of welded fittings as well as accompanying documents for each batch shall comply with 2.3 and 2.4.

## APPENDIX 2

### LIST OF ITEMS TO BE SUBMITTED TO THE REGISTER FOR TECHNICAL SUPERVISION<sup>1,2</sup>

Nos.	Item of technical supervision	Minimum scope of surveys and tests	Survey and test procedure	Presentation of survey results
<b>1 MANUFACTURE OF CONTAINER PROTOTYPES (not less than two samples)<sup>1,2</sup></b>				
1.1	Products for containers manufactured by the container manufacturer, indicated in Table 2.1.2 of the General Regulations for the Technical Supervision of Containers	Each product is subject to survey with performance, where necessary, of tests under program approved by the Register <sup>3,4</sup>	Refer to provisions of 2.3 and 2.4, Section 2 and Appendix 1	The manufacturer's documents and/or Report (form 6.3.29) or the document in accordance with Table 2.1.2 of the General Regulations for the Technical Supervision of Containers
1.2	Materials and products supplied under cooperation agreement	Verification of the manufacturer's documents, the Register certificates or documents of another classification society (refer to 3.5.2.) <sup>5</sup> Inspections during mounting and tests	Refer to provisions of 3.5 and 3.6	Where non-conformities are identified, the documents contemplated by the RS QMS procedures shall be issued
1.3	Monitoring of assembling and welding procedures of accessories and parts	According to the list of the items of technical supervision agreed with the manufacturer	Refer to provisions of 3.2, Section 3	The manufacturer's documents or Report (Form 6.3.29)
1.4	Assembled container	Survey including verification of the Technical Supervision Book (process sheet) and other documents of the manufacturer's Inspection Department	Refer to provisions of 3.2, Section 3	Issue of documents completing container assembly and welding. A Report (Form 6.3.29) is issued for test approval
1.5	Tests of container (one prototype)	Participation in tests conducted under program approved by the Register	Refer to provisions of Section 4	Issue of the Report (form 6.3.29) and Report on Container Tests by the laboratory
1.6	Installation of insulation, painting, marking, etc.	Final survey. Check of lacquer coating and correctness of the customer marking is carried out subject to the customer application.	Refer to provisions of 3.8	Report (form 6.3.18), Certificates (Forms 6.5.23, 6.5.28, 6.5.29). Certificate of Approval by Design Type (forms 2.3.1, 2.3.2, 2.3.3, 2.4.1, 2.4.2) and Certificate of Compliance (Form 2.3.4)
<b>2 MANUFACTURE OF CONTAINERS AT ESTABLISHED PRODUCTION</b>				
2.1	Products manufactured by the container manufacturer	According to provisions of 2.3 and 2.43, 4, 6, Section 2	Refer to Table 2.3.1, Section 2	The manufacturer's documents and/or Report (Form 6.3.29) or the document in accordance with Table 2.1.2 of the General Regulations for the Technical Supervision of Containers
2.2	Materials and products supplied under cooperation agreement	Verification of the manufacturer's documents, the Register certificates or documents of another classification society (refer to 3.5.2.) <sup>5</sup>	Refer to provisions of 3.5 and 3.6	Where non-conformities are identified, the documents contemplated by the RS QMS procedures shall be issued
2.3	Survey of assembled containers after manufacture (except for the specialized ones)	5 % of the submitted batch, but not less than two containers	Refer to 3.3.3, Section 3	Where defects are found, a Report (form 6.3.29) on survey results shall be issued (form 6.3.29)
2.4	Survey of tank containers	Survey of each tank container	Refer to 3.3, Section 3	Certificate (form 6.5.29). Where defects are found during survey, a Report (form 6.3.29) on survey results shall be issued

Nos.	Item of technical supervision	Minimum scope of surveys and tests	Survey and test procedure	Presentation of survey results
2.5	Weathertightness of containers, except for tank containers	Check of results of the tests performed by the firm and technical supervision during the testing of the number of containers specified in the Agreement of Technical Supervision (refer to 3.3)	Refer to 4.1.3.8, Section 4	Where defects are found, a Report (form 6.3.29) on survey results shall be issued (form 6.3.29)
2.6	Pressure and leakproofness tests of tanks, test of heating appliances and pressure units of a container	Each tank container and each item of equipment shall be subject to tests	Refer to 3.3, Section 3	Where defects are found, a Report (form 6.3.29) on survey results shall be issued (form 6.3.29)
2.7	Sampling tests of general cargo containers	On sampling basis, at the Surveyor's direction, one container out of the batch of 500 containers satisfactorily surveyed <sup>8</sup> is tested to the extent agreed by the Register and the customer	According to the approved test program	1. Container Test Report (to be issued by the laboratory). 2. Report (form 6.3.18). 3. Certificate (form 6.5.23)
2.8	Sample tests of tank containers	On a sampling basis, at the Surveyor's direction, one tank container from each 100 ones is tested under the prototype test program, in case of customer's claims and depending on stability of workmanship of type-series containers.	According to the approved program of prototype container testing	1. Container Test Report (to be issued by the laboratory). 2. Report (form 6.3.18). 3. Certificate on Tank Container <sup>9</sup> (form 6.5.29)
2.9	Airtightness tests of thermal containers	Number containers is established by the Register in each particular case depending on container design and stability of workmanship, but not less than one container in the batch or every 50th container	Refer to 3.3, Section 3	Certificate (form 6.5.28). Where defects are found during survey, a Report (form 6.3.29) shall be issued
2.10	Performance tests of containers with refrigerating/heating plants	Tests of thermal containers with refrigerating/heating plant for performance thereof are carried out to conform the characteristics of the refrigerating/heating plant by the Register	Refer to 3.7, Part III "Thermal Containers" of the Rules for the Manufacture of Containers	Certificate (form 6.5.28). Where defects are found during survey, a Report (form 6.3.29) shall be issued
2.11	Sample tests of thermal containers	Every 50th container which is satisfactorily surveyed <sup>8</sup> is tested for lifting, floor strength and heat transfer	According to the approved test program	Test Report is issued by the laboratory, Certificate (form 6.5.28). Where defects are found, a Report (form 6.3.29) is issued
2.12	Four points lifting test of offshore containers and weathertightness test (if required)	Number of containers to be tested is specified in Table 8.1.8, Part VII "Offshore Containers" of the Rules for the Manufacture of Containers <sup>8</sup>	Refer to 8.2, Part VII "Offshore Containers" of the Rules for the Manufacture of Containers	Test report is issued by the laboratory, Certificate (form 6.5.34 or form 6.5.36). Where defects are found, a Report (form 6.3.29) is issued
<b>3 MANUFACTURE OF ACCESSORIES AND PARTS FOR CONTAINERS</b>				
3.1	Survey of corner and intermediate fittings	Check of results of tests conducted by the manufacturer (2.2 of Appendix 1) and inspection in accordance with 2.2.4 of Appendix 1 <sup>4</sup>	Refer to Appendix 1	Certificate (form 6.5.30). Where defects are found during survey, a Report (form 6.3.29) is issued
3.2	Tanks	Each tank is subjected to survey and testing	Refer to 2.3, Section 2	Where defects are found, a Report (form 6.3.29) on survey results shall be issued (form 6.3.29)
3.3	Closure fittings, safety devices, vacuum valves	Survey and testing of 10 % of products out of the batch submitted. Where non-conformities are identified, each product shall be surveyed and tested	Refer to 2.3, Section 2	Certificate (form 6.5.30 or 6.5.31) or Certificate (form 6.3.29), if any defects are found as a result of survey

Nos.	Item of technical supervision	Minimum scope of surveys and tests	Survey and test procedure	Presentation of survey results
3.4	Pressure units and heating appliances	Each item of equipment shall be surveyed and tested	Refer to 2.3, Section 2	Certificate (Form 6.5.30 or 6.5.31) or Certificate (Form 6.3.29), if any defects are found as a result of survey
3.5	Refrigerating/heating plants for thermal containers	Performance test of each plant. Number of plants for checking operational performance of the container with the refrigerating plant in operation at high ambient temperature and for checking of operational performance of the refrigerating plant is established subject to agreement with RRH in each case depending on stability of production and technical supervision experience at the firm	Tests in accordance with 3.1.7, 3.6 and 3.7, Part III "Thermal Containers" of the Rules for the Manufacture of Containers	Certificate (orm 6.5.30) or Certificate (form 6.3.29), if any defects are found as a result of survey
3.6	Components of lifting sets for offshore containers	In compliance with the standards for the components and approved technical documentation	Testing and survey in compliance with 2.3.13	Issue of test protocols by the laboratory, Certificate 6.5.30/6.5.31) or Report (form 6.3.29), when any nonconformities are revealed
3.7	Lifting sets for offshore containers	Each lifting set	Testing and survey in compliance with 2.3.13	Issue of test protocols by the laboratory, Certificate 6.5.30/6.5.31) or Report (form 6.3.29), when any nonconformities are revealed
<p><sup>1</sup>Containers satisfactorily surveyed after manufacture.</p> <p><sup>2</sup>When granting approval in accordance with CSC one tank container is subjected to dynamic test (in case where the tank containers are intended for the carriage of dangerous goods).</p> <p><sup>3</sup>The batch of the remaining products shall consist of products in number necessary to manufacture not more than 100 containers of the same design type.</p> <p><sup>4</sup>Depending on the workmanship, the number of corner fittings or other products from a batch to be surveyed and tested may be increased at the surveyor's demand.</p> <p>In case where the results of survey of increased number of corner fittings are unsatisfactory, the entire batch shall be corrected and repeatedly submitted to the Register. When the batch is repeatedly submitted, the number of corner fittings or other products contained in the batch shall be doubled as compared to that specified in this Appendix.</p> <p><sup>5</sup>In case of doubts upon the conformity of materials used in manufacture of containers, with the documentation submitted thereon or the materials in the parts, accessories and structures of containers are faulty, the surveyor may require additional tests of materials according to 2.2.</p> <p><sup>6</sup>Certificate (form 6.5.30) or Report (form 6.3.29) where defects are found as a result of survey.</p> <p><sup>7</sup>The batch of containers shall consist of not more than 500 containers of the same design type, manufactured at the firm in question in conformity with the approved technical documentation.</p> <p><sup>8</sup>Based on the results of container survey, the Register surveyor may require additional tests (for tension and compression of frames, strength of end walls, etc.) to be conducted on other containers from the batch submitted. It is necessary to carry out additional tests on doubled number of containers selected by the surveyor from the batch submitted, when the results associated with at least one type of tests are unsatisfactory. Where the additional tests results are unsatisfactory, even for one of the containers tested, the whole batch from which the containers have been selected shall be rejected or repaired according to the procedure approved by the Register with repeated survey of assembled containers and tests thereof as newly manufactured.</p> <p><sup>9</sup>Certificate (form 6.5.29) is issued for each tank container.</p> <p>Notes: 1. Branding is performed in accordance with Table 2.1.2 of the General Regulations for the Technical Supervision of containers.</p> <p>2. During technical supervision of the manufacture of containers of other types than those specified by this Table, the list of the items of supervision shall be agreed with RHO.</p>				



## **RULES FOR THE CERTIFICATION OF WELDERS TO PERFORM WELDING DURING THE MANUFACTURE AND REPAIR OF CONTAINERS**

### **1 GENERAL**

**1.1** Rules for the certification of welders are set out in Section 4, Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

This Appendix contains amendments to the certification of welders for their approval and permit to perform welding during the manufacture and repair of containers.

**1.2** Certification of welders may be carried out by a standing commission on certification the members of which are approved by the order for the firm.

**1.3** The commission shall include:

- chief engineer of the firm — chairman of the commission;
- welding engineer — deputy chairman (Secretary);
- head of the Quality Control Department or Inspection Department;
- head (supervisor) of the production site;
- safety engineer;
- representative of the Register.

### **2 SCHEDULE OF WORK OF THE COMMISSION ON CERTIFICATION. ISSUE OF DOCUMENTS**

**2.1** The commission shall check the theoretical knowledge of welders, be present during welding of samples, and consider the test results in order to make a decision regarding these results.

**2.2** All the members of the commission shall be notified of the date of its meeting:

- employees of the firm — not less than 3 days before the date;
- employees of other organizations — not less than 10 days before the date.

**2.3** The following documents shall be submitted to the commission:

- program of welders certification;
- list of welders to be certified with indication of education, rate and professional experience;
- certificates of welders;
- conclusion based on the results of testing of test assemblies (in case of retests);
- reference of the quality of welders' works signed by the Quality Control Department (Inspection Department) in order to exempt the welder from retests.

**2.4** The decision of the commission shall be considered to be legitimate if not less than 60 % of its members are present at the meeting.

**2.5** When practical tests are performed, presence of two members of the commission (Head of the Quality Control Department/Inspection Department and Welding Engineer) to supervise performance of welding and assess the quality of samples visually, and the representative of the Register will be sufficient.

**2.6** Proceeding from the results of the practical and theoretical examinations of welders, the certifying commission executes a protocol in accordance with the form recommended in Appendix 3 to Section 4, Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

**2.7** Based on the protocol of welders' certification and provided that all the requirements of the Rules for the Manufacture of Containers to the certification of welders the Register draws up and issues a Welder Approval Test Certificate (form 7.1.30).

### 3 CHECKING OF PRACTICAL SKILLS

**3.1** Welders performing welding of parts and accessories with corner fittings shall carry out tee butt welding (refer to Fig. 3.1).

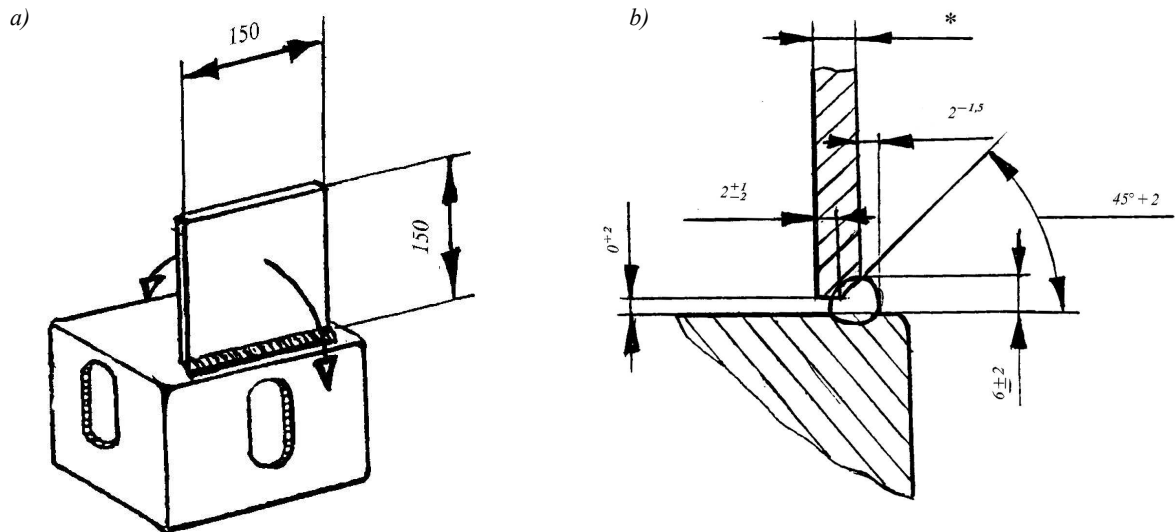


Fig. 3.1 Special tee-joint sample tested for fracture:

a) general view; b) sectional view

\* Minimum 4 mm or the maximum thickness used in structure.

**3.2** For welders carrying out welding on automatic (mechanized) sets, their work on container parts and accessories being welded shall be checked with subsequent visual inspection and measurement. A welder shall demonstrate skills in adjustment of the facility, correction of welding conditions and other necessary parameters.

**3.3** The materials of samples to be welded shall be identical to those used in container design. The quality of steel shall be confirmed by certificates. Other materials welding is not allowed.

**3.4** The dimensions of plates for samples to be welded are given in Appendix 1 to Section 4, Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships and in Figs. 3.1 and 3.4.

**3.5** Where the results of visual examination are unsatisfactory, a welder has the right to carry out rewelding of the check sample; the procedure of the repeated tests shall comply with the requirements of 4.4.6., Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

### 4 QUALITY OF WELDS

**4.1** The quality of welds is evaluated in accordance with the provisions of 4.4.5, Section 4, Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

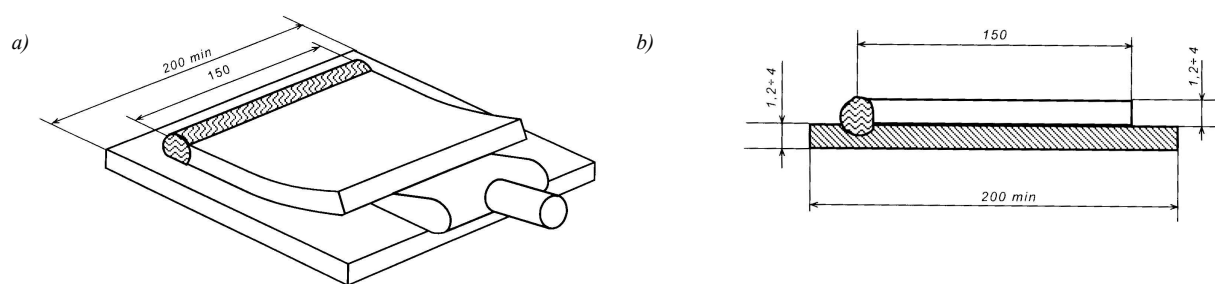


Fig. 3.4 Overlap joint sample tested for separation of plates:  
a) general view; b) sectional view

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

## **1 GENERAL**

### **1.1 APPLICATION**

**1.1.1** The requirements of the present Rules apply to the containers complying with the corresponding CSC and IMDG Code requirements, as well as the requirements of the Rules for the Manufacture of Containers

### **1.2 DEFINITIONS**

**1.2.1** For the purpose of these Rules the following definitions have been adopted.

**S u r v e y s** are examinations, gauging, tests and checks in operation as well as checking of the prescribed marking and stamping.

**V e r i f i e d   g r o s s   m a s s** is the total gross mass of a packed loaded container as obtained by one of the two methods:

Method 1: weighing of a fully packed and sealed container.

Method 2: weighing all packages and cargo items, including other securing material equipment to be loaded and added tare mass of the container using the calculation procedures agreed by the Register.

**S h i p p e r** is a legal entity or a person named on the bill of lading or sea bill of lading or equivalent multimodal transport document (e.g. "through" bill of lading) as shipper and/or who (or in whose name or on whose behalf) a contract of carriage has been concluded with a shipper.

## **2 TECHNICAL SUPERVISION**

### **2.1 GENERAL**

**2.1.1** The responsibility for submission of containers for surveys within the terms of these Rules and in the stipulated cases, presentation of necessary documents, as well as testing, gauging and inspecting for defects tests with the owner of containers.

The CSC gives the owners of container power to choose survey procedures:

submission of containers for examinations at time intervals given in 3.2 (periodical examination program);

submission of containers for survey in accordance with ACEP program approved by the Register.

**2.1.2** The responsibility for maintaining containers in proper condition for safe operation thereof rests with the owner of containers. At time intervals between prescribed surveys the owner shall ensure the necessary checks and examinations to reveal possible defects and faults, availability of marking of the containers and its compliance with the CSC and IMDG Code provisions, and the requirements of the Rules for the Manufacture of Containers.

**2.1.3** If an approved container has ceased to comply with the CSC provisions and the requirements of the Rules for the Manufacture of Containers due to structural or manufacturing defects revealed during service, and such occurrence is observed on a considerable number of containers out of the approved series, the Register may cancel the approval.

**2.1.4** In the case of loss of a CSC and/or CCC Plate, approval of an individual container for further service is subject to special consideration by the Register in each particular case.

When the approved containers undergo modification, all documents relative to such modification shall be submitted to the Register. Based on the results of consideration of the documentation submitted and the results of the prototype container testing to be performed, if considered necessary, the Register may grant a new approval.

The scope of testing shall be established by the Register in each particular case.

### **3 SURVEYS**

#### **3.1 GENERAL**

**3.1.1** Containers shall be surveyed on the application submitted to the Register.

**3.1.2** Non-destructive testing and quality assessment of welded joints of containers in service, when required by these Rules, shall be performed by testing laboratories (centers), whose competence and status comply with the requirements for 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 Register surveyor prior to non-destructive testing.

#### **3.2 PERIODICAL EXAMINATION PROGRAM ACCORDING TO CSC**

**3.2.1** The Register performs the following surveys of containers under the periodical examination program:

**.1** first special survey, not later than 5 years after the date of manufacture.

*Notes:* 1. The date (month, year), before which a container shall undergo its first survey is indicated on the CSC Plate affixed to the container after manufacture and may be indicated on both marked panels of the container side walls (when these are not provided, in the bottom portion of both side walls, in way of the owner code and number marking).

2. For tank containers for transportation of dangerous cargo the first periodical survey shall be carried out within the period specified in 3.4;

**.2** subsequent special surveys, at intervals not exceeding 30 months.

*Note.* The date (months, year), before which a container shall undergo a special survey is indicated on the CSC Plate or on the container itself, near the CSC Plate, and may be indicated on both marked panels of the container side walls (when they are not provided, then in the bottom part of both side walls, near the owner code and number marking);

**.3** occasional surveys to be held on application from owners of the containers or other organizations concerned.

**3.2.2** Special surveys of the containers include:

**.1** external examination including examination of the roof, base and internal volume of an empty container as well as examination of marking.

*Note.* If permissible load during the container stacking is less than 192,000 kg of the force when testing for transverse racking is less than 150 kN, the marking of container type and size of container shall be applied/changed in compliance with ISO 6346;

**.2** examination with provisions of access for examination, opening-up or dismantling of machinery (units), thermal insulation etc. at the discretion of the Register surveyor, depending on technical condition of the container;

**.3** tests and inspections at the discretion of the Register inspector, depending on technical condition of the container.

**3.2.3** In specific cases, depending on the technical condition of the tank container, the Register may require a diagnostic examination of the container to be made by methods approved by the Register.

*Note.* Diagnostic examination may include examination of framework welds and points of attachments of the tank to the framework by non-destructive methods, as well as the examination of the tank in compliance with 3.4.5.1.2.1.

**3.2.4** The scope of special surveys of thermal containers shall comply with the requirements of 3.2.2 and moreover, in accordance with the application from the owner or lessee, the extent of the survey may be extended for the objects listed in Table 3.2.4.

Table 3.2.4

Scope of survey of thermal containers		
Nos	Scope of survey	Survey <sup>1</sup>
<b>I</b>	<b>Insulated container</b>	CH
<b>II</b>	<b>Refrigerated and/or heated container</b>	
<b>1</b>	Refrigerating unit (as a whole)	OP
<b>2</b>	Components of refrigerating unit	
<b>2.1</b>	Compressor	OPH
<b>2.2</b>	Fans	P
<b>2.3</b>	Refrigerant pressure vessels and apparatus	OH
<b>2.4</b>	Safety valves (devices)	OPH
<b>2.5</b>	Refrigerant pipes and fittings	OPH
<b>2.6</b>	Starting and control arrangements of refrigerating unit	P
<b>2.7</b>	Instrumentation	E
<b>2.8</b>	Automatic equipment of refrigerating unit	
<b>2.8.1</b>	Control devices	P
<b>2.8.2</b>	Protection devices of refrigerating unit	OP
<b>3</b>	Thermal insulation of container and of closing devices thereof	C
<b>4</b>	Air pipes and air ducts, drainage arrangements	OP
<b>5</b>	Electrical equipment	
<b>5.1</b>	Source of electric power, if any	OPM
<b>5.2</b>	Distribution gears	OEPM
<b>5.3</b>	Cables	OM
<b>5.4</b>	Plugs	OM
<b>5.5</b>	Electrical drives of fans and compressors	OPM
<b>5.6</b>	Alarms and protective devices	OP
<b>5.7</b>	Heating unit, if any	OPM
<b>6</b>	Drive of electrical power source, if any	OPM
<b>III</b>	<b>Refrigerated container with expendable refrigerant</b>	
<b>1</b>	Refrigerant pressure vessels	C
<b>2</b>	Fans	P
<b>3</b>	Refrigerant sublimation or evaporation control devices	P
<b>4</b>	Instrumentation	E
<b>5</b>	Thermal insulation of container and of closing devices thereof	C
<b>6</b>	Air pipes and air ducts, drainage arrangements	OP
<sup>1</sup> Symbols: O — examination with provision of access, opening-up or dismantling of machinery (units), thermal insulation upon consideration of the Register surveyor depending on the container technical condition; C — external examination (inclusive of internal volume of the container); M — gauging of wear, clearances, insulation resistance of electrical equipment, non-destructive sampling inspection of welds; H — tests (thermal, hydraulic, leakage tests); E — checking of availability of the documents and/or brands of classification societies or appropriate competent authorities; P — testing of machinery (units) in service and external examination thereof.		

**3.2.5** Criteria for safe operation of containers set forth in 4.1.5 are considered as minimum requirements for survey for compliance with these Rules and the CSC provisions.

**3.2.6** In case of satisfactory survey results, the CSC plate shall be marked in compliance with Section 5.



### **3.3 APPROVED CONTINUOUS EXAMINATION PROGRAM (ACEP)**

**3.3.1** Containers shall be surveyed under ACEP in accordance with 2.1.1 by means of:

.1 complete surveys which constitute surveys carried out upon major repair, updating, modification or taking on/off lease;

.2 examinations in service, which are considered as re-inspections performed with the aim to reveal any damage or wear which can necessitate corrective measures.

**3.3.2** The containers, examination of which shall be made under ACEP, shall be subjected to complete survey in cases specified in 3.3.1.1, but at any case not less than once every 30 months.

**3.3.3** The ACEP Program to be submitted to Register Head Office for approval, shall contain the following information:

.1 number of containers included in the program;

.2 numbers of Approval Certificates according to CSC provisions for each type of container design;

.3 information on technical characteristics of container models included in the program;

.4 a system for recording and updating the identification numbers of all containers included in the program;

.5 conditions and procedure for adding containers into an already approved program;

.6 methods, scope and criteria of the condition assessment being used during the container survey;

.7 qualifications of the personnel authorized to carry out surveys;

.8 the nature and periodicity of inspections;

.9 terms of surveys and measures to ensure container surveys at least once per 30 months;

.10 information on control system of the survey terms;

.11 measures that shall be taken by the owners in respect of containers which cease to comply with the CSC requirements and the requirements of the Rules;

.12 system of keeping records and documents that shall capture:

the owner's unique serial number of the container;

the date of the container manufacture;

the date on which the survey was carried out;

a competent person who carried out the survey;

the name of the organizations and firms where the container survey and/or technical maintenance (repair) will be carried out;

.13 the survey results.

**3.3.4** If satisfied with the results of consideration of the submitted ACEP Program, the Register shall notify the owner and other concerned parties on the approval of the Program.

**3.3.5** A sign containing letters with the name of country and the number of the program approved by the Register shall be marked on the CSC Plate or in immediate proximity thereof to indicate that the container is operated in conformity with the approved ACEP Program.

**3.3.6** The approval of ACEP program is valid for not more than 10 years. The program shall be confirmed at least once per 30 months.

**3.3.7** ACEP program does not cover tank containers.

**3.3.8** Firms and organizations carrying out maintenance, repair and tests of the containers shall be recognized by the Register.

### **3.4 PERIODICAL SURVEYS OF TANK CONTAINERS**

**3.4.1** Tank containers intended for transport of dangerous goods among others shall be tested and surveyed at not more than at 5 year intervals from the date of initial strength test at the firm (manufacturer) with an intermediate survey every 2,5 years.

Tank containers filled prior to the expiry date of the recent periodical surveys may be transported within not more than 3 months upon the expiry date of the recent periodical surveys.

**3.4.2** The firm, where periodical survey of tank containers may be carried out shall be inspected by the Register and have Certificate of Firm Conformity (CCFI/CPI) with activity code 40000006 specialized in "Preparing and testing of tank containers during periodical surveys".

To obtain the Certificate of Firm Conformity (CCFI) the firm shall comply with the following requirements.

**3.4.2.1 Personnel.**

**.1** The firm shall have documents on the personnel containing the following information:

functional duties;

professional and special training;

**.2** the firm shall have the regular staff of specialists;

**.3** the firm shall have and adhere to the plans (schedules) of the following:

personnel training and re-training;

advanced training.

**3.4.2.2 Technological infrastructure.**

**.1** The firm shall have the lists of equipment, premises and facilities necessary for periodical survey of tank containers;

**.2** the firm shall have and adhere to the schedules of maintenance of equipment and facilities.

**3.4.2.3 Measurement assurance.**

**.1** The firm shall have the lists of the following:

measuring equipment;

testing and auxiliary equipment;

**.2** the firm shall have and adhere to the schedules of the following:

**.1** maintenance of measuring and testing equipment;

**.2** verification (calibration) of measuring equipment.

**3.4.2.4 Files of the firm documents.**

**.1** The firm shall have the valid normative and technical documents necessary for performance of activity in the relevant area, including:

list of activities performed (area of activity);

program and procedure of testing;

operating and maintenance documentation of equipment;

duty regulations;

documents on records keeping and archives maintenance.

**.2** the procedure for obtaining CFI is given in 4.3.

**3.4.3** The tank containers prepared for survey by the Register surveyor shall be cleaned, degassed, ventilated and have the document issued by a cleaning station, which specifies the last cargo carried and the cleaning method, as well as the valid document on the gas analysis of tank medium with the conclusion on a possibility of work performance inside the tank, signed by the specialist who did the air analysis. The tests shall be carried out according to the program approved by the Register and to the test procedure.

**3.4.4** Criteria of safe operation of containers set forth in 4.1.5 and 4.1.6 are minimum ones for periodical surveys.

### **3.4.5 Survey every 2,5 years.**

#### **3.4.5.1** The scope of survey of tank containers shall include the following:

**.1** assessment of technical condition of all frame members (fittings, longitudinal, transverse frame members, corner posts, attachments of the tank to the framework, welds etc.);

**.2** tank survey:

**.2.1** assessment of technical condition of internal surface.

*Notes:* 1. Where the corrosion of the tank material, the character and dimensions of which cannot be determined without using the special diagnostic means, has been revealed and it may result in the reduced thickness of the tank shell below the minimum value required by the construction, in order to determine the character and dimensions of damage, the Register may demand conducting the diagnostic examination using the methods agreed with the Register.

2. Tank containers operating for more than 10 years from the date of manufacture are subject to mandatory diagnostic examination by methods approved by the Register during periodical surveys each five years within the scope prescribed by Surveyor of the Register upon results of the examination.

3. Diagnostic examination includes residual wall thickness measurements of the tank and may include examination of tank welds and points of attachment of the tank to the frame by nondestructive testing. The scope of non-destructive testing of welds shall be determined based on the results of internal examination of the tank.

The method of non-destructive examination shall be selected with due regard to the tank material, its thickness and mutual arrangement of the welded components of the area inspected.

The requirements to the applicability of the methods and performance of non-destructive testing are specified in 3.1 and 3.2, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships. Quality assessment of welded joints shall be carried out in compliance with 3.4, Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships.

Tank thickness measurement may be carried out by the firm specialists when the firm complies with 1.5.2.1.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers as applicable to wall thickness measurement of the tank and if the corresponding devices with valid verification results are available at the firm. The firm shall be responsible for the qualification, professional training of the personnel in compliance with the national, international and industrial standards. The firm shall have and adhere to the schedules of maintenance of equipment and possess measuring instruments as part of the Appendix to the Certificate (CII, CCI) of the firm information on the ability to carry out residual thickness measurements on its own.

4. Internal examination of tank containers with the vacuum insulation is carried out at intervals specified by the manufacturer;

**.2.2** assessment of technical condition of external surface.

*Note.* The Register may require full or partial dismantling of insulation if a suggestion that a tank is damaged appeared during internal or external examination;

**.3** assessment of completeness and technical condition of operating equipment, safety devices, devices for producing and maintaining of pressure and temperature, meanwhile:

**.3.1** all stop valves and vents shall be checked for operability. In case of any doubts about proper functioning of any equipment, it shall be dismantled and checked;

**.3.2** all safety valves and frangible discs shall be dismantled and inspected. The safety valve turn-on pressure shall be inspected for compliance with the value specified on valve marking keeping due note of pressure required by the international and national normative documents. Safety valves shall close at pressure, which is at least by 10 % less than the turn-on pressure and remain closed at all lower pressures.

*Note.* This inspection shall be carried out at the approved test bench;

**.3.3** the frangible disks shall be 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). Frangible disks fitted on tank containers shall have the Register Certificates. In the absence thereof, the documents of the manufacturer verified by the RS surveyor shall be provided;

**.3.4** replaceable instrumentation shall be verified and have valid documents and marking;

**.4** tests.

Leakproofness tests shall be carried out in accordance with procedure described in 3.8, Part IV "Tank Containers" of the Rules for the Manufacture of Containers without removal of insulation and protective coating.

A tank shall be kept under pressure for at least 10 minutes. Absence of any leaks in a tank, its fittings and joints is checked during tests using suds or other effective method of leak detection;

**.5 inspection of marking:**

**.5.1** check of availability of all required plates, correctness and readability of notes.

*Note.* Recovery of plate with tank data, CSC and CCC Plates in case of their loss is a matter of special consideration by the Register in each particular case;

**.5.2** check of compliance of the tank container marking with the requirements of Section 4, Part IV "Tank Containers" of the Rules for the Manufacture of Containers, as well as the requirements of 3.2.2.1;

**.5.3** in case of satisfactory survey results the CSC plate shall be branded in compliance with Section 5.

**3.4.6 Survey every five years.**

**3.4.6.1** In addition to the scope of survey set forth in 3.4.5 the following tests shall be carried out:

**.1** hydraulic test of a tank by pressure specified on a plate with tank data without removal of insulation and protective coating as well as hydraulic test of refrigerating or heating systems.

*Notes:* 1. Prior to hydraulic test of a tank the safety and vacuum valves shall be removed and replaced by hermetic plugs of the relevant design and strength. For the purposes of hydraulic tests, the gasket of a manhole may be replaced by a rubber one. A tank shall remain under pressure for at least 30 min.

2. In particular cases, the Register may consider other means of determining the technical condition of the tank and diagnostic methods.

Absence of a leak and pressure drop in a tank, its fittings and refrigerating or heating systems shall be checked during the test.

**.2** if hydraulic tests are completed successfully, the leakproofness test shall be carried out in accordance with the procedure specified in 3.4.5.1.3.

*Note.* Prior to the leakproofness test, the sealings of material required for operation shall be fitted to all connections between the tank and equipment, as well as to a manhole;

**.3** check of efficiency of devices for producing and maintaining of pressure in a tank;

**.4** in case of satisfactory survey results, the plates shall be marked in compliance with Section 5.

### **3.5 PERIODICAL SURVEYS OF OFFSHORE CONTAINERS**

**3.5.1** The scope and frequency of surveys of offshore containers shall comply with the requirements of Table 3.5.1.

**3.5.2** The scope of visual inspection shall comply with that specified in 3.2.2. Special attention shall be paid to condition of welds of pad eyes and members impacting the structural strength of the container.

**3.5.3** Non-destructive testing of pad eye welds and mating elements shall be carried out by magnetic particle inspection check, dye penetrant inspection or eddy current method (considering the requirements of 8.3 ISO 10855-3).

The Register may require diagnostic examination by other methods. The requirements for non-destructive testing and quality assessment of welded joints are specified in 3.2.2 of the Rules for Technical Supervision during Manufacture of Containers.

*Note.* Non-destructive testing report shall be attached to the container survey report.

**3.5.4** Offshore tank containers intended for the transport of dangerous goods shall in addition pass surveys listed in 3.4.

**3.5.5** The survey scope and frequency of the lifting sets of offshore containers shall meet the requirements of Table 3.5.5.

Table 3.5.1

Interval	Test/survey			
	Lifting test <sup>1</sup>	Non-destructive testing of lifting eyes	Visual examination	Marking on inspection plate <sup>2</sup>
Regular, at intervals not exceeding 12 months	Up to Surveyor to the Register discretion	Up to Surveyor to the Register discretion	+ <sup>3</sup>	T or VN or V
Regular, at intervals not exceeding 48 months	Up to Surveyor to the Register discretion	+	+	T or VN
After major repair or modernization <sup>4</sup>	+	+	+	T

<sup>1</sup> Lifting test procedure shall comply with the procedure given in 8.2.1 and 8.2.2, Part VII «Offshore Containers» of Rules for the Manufacture of Containers. No residual deformation preventing use of a container for its purpose shall remain after testing. Tests shall be carried out in the laboratories having Recognition Certificate of Testing Laboratory (CITL) or complying with the requirements of 1.5.2.1.5, Part I "Basic Requirements" of the Rules for the Manufacture of Containers.

<sup>2</sup> T — marking denoting visual examination, lifting test and non-destructive testing;  
VN — marking denoting visual examination and non-destructive testing;  
V — marking denoting visual examination only.

<sup>3</sup> + — is carried out.

<sup>4</sup> The major repair or modernization means repair or modernization of members of container affecting its structural strength.

Table 3.5.5

Interval	Application	Tests/survey			
		Load test	Non-destructive testing <sup>1</sup>	Visual examination	Stamping of identification tag <sup>2</sup>
Special surveys at interval not exceeding 12 months	Complete lifting set	—	—	+ <sup>3</sup>	V
Special surveys at interval not exceeding 48 months	Sling components and joining links excluding legs	Load test or non-destructive testing <sup>1</sup>		+	T or VN
	Wire legs	—	—	+	—
	Chain sling legs	Load test or non-destructive testing <sup>1,2</sup>		+	T or VN
	Shackles	—	—	+	—
After substantial repair or modernization	Complete lifting set	+ <sup>3</sup>	+ <sup>3</sup>	+	T

<sup>1</sup>The magnetic particle method is used for the non-destructive testing of the lifting set items but steel wire ropes.

<sup>2</sup>Non-destructive testing shall be performed at the end links of each leg + 10 % of the leg length. The location of these 10 % shall be selected based on visual examination.

<sup>3</sup>In accordance with the applicable standards including EN 818-6.

T means the performance of visual examination, load test and non-destructive testing.  
VN means the performance of visual examination and non-destructive testing.  
V means the performance of visual examination only.

**3.5.6** The Register may require the diagnostics performance by other methods as well as carrying out additional surveys and tests.

**3.5.7** The survey of chain and wire lifting sets and members thereof shall be carried out in accordance with the applicable requirements of EN 818-6 and EN 13414-2 standards respectively.

**3.5.8** During survey, it is necessary to make sure that the marking plate and the information thereon corresponds with the technical characteristics of the presented lifting set it is attached to.

The slings of the lifting set shall be attached to the container and the fore runner, if any, without twisting.

**3.5.9** During testing of chain sling legs of lifting sets, a load equal to  $2,5 \times WLL \pm 2 \%$  shall be statically applied to each sling. The load shall be applied for 5 min as a minimum. Upon completion of the testing, the visual and measuring examination and, if necessary, non-destructive magnetic particle testing shall be carried out in the scope agreed with the Register.

*Note.* WLL for testing of each sling of the lifting set shall be assumed according to EN 818-4 (Table 3) for a single sling leg depending on the chain caliber indicated on the lifting set marking plate.

**3.5.10** Testing of the rings and connecting links of chain and wire lifting sets by test load is carried out according to the requirements of standards in compliance with which the products are made/ Minimum time for exposure under load is 5 min.

Upon completion of the testing, the visual and measuring examination and, if necessary, non-destructive magnetic particle testing shall be carried out in the scope agreed with the Register.

**3.5.11** No permanent deformations and damages preventing the safe use of the lifting set and its components according to their purpose shall be detected after testing.

*Note.* To assess the lifting set items condition, the provisions of 10.6 of the Rules for the Cargo Handling Gear of Sea-Going Ships may be applied during survey.

**3.5.12** In case of satisfactory results of the survey, the marking shall be applied on the lifting set in compliance with Section 5.

### **3.6 PERIODICAL SURVEYS OF TANK CONTAINERS WITH FIBER-REINFORCED PLASTICS (FRP) SHELL FOR THE TRANSPORTATION OF DANGEROUS GOODS**

**3.6.1** Tank containers with fiber-reinforced plastics (FRP) shell intended for transportation of dangerous goods shall undergo periodical surveys at least every 5 years from the date of the first strength test by the manufacturer with intermediate surveys every 2,5 years. Intermediate surveys can be carried out within 3 months before and after the prescribed date of survey.

**3.6.2** Requirements and definitions of Part VIII "Tank Containers with Fiber-Reinforced Plastics (FRP) Shell" of the Rules for the Manufacture of Containers and the requirements of 3.4 of these Rules shall apply to tank containers with FRP shell.

#### **3.6.3 Survey every 2,5 years.**

**3.6.3.1** The survey of tank containers with FRP shell, besides the requirements specified in 3.4.5 (except for Notes 2 and 3), shall include the following:

**.1** survey of tank with FRP shell:

**.1.1** technical condition of FRP shell shall be determined as per the procedures approved by the Register;

**.1.2** determining of the technical condition of FRP shell shall include checking of the condition of a chemically resistant layer, structural layer, and fireproof coating for compliance with the criteria specified in Table 3.6.3.1;

**.1.3** technical condition of FRP shell shall be determined in production areas or outdoors at an ambient temperature, which is not lower than 5 °C with no precipitations and with observance of the provisions of EN 13018;

**.1.4** non-destructive testing of FRP shell shall be carried out in case of operational damages mentioned in the technical documentation of the tank container manufacturer using the methods approved by the Register;

**.1.5** measurement of surface resistance and resistance to discharge to ground of each manufactured tank in accordance with the procedure approved by the Register.

Table 3.6.3.1

List of possible operational damages of FRP shell

No.	Type of damages	Criterion
<b>Chemically resistant layer</b>		
1.	Non-through thickness cracks on the chemically resistant layer surface	Max. 0,5 mm in depth; max. 0,05 mm in width; max. 100 mm in length; total length max. 1 m.
2.	Non-through thickness cracks on a chemically resistant layer in the area of jointing of cylindrical part and heads	Not allowed
3.	Through cracks on chemically resistant layer	Not allowed
4.	Hairlike cracks	Allowed
5.	Change of color tones of chemically resistant layer	Allowed
<b>Fireproof coating</b>		
6.	Non-integrity of fireproof coating	Baring of structural layer on the area max. 100 cm <sup>2</sup>
7.	Blistering of fireproof coating	Not more than 500 cm <sup>2</sup> (without baring of structural layers)
8.	Change of color tones of fireproof coating	Allowed
9.	Notches, scratches, attritions of fireproof coating without baring of structural layers	Total reduced area max. 1,0 m <sup>2</sup>
<b>Structural layers</b>		
10.	Non-through cracks, delaminations or cracks in structural layers	Maximum linear dimension 100 mm, depth of crack max. 0,1 of structural shell thickness
11.	Non-tightness in the area of shut-off valves and safety devices	Not allowed

### 3.6.4 Survey every five years.

3.6.4.1 In addition to survey specified in 3.6.3, the inspections and tests in accordance with the requirements of 3.4.6 shall be carried out.

### 3.6.5 Occasional surveys.

3.6.5.1 Occasional surveys shall be carried out in accordance with the requirements of 3.6.4 in case of damage of a tank container with FRP shell and after its repair.

### 3.6.6 Requirements for technical supervision of repair of tank containers with FRP shell.

3.6.6.1 Repair of tanks with FRP shell shall be carried out in accordance with the Repair Manual approved by the Register.

3.6.6.2 Materials used for repair of FRP shells shall meet the requirements of 2.2.5 and 2.2.6, Part VIII "Tank Containers with Fiber-Reinforced Plastics (FRP) Shell" of the Rules for the Manufacture of Containers.

3.6.6.3 Tank container with FRP shell with detected damages shall be sent to repair after reporting that confirms the necessity of the repair and is stipulated by the method of establishing of the technical state of the tank container approved by the Register.

3.6.6.4 FRP shell shall be repaired at a specialized repair organization according to the technology agreed with the manufacturer and approved by the Register or at the manufacturer's. Upon completion of FRP shell repair, the Register shall survey the shell to determine the possibility of its further operation.

## **4 TECHNICAL SUPERVISION OF CONTAINERS UNDER REPAIR**

### **4.1 GENERAL**

**4.1.1** Containers which sustained damages during operation involving impairment of strength performance of bearing structures shall be repaired under the Register technical supervision. Such damages include those requiring:

- replacement of one or more corner fittings;
- full or partial replacement of primary structure parts, (corner posts, side rails, cross-members);
- full or partial (more than 1/3 area) replacement of side and end panels, roof panels;
- full replacement of floor.

**4.1.2** In addition to damages listed in 4.1.1, the following damages and malfunctions of the thermal containers shall be repaired under the Register technical supervision:

- damage of insulation;
- damage of cold (heat) generation means;
- impairing of weathertightness;
- damage of drainage system;
- damage of closures;
- malfunction of control, protection and control devices;
- malfunction of electrical equipment.

**4.1.3** In addition to damages listed in 4.1.1, the following damages of tank containers shall be remedied under technical supervision of the Register:

- damage of tank shell and heads;
- damage of supports and fastenings;
- damage of safety devices;
- damage of pipes and fittings;
- damage of monitoring devices;
- damage of cold (heat) generation means, if any;
- damage of thermal insulation, if any.

**4.1.4** In addition to damages listed in 4.1.1, the following damages of offshore containers shall be repaired under the Register technical supervision:

- damages of bearing structure;
- damages of pad eyes.

*Note.* One shall consider the requirements of 4.1.2 and 4.1.3 in respect to tank containers and offshore thermal containers.

**4.1.5** As criteria for defining the possibility of safe operation of the general freight containers which sustained damages, the Register recommends to use those listed below:

**.1** for corner fittings:

- dimensions of corner fitting apertures shall not exceed ISO tolerances;
- corner fitting shall have no cracks and notches and shall not be detached from structural elements of the container;

**.2** for corner posts:

- depth of a single deformation shall not exceed 25 mm, irrespective of its length and location with two or more indentations, none of these shall exceed 15 mm in depth; cracks, ruptures and punctures shall be repaired regardless of their size;

deformation of corner posts shall not cause the external dimensions of the container change that could exceed ISO tolerance by more than 5 mm;

deformation of the rear corner posts shall not render the doors inoperable and impair the watertight integrity;



**.3** for top and bottom side rails and cross-members;

top side rails and cross-members:

deformations of top side rails and the front end rails (dents, bendings, etc.) shall not exceed 25 mm in depth;

deformation of rear top cross-member shall not exceed 35 mm, render the doors inoperable and impair the watertight integrity;

bottom side rails:

deformations on the webs of side rails shall not exceed 50 mm in depth; bottom end rails:

deformations on a web shall not exceed 50 mm in depth;

deformation of the rear bottom rails shall not render the doors inoperable or impair the watertight integrity;

deformation of the cross-member shall not cause the external dimensions of the container to change so as to exceed ISO tolerance by more than 5 mm;

deformation shall not cause a change in length of diagonals between the corner fitting apertures to exceed the ISO tolerance;

cracks, ruptures and punctures shall be repaired, irrespective of their size;

**.4** for walls and roof:

front and side walls:

no deformation, such as dents, bendings, etc. on a plane portion of the side and front wall where the marking shall be applied, or on internal or external corrugations, shall exceed 35 mm;

any two deformations existing on the opposite walls and facing one another shall not cause the distance between the walls to decrease by more than 50 mm against the constructional dimension;

no deformation involving the length or height of a wall shall lead to the reduction of internal dimensions by more than 50 mm;

any deformation of the side walls shall not exceed ISO tolerance by more than 10 mm,

any deformation of the front wall — by more than 5 mm;

any deformation which may result in sharp edges liable to cause damage to cargo shall be eliminated; cracks and punctures, irrespective of their dimensions, shall be repaired;

roof:

deformation shall not exceed 35 mm in depth; no deformation involving the length or width of a roof shall lead to the reduction of internal dimensions by more than 50 mm;

punctures, cracks, ruptures shall be repaired, irrespective of their dimensions;

**.5** for floor boardings: cracks and cleavings shall not exceed 15 mm in depth, irrespective of the damage length, or shall not exceed 5 mm when the damage width is more than 150 mm;

difference in height between the faces of the adjoining boards shall not exceed 5 mm;

any through holes, spillings of material, splittings shall be repaired;

floor boardings shall be dry, clean and shall not emit specific odour;

**.6** for bottom cross-members:

no deformation on a web of cross-members, or on the top plate of fork lift pockets and gooseneck tunnel shall exceed 50 mm;

deformations on a top flange shall not intrude more than 50 mm into the container;

clearance between the top face plate of the cross-member and the floor boardings shall not exceed 10 mm;

in no instance shall the deformations on the bottom flange of cross-members, fork lift pockets and gooseneck tunnel project below the plane 1 mm above the plane of the bottom faces of bottom corner fittings;

any cracks, notches, ruptures shall be repaired;

no deformation of fork lift pockets and gooseneck tunnel shall cause their dimensions to change so as to exceed ISO tolerances by more than 10 mm;

**.7** for doors:

no deformation of the door panel shall exceed 35 mm;

no deformation shall render the doors inoperable and shall cause the ISO tolerance for external dimensions to be exceeded by more than 5 mm;

doors shall not have cracks, punctures and other damages which may entail failure of the container waterproofness;

**.8** for door lock:

broken or notched cams, cam retainers, hinges, hinge bolts, door locking bars shall not be allowed;

bent door locking bars and door locking handles preventing the door from being properly opened or closed, shall be repaired or replaced;

**.9** for other damages: partial or complete lack of marking shall not be allowed.

*Note.* The Register may approve the use of other international or national regulations and guidelines based on the CSC and CCC provisions and submitted by the owners of containers, repair firms or surveying companies. The criteria determining the safe operation of dry freight containers and related to their framework apply to the frame of tank containers.

**4.1.6** In addition to the requirements of 4.1.5 the Register recommends to use the following criteria defining possibility of safe use of tank containers:

**.1** for the tank container in general:

absence of any damage leading to impossibility of the use of tank container for the purposes it is intended for;

absence of any deformation leading to excess of ISO tolerances for outer dimensions by more than 5 mm for end surfaces and by 10 mm — for side surfaces;

**.2** for the framework and elements attaching a tank to a framework:

cracks, cuts, ruptures, punctures etc. shall be repaired regardless of their size;

when the bottom rear end rail is deformed the gap between a rail and securing device of the bottom discharge shall not be less than 5 mm;

deformation of the diagonal braces in side, end, bottom and top surfaces of a frame shall not exceed 20 mm;

deformation of elements attaching the tank to the framework shall not exceed 13 mm; corrosion of framework members and welds shall not lead to reduction of tank container strength;

**.3** for the tank (made of metal):

cracks, ruptures, punctures, etc. shall be eliminated regardless of their size;

corrosion of tank material or welds shall not result in reduction of the tank shell thickness below the minimum value required.

*Note.* The minimum value required is determined basing on the requirements of the relevant sections of Chapter 6.7 of the IMDG Code regarding the type and design of the tank container;

depth of scratches, grooves, machining traces shall not exceed 5 % of the tank metal thickness;

no tank repairs made by fitting patches on the inner surface;

deformation of the tank walls within the upper third of the tank cross-section shall not exceed 6 mm;

deformation of the tank walls within the lower two thirds of the tank cross-section shall not exceed 10 mm;

**.4** for thermal insulation and its coating:

cracks, cuts, ruptures, punctures, etc. shall be repaired regardless of their size;

delamination of thermal insulation covering in the place of butts, joints, etc., loss of components and fastenings shall be eliminated.

**4.1.7** Upon completion of the repair, containers with the CCC Plates shall comply with requirements of the Rules for the Approval of Containers for the Transport of Goods Under Customs Seals.

**4.1.8** Materials used for repairing containers shall have characteristics equivalent to those of the materials used for the manufacture of containers or exceeding them. Material used for repairing vessels of tank containers shall have a document confirming technical supervision of the Register.

**4.1.9** Tank container vessels shall be repaired keeping due consideration to calculation standards for pressure vessels used for the design of the tank container.

**4.1.10** Repair of container members listed in 4.1.1 through 4.1.4 shall be performed by welders certified by the Register and having the Welder Approval Test Certificate of a due form.

## **4.2 TECHNICAL DOCUMENTATION FOR REPAIR OF CONTAINERS**

**4.2.1** Repair of container members listed in 4.1.1 — 4.1.4 shall be performed in accordance with the technical documentation approved by the Register.

**4.2.2** The technical documentation submitted for repairs shall contain:

.1 description of repair procedure that may be based on the national and international normative documents agreed or recognized by the Register;

.2 necessary drawings;

.3 the table of welding procedures and welding materials, and in the case of repair of tank containers intended for the transport of pressurized goods, Welding Procedure Approval Test Certificate of a due form;

.4 description of welding quality control methods.

**4.2.3** The Register may approve technical documentation and repairing procedures for a particular type of containers.

## **4.3 RECOGNITION OF ORGANIZATIONS AND FIRMS PERFORMING MAINTENANCE (REPAIR) OF CONTAINERS**

### **4.3.1 Recognition of repair firm.**

**4.3.1.1** Recognition of repair firm means that their capability of performing repair of containers has been recognized by the Register.

**4.3.1.2** To obtain recognition, the repair firm shall submit a written application to the Register Head Office (RHO) stating the name of the organization, its address, bank details, types and dimensions of containers which may be repaired, list of normative documents used in the inspection for defects and in repairs, guarantee of payment for the Register services and the traveling expenses, as well as the technical documentation specified in 4.2.2 and the following information:

.1 firm's structure including its subsidiaries;

.2 list of experts performing the examination, inspection for defects, acceptance of containers, welding, adjustment (if any) and tests (if any), and their qualification;

.3 firm's experience in repairing containers;

.4 description of testing equipment (if any);

.5 copies of certificates and licenses issued previously (if any).

.6 production capacity of the firm (list of equipment for container repairs, availability of facilities for containers storage and examination, methods of containers transportation);

.7 container repair organizational chart implemented at the repair firm with indication of the location of test areas, production process monitoring, storage of materials, accessories, etc.;

.8 information on the quality control system implemented at the repair firm;

.9 welders' certification program complying with the general provisions set forth in Appendix 3 of the Rules for Technical Supervision during Manufacture of Containers;

.10 welding procedures for their approval by the Register in case of repair of tank containers intended for the carriage of pressurized cargoes.

**4.3.1.3** The repair firm shall state that it undertakes to:

.1 submit to the Register for inspection the containers under repair at various stages of repairing;

.2 agree with the Register any alterations in the technical documentation on repairs and in repairing procedures;

.3 fulfill the Customs requirements for containers design;

.4 keep records in compliance with the applicable provisions of 1.4.2.6, Part I "Basic Requirements" of the Rules for the Manufacture of Containers;

.5 submit certificates and relevant documents for accessories and materials used in repairing containers.

**4.3.1.4** To recognize the repair firm, the procedure and the applicable requirements of 1.5.1, Part I "Basic Requirements" of the Rules for the Manufacture of Containers shall be used.

**4.3.1.5** Upon verification of requirements in 4.3.1.2, satisfactory results of the repair firm examination and upon completion of technical supervision of at least 10 containers repair, the Register may issue Recognition Certificate (RC).

**4.3.1.6** Maintenance of the conditions for issuing the Recognition Certificate (RC) is subject to periodical checks by the Register.

#### **4.4 INSPECTIONS AND TESTS**

**4.4.1** The scope of technical supervision of containers repair at firm, which does not possess the Recognition Certificate for Container Repairs, is determined by the Register in each particular case.

**4.4.2** If necessary, the scope of technical supervision of containers repair at the firm recognized by the Register is established by the agreement on technical supervision.

**4.4.3** On completion of repair of the general cargo containers, the following steps to be shall be at least performed:

- .1 examination to assure that the repair has been properly performed;
- .2 examination to assure that the Customs requirements are complied with;
- .3 inspection of the prescribed dimensions and marking of the container;
- .4 weathertightness testings.

*Note.* In particular cases, the Register may require additional tests.

**4.4.4** Thermal containers and tank containers, in addition to tests specified in 4.4.1, may be subjected to special tests prescribed for containers concerned, within the scope established by the Register.

## **5 DOCUMENTS. MARKING AND BRANDING**

### **5.1 DOCUMENTS**

**5.1.1** Based on the results obtained from survey of a container, the Register, in accordance with the list of documents to be issued, shall draw up a survey report stating technical condition of the container.

### **5.2 MARKING AND BRANDING**

**5.2.1** After performing the surveys according to the periodical examination program, the stamp of the Register of approved type and date (month, year) of subsequent survey shall be marked on the CSC Plate or as close thereto as possible. The date may be also marked on the sticker of the approved type without branding.

**5.2.2** Following the survey of tank containers, the Register brand of approved type shall be put in the appropriate column of the identification plate with tank data, and the date (month and year), pressure in leakproofness tests and the applicable units of measurement shall be specified.

*Note.* On identification plates of tank containers manufactured in accordance with the Rules for the Manufacture of Containers, issued before 2003 without taking into consideration the subsequent amendments, indication of the type of survey and test pressure is not required.

**5.2.3** After performing the surveys under ACEP a survey report shall be drawn up and availability of the ACEP label ascertained without putting the Register brand and the survey date.

**5.2.4** Marking of the container shall comply with the requirements of these Rules, Rules for the Manufacture of Containers and Rules for the Approval of Containers for the Transport of Goods under Customs Seals.

**5.2.5** Containers with dangerous goods or toxic atmosphere inside, in addition to marking according to 5.2.4 shall bear signs in conformity with the applicable rules for the carriage of dangerous goods.

**5.2.6** After survey of offshore containers the stamp of the Register of approved type and date (in YYYY.MM.DD format) of the performed survey and marks in accordance with Table 3.5.1 shall be marked on the Inspection Plate.

*Note.* Offshore tank containers intended for the transport of dangerous goods shall be additionally marked in accordance with 5.2.2.

**5.2.7** According to the results of the lifting sets of offshore containers survey, the Register brand of approved type shall be put in the first column of the identification plate of the lifting set (refer to 9.7.6 and 9.7.7, Part VII "Offshore Containers" of the Rules for the Manufacture of Containers), and the date of the survey conducted in format YY.MM.DD and the marks according to Table 3.5.5 shall be specified.

*Note.* Where the lifting set shackles were replaced, the appropriate alterations shall be entered in the identification plate or the latter shall be replaced.

## **6 RECOGNITION OF FIRMS ENGAGED IN THE EXAMINATION OF FREIGHT CONTAINERS IN SERVICE (EXCEPT FOR TANK CONTAINERS) COVERED BY CSC**

### **6.1 GENERAL**

**6.1.1** The requirements of this Section apply to the firms engaged in the examination of freight containers in service (except for tank containers) covered by the CSC requirements, as required by CSC and 3.2 of these Rules.

**6.1.2** Recognition of a firm consists in the Register confirmation of the firm's competence in examining freight containers in service in accordance with the CSC requirements.

**6.1.3** The firm shall demonstrate its activities in the declared field.

**6.1.4** The firm's recognition by the Register is confirmed by Recognition Certificate for the Firm performing Freight Containers Examination, which is issued in accordance with 1.4 of the General Regulations for the Technical Supervision of Containers.

**6.1.5** In case the firm recognition is confirmed by the Recognition Certificate for the Firm Performing Freight Container Examination, the firm shall be surveyed and the container examination activities of the firm personnel shall be monitored in accordance with the CSC requirements and 3.2 of these Rules.

**6.1.6** Register approval of a firm includes the following:

**.1** review of documents confirming the firm's compliance with the Register requirements;  
**.2** survey of the firm and monitoring container examination by the firm's personnel in accordance with the CSC requirements and 3.2 of these Rules.

**6.1.7** The firm shall submit the following for review:

- .1** documents or their copies confirming compliance with 6.2.1;
- .2** lists of personnel containing information on their compliance with 6.2.2.2;
- .3** lists of equipment and instruments specified in 6.2.3;
- .4** container examination procedure and deformation measurement methodology;
- .5** list of documents specified in 6.2.5.1;
- .6** quality manual or another document in accordance with 6.2.8.1;
- .7** report as per the form specified in 6.2.6.1.

**6.1.8** When receiving the Recognition Certificate for the Firm Performing Freight Container Examination, the technical personnel of the firm are authorized to examine freight containers except for tank containers on the basis of container operation safety criteria stated under 3.2 of these Rules proceeding from the Agreement on Survey with RS concluded in accordance with 4.5, 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.

**6.1.9** Where the container examination results are satisfactory, the firm applies the required marking to the CSC Plate in accordance with the provisions of these Rules and issues Report on Survey of Containers (form 6.3.58-1 for Thermal Containers and form 6.3.46-2 for other types of containers except for tank containers), which is registered, checked and endorsed by the Register and sent to the firm to be transferred to the customer.

**6.1.10** The firm sends the container survey reports (forms 6.3.58-1 and 6.3.46-2) to the Register by e-mail to be signed in electronic form with originals to be sent by mail within 10 days after the survey.

*Note.* Where survey reports are signed or endorsed using electronic signatures with visible stamp or signature impression, hard copies of the reports may not be issued.

## **6.2 REQUIREMENTS**

### **6.2.1 Legal status.**

**6.2.1.1** Legal status of the manufacturer shall comply with the current legislation.

**6.2.1.2** The manufacturer shall have organizational structure and the Head Officer.

**6.2.1.3** A firm that has the status of a legal entity during inspections of containers shall be independent of the parties interested in the results of inspections.

**6.2.1.4** The firm shall be responsible for the impartiality and objectivity of the containers inspection results.

**6.2.1.5** The firm shall be able to demonstrate that it is impartial and that neither the firm nor its personnel are under commercial or other pressure that could affect their technical solutions.

### **6.2.2 Personnel.**

**6.2.2.1** The firm's personnel shall have appropriate education, professional training, qualification and experience necessary to carry out the declared activities.

**6.2.2.2** The firm's personnel performing the examination of containers shall have valid certificates to confirm completion of a theoretical training course on the subject "Freight containers, international and national requirements".

**6.2.2.3** Personnel performing container examinations shall have at least a year of practical experience in the area of recording or appraisal of freight container technical condition.

**6.2.2.4** Personnel responsible for audits and compliance monitoring with the requirements of the quality management system during the work shall have at least a two year experience in the container examination. With a single person on the personnel, this person shall comply with the qualification requirements for a container supervisor.

**6.2.2.5** The firm shall keep and maintain personnel attestation plans.

### **6.2.3 Technique.**

**6.2.3.1** The firm shall have technique required for measuring container components, container deformations and damage as well as photographic equipment.

### **6.2.4 Measurement assurance.**

**6.2.4.1** The firm shall have and apply measuring instruments calibrated in accordance with established procedure.

**6.2.4.2** The firm shall develop measuring instrument calibration schedules and adhere thereto.

### **6.2.5 Document files of the firm.**

**6.2.5.1** The firm shall have valid regulatory and technical documents required for stated activities including:

- .1 documents which contain requirements for cargo containers, CSC and the Register Rules included;
- .2 container examination procedure and deformation measurement methodology agreed with RS;
- .3 occupational safety documents for container inspection;
- .4 quality manual or similar document. The documentation shall be available for the firm's personnel where necessary.

### **6.2.6 Reporting.**

**6.2.6.1** The form and contents of reports (container examination reports, damage description where necessary) shall comply with the requirements of the Register Rules and include the following at least:

- .1 unique number and date of issue;
- .2 applicant's name and address;
- .3 place and date of examination;
- .4 container identification numbers and necessary data from statutory plates;
- .5 data on damage, wear and defects to be repaired;
- .6 conclusion on the opportunity for the RS certificate issue;
- .7 performer's full name and signature;

.8 photos of the examined containers and their damage within the scope necessary to determine whether the container condition is in accordance with established requirements.

**6.2.6.2** Subject to observance of confidentiality provisions, the firm shall keep records (databases) of requests, numbers of the examined containers, issued examination and survey reports.

**6.2.6.3** The firm shall preserve copies of the issued reports for ten years at least, which shall be specified in its documents.

**6.2.7 Checking and control.**

**6.2.7.1** The firm shall check whether activities in the declared field are in conformity with requirements stated in documents and whether the RS agreed procedures and techniques are followed during the work.

**6.2.7.2** The firm shall take measures to eliminate and prevent non-conformities and complaints in respect of its activities in the declared area.

**6.2.8 Quality management system.**

**6.2.8.1** The firm shall maintain a documented quality management system to cover at least the following:

- .1 code of ethics in order relevant activities to be performed;
- .2 measuring instruments and their calibration;
- .3 personnel training programs;
- .4 checking and control to ensure compliance of work results with working procedures;
- .5 document maintenance and records;
- .6 measures to be taken to eliminate and prevent complaints;
- .7 periodical verification of procedures for working process, complaints, corrective actions as well as certificate issue, maintenance and management.



## **7 RECOGNITION OF ORGANIZATIONS OR FIRMS OPERATING WITHIN IMO RESOLUTION MSC.380(94) TO COMMUNICATE THE VERIFIED GROSS MASS OF CONTAINERS**

### **7.1 GENERAL**

**7.1.1** The requirements of this Section apply to the organizations or firms acting in compliance with IMO resolution MSC.380(94) and engaged in weighing packed and sealed containers using Method 1 as well as shippers using Method 2 to communicate the verified gross mass of containers.

**7.1.2** Recognition of organizations and firms consists of the Register approval of the organizations/firms' competence to communicate the verified gross mass of containers using Method 1 and/or Method 2.

**7.1.3** The organization/firm shall demonstrate their ability to perform their activity in the area indicated in the request.

**7.1.4** Recognition of an organization/firm is confirmed by the Recognition Certificate and the signed Agreement on application of the Recognition Certificate, stating the parties' responsibilities. The Recognition Certificate is issued for the period of 3 years.

Recognition of organizations or firms includes the following:

**.1** review of the submitted documents confirming the organizations and firms' compliance with the Register requirements;

**.2** checks of an organization or a firm communicating the verified gross mass of containers in accordance with Method 1 and/or Method 2.

**7.1.5** An organization or a firm communicating the verified gross mass of containers in accordance with Method 1, shall submit to the Register the following:

**.1** a written application stating the name of the organization, its address, bank details, guarantee of payment for the Register services;

**.2** the documented procedure for the containers weighing;

**.3** a list of the equipment utilized for the containers weighing, the technical documentation (data sheet), information on the routine maintenance carried out, documents declaring the prescribed manner the equipment verification and calibration, the schedules of maintenance of equipment;

**.4** system for the identification and record of the issued documents;

**.5** list of the trained personnel.

**7.1.6** An organization or a firm communicating the verified gross mass of containers in accordance with Method 2, shall submit to the Register the following:

**.1** calculation procedure for gross mass of packed including cargo (cargoes), securing, separating and backing materials, etc., as well as their properties if they affect the mass, for example, humidity that shall be regarded by the calculation method;

**.2** the documented procedure for weighing cargo items and package, including pallets, separating and backing and other materials intended to load and secure, to be packed in the container, and adding tare mass of the container. In doing so, if the third party, besides the shipper, participates in communicating the verified gross mass of a container which has either performed packing of all the cargo items in the container, or a part of them, such party shall notify the cargo owner of the weighing location, claim responsibility for delivery of information on the weighed mass of cargo items; in this case, when loading a container, individual, original sealed packages that have the accurate mass of the packages and cargo items (including any other material such as packing material and refrigerants inside the packages) clearly and permanently marked on their surfaces, do not need to be weighed again when they are packed into the container;

**.3** a list of the equipment utilized for the containers weighing, including the equipment utilized by the third party, submitting the technical documentation (data sheet), information on the routine maintenance carried out, documents, which confirm in the prescribed manner the equipment verification and calibration, the schedules of maintenance of equipment;

.4 system for the identification and record of the issued documents.

7.1.7 The organization or firm shall claim that it:

bears responsibility for the correctness of procedure application and the obtained value of the verified gross mass;

carries out the container weighing to comply with CSC;

agrees upon with the Register amendments to the documentation approved.

## **7.2 REQUIREMENTS**

### **7.2.1 Legal status.**

7.2.1.1 Legal status of the organization or firm shall comply with the current legislation.

7.2.1.2 The organization or firm shall have organizational structure and the chief executive officer.

### **7.2.2 Personnel.**

7.2.2.1 The organizations or firms' personnel shall have the appropriate education, qualification and experience necessary for performance of activity in the area indicated in the request.

### **7.2.3 Technique.**

7.2.3.1 The organization or firm shall have technique in accordance with 7.1.6.3 and 7.1.7.3.

### **7.2.4 Measurement assurance.**

7.2.4.1 The organizations or firms shall have and apply measuring instruments calibrated in accordance with the established procedure.

7.2.4.2 The organizations or firms shall have measuring instrument calibration schedules and adhere thereto.

### **7.2.5 Reporting.**

7.2.5.1 Form and content of reports shall at least include the following:

.1 unique number and date of issue;

.2 applicant's name and address (shipper);

.3 place and date of weighing;

.4 weighing means and information on its calibration;

.5 identification number of a container;

.6 weighing procedure;

.7 value of the verified gross mass of each container;

.8 declaration confirming that the gross mass of a container(s) has been approved in compliance with SOLAS (refer to IMO resolution MSC.380 (94) of 21 November 2014).

.9 performer's full name and signature.

Names of a record's fields shall be both in Russian and in English.

7.2.5.2 Under conditions of confidentiality, the organization or firm shall keep records (database) of the requests, issued documents.

7.2.5.3 The organizations or firms shall keep copies of the issued reports for at least six months, which shall be established in the documents of the organization or firm.

### **7.2.6 Checking and control.**

7.2.6.1 The organizations or firms shall check the compliance of the activity in the declared area with the requirements established in the documentation, as well as the compliance of the RS-agreed procedures and methods during the work performance.

7.2.6.2 The organizations and firms shall take measures on elimination and prevention of nonconformities and claims against the organization and firm's activity in the declared area.

Российский морской регистр судоходства

**Общие положения по техническому наблюдению за контейнерами**

**Правила изготовления контейнеров**

**Правила допущения контейнеров к перевозке грузов под таможенными печатями и пломбами**

**Правила технического наблюдения за изготовлением контейнеров**

**Правила технического наблюдения за контейнерами в эксплуатации**

Russian Maritime Register of Shipping

**General Regulations for the Technical Supervision of Containers**

**Rules for the Manufacture of Containers**

**Rules for the Approval of Containers for the Transport of Goods under Customs Seal**

**Rules for Technical Supervision during Manufacture of Containers**

**Rules for Technical Supervision of Containers in Service**

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