Polski Rejestr Statków

RULES
FOR THE CONSTRUCTION OF CONTAINERS

2014
July

GDAŃSK

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Rules for the Construction of Containers – July 2014 were approved by the PRS Board on 27 June 2014 and enter into force on 1 July 2014.

The present *Rules* replace the *Rules for the Construction of Containers – 2012*

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PART I

GENERAL REGULATIONS

1 GENERAL

1.1 Application

1.1.1 *Rules for the Construction of Containers,* hereinafter referred to as the *Rules,* apply to containers intended for the carriage of cargoes by sea, rail and road transportation systems and their transfer from one transportation system to another.

1.1.2 The present *Rules* do not apply to containers specially designed for air transport. The construction of such containers may be considered by PRS separately.

1.2 Definitions and Explanations

In the present *Rules*, the following definitions have been adopted:

Container – an article of transport equipment:

- 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 an intermediate reloading;
- designed to be secured and readily handled, having corner fittings for these purposes;
- of such size that the area enclosed by the four outer bottom corners is at least 14 m^2 or 7 m^2 if it is fitted with top corner fittings (see Fig. 1.2);
- constructed in such a way as to facilitate easy loading and reloading.

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

Maximum permissible mass (P) – the difference between the maximum service gross mass and tare mass.

Maximum gross weight (R) – the maximum allowable combined mass of the container and its cargo (P+T).

Tare mass (T) – the mass of the empty container, including permanently fixed auxiliary equipment.

Corner fittings – an arrangement of apertures and faces at the top and bottom of a container for the purpose of container handling, stacking and securing.

Prototype – a single non-series container or a sample unit representative of all subsequent containers produced to the same design.

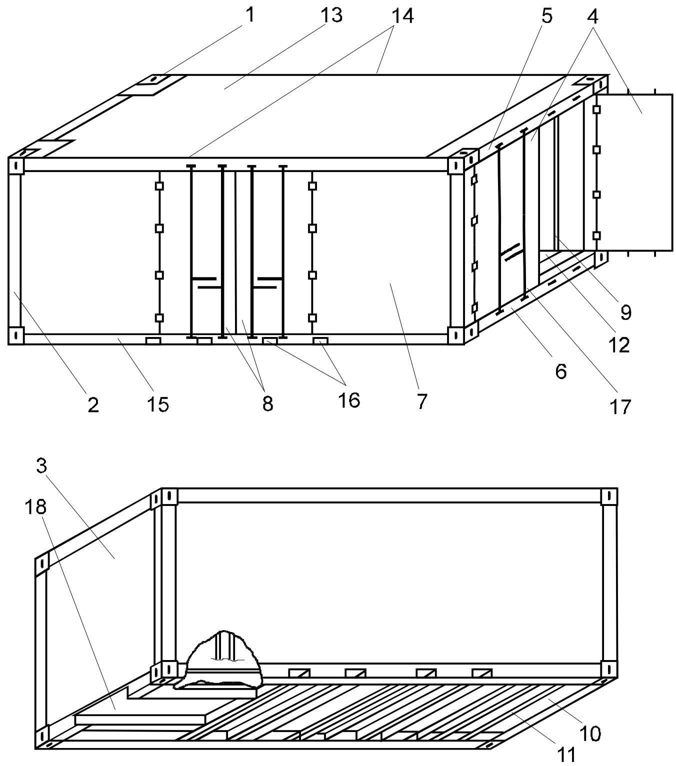


Fig. 1.2. Structural elements of a container (general purpose)
1 – corner fitting, 2 – corner post, 3 – end wall, 4 – end door, 5 – rear header, 6 – rear sill, 7 – side wall, 8 – side door, 9 – side rib, 10 – bottom, 11 – cross member, 12 – floor, 13 – roof, 14 – top side rail, 15 – bottom side rail, 16 – fork lift pockets (internal – for an empty container), 17 – locking device, 18 – gooseneck tunnel.

T y p e o f c o n t a i n e r – the container design type which complies with the requirements of the present *Rules* and has been approved for manufacture.

1.3 Scope of Survey

1.3.1 PRS' construction survey of containers covers the following:
.1 consideration and approval of technical documentation;
.2 construction survey;
.3 testing;
.4 marking and stamping;
.5 issue of certificates;
.6 approval of the manufacturer's works and testing stations.

1.3.2 The survey is carried out according to the provisions of the present *Rules*, with due regard paid to the applicable requirements of PRS' *General Survey Regulations.*

1.4 Technical Documentation

1.4.1 Prior to manufacture of a single container or a prototype of container design type, technical documentation, in triplicate, is to be submitted to PRS for approval. The documentation is to contain the following:

.1 specification of the container, including a description of its construction, dimensions, full details of the materials used, workmanship, welding procedure, assembly procedure, finishing and painting;

.2 assembly drawings, sections drawings of joints and connections of individual elements, indicating the material used;

.3 test programme, indicating the internal and external loadings and the methods of their application, should the loadings applied differ from those generally assumed.

1.4.2 If necessary, PRS may require to be supplied with additional drawings and specifications.

2 PRINCIPLES FOR APPROVAL OF CONTAINERS, MANUFACTURER'S WORKS AND TESTING STATIONS

2.1 Approval of Containers

2.1.1 Approval of container by PRS means that the container design type or a single container meets the requirements of the present *Rules*, is safe in handling and capable of carrying cargoes in accordance with its designation.

2.1.2 To obtain approval of container design type or a single container, application is to be submitted to PRS.

2.1.3 The application for approval of container design type or a single container is to be accompanied by technical documentation, specified in 1.4, to be approved by PRS.

2.1.4 A prototype (a sample unit of the container design type or a single container) is to be subjected to tests in accordance with the requirements of these *Rules* in the presence of PRS' Surveyor.

2.1.5 On satisfactory completion of container prototype tests, PRS issues *Type Approval Certificate* for container design type, hereinafter referred to as *Approval Certificate*.

2.1.6 *Approval Certificate* entitles the manufacturer to affix the CSC Safety Approval Plate to each container of the series built in accordance with an approved design type and to a single container (CSC – *International Convention for Safe Containers*, 1972, with amendments and supplements).

2.1.7 Containers which are modifications of the approved design type may be accepted by PRS for service without any additional tests if so considered having regard to the nature of modifications made.

2.2 Approval of Series Containers Manufacturers and Testing Stations

2.2.1 Approval of Series Containers Manufacturers

2.2.1.1 Prior to manufacture of series containers, the manufacturer is to establish an effective quality control system approved by PRS. The quality control documentation of series produced containers, in triplicate, is to be submitted to PRS for approval and is to contain:

.1 a description of the works' organization;
.2 the Quality Manual (if the works has established the Quality Management System);
.3 scope of responsibility of the quality control department and confirmation of its independence from production departments;
.4 the system used for introducing changes, approved by PRS, to technical documentation, technical specification and manufacture process, as well as arrangements to ensure their implementation at appropriate stages of containers manufacture;
.5 arrangements made to ensure that the supplied materials and services meet the design requirements approved by PRS;
.6 arrangements made by the works' quality control to verify the measurements of the instruments frequently used for determining the principal dimensions of containers and their components;
.7 materials and container components storage conditions;
.8 the system of identification and rejection of defective container components;
.9 approved procedures for container prefabrication and assembly;
.10 qualifications of personnel engaged in container prefabrication and assembly;
.11 internal audits and corrective actions system;
.12 the system of documenting particular stages of container manufacture;
.13 specimens of documents for each container to be completed during its production, as well as during carrying out recommendations and changes.

2.2.1.2 The manufacturer of series containers is obliged to:

.1 submit, at PRS' request, any container of the approved design type for external examination;
.2 affix the CSC Safety Approval Plate to each series container made in conformity with the approved design type, indicating all required data, as well as to affix the PRS emblem to each built container;

.3 agree with PRS any changes in container structure, technical specification or container manufacture process;

.4 in cases mentioned in 2.2.1.2.3 – to affix the CSC Safety Approval Plate after approval, by PRS, of all these changes;

.5 keep a record of containers manufactured to the approved design type, showing at least the identification number of each container established by the manufacturer, production date, the name and address of the Owner to whom the container is to be delivered, as well as register of documents of tests and checking;

.6 advise PRS, in due time, about the date of beginning the manufacture of each new series of containers made in conformity with the approved design type;

.7 re-approve technical documentation of containers at intervals specified in *General Survey Regulations*.

2.2.1.3 Inspection of the manufacturer' works is carried out by PRS to verify the data provided in the works approval documentation.

2.2.1.4 If the results of the inspection are satisfactory, *Approval Certificate* will be issued by PRS to the works. The *Approval Certificate* will be valid for 4 years.

2.2.2 Approval of Testing Stations

2.2.2.1 Container testing station is to be approved by PRS. To obtain approval, application is to be submitted to PRS.

The application is to be accompanied by documentation, in triplicate, containing:

.1 a general description of the testing station;

.2 a description of the testing station equipment allowing to perform all required tests;

.3 information on owned measuring instruments which should be provided with appropriate seals and/or valid verification certificates issued by competent bodies;

.4 kinds and types of containers which may be subjected to testing;

.5 information on the duration of each test.

2.2.2.2 PRS carries out inspection of the testing station and participates in the tests of containers, making itself sure as to the possibility of carrying out the tests according to the prototype tests programme.

2.2.2.3 If the results of the inspection and the tests, specified in 2.2.2.2, are satisfactory, Approval Certificate will be issued by PRS to the testing station.

2.2.2.4 Testing station is to keep copies of test reports and records of all tested containers, showing at least: kind and type of container, names and addresses of the Owners, container identification number, types and dates of the performed tests.

2.3 Survey of Series Containers Manufacture

2.3.1 Containers manufactured in series may be surveyed as single containers directly by PRS or by the works' quality control with subsequent PRS' survey of containers submitted in batches.

2.3.2 The condition for survey of containers by the works' quality control is *Approval Certificate* issued to the works by PRS in accordance with 2.2.1.

2.3.3 As a result of the survey, containers are issued with *Individual Freight Container Certificate*, *Tank Container Certificate* or *Freight Containers Production Certificate*.

2.3.4 Tank containers manufactured on a single or series basis are subject to PRS' direct survey.

2.3.5 Tests of Containers Manufactured in Series

2.3.5.1 Containers manufactured in series are to be subjected to the following tests and checks:

- **.1** external examination – each container;
- **.2** checking the container dimensions – each container;
- **.3** weathertightness test – each container;
- **.4** lifting from the top corner fittings – every 50th container;
- **.5** transverse racking test – every 50th container;
- **.6** floor strength test – every 100th container;
- **.7** refrigerating plant operation test – each container;
- **.8** capacity test of refrigerating plant – every 250th container;
- **.9** hydraulic test and tightness test of the tank in tank container – each tank container.

2.3.5.2 The results of the tests and checks of series containers are to be documented and maintained by the works in accordance with 2.2.1.

3 GENERAL TECHNICAL REQUIREMENTS

3.1 Dimensions and Mass

3.1.1 Depending on dimensions and mass, the following types of containers are distinguished: 1 EEE, 1EE, 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CC, 1C, 1CX, 1D and 1DX.

3.1.2 Nominal dimensions and tolerances of containers, detailed in 3.1.1, as well as their maximum gross weight are shown in Table 3.1.2. For such containers, the change of their height and increase of the maximum gross mass is permitted. The dimensions and weight of other types of containers are subject to special consideration of PRS.

3.1.3 Dimensions and tolerances given in Table 3.1.3 are to comply with the measurements taken at a temperature of +20 °C (293 K).

Table 3.1.2
Container characteristics

Type of container		1EEE	1EE	1AAA	1AA	1A	1AX	1BBB	1BB	1B	1BX	1CC	1C	1CX	1D	1DX
External dimensions [mm]	Height H	2896^{0}_{-5}	2591^{0}_{-5}	2896^{0}_{-5}	2591^{0}_{-5}	2438^{0}_{-5}	$<2438^{0}_{-5}$	2896^{0}_{-5}	2591^{0}_{-5}	2438^{0}_{-5}	$<2438^{0}_{-5}$	2591^{0}_{-5}	2438^{0}_{-5}	$<2438^{0}_{-5}$	2438^{0}_{-5}	$<2438^{0}_{-5}$
	Width W	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}	2438^{0}_{-5}
	Length L	13716^{0}_{-10}	13716^{0}_{-10}	12192^{0}_{-10}	12192^{0}_{-10}	12192^{0}_{-10}	12192^{0}_{-10}	9125^{0}_{-10}	9125^{0}_{-10}	9125^{0}_{-10}	9125^{0}_{-10}	6058^{0}_{-6}	6058^{0}_{-6}	6058^{0}_{-6}	2991^{0}_{-5}	2991^{0}_{-5}
Maximum gross weight R, [kg]		30480	30480	30480	30480	30480	30480	30480	30480	30480	30480	30480	30480	30480	10160	10160
Distance between the centers of apertures of the corner fittings, [mm]	S	11985	11985	11985	11985	11985	11985	8918	8918	8918	8918	5853	5853	5853	2787	2787
	P	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259
K_1 max, [mm]		19	19	19	19	19	19	16	16	16	16	13	13	13	10	10
K_2 max, [mm]		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

3.2 Corner Fittings

3.2.1 General Requirements

3.2.1.1 All containers are to be equipped with top and bottom corner fittings. 1EEE and 1EE containers are to also have intermediate corner fittings in the 1AAA/1AA/1A position.

Dimensions and tolerances of corner fittings, as well as their mutual arrangement are shown in Figs. 3.2.1.1-1, 3.2.1.1-2, 3.2.1.1-3 and Table 3.1.2.

Each top corner fitting is to consist at least of top, side and face walls. Each bottom corner fitting is to consist at least of bottom, side and face walls.

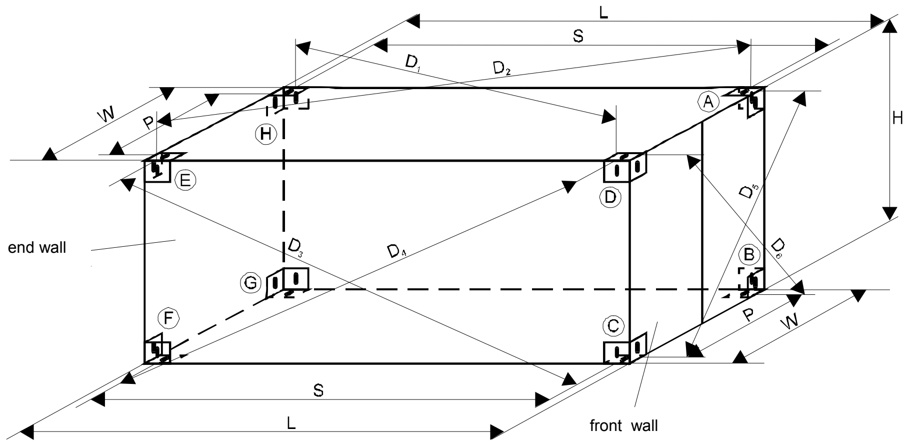


Fig. 3.2.1.1-1.
Mutual arrangement of corner fittings

L – external length of the container; *W* – external width of the container; *H* – maximum height of the container; *S* – distance between the centres of apertures in corner fittings on the length of the container; *P* – distance between the centres of apertures in corner fittings on the breadth of the container; *D* – diagonals of the container measured between the centres of apertures in corner fittings: D_1, D_2, D_3, D_4, D_5, D_6;
K_1 – difference between D_1 and D_2 or D_3 and D_4 (i.e. $K_1 = D_1 - D_2$ or $D_3 - D_4$);
K_2 – difference between D_5 and D_6 (i.e. $K_2 = D_5 - D_6$).
Letters in circles are given to facilitate completion of the documents.

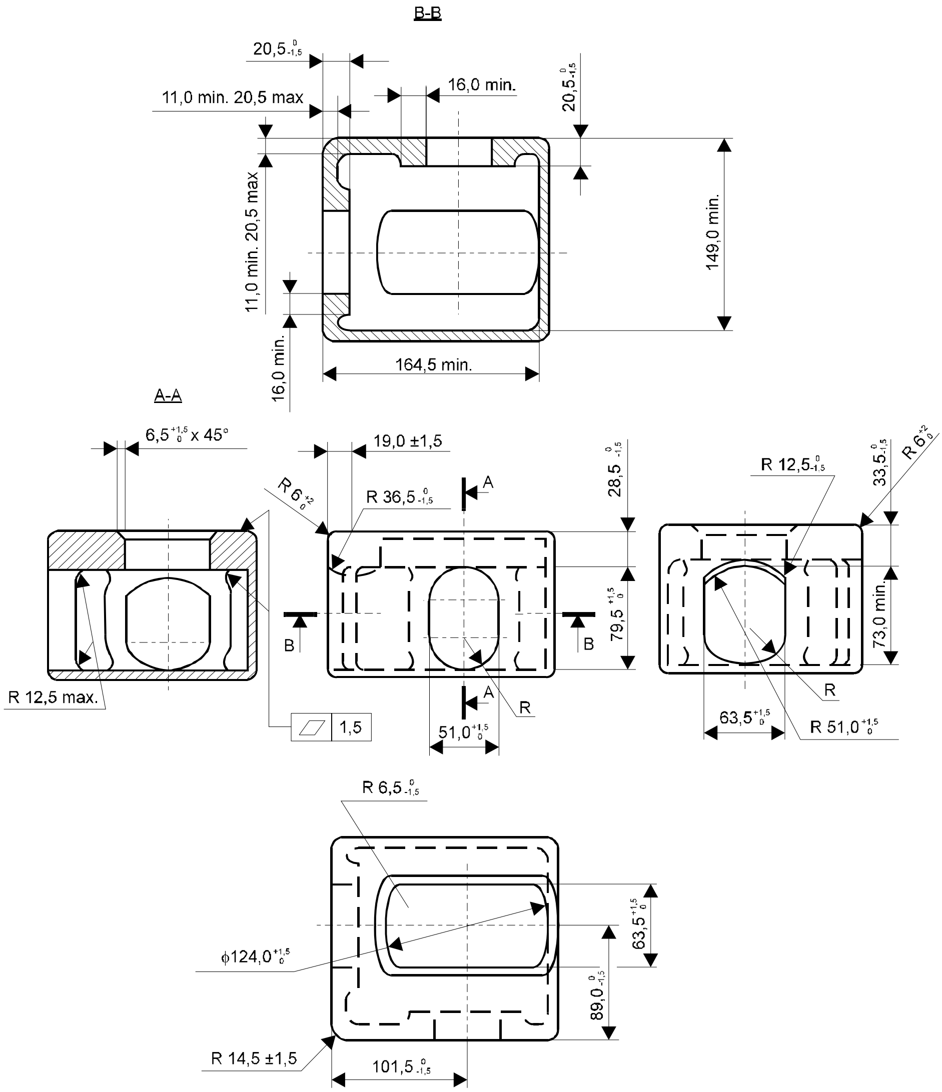


Fig. 3.2.1.1-2.
Top corner fitting

The external and internal rounding radii, not shown in the figure, are not to be greater than 3 mm.

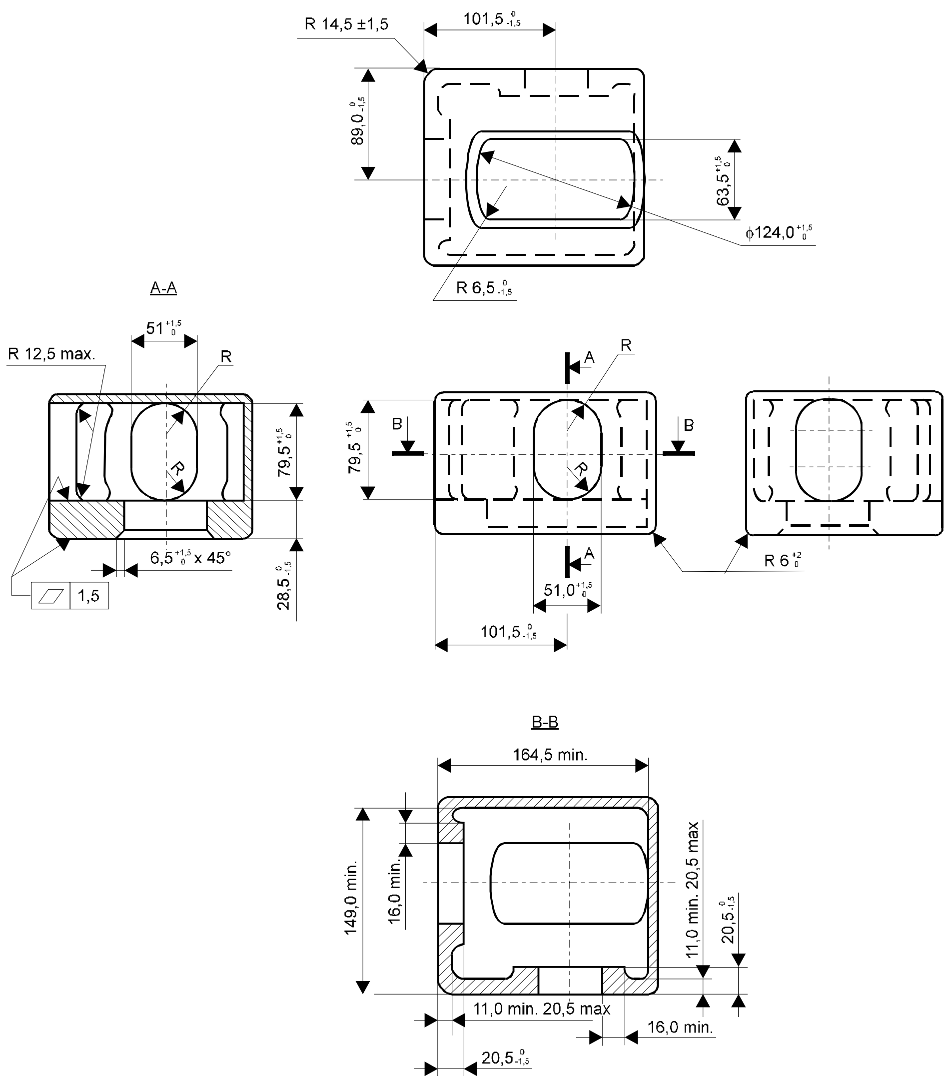


Fig. 3.2.1.1-3. Bottom corner fitting

The external and internal rounding radii, not shown in the figure, are not to be greater than 3 mm.

3.2.1.2 In the constructed container, the external upper surfaces of the top corner fittings are to protrude at least 6 mm above the highest point of the roof.

Where corner gussets are provided in the vicinity of the top corner fittings, they are to be of such thickness as not to protrude above the upper faces of the top corner fittings. The gussets may extend over the whole width of the container, but they cannot extend more than 750 mm from either end of the container.

3.2.1.3 The bottom corner fitting is to withstand the load equal to 150 kN applied perpendicular to an area of 25 x 6 mm being the lower surface of the corner fitting – see Fig. 3.2.1.3.

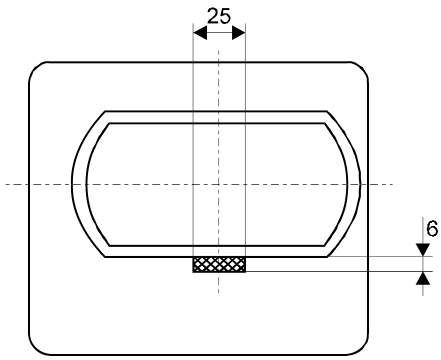


Fig. 3.2.1.3. Bottom corner fitting (bottom view)

3.2.1.4 Corner fittings are to be capable of transmitting the following loads:

.1 stacking:
- top corner fittings – 848 kN, when the test corner fitting or a pad is offset by 25.4 mm laterally and by 38 mm longitudinally;
- bottom corner fittings – 954 kN for the whole bottom area of the fitting;
- bottom corner fittings – 848 kN, when the test corner fitting or a pad is offset by 25.4 mm laterally and by 38 mm longitudinally;

.2 lifting:
- top corner fittings – 150 kN (with a twistlock, hook or shackle);
- bottom corner fittings – 300 kN (at an angle of 30^{o} with respect to the horizontal);

.3 longitudinal restraint:
- bottom corner fittings – 300 kN on each corner fitting;

.4 fastening of container by fittings:
- apertures in the face and side walls of the bottom and top corner fittings – 300 kN perpendicularly and 150 kN horizontally for each corner fitting;
- the lines of action of the forces are to be positioned at a distance not greater than 38 m from the relevant surface of the fitting;
- the maximum resultant force due to the action of the horizontal and perpendicular force components is not to exceed the values given in Fig. 3.2.1.4.

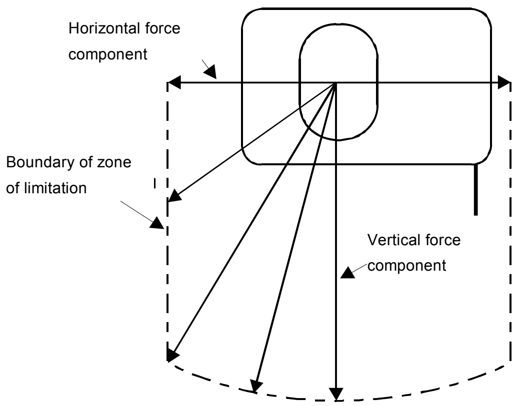


Fig. 3.2.1.4. Diagram of loads of corner fittings of the container when secured

3.2.2 Corner Fittings Marking

The below symbols (at least 10 mm high) are to be durably cast in, moulded or embossed at the inner surface of each fitting:

.1 the manufacturer's brand;
.2 heat number (or batch number) – abbreviated symbol allowing to retrace the cast;
.3 PRS' stamp.

3.2.3 Certificates

For each fitting or a batch of fittings subject to PRS' survey or quality control, a certificate is to be issued, containing at least the following data:

.1 purchaser's name and order number,
.2 type of corner casting and cast steel grade,
.3 assembly drawing number,
.4 method of manufacture,
.5 heat or batch number,
.6 chemical composition of the material,
.7 details of heat treatment,
.8 number of corner fittings and their total weight,
.9 results of inspections and mechanical tests.

3.3 Base Structure

3.3.1 In containers subjected to static and/or dynamic tests with the load distributed uniformly by a gravity force equivalent to a mass of 1.8 *R*, no part of the base structure is to protrude by more than 6 mm below the lower surface of the bottom corner fittings.

3.3.2 The base structure of type 1AAA, 1AA, 1A, 1AX, 1BBB, 1 BB, 1B, 1BX, 1CC, 1C and 1CX containers is to be such that the load is transferred from the base to the body of the means of transport.

3.3.3 The distance between the lower surfaces of rear/front sills and crossmembers of the base structure and the plane passing through the lower surfaces of the bottom corner fittings is to be $12.5^{+5}_{-1.5}$ mm.

If sills, in the vicinity of the bottom corner fittings, are fitted with bottom corner gussets, they are to be of such thickness as to ensure at least 5 mm distance between the lower faces of the bottom corner fittings and the lower faces of the gussets. Such gussets are not to extend more than 550 mm from the outer end and not more than 470 mm from the side faces of the bottom corner fittings.

3.3.4 The minimum number of pairs of the load transfer areas, for a given type of container, is to be as follows:

.1 1AAA, 1AA, 1A and 1AX containers – 5;

.2 1AAA, 1AA, 1A and 1AX containers (without continuous gooseneck tunnel) – 6;

.3 1BBB, 1BB, 1B and 1 BX containers – 5;

.4 1CC, 1C and 1CX containers – 4.

The load transfer zones are to be at least 375 mm in width, as shown in Figs. 3.3.4-1 and 3.3.4-2.

3.3.5 Each pair of areas in the load transfer zones in the cross-bars of the face and door frame base is to be capable of transferring the gravity force of 0.5 *R*.

Every other intermediate pair of areas in the load transfer zones is to transfer the gravity force of 1.5 *R/n*, where *n* – number of intermediate pairs of areas in the load transfer zones.

Each load transfer area is to be at least 25 mm in length.

Each load transfer area of gooseneck tunnel (see Fig. 3.3.4-2) consists of two parts – the upper part A and the bottom part B – which constitute a common load transfer area. The total area of A and B areas is not to be less than 1250 mm^2.

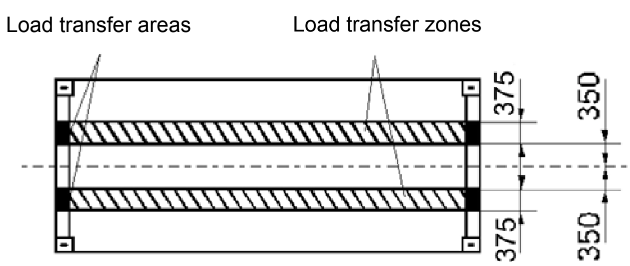


Fig. 3.3.4-1.
Diagram of distribution of the load transfer zones from the container base to the body
(Dimensions in mm)

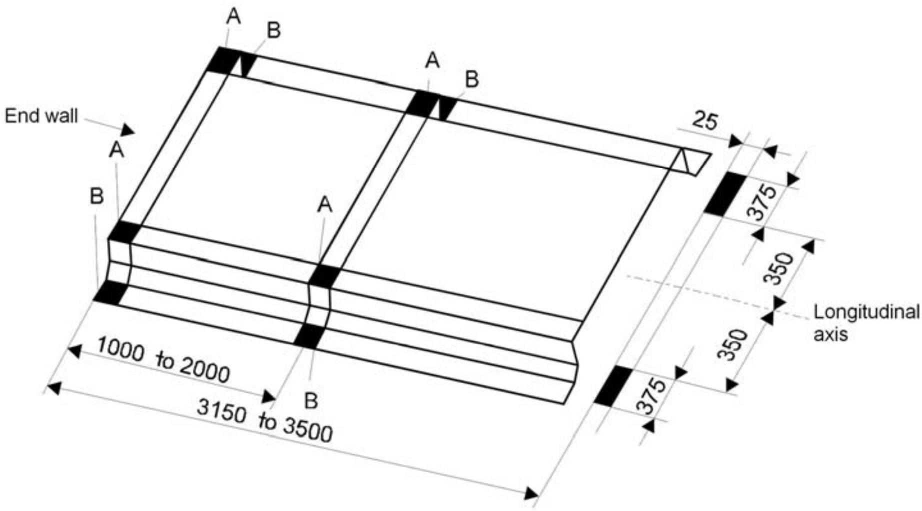


Fig. 3.3.4-2.
Distribution of the load transfer areas in gooseneck tunnel (where the areas are not continuous)

3.3.6 The distance between the load transfer areas on the base cross-bars and the nearest pair of load transfer areas is to be:

.1 from 1700 to 2000 mm – for containers having the minimum number of pairs of load transfer areas;

.2 from 1000 to 2000 mm – for containers having at least one pair of the load transfer areas more than the required minimum.

Distribution of the load transfer areas is given in Figs. 3.3.6-1, 3.3.6-2, 3.3.6-3 and 3.3.6-4.

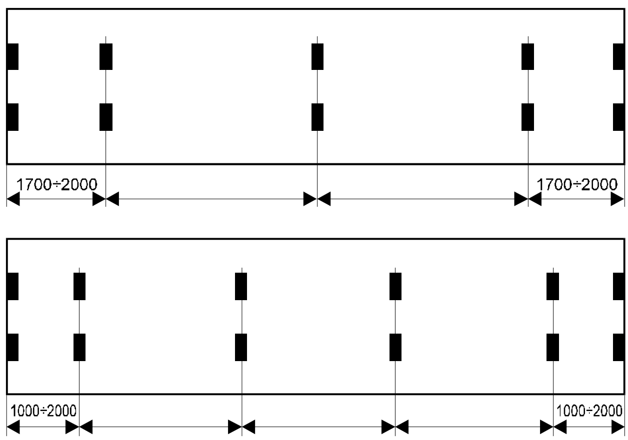


Fig. 3.3.6-1.
Distribution of the load transfer areas in 1AA, 1A and 1AX containers
(without gooseneck tunnel)

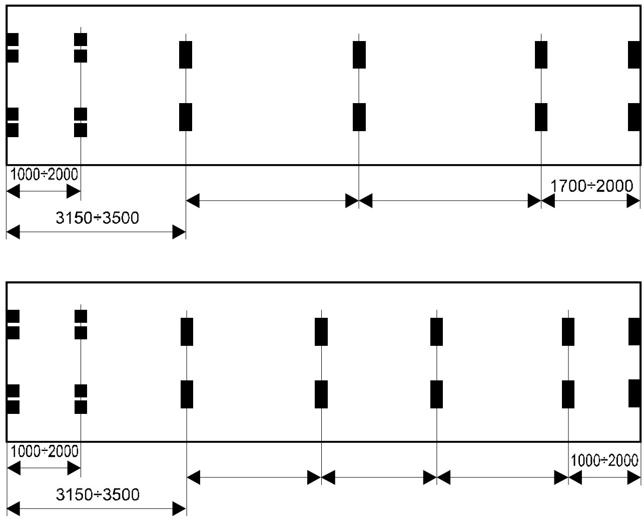


Fig. 3.3.6-2.
Distribution of the load transfer areas in 1AAA, 1AA, 1A and 1AX containers
(with gooseneck tunnel)

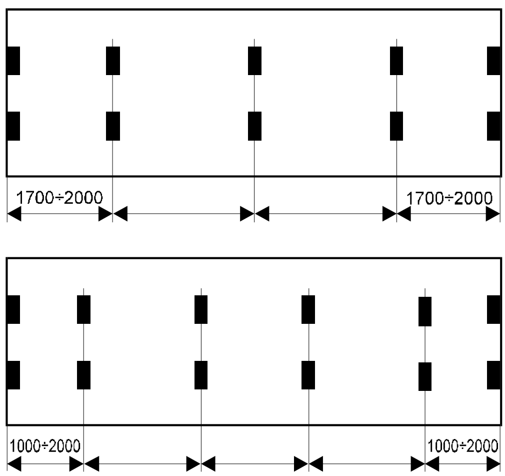


Fig. 3.3.6-3.
Distribution of the load transfer areas in 1BBB, 1BB, 1B and 1BX containers

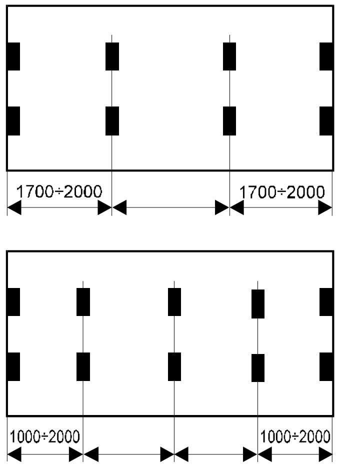


Fig. 3.3.6-4.
Distribution of the load transfer areas in 1CC, 1C and 1CX containers

3.3.7 1EEE and 1EE containers are to have recesses longitudinally-outboard of each of their fittings in the 1AAA/1AA/1A position. The recesses are to have the following dimensions: height – not less than 76 mm, length – not less than 254 mm, width – not less than 154 mm.

3.4 End Structure

In 1EEE, 1EE, 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CC, 1C and 1CX containers, the sideway deflection of the roof of the container with respect to the bottom of the container, at the time it is under full transverse rigidity test conditions, is not to cause the sum of the changes in length of the two diagonals D_5 and D_6 (Fig. 3.2.1.1-1) to exceed 60 mm.

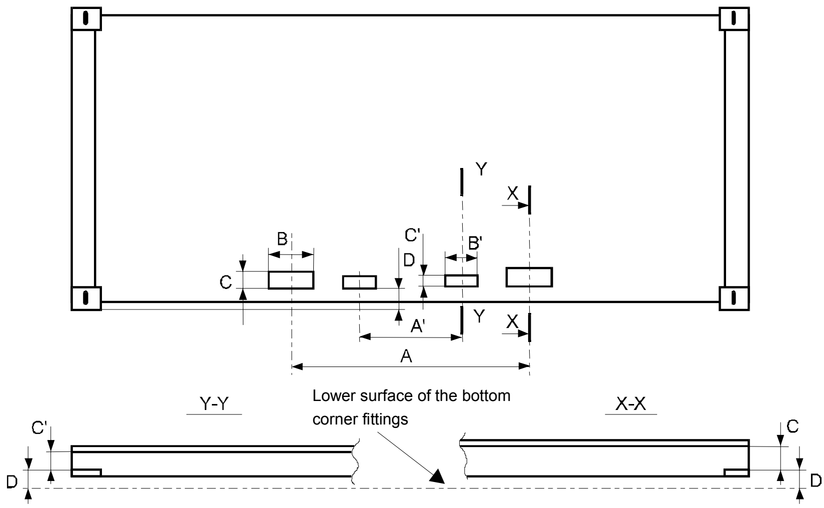
3.5 Side Structure

In 1EEE, 1EE, 1AAA, 1AA, 1AX, 1BBB, 1BB, 1B, 1CC, 1C and 1CX containers, the longitudinal deflection of the roof of the container with respect to the bottom of the container, at the time it is under full longitudinal rigidity test, is not to exceed 25 mm.

3.6 Optional Structures

3.6.1 Fork Lift Pockets

3.6.1.1 Fork lift pockets may be provided for handling 1CC, 1C, 1CX, 1D and 1DX containers, excluding tank containers. Location and dimensions of the pockets are shown in Fig. 3.6.1.1.



Type of container	Dimensions						
	Fork lift pockets for loaded and empty containers				Fork lift pockets for empty containers only		
	[mm]				[mm]		
	A	B	C	D	A′	B′	C′
1CC, 1C and 1CX	2050 ± 50	355 min.	115 min.	20 min.	900 ± 50	305 min.	102 min.
1D and 1DX	900 ± 50	305 min.	102 min.	20 min.			

Fig. 3.6.1.1. Location and dimensions of fork lift pockets

3.6.1.2 Fork lift pockets are to be cut in the base longitudinals on both sides of the side walls. The pockets are to pass across the full width of the container.

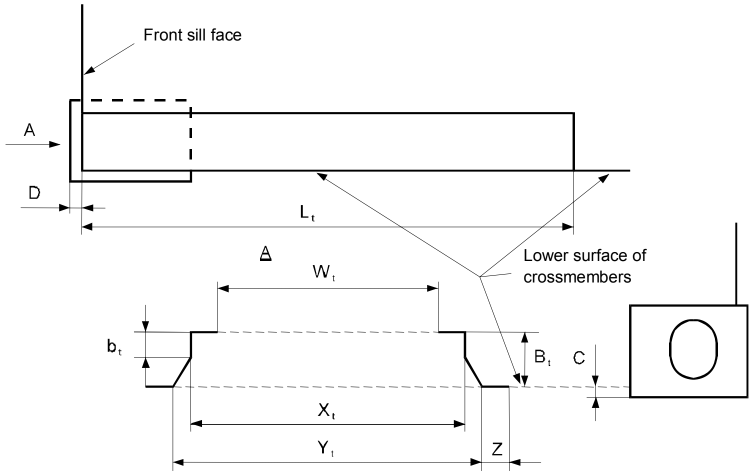
3.6.2 Gooseneck Tunnel

3.6.2.1 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B and 1BX containers may be provided with gooseneck tunnel.

Containers of other types may be provided with gooseneck tunnel subject to special agreement with PRS.

Location and dimensions of gooseneck tunnel are shown in Fig. 3.6.2.1.

3.6.2.2 The application of the tunnel is not to impede compliance with the requirements for container base structure, specified in 3.3.



Length		Width				Height		
[mm]								
L_t	D	W_t	X_t	Y_t	Z	B_t	b_t	C
3150÷3500	6^{+1}_{-2}	930 max.	1029^{+3}_{0}	1070 min. 1130 max.	25 min.	120^{0}_{-3}	35 min. 70 max.	$12{,}5^{+5}_{-1.5}$
Tolerance B_t is to be measured checked in the rear part of the tunnel over a length of about 600 mm								

Fig. 3.6.2.1.
Location and dimensions of gooseneck tunnel

4 MATERIALS AND WELDING

4.1 General Requirements

4.1.1 Materials used in the construction of containers are to be certified by PRS. PRS may also accept materials manufactured by the works approved by PRS, based on material certificates.

Material certificates are to contain at least data on strength characteristics, chemical composition and the grade of material.

4.1.2 The container corner fittings are subject to PRS' direct survey or the works quality control if the works operates according to quality assurance system approved by PRS.

4.1.3 Where structural components of containers are made of various metals, they are to be separated by an insulating material, agreed with PRS, to protect against electromechanical corrosion.

4.2 Metals

4.2.1 The carbon content in the structural components subject to welding is to be as follows:

- for carbon steels – not greater than 0.25%;
- for carbon-manganese and low-alloyed steels – not greater than 0.20%.

The components are to be manufactured of at least semi-killed steel.

4.2.2 Steel of the following mechanical properties is to be used for the construction of containers:

- normal strength rolled steel – with yield stress not less than 235 MPa;
- higher strength rolled steel – with yield stress not less than 355 MPa and impact strength $KV^{-20} = 27$ J;
- steel forgings – with tensile strength of at least 400 MPa;
- steel castings – with tensile strength of at least 400 MPa;
- corner fittings – with yield stress not less than 220 MPa, tensile strength of at least 430 MPa, relative elongation A_5 at least 25%, relative reduction of area $Z = 40\%$ and impact strength at least $KV^{-20} = 27$ J and $KV^{-40} = 21$ J.

4.2.3 The use of aluminium alloys or other alloys of similar properties for supporting structures of containers is subject to special consideration of PRS.

4.3 Wood and Wood-Like Materials

4.3.1 Kinds and quality of wood used for the components subject to PRS' survey are to be selected according to the load types and service conditions of such components and they are subject to special consideration of PRS in each particular case.

The wood affected by fungus or pests and with humidity exceeding 15 per cent is not to be used.

4.3.2 Plywood used in the construction of containers is to be made of wood of a proper kind and quality, applying waterproof glues.

4.3.3 The use of other kinds of wood in the construction of containers is subject to special consideration of PRS.

4.3.4 Preparations used for impregnation (preservation) of wood and wood-like materials are to have PRS' acceptance. Such preparations are not to affect adversely the cargoes carried in containers.

4.4 Plastics

4.4.1 Plastics and composite materials used in the construction of containers are to be approved by PRS.

4.4.2 Glass fibre reinforced laminates are to be manufactured with the use of unsaturated polyester resins approved by PRS.

4.4.3 Sealing materials used in the construction of containers (rubber, liquid sealant or alike) are to be elastic within the temperature range from – 30 °C (243 K) to +66 °C (339 K), resistant to mechanical wear and to the influence of sea-water and petroleum products, and are not to be liable to quick ageing.

4.5 Welding

4.5.1 Welding procedure and methods are to be agreed upon with PRS. Welding consumables are to be provided with manufacturer's certificates and are to be manufactured in the works approved by PRS.

4.5.2 Welding operations are to be carried out by welders certified by PRS.

5 MARKING

5.1 CSC Safety Approval Plate

5.1.1 The CSC Safety Approval Plate, hereinafter referred to as “Approval Plate”, is to be affixed to each container of the approved design type or to the approved single container.

5.1.2 The plate is to contain the following information in the English language:
– the plate heading:

CSC SAFETY APPROVAL

– and the following data:
- **.1** country of approval and the number of Approval Certificate,
- **.2** date of manufacture,
- **.3** identification No.,
- **.4** maximum gross mass (kg and lb),
- **.5** allowable stacking mass for 1.8 *g* (kg and lb),
- **.6** transverse racking test load value (newtons),
- **.7** end wall strength – if different than 0.4 *P* (kg and lb),
- **.8** side wall strength – if different than 0.6 *P* (kg and lb),
- **.9** date of surveys.

A blank space is to be reserved on the plate for stamped signs.
The example of the CSC Safety Approval plate is shown in Fig. 5.1.2.

CSC SAFETY APPROVAL		
APPROVAL REFERENCE		
DATE MANUFACTURED		
IDENTIFICATION No.		
MAXIMUM OPERATING GROSS MASS	kg	lb
ALLOWABLE STACKING LOAD FOR 1.8 g	kg	lb
TRANSVERSE RACKING TEST FORCE	newtons	
END WALL STRENGTH	kg	lb
SIDE WALL STRENGTH	kg	lb
NEXT EXAMINATION DATE		

Fig. 5.1.2.
CSC Safety Approval plate

Notes to Fig 5.1.2:
1. The country of approval is to be indicated by distinguishing letters**.**
2. Date of manufacture: month and year.
3. Identification No.: the manufacturer's number of the container.
4. Maximum gross mass *R*.
5. Stacking mass for 1.8 *g*: permissible load during the stacking test at the overload of 1.8 ***g*.**
6. Racking test load value (kg and lb),
7. End wall strength – to be indicated on the plate only if the end walls are designed to withstand a load less or greater than 0.4 *P*.
8. Side wall strength – to be indicated on the plate only if the side walls are designed to withstand a load less or greater than 0.6 *P*.
9. Dates of surveys – date (month and year) of the first intermediate survey of container and the date (month and year) of subsequent surveys. The interval from the date of manufacture to the date of the first intermediate survey is not to exceed 5 years.

5.1.3 The Safety Approval Plate is to have the form of a rectangular plate, measuring not less than 200 mm x 100 mm. The heading letters are to be at least 8 mm in height; all other letters and numbers – 5 mm in height.

The heading and all other words are to be embossed, moulded or indicated on the surface of the plate in any other permanent and legible way.

The letters and numbers on the plate are to be 5 mm in height and are to be embossed, moulded or indicated on the surface of the plate in any other permanent way.

5.1.4 The Approval Plate is to be corrosion-resistant and resistant to the flame of a temperature 538 °C (811 K) during a period of 5 minutes.

5.1.5 The Approval Plate is to be permanently affixed to the container at a readily visible place, where it would not be easily damaged.

It is permitted that the Approval Plate be grouped with other data plates on one base plate.

5.1.6 A two-door general purpose container with two doors installed is to be fitted with the CSC Safety Approval plate including, in addition to information given in 5.1.2, the value of allowable stacking load and transverse racking test load for the container when one door is off as follows:

ONE DOOR – OFF OPERATION		
ALLOWABLE STACKING LOAD ONE DOOR OFF FOR 1.8 g	kg	lb
TRANSVERSE RACKING TEST LOAD VALUE	newtons	

5.1.7 When an existing two-door CSC approved container fitted with the CSC Safety Approval plate is being modified for one door – off operation, an additional plate containing the modified values of allowable stacking load and transverse racking test load is to be affixed as close as practicable to the CSC plate.

5.2 Additional Marking

5.2.1 In addition to the Approval Plate, the PRS emblem and the following inscriptions are to be placed on the container:

.1 owner code, serial number and check digit,

.2 letters and numbers indicating the kind and type of container,

.3 maximum gross weight and tare weight of the container.

Inscriptions, referred to in 5.2.1, are to be made in a colour contrasting with that of the container. The height of the characters and numbers is not to be less than 100 mm, and the width not less than 10 mm, except the numbers of gross weight and tare weight, the height of which is to be at least 50 mm.

5.2.2 If stacking loads and transverse rigidity test loads are less than 213 000 kg and 150 kN, respectively, this is to be clearly indicated on the container.

5.2.3 If the container is equipped with special devices which may be used only when the container is empty (e.g. fork lift pockets), the inscriptions warning against their use when the container is loaded are to be placed in the vicinity of such devices.

These inscriptions are to be made in English and, additionally, they may be made in other languages.

5.2.4 Containers complying with all requirements of the *Rules,* conventions, agreements, standards and other documents concerning containers intended for international trade are to be identified by the PRS emblem shown in Fig. 5.2.4.

5.2.5 Containers which do not comply, wholly or in part, with the requirements of the *Rules*, conventions, agreements, standards and other documents concerning containers intended for international trade, but are surveyed by Polski Rejestr Statków, are to be marked with the PRS emblem shown in Fig. 5.2.5.

Fig. 5.2.4

Fig. 5.2.5

5.3 Cargo Securing Systems

The cargo securing equipment, where provided inside containers, is to comply with para. 3.12, Part II of the present *Rules.*

PART II

GENERAL PURPOSE CONTAINERS

1 GENERAL

1.1 Application

1.1.1 The requirements of the present Part apply to general purpose containers, as well as to other containers, where applicable, in their entirety or in part.

1.1.2 General purpose containers are to comply also with the requirements specified in Part I.

1.2 Definitions and Explanations

Definitions and explanations relating to the general terminology used in the *Rules* are given in Part I.

In the present Part, the following definition has been adopted:

General purpose container – a container intended for the carriage and storage of unit loads and loose materials.

1.3 Scope of Survey

PRS' technical survey covers the whole container: framework (supporting structure), floor, corner fittings and locking devices.

1.4 Technical Documentation

Prior to construction of a single container or a prototype of container design type, technical documentation, specified in 1.4.1, Part I, is to be submitted to PRS for approval.

2 TECHNICAL REQUIREMENTS

2.1 Door Opening

2.1.1 Each container is to be provided with the door opening at least at one end.

2.1.2 It is recommended that the door opening in general purpose containers should correspond to the container internal dimensions, but in no case can the dimensions of the door opening and the container internal dimensions be less than those given in Table 2.1.2.

Departures from the above requirement are subject to special consideration of PRS.

In 1AX, 1BX, 1CX and 1DX containers, the dimensions of the door opening (where provided) are subject to special consideration of PRS.

Table 2.1.2

Type of container	Minimum internal dimensions			Door opening minimum dimensions	
	Height [mm]	Width [mm]	Length [mm]	Height [mm]	Width [mm]
1EEE	Container nominal external height minus 241 mm	2330	13542	2566	2286
1EE			13542	2261	
1AAA			11998	2566	
1AA			11998	2261	
1A			11998	2134	
1BBB			8931	2566	
1BB			8931	2261	
1B			8931	2134	
1CC			5867	2261	
1C			5867	2134	
1D			2802	2134	

2.2 Doors

Container doors are to open and close freely and are to be tight when closed. The opening angle of both door leaves in an end wall is to be about 270^{o} and in a side wall 180^{o}.

Container is to be provided with a suitable locking device enabling to immobilize the door in the open position.

Container door is to be so designed as to allow security seal complying with the requirements of ISO/PAS 17 712 (the so-called "high security seal") to be fitted in a manner that precludes opening or gapping of the door without first removing the seal.

3 TESTS

3.1 General Requirements

3.1.1 General purpose containers, irrespective of their design and materials used are to be subjected to tests and loads specified in 3.2 to 3.10. The container dimensions and tare mass are checked according to the requirements of 3.11. Containers of other types – e.g. not fitted with the rigid roof or side walls, etc. – are to be subjected to those tests specified in 3.2 to 3.10 which are appropriate to the structure provided.

3.1.2 Test stands on which forces and loads are applied to the container are not to restrict free deflections of all components of the container subjected to test.

3.1.3 Upon completion of each test, the containers are to show neither permanent deformations nor abnormality which will make them unsuitable for use.

3.1.4 The container tests may be carried out in any sequence, except the test specified in 3.10 which is to be conducted last.

3.2 Container Lifting

3.2.1 General Requirements

During the test, the container having the specified internal load is to be carefully lifted in such a way that no significant acceleration forces are imposed.

After lifting, the container is to be suspended for 5 minutes and then smoothly lowered to the ground.

3.2.2 Lifting from the Corner Fittings

3.2.2.1 Before testing, the container is to be loaded with a uniformly distributed load in such a way that the combined mass of container and the test load is equal to 2 *R*.

3.2.2.2 The container is to be subjected to external forces allowing to lift the combined mass of 2 *R* in the manner specified in 3.2.2.3 and 3.2.2.4.

3.2.2.3 When lifting the container from the top corner fittings, the lifting forces are to be applied at all top corner fittings (Fig. 3.2.2.3), as follows:

.1 for 1EEE, 1EE, 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CC, 1C and 1CX containers, the lifting forces are to be applied vertically;

.2 for 1D and 1DX containers, lifting is to be carried out by means of slings, the angle of each leg being at 30° from the vertical.

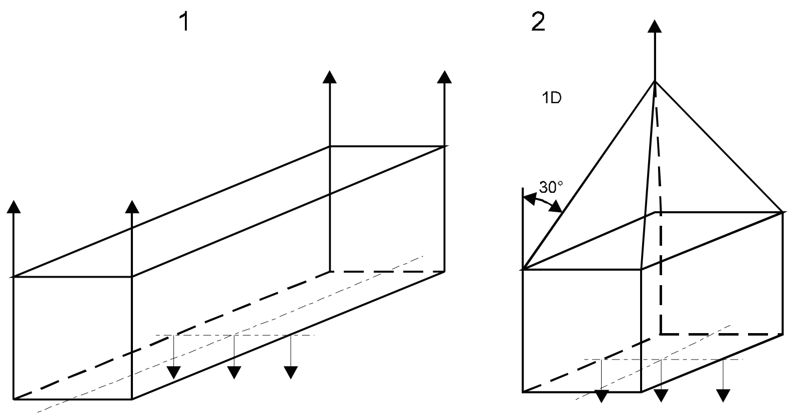


Fig. 3.2.2.3. Lifting from the top corner fittings

3.2.2.4 When lifting the container from the bottom corner fittings (Fig. 3.2.2.4), the lifting devices are to be fixed in the side apertures of the corner fittings in such a way that the lines of action of the lifting forces will be no farther apart than 38 mm from the outer faces of the corner fittings and at the following angle to the horizontal:

- 30° – for 1EEE, 1EE containers (separately for end and intermediate corner fittings),
- 30° – for 1AAA, 1AA, 1A and 1AX containers,

– 37° – for 1BBB, 1BB, 1B and 1BX containers,
– 45° – for 1CC, 1C and 1CX containers,
– 60° – for 1D and 1DX containers.

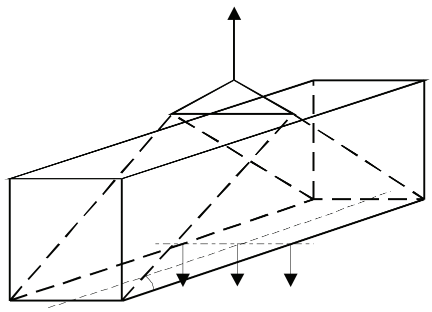


Fig. 3.2.2.4. Lifting from the bottom corner fittings

3.2.3 Lifting from Fork-Lift Pockets

3.2.3.1 Before testing, the container is to be loaded with a uniformly distributed load in such a way that the combined mass of container and the test load is equal to 1.6 *R* for the outer pockets and 0.625 *R* for the inner pockets.

3.2.3.2 The container is to be subjected to external forces allowing to lift the combined mass, given in 3.2.3.1, in the manner specified in 3.2.3.3.

3.2.3.3 During the test, the container is to be supported on two horizontal bars, one bar centred within each fork-lift pocket, which is used for lifting the loaded container. The bars are to be 200 mm wide and are to project 1828 ± 3 mm into the fork-lift pockets, measured from the outside face of the side of the container. In containers fitted with four fork-lift pockets, the bars are to be first inserted into the outer pockets and then into the inner pockets.

3.2.4 Additional Methods of Lifting

Where containers are designed to be lifted in the loaded condition by a method other than that specified in 3.2.2 or 3.2.3, they are to be tested with the internal loading and externally applied forces representative of the acceleration conditions appropriate to that method.

3.3 Stacking Strength

3.3.1 The purpose of the test is to prove the ability of the container to transfer, in acceleration conditions, the forces given in Table 3.3.4 applied to the top corner fittings and taking into account longitudinal and transverse shifting between containers, as specified in 3.3.3.

3.3.2 The container, loaded with a uniformly distributed load such that the combined mass of container and test load is equal to 1.8 R , is to be placed on four level pads, which are in turn supported on a rigid horizontal surface. The pads are to be centrelized under the fittings and are to be substantially of the same plan dimensions as the fittings (Fig. 3.3.2).

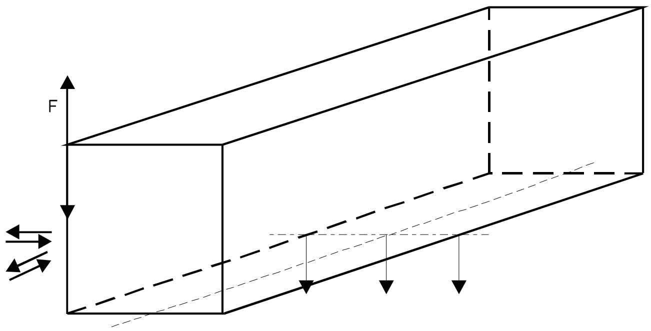


Fig. 3.3.2. Containers stacking strength test

3.3.3 The container, prepared for the test, is to be subjected to forces, specified in 3.3.4, distributed uniformly and applied simultaneously to all four corner fittings or to each pair of end fittings through test corner fittings or pads of the same plan dimensions as the container corner fittings. The test corner fitting or pad is to be offset with respect to the top corner fitting of the container by 25.4 mm laterally and 38 mm longitudinally.

3.3.4 The top corner fittings are to be subjected to external vertical forces, specified in Table 3.3.4.

Table 3.3.4

Type of container	Force applied to four corner fittings simultaneously [kN]	Force applied to a pair of end fittings [kN]	Superimposed mass of containers represented by test force [kg]
1EEE, 1EE	3767	1883	213 360
1AAA, 1AA, 1A, 1AX	3767	1883	213 360
1BBB, 1BB, 1B, 1BX	3767	1883	213 360
1CC, 1C, 1CX	3767	1883	213 360
1D, 1DX	896	448	50 800

Note 1: The test force 3767 kN per container is derived from the superimposed mass of nine-high stacking, i.e. eight containers stacked on top of one container, all being rated to 213 360 kg, and an acceleration force of 1.8 g. (The corner posts of such containers are subjected to a load of 96 012 kg).
Note 2: The stacking loads for 1EEE and 1EE containers in different modes:
1. stacking at 1EEE/1EE position and supported in 1EEE/1EE position: 96 000 kg;
2. stacking at 1AAA/1AA/1A position and supported in 1AAA/1AA/1A position: 41 150 kg;

3. stacking at 1AAA/1AA/1A position and supported at 1 EEE/1EE position: 27 430 kg;
4. stacking at 1EEE/1EE position and supported in 1AAA/1AA/1A position: 41 150 kg.

3.3.5 Where it is expected that during the transport of containers the maximum vertical acceleration forces will vary significantly from 1.8 *g* – the stacking test load may be varied by the appropriate ratio of the acceleration forces.

Two-door containers are to be subjected to additional prototype "one-door-off" stacking strength test. The maximum allowable force applied simultaneously to all four corner fittings is to be 1270 kN (72 000 kg).

3.4 Roof Strength

The container under test is to have no internal loading. The roof of the container is to be subjected to a load of 300 kg, uniformly distributed over an area of 300 mm x 600 mm. The load is to be applied to the outer surface of the weakest area of the roof (Fig. 3.4).

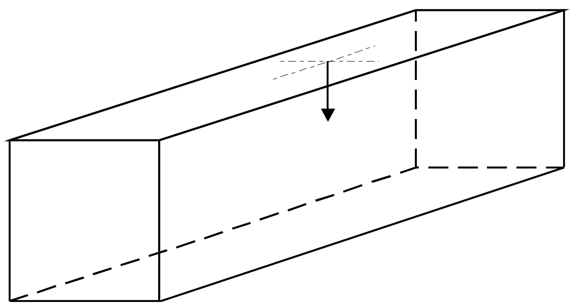


Fig. 3.4. Roof strength test

3.5 Floor Strength

3.5.1 The container is to be placed on four level supports under its four bottom corner fittings in such a way that the base structure of the container is free to deflect (Fig. 3.5.1).

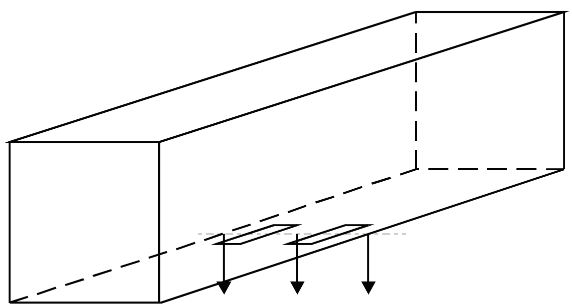


Fig. 3.5.1. Floor strength test

3.5.2 The test is to be performed using a test vehicle with an axle load of 7260 kg, i.e. 3630 kg on each wheel. It is to be so arranged that each wheel makes physical contact with the floor over an area of not more than 142 cm^2.

During the test, all points of contact between each wheel and the flat surface are to lie within a rectangle measuring: 185 mm parallel to the circle axis by 100 mm. The wheel width is to be not greater than 180 mm and the wheel centres are to be 760 mm apart.

The vehicle is to be manoeuvred over the entire floor area. No external forces are to be applied to the container.

3.6 Container Structure Rigidity

1EEE, 1EE , 1AAA, 1AA, 1A, 1AX, 1BBB, 1BB, 1B, 1BX, 1CC, 1C and 1CX containers are to be able to withstand longitudinal and transverse forces resulting from ship movement.

3.6.1 Transverse Rigidity Test

3.6.1.1 Transverse rigidity test is to be performed for all types of containers, except 1D and 1DX containers. The container in tare condition is to be placed on four level supports, one under each corner fitting, and is to be restrained against lateral and vertical movement by means of anchor devices so arranged that the lateral restraint is provided only at the bottom corner fittings diagonally opposite to those at which the forces are applied (Fig. 3.6.1.1).

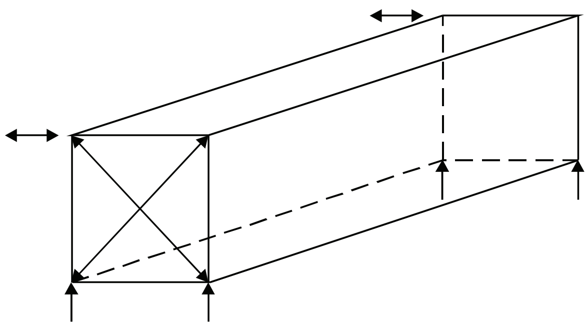


Fig. 3.6.1.1. Transverse rigidity test

3.6.1.2 External forces of 150 kN are to 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 of the container. The forces are to be applied first towards and then away from the top corner fittings.

Two-door containers are to be subjected to additional prototype “one door-off” transverse rigidity test. The applied external force is to be 75 kN.

3.6.1.3 In the case of containers in which each end is symmetrical about its own vertical centreline, one side only need be tested. In containers with asymmetric ends, both sides of the ends are to be tested.

3.6.2 Longitudinal Rigidity Test

3.6.2.1 Longitudinal rigidity test is to be performed for all types of containers, except 1D and 1DX containers. The container in tare condition is to be placed on four level supports, under each bottom corner fitting and is to be restrained against longitudinal and vertical movement by means of anchor devices so arranged that the longitudinal restraint is provided only at the bottom corner fittings diagonally opposite to those at which the forces are applied (Fig. 3.6.2.1).

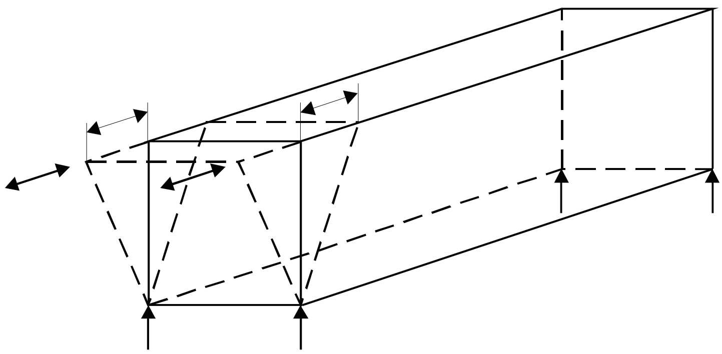


Fig. 3.6.2.1. Longitudinal rigidity test

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

3.6.2.3 In the case of container with sides symmetrical about their own vertical centrelines, external forces are to be applied to the top corner fittings at one side only.

Where sides are not symmetrical about their own vertical centrelines and are of different design, a sufficient number of tests is to be carried out to cover all design modifications applied.

3.7 Restraint in Longitudinal Direction

3.7.1 The container with a load uniformly distributed in such a way that the combined mass of a container and the test load is equal to R is to be secured longitudinally to rigid anchor points through the bottom apertures of the bottom corner fittings at one end of the container (Fig. 3.7.1).

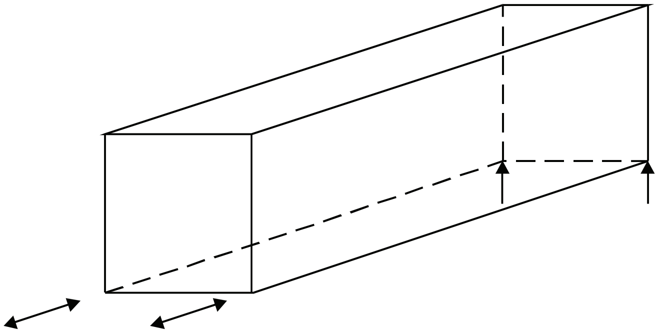


Fig. 3.7.1. Restraint in longitudinal direction test

3.7.2 Two external forces of magnitude *Rg* are to be applied horizontally to the container through the bottom apertures of the other bottom corner fittings, first towards and then away from the anchor points in such a way as to subject the container base to a combined force of 2 *Rg*.

3.8 End Walls Strength

3.8.1 The end walls are to be able to withstand a load equal to 0.4 *Pg,* uniformly distributed over the end wall under test. The end walls of the container may be also subjected to a test under load less or greater than 0.4 *Pg* if they are designed to withstand such loads.

The load is to be so arranged over the wall as to allow its free deflection (Fig. 3.8.1).

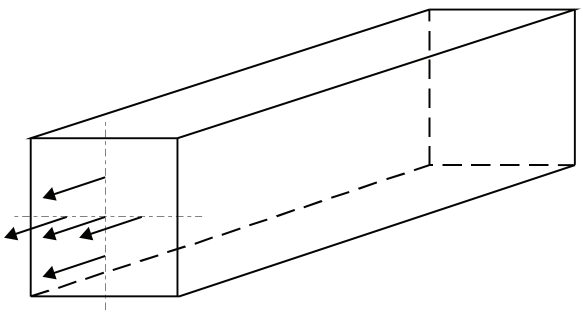


Fig. 3.8.1. End walls strength test

3.8.2 The inside surface of an end wall is to be subjected to a uniformly distributed load of 0.4 *Pg* (or such other load for which the container end wall is designed). Each end wall is to be tested separately.

No external forces are to be applied to the container.

3.8.3 The container is to have each end wall tested. In the case of symmetrical construction, one end wall only need be tested.

3.9 Side Walls Strength

3.9.1 The side walls are to be able to withstand a load equal to 0.6 *Pg,* uniformly distributed over the wall under test. The side walls of the container may be also subjected to a test under load less or greater than 0.6 *Pg* if they are designed to withstand such loads. The load is to be so arranged as to allow free deflection of the wall and its longitudinal members (Fig. 3.9.1).

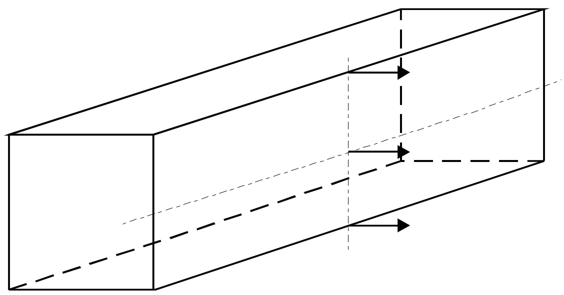


Fig. 3.9.1. Side walls strength test

3.9.2 The inside surface of a side wall is to be subjected to a uniformly distributed load of 0.6 *Pg* (or such load for which the container side wall is designed). Each side wall is to be tested separately.

No external forces are to be applied to the container.

3.9.3 The container is to have each side wall tested. In the case of symmetrical construction, one side wall only need be tested.

3.10 Weatherproofness

3.10.1 A stream of water is to be applied to all exterior surfaces, joints and seams of the container, the following parameters being maintained:

.1 a nozzle inside diameter – 12.5 mm;
.2 water pressure – 0.1 MPa (1 bar);
.3 the distance between the nozzle outlet and the tested surface – 1.5 m;
.4 the angle between the water jet and the tested surface – 90^o;
.5 the stream traverse speed – 100 mm/s.

3.10.2 Procedures involving the use of several nozzles are acceptable, provided that water streams parameters comply with the requirements of 3.10.1.

3.10.3 On completion of the test, the interior of the container is to be dry.

3.10.4 The weatherproofness test may be carried out by other means approved by PRS.

3.11 Checking

3.11.1 Checking is to include visual inspection, standarized dimensions check and determining the container mass.

3.11.1.1 Visual inspection is to be carried out during construction of a container and/or after its completion to ensure that the structural elements, materials and workmanship comply with the requirements of the present *Rules.* During visual inspection, operation of the container doors at their closing and opening is to be checked.

3.11.1.2 Standarized dimensions check is to be made before and after the tests.

3.11.1.3 The container mass is to be determined after completion of all work, including outfitting and painting.

3.12 Cargo Securing Systems Tests

3.12.1 Cargo securing points are to be subjected to tensile strength test, applying a tensile force equal to 1.5 times the rated load given in 3.12.5.

3.12.2 Cargo anchor points, located in the base structure of the container are to be subjected to a force, specified in 3.12.1, acting in a plane perpendicular to the axis of the container structural member to which it is attached and at an angle of 45° to the horizontal plane.

3.12.3 Cargo lashing points installed at other elements of container frame, except top side rails and rear and front headers are to be subjected to a force, specified in 3.12.1, applied at 45^o upwards and downwards from the horizontal plane.

3.12.4 Cargo lashing points installed at top side rails and rear/front headers are to be subjected to a force, specified in 3.12.1, applied at 45° downwards.

3.12.5 The minimum rated load of cargo anchor points is to be 1000 kg; the minimum rated load of cargo lashing points is to be 500 kg.

3.12.6 On completion of the tests, neither cargo securing devices, nor their attachments to the container structure are to show any permanent deformations or abnormality which will render them unsuitable for use.

PART III

THERMAL CONTAINERS

1 GENERAL

1.1 Application

The requirements of Part III apply to thermal containers.

1.2 Definitions and Explanations

Definitions and explanations relating to the general terminology used in the *Rules* are given in Part I.

In the present Part, the following definitions have been adopted:

Thermal container – container built with insulated walls, doors, floor and roof or with these elements made of insulated materials so as to retard the rate of heat transmission between the inside and the outside of the container and to maintain the specified inside temperature:

– refrigerated container – thermal container served by a refrigerating appliance (mechanical compressor unit, etc.);
– cooled container – thermal container using a means of cooling such as dry ice, liquefied gases (nitrogen, carbon dioxide), with or without cooling control, which requires no external power or fuel supply;
– cooled and heated container or refrigerated and heated container – thermal container using means of cooling or served by refrigerating appliance and heat-producing appliance;
– insulated container – thermal container having no devices for cooling and/or heating;
– heated container – thermal container served by a heat-producing appliance.

Batten – member protruding from the inside walls of the container to hold the cargo away from the wall to provide an air passage. The member may be integral with the wall, fastened to the wall or added during cargo loading.

Internal capacity of container – a volume within the inside walls of the container; battens and equipment placed inside the container are not to be included in the internal capacity.

Drainage – outlet system for draining the water after the defrosting of cooling elements and other condensates, consisting of dripping pipes and closing appliances at the openings, as well as for reducing the internal pressure.

Floor air duct – passages located beneath the cargo support surface or on that surface to direct air flow.

Refrigerating units room – a compartment or an enclosed space housing compressors and other components of refrigerating units.

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

Refrigerating plant – a complete arrangement consisting of one or several refrigerating units, pipings and control system, monitoring and adjusting systems capable of generating and maintaining the required temperature inside the container.

Removable equipment – a refrigerating and/or heating unit designed for easy removal or detachment when transferring the container from one transportation system to another.

Refrigerating unit – an unit composed of one or two compressors, one or two condensers, evaporator and the necessary fittings and control equipment ensuring an independent operation of the unit. It may also include an independent source of power supply (generating set).

1.3 Scope of Survey

1.3.1 PRS' technical survey covers:

.1 framework (supporting structure with walls, floor and roof);
.2 corner fittings;
.3 doors and door closures;
.4 fixed refrigerating units and/or heating appliances of the container;
.5 electrical equipment;
.6 source of power supply, including prime mover.

1.3.2 During manufacture, particular components of the container, as well as its equipment, specified in 1.3.1, are to comply with the requirements of the present Part and other applicable PRS Rules.

1.4 Technical Documentation

In addition to technical documentation, required in 1.4.1, Part I, the application for approval of thermal container design type or a single container is to be accompanied by the following documentation, in triplicate, to be approved by PRS:

.1 technical description of refrigerating plant, diagrams and drawings of refrigerating plant and/or heating appliance indicating thermal, mechanical and other characteristics;
.2 specification of electrical equipment indicating the characteristics of protection and control devices, drawings of jointing plugs, wiring and mounting diagrams;
.3 specification, diagrams and drawings of electrical source of power, together with its drive;
.4 specification of thermal insulation;
.5 thermal calculations;
.6 programme and methods of thermal tests, indicating the predicted values;
.7 test programme of the prototype and of the refrigerating and/or heating units manufactured in series.

2 TECHNICAL REQUIREMENTS

In addition to the requirements of the present Chapter, thermal containers are to comply with the applicable requirements specified in Chapter 3, Part I.

2.1 Internal Dimensions

The minimum internal dimensions of thermal containers are given in Table 2.1.

Table 2.1[1)]

Type of container according to Table 2.5.1	Minimum length [2)] = nominal container external length minus: [mm]	Minimum width = nominal container external width minus: [mm]	Minimum height[2)] (no gooseneck tunnel) = nominal container external height minus: [mm]	Minimum height[2)] (with gooseneck tunnel) = nominal container height minus: [mm]
1, 2, 3, 4	690	220	345	385
5, 6, 7, 9	990			
8	440			

Notes:
1) The minimum internal dimensions of 1BB, 1B and 1D containers are subject to special consideration of PRS.
2) Part of the container height and length may be used for air circulation.

2.2 Equipment for Hanging Cargoes

The construction of equipment intended for the carriage of suspended cargoes is to be such as to withstand the load specified in 3.2.2.

2.3 Door Opening

Where possible, the container door opening is to be situated on the end wall. The dimensions of the door opening are to correspond to the dimensions of the internal cross-section of the container, but the width of the opening is to be not less than that given in Table 2.1.

2.4 Doors

The requirements concerning doors are specified in 2.2, Part II.

2.5 Thermal Characteristics

2.5.1 The design of thermal containers is to ensure that thermal characteristics, specified in Table 2.5.1, are maintained.

Table 2.5.1

Item	Type of container	U_{max} [W/K]								Temperature			
		1D	1CC, 1C	1BB, 1B	1BBB	1AA, 1A	1AAA	1EE	1EEE	Inside		Outside	
										K	°C	K	°C
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Cooled container	13	22	31	33	40	42	44	46	255	–18	318	+45
2	Refrigerated container	13	22	31	33	40	42	44	46	255	–18	318	+45
3	Cooled and heated or refrigerated and heated container	13	22	31	33	40	42	44	46	289 255	+16 –18	253 318	–20 +45
4	Heated container	13	22	31	33	40	42	44	46	289	+16	253	–20
5	Refrigerated, self-powered container	13	22	31	33	40	42	44	46	255	–18	318	+45
6	Cooled and heated or refrigerated and heated, self-powered container	13	22	31	33	40	42	44	46	289 255	+16 –18	253 318	–20 +45
7	Heated, self-powered container	13	22	31	33	40	42	44	46	289	+16	253	–20
8	Cooled and/or heated, refrigerated and/or heated container, with removable equipment, appliance located externally	13	22	31	33	40	42	44	46				
9	Cooled and/or heated, refrigerated and/or heated container, with removable equipment, appliance located internally	13	22	31	33	40	42	44	46				

Notes:

1. The value of U_{max} for containers with increased insulation (items 1, 2, 3, 4, 5, 6, 8 and 9) corresponds to heat transfer coefficient $K \leq 0.4$ w/m^2 °C.
2. For containers, referred to in items 8, 9, temperature limits have not been specified; the actual performance is dependent on the capability of refrigerated and/or heated removable equipment used in any transport mode.

2.5.2 Fluctuations in temperature inside the thermal container are not to exceed ±1 °C (±1 K).

2.6 Temperature Measuring Devices

2.6.1 Thermal containers are to be provided with temperature measuring devices so located as to allow the temperature to be read from outside of the container.

2.6.2 Thermal containers, except insulated and cooled containers, are to be fitted with a thermograph recording internal temperature.

2.7 Ventilation

2.7.1 The design of openings for the ventilation of the container internal space by means of external air is to ensure their easy opening and closing from outside.

2.7.2 In 1AA, 1CC and 1C containers, the openings for cooling or heating air circulation from removable units are to comply with the following requirements (see Fig 2.7.2):

.1 projections around the openings are to be either circular or square with the diameter or side not less than 457 mm for 1CC and 1C containers and not less than 550 mm for 1AA containers;

.2 the surface of projections is to be flat, with roughness tolerance 0.25 mm, and parallel to the front face of the corner fittings;

.3 faces of projections are to be recessed 4^{+2}_{-1} mm from the front faces of the corner fittings;

.4 the diameter of the openings is to be not less than 254 mm for 1CC and 1C containers and not less than 350 mm for 1AA containers;

.5 openings are to be provided with closing appliances according to Customs requirements.

For other types of containers, the dimensions and arrangement of openings are subject to special consideration of PRS.

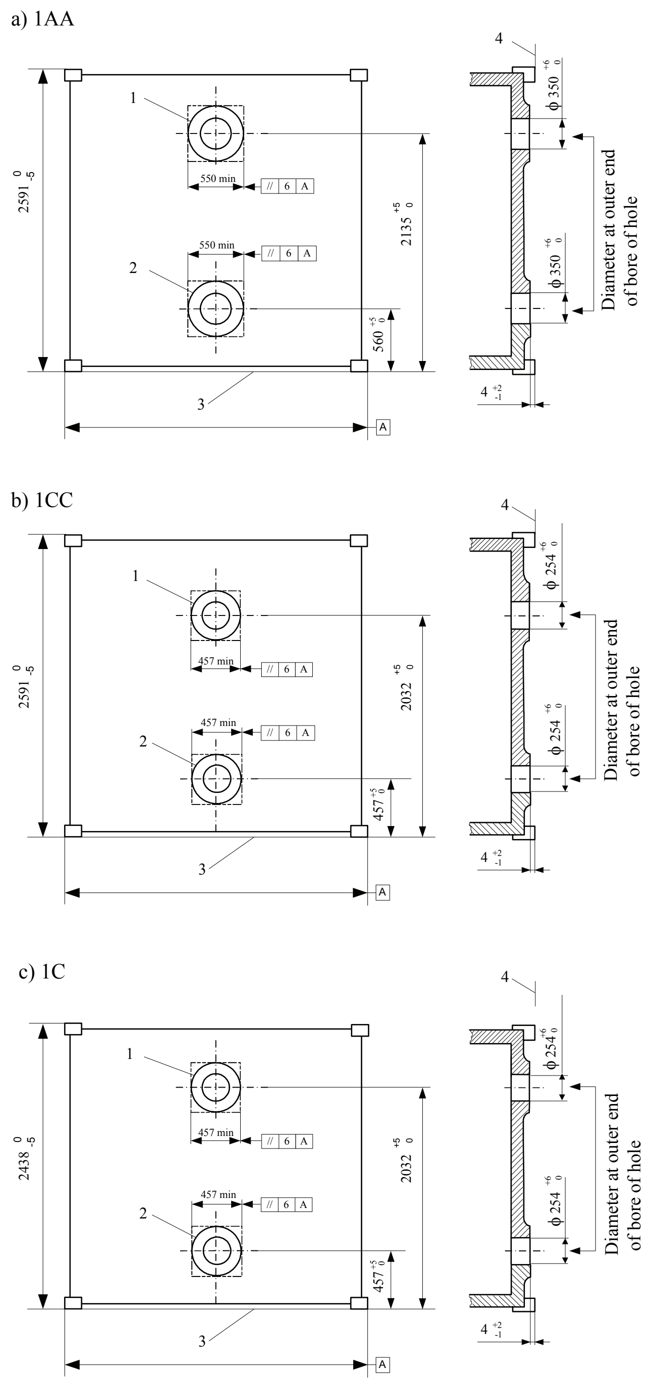


Fig. 2.7.2. Ventilation openings in the end wall of 1AA, 1CC and 1C containers

1 – air outlet opening; 2 – air inlet opening; 3 – base line, bottom face of bottom corner fittings; 4 – base line, front face of front corner fittings.

2.8 Drainage

If thermal container is provided with a drainage system, the system is to comply with the following requirements:

.1 it is to be provided with fittings which open automatically above normal internal operating pressure;

.2 if the system is used for cleaning the interior of the container, it is to be provided with manual closures.

2.9 Intermediate Sockets for Clip-On Units

Where intermediate sockets are provided for use of clip-on units, they are to be located and arranged as shown in Fig. 2.9.

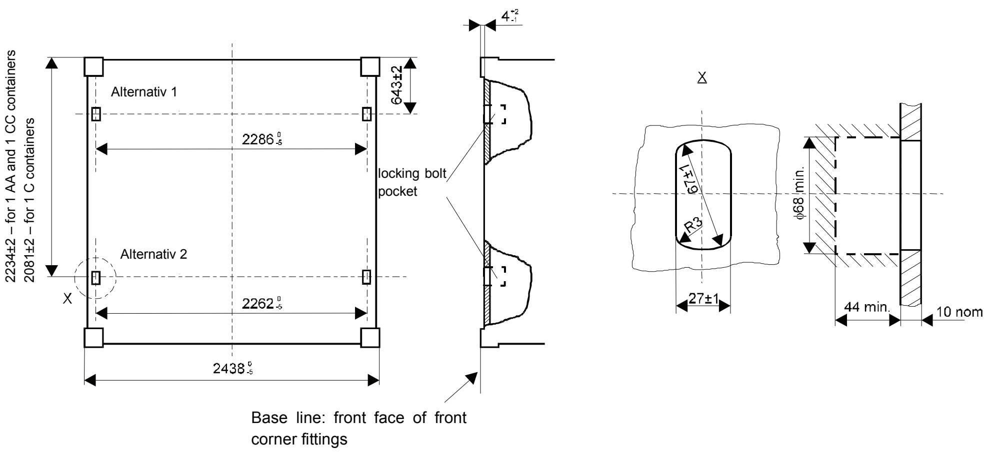


Fig. 2.9. Arrangement of intermediate sockets for clip-on units

2.10 Sanitary Requirements

2.10.1 Materials used for the construction of container and its cooling, refrigerating or heating appliance are to be so selected as to prevent adverse effects in the carried cargo, especially foodstuff.

2.10.2 The interior surfaces of container are to be:

.1 smooth and such as to preclude accumulation of water;

.2 resistant to cleaning agents such as steam and detergents;

.3 void of pockets that cannot be reached by conventional cleaning methods.

2.10.3 It is recommended that the internal and external surfaces of container should be painted in bright colours (white, light-grey, silvery, etc.).

2.11 Electrical Equipment

2.11.1 Electrical Power Supply

2.11.1.1 Electrical equipment installed in thermal containers is to be designed to operate from three-phase current supply sources when the nominal voltage measured between phases at the receptacle is as follows: in range from 360 V to 460 V and frequency 50 Hz and in range from 400 V to 500 V and frequency 60 Hz.

2.11.2 General Requirements

2.11.2.1 The degree of protection of electrical equipment enclosures is to be at least IP 56.

2.11.2.2 Electrical equipment is to be capable of correct operation at deviations from the rated frequency within ±2.5%.

2.11.2.3 The electrical equipment of the container is to have a maximum electrical loading not exceeding 15 kW (18.75 kVA).

2.11.2.4 The following is to be used as the earthing of electrical equipment:
– in the case of power supply from an external source of power – a separate earth strand in a flexible feeding power cable;
– in the case of power supply from its own source of power – a special earth conductor with the cross-section not less than 16 mm^2 connected to the container casing.

2.11.2.5 Insulation resistance of electrical equipment is to be not less than 1 MΩ.

2.11.2.6 The container electric installation is to be provided with a change-over switch enabling its disconnection from an external power source and switching to its own power source.

2.11.3 Cables

2.11.3.1 When the container is supplied from an external source of power, a flexible four-core cable is to be used with the core cross-section sufficient for the simultaneous supply of all receivers with the total power specified in 2.12.2.3. The length of the cable is to be equal to the container length plus 6 m or is to be 15 m – whichever is the greater.

2.11.3.2 A flexible power cable is to be permanently attached to the container electric equipment terminals at one end and is to be fitted with a male plug with three current pins and one earth pin at the other end.

2.11.3.3 Flexible power cables are to be stored in a well-ventilated storage compartment, provided for this purpose.

2.11.3.4 The container electrical equipment, supplied from an external source of electric power, is to be fed through plug-in sockets in A(R), B(S), C(T) phase-sequence, as shown in Fig. 2.11.3.4.

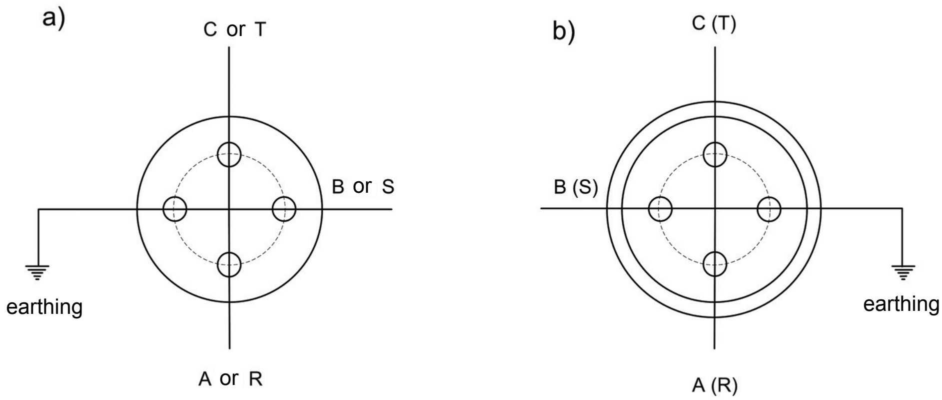


Fig. 2.11.3.4. Phase-sequence on the plug and plug-in socket.
a – plug (front view); b – plug-in socket (front view)

2.11.4 Plug Connections

2.11.4.1 The design of plugs and plug-in sockets is to comply with the requirements of Publication IEC 947-1.

2.11.5 Switch Gear, Starting and Protective Devices

2.11.5.1 Electrical equipment control systems are to be properly arranged, easy in service and duly protected against mechanical damages.

2.11.5.2 The container electric consumers are to be supplied through an ON/OFF switch enabling to disconnect power supply on each phase. A visual signal is to be provided to indicate that the switch is in ON position.

2.11.5.3 With the switch in ON position, the electrical equipment is to operate automatically on its own control system.

2.11.5.4 All starting-control devices and electric motors of the container are to be so selected that the starting current is as low as possible. In no case is the starting current to exceed 150 A.

2.11.5.5 The increase in the rotational speed of electric motors during starting is to be such that the starting current, specified in 2.12.5.4, will decay to 1.25 of the rated current within one second.

2.11.5.6 The container starting and control devices are to be adequately protected against overloads and short circuits.

2.11.5.7 Protective devices characteristics are to satisfy the following requirements:
– continuous operation with loads up to 50 A inclusive;
– disconnection of consumers supply with tripping time: at a current of 100 A – not shorter than 3 s, at a current of 180 A – not longer than 10 s, at a current above 300 A – not longer than 0.2 s.

3 TESTS

3.1 General Requirements

3.1.1 Thermal containers, irrespective of their design and materials used, are to be subjected to tests and loads, specified in 3.1.5 and 3.2 to 3.7, as well as to standarized dimensions and mass check in accordance with 3.8.

3.1.2 Refrigerated and/or heated containers are to be tested together with associated refrigerating and/or heating appliances.

3.1.3 When testing containers with removable refrigerating/or heating units, these units may be substituted by equivalent mass or strength equivalents.

3.1.4 On completion of each test, the container is to show neither permanent deformations nor abnormality which would render it unsuitable for use in accordance with its assignment.

3.1.5 The requirements, specified in Chapter 3, Part II, relating to the following tests:
– lifting by different methods,
– strength at stacking,
– floor strength,
– structure rigidity,
– restraint in longitudinal direction (static test),
– strength of the end and side walls,
apply also to thermal containers.

3.1.6 Measuring instruments used for the tests are to be checked by the appropriate body and are to ensure the following accuracy of measurements:
– electrical measuring instruments: ± 2%,
– temperature measuring instruments (protected against heat radiation): ± 0.5 °C (± 0.5 K),

– manometers: ± 5%,
– flow meters: ± 3%.

3.2 Strength of the Roof and Equipment for the Carriage of Hanging Cargoes

3.2.1 The roof strength test is to be carried out in accordance with 3.4, Part II.

3.2.2 The equipment for carrying hanging cargoes, used in thermal containers, is to withstand the load equal to twice the mass of the cargo to be carried per 1 m length or equal to 3000 kg/m – whichever is the greater.

3.3 Weatherproofness

The tested container is to be fully equipped. The test methods and parameters are to comply with 3.10, Part II. Only the following container elements are to be subjected to testing: door seals, exterior flange joints, openings fitted with closing appliances, as well as refrigerating units and their connections with the container.

3.4 Air tightness

3.4.1 This test is to be carried out after the tests, specified in 3.1.5, 3.2 and 3.3, have been completed and prior to the heat leakage test.

3.4.2 The test is to be carried out at temperatures outside and inside the container within the range of +15 °C (288 K) to +25 °C (298 K) in normal atmospheric conditions.

3.4.3 During the test, the difference between the inside and outside temperatures is to be maintained within 3 °C (3 K).

3.4.4 The container is to be fully equipped. The doors, drain openings, ventilation and other openings are to be closed in the normal manner.

3.4.5 The air pipe connected to the container is to be provided with a reducing pipe, manometer and flow-measuring device. The manometer is to be fitted directly on the container and is not to be part of the air supply system.

3.4.6 The positive gauge pressure equal to 250 ± 10 Pa (25 ± 1 mm H_2O) is to be developed in the container.

Once steady test conditions have been established, the air flow required to maintain the pressure is to be recorded.

3.4.7 For all thermal containers other than those with additional door openings, the air leakage rate, determined in standard atmospheric conditions, is not to exceed 10 m^3/h. For each additional door opening (e.g. side doors), an extra rate of 5 m^3/h is to be granted.

3.5 Heat Leakage

3.5.1 Heat leakage test is to be carried out after satisfactory completion of the airtigthness test, stated in 3.4, and with the refrigeration and/or heating equipment in place. Where the thermal container is designed for use with removable equipment, the equipment need not be in position, but the closures in the end wall must be shut.

3.5.2 In order to establish heat balance for the purpose of determining heat leakage, an electric dispersed heat source, located in the container geometrical centre, as well as fans distributing air uniformly are to be used.

3.5.3 The total heat leakage rate, U_t, is calculated from the formula:

$$U_t = \frac{Q}{t_w - t_z}, \quad \text{[W/K]} \tag{3.5.3}$$

Q – power of the internal heaters and fans, [W];

t_w – the average inside temperature, in [K], calculated as the arithmetic mean of the temperatures recorded at the end of each test reading in at least twelve different points (see Fig. 3.5.3-1);

t_z – the average outside temperature, in [K], calculated as the arithmetic mean of the temperatures recorded at the end of each test reading in at least twelve different points (see Fig. 3.5.3-2);

t – the mean wall temperature, in [K], expressed as $t = \frac{t_w - t_z}{2}$.

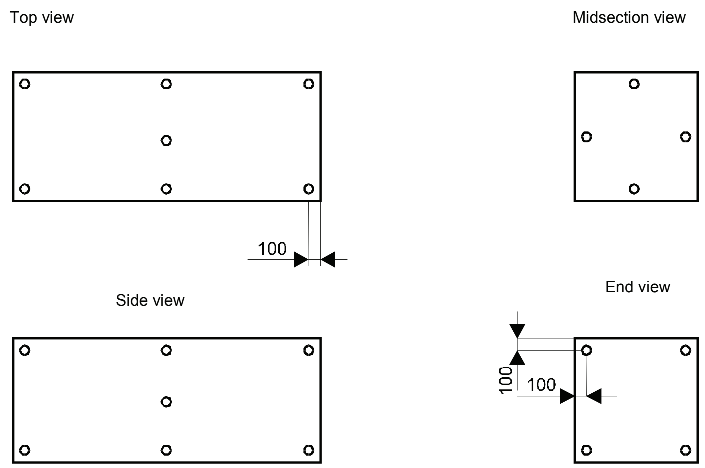


Fig. 3.5.3-1. Air temperature measurement points inside the container

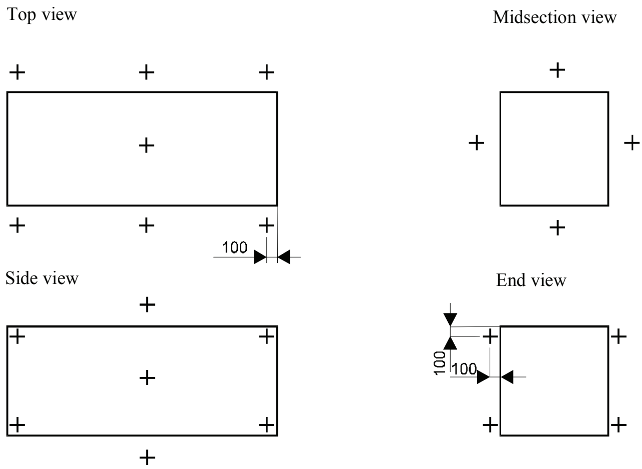


Fig. 3.5.3-2. Air temperature measurement points outside the container

3.5.4 Test data for determining the heat leakage of the thermal container are to be taken after steady test conditions, inside and outside the container, have been established.

The test data are to be taken for a continuous period of not less than 8 h, during which the following conditions must be satisfied:

.1 the test is to be performed with a mean wall temperature between +20 °C (293 K) and +32 °C (305 K) and a temperature difference between inside and outside of not less than 20 °C (20 K);

.2 the maximum temperature difference between the warmest and coldest inside points at any one time is not to exceed 3 °C (3 K);

.3 the maximum difference between the warmest and coldest outside points at any one time is not to exceed 3 °C (3 K);

.4 the maximum difference between any two average inside air temperatures at different times is not to exceed 1.5 °C (1.5 K);

.5 the maximum difference between any two average outside air temperatures at different times is not to exceed 1.5 °C (1.5 K);

.6 the greatest difference between the lowest and the highest power dissipation, in [W], is not to exceed 3% of Q_l :

$$(Q_l - Q_h)\max \le 0.03Q_l \qquad (3.5.4.6)$$

3.5.5 All temperature measuring devices are to ensure the measurements accuracy, as specified in 3.1.6, and sets of readings are to be recorded at intervals of not more than 30 min.

3.5.6 Air is to be circulated over the exterior of the container at a velocity not exceeding 2 m/s at points approximately 100 mm from the mid-length of the side walls and the roof of the container.

3.5.7 All temperature-measuring devices placed inside and outside the container are to be protected against radiation.

3.5.8 The electric heating element is to be operated at temperatures sufficiently low to minimize radiation effects.

3.5.9 The heat leakage, *U,* in [W/K], is to be calculated as the average of at least 17 sets of readings taken during the continuous period of not less than 8 hours for which steady-state conditions were maintained, using the following formula:

$$U = \frac{1}{n}\sum_{i}^{n} U_t \text{ [W/K]} \qquad (3.5.9)$$

where: $n \geq 17$.

The value of *U,* obtained from the formula, is to be recorded together with the mean wall temperatures which were maintained during the test period. The value of *U*, corrected to the standard mean wall temperature of +20 ° C (20 K), is to be also recorded. The correction is to be made using a curve *U* relating to mean wall temperature $U = f(U_t)$. The value of *U* is not to exceed the values given in Table 2.5.1.

3.6 Performance Test of Refrigerating Plant

3.6.1 After satisfactory heat leakage test results, the container fitted with a mechanical refrigeration unit (MRU), either an integral or clip-on unit, is to be placed in a room of a temperature suitable for the given type of container according to Table 2.5.1. The container is to comply with the requirements of 3.4.4; the outside air flow is to comply with the requirements of para. 3.5.6.

3.6.2 The refrigerating plant is to be capable of reducing the inside temperature to that required for a given type of container, at a given outside temperature according to Table 2.5.1 and maintaining that temperature for a period of 8 h without additional heat load above that leaking through the walls, floor and the roof of the container.

3.6.3 After the period of operation, specified in 3.6.2, the heater(s) and fan(s), inside the container, are to be turned on to provide an additional heat load equal to at least 25 % of the total heat leakage rate for the containers, as determined according to 3.5. Additional heat load is to be calculated from the formula:

$$N_A = 0.25 U_t (t_z - t_w) \text{[W]} \quad . \qquad (3.6.3)$$

For symbols, see 3.5.3.

3.6.4 With the refrigerating plant and heating plant running simultaneously and the steady-state conditions being re-established, the refrigerating plant is to be capable of maintaining the required inside temperature, specified in 3.6.2, for a period of at least 4 h.

3.6.5 The container under test is to be fitted with instruments for the measurement of:

.1 inside and outside air temperatures in 12 points (see Figs. 3.5.3-1 and 3.5.3-2.);

.2 inlet and outlet air temperature (dry bulb) inside the container (minimum two sensors on each side);

.3 air temperature at the inlet to the condenser, where an air-cooled condenser is used;

.4 the power supplied to heaters and fans;

.5 the power consumed by heaters and fans.

3.6.6 During the periods of steady-state operation, the container inside and outside temperatures and the power consumed by the heaters and fans are to be recorded at intervals not exceeding 30 min. The values of the recorded temperatures are to comply with the requirements of 3.5.4.

3.7 Performance Test of Refrigerating Equipment Using Liquid Expendable Refrigerant (LER)

Performance test of refrigerating equipment using a liquid expendable refrigerant is to be performed in accordance with ISO 1496-2.

3.8 Checking

Thermal container is to be checked in accordance with sub-chapter 3.11, Part II.

4 MARKING

4.1 Name Plate

The manufacturer's name plate containing technical data on the refrigerating and/or heating plant is to be attached to the plant in a conspicuous place.

4.2 Additional Marking

4.2.1 Additional inscriptions in the national or the English language, indicating the minimum and the maximum inside temperatures for which the container is designed, are to be placed on the doors of the container.

4.2.2 Where a container is provided with fittings for carrying hanging cargoes, the inscription indicating the maximum strength of these fittings over the length of 1 m is to be placed inside the container.

4.2.3 An instruction placard and a circuit diagram are to be attached to the refrigerating and/or heating plant.

PART IV

TANK CONTAINERS

1 GENERAL

1.1 Application

1.1.1 The requirements of Part IV are applicable to tank containers intended for the carriage of liquids, gases and solid dry bulk cargoes which may be loaded or unloaded by pressure discharge or gravity (Table 1.1.1).

Additionally, tank containers are to meet the requirements of *European Agreement Concerning the Carriage of Dangerous Goods by Rail* (RID), *European Agreement Concerning the International Carriage of Dangerous Goods by Road* (ADR), as well *as International Maritime Dangerous Goods Code* (IMDG Code).

Table 1.1.1

Type of cargo and ISO tank type					Minimum test pressure	
Liquids		Gases	Dry bulk			
Non-dangerous	Dangerous		Horizontal discharge	Tipping discharge	MPa	Bar
T0					0.045	0.45
T1	T3		B3	B5	0.15	1.5
T2	T4		B4	B6	0.265	2.65
	T5				0.4	4.0
	T6				0.6	6.0
		T7			1.05	10.5
		T8			2.2	22.0
		T9			not specified	

1.1.2 Tank containers, other than 1AAA and 1BBB containers, are to comply with the requirements of Part I, as appropriate.

1.1.3 In view of greater tank(s) volume and inertia of the carried cargo, 1AAA and 1BBB containers are subject to special consideration of PRS.

1.2 Definitions and Explanations

Definitions and explanations relating to general terminology used in the *Rules* are given in Part I.

In Part IV, the following definitions have been adopted:

L i q u i d – fluid substance having a vapour pressure not greater than an absolute pressure of 0.3 MPa (3 bar) at 50 ^{o}C (323 K).

T e s t p r e s s u r e – the gauge pressure at which the tank is tested, measured in [MPa], [bar].

Gas – fluid substance having a vapour pressure greater than an absolute pressure of 0.3 MPa (3 bar) at 50 °C (323 K).

Competent Authority – the Authority or Authorities designated as such in each country (or in each specific case) by the Governments concerned for the approval of tank containers.

Tank container – freight container which includes two basic elements: the tank (tanks) and the framework complying with the requirements of the present Part.

Dangerous cargoes – substances classified as dangerous according to IMDG Code, ADR or RID.

Maximum allowable working pressure – the pressure assigned by IMDG Code, ADR or RID for operation to a particular tank, above which that tank is not intended to be operated [MPa], [bar].

Total capacity – the volume of water which will completely fill the tank at +20 °C (293 K), [*l*].

Compartment – a hermetic section of the tank formed by the walls, bottom and/or tight bulkheads.

Dry bulk – assemblies of separate solid particles normally substantially in contact with one another which are, or may be rendered, capable of fluid flow.

Mild steel – steel with minimum tensile strength of 360 N/mm^2 to 440 N/mm^2.

Reference steel – steel with a minimum tensile strength of 370 N/mm^2 and elongation at fracture of 27%.

Framework – tank mountings, end structure and all load-bearing elements not occupied by cargo, which transmit static and dynamic forces arising from the lifting, handling, securing and transporting the tank container.

Ullage – the portion of the total capacity of the tank (s) not occupied by cargo, expressed as a percentage of the total capacity.

1.3 Scope of Survey

PRS' technical survey covers the following:

.1 framework (supporting structure and tank attachments);
.2 corner fittings;
.3 tank(s);
.4 safety and other valves;
.5 pipelines;
.6 pressure maintenance devices, as well as refrigerating and/or heating plant, where provided.

1.4 Technical Documentation

In addition to technical documentation, specified in 1.4.1, Part I, the following documentation, in triplicate, is to be submitted to PRS for approval:

.1 specification and structural drawings of the tank(s) with sections, indicating data necessary to verify the calculations of tank structural elements (dimensions, materials, welded joints, fixing elements, etc.);

.2 specification and drawings of fittings, as well as of monitoring and control devices, indicating the materials used;

.3 specification of insulating materials (where used) and the materials fastening drawings;

.4 technical description and structural drawings of pressure maintenance devices, as well as of cargo refrigerating and/or heating plants, if fitted;

.5 strength calculations of the tank(s) and framework made by a method approved by PRS;

.6 tank container test programme;

.7 a list of cargoes which the container may carry;

.8 documents confirming that the materials from which parts and sections of the tank are made, which are in contact or are likely to be in contact with its contents, do not come into reactions with them.

2 TECHNICAL REQUIREMENTS

2.1 General Requirements

2.1.1 Where the tank container is loaded to its rating *R*, no part of the tank and its associated shell fittings are to project downwards below a plane 25 mm above the undersides of the bottom corner fittings.

2.1.2 Tank containers are not to be fitted with fork-lift pockets.

2.1.3 Framework, tank(s) with its supports and attachments are to withstand the effects of inertia of the tank contents resulting from transport motions and handling operations. Tank(s), framework and their attachments are to withstand (at the maximum permissible load not lower than the maximum operating gross mass *R*) the following dynamic loads:

$2Rg$ – longitudinally,
$1Rg$ – laterally ($2\ Rg$ – if direction of forces is not precisely defined),
$2Rg$ – vertically downwards,
$1Rg$ – vertically upwards.

2.1.4 1CC, 1C, 1CX, 1D and 1DX containers need not have intermediate pairs of load transfer areas in load transfer zones.

2.1.5 The minimum number of pairs of load transfer areas for the given type of container is to be as follows:

.1	1AAA, 1AA, 1A and 1AX containers	– 3
.2	1AAA, 1AA, 1A and 1AX containers (without gooseneck tunnel)	– 4
.3	1BBB, 1BB, 1B and 1BX containers	– 2
.4	1CC, 1C and 1CX containers (where provided)	– 2

The load transfer zones are to be at least 250 mm in width.

2.1.6 Each pair of areas in the load transfer zones on the cross-bars of the face frame base is to be capable of transferring the load *R*.

Every other intermediate pair of areas in the load transferring zones is to be capable of transferring the load *2R/n*; – *n* number of intermediate pairs of areas in the load transferring zones.

Every pair of the load transfer areas is to be at least 75 mm in length.

Each load transfer area of "gooseneck tunnel", which consists of two parts – the upper part A and the bottom part B (see Fig. 3.3.4-2, Part I) – is not to be less than 1250 mm^2.

2.2 Tanks

2.2.1 Under the loads specified in 2.1.3, the safety factors to be observed for the combined stresses in tanks, framework, supports and attachments are to be as follows:

.1 for metals with clearly defined yield stress (R_e) – a safety factor of 1.5 in relation to the determined yield stress;

.2 for metals not exhibiting clearly defined yield stress – a safety factor 1.5 in relation to proof stress ($R_{0.2}$ or $R_{0.1}$ for austenitic steels).

2.2.2 At the test pressure, stresses in the tank shell for metals and alloys exhibiting yield stress (R_e) or proof stress ($R_{0.2}$ or $R_{0.1}$ for austenitic steels) are not to exceed 0.75 R_e or 0.5 R_m , whichever is the lesser.

2.2.3 For steels used in the construction of the tanks, the elongation at fracture, in per cent, is to be not less than 10000/R_m with an absolute minimum of 16 per cent for fine-grained steel and 20 per cent for other steels. For aluminium alloys, the elongation at fracture, in per cent, is to be not less than 10000/6 R_m with an absolute minimum of 12 per cent.

Test specimens used to determine the elongation at fracture are to be taken transversely to the direction of rolling, are to have a standard gauge length 50 mm and a rectangular cross-section. The specimens are to be prepared in accordance with ISO 6892:1984.

2.2.4 The cylindrical portions, ends (heads) and manhole covers of tanks not more than 1.80 m in diameter are to be not less than 5 mm thick in the reference steel or are to be of equivalent thickness (see 2.2.6) if other metal is to be used.

In the case of tanks more than 1.80 m in diameter, the shell is to be not less than 6 mm thick in the reference steel or is to be of equivalent thickness if other metal is to be used. Where the tank is intended for the carriage of powdered or granular solid substances of packing group II or III, the shell thickness may be reduced to 5 mm in the reference steel or it may be of equivalent thickness if other metal is to be used.

2.2.5 Where tanks are provided with suitable protection against damage, other than safety valves, considered by PRS as satisfactory and the test pressure of the tanks is below 0.265 MPa (2.65 bar), the thickness of the shell and ends may be reduced. For tanks of not more than 1.80 m in diameter, this thickness is to be not less than 3 mm in the reference steel or the shell and ends are to be of equivalent thickness if other metal is to be used. For tanks of more than 1.80 m in diameter, the thickness of the shell and ends is to be not less 4 mm in the reference steel or they are to be of equivalent thickness if other metal is to be used.

2.2.6 The equivalent thickness is to be determined from the formula:

$$e_1 = \frac{21.4 \times e_0}{\sqrt[3]{R_{m1} \times A_1}}, \quad [\text{mm}] \qquad (2.2.6\text{-}1)$$

where:

e_1 – the required equivalent thickness of the metal to be used, [mm];

e_0 – minimum thickness of the reference steel specified in the *IMDG Code Dangerous Goods List*, [mm];

R_{m1} – tensile strength of the metal to be used, [N/mm^2];

A_1 – minimum elongation at fracture of the metal to be used, [%].

Where the minimum thickness of the reference steel specified in the IMDG Code Dangerous Goods List is 8 mm, 10 mm or 12 mm and metal other than mild steel has been used in the construction of the tank or in the case of tanks of more than 1.8 m in diameter, the equivalent thickness is to be determined from the formula:

$$e_1 = \frac{21.4 \times e_0 \times d_1}{1.8\sqrt[3]{R_{m1} \times A_1}}, \quad [\text{mm}] \qquad (2.2.6\text{-}2)$$

where:

e_1 – required equivalent thickness of the metal to be used, [mm];

e_0 – minimum thickness of the reference steel specified in the *IMDG Code Dangerous Goods List*, [mm];

R_{m1} – tensile strength of the metal to be used, [N/mm^2];

A_1 – minimum elongation at fracture of the metal to be used, [%];

d_1 – diameter of the tank (but not less than 1.8 m), [m].

2.2.7 The suitable protection against damage may be provided by the outer shielding of the shell and ends secured to the shell shielding with longitudinal and transverse structural members or by other means considered by PRS satisfactory.

2.2.8 In no case can the thickness of the shell and ends be less than 3 mm. The method of calculating the cylindrical portions and ends of the tank (compartments) made of other materials than metals is subject to special consideration of PRS.

2.2.9 Materials from which parts or sections of the tanks are manufactured are to be immune to the attack by the tank contents.

2.2.10 Where corrosion of the tank cannot be excluded, the thickness of cylindrical portions and ends of tanks (see 2.2.4) is to be increased by corrosion additions.

2.2.11 Tanks may be made of various metals. The difference between the thickness of the cylindrical portions and ends of tanks is not to be significant and the minimum thickness is not to be less than that specified in the present Part.

2.2.12 Tank or tanks are to be rigidly mounted to the frame elements of the container. Tank supports and its attachment to the container frame are not to cause dangerous concentrated stresses in the tank.

2.2.13 All welded joints in the container intended for the carriage of dangerous goods are to be inspected by X-rays or by other method approved by PRS. Percentage of the welded joints to be inspected in tanks intended for the carriage of other cargoes is to be agreed with PRS in each particular case.

2.2.14 The filling and discharging openings of tanks intended for the carriage of dangerous goods are to be made in accordance with the IMDG Code or ISO 1496-3 requirements.

2.2.15 Tanks or tanks compartments not provided with vacuum relief valves are to be designed to withstand, without permanent deformations, an external pressure of at least 0.04 MPa (0.4 bar) above the internal pressure.

2.2.16 Tanks or tanks compartments, the strength of which is less than that specified in 2.2.15, are to be provided with vacuum relief valves and are to be designed to withstand, without permanent deformations, an external pressure not less than 0.021 MPa (0.21 bar).

2.2.17 All materials from which tank, fittings and pipe-work are manufactured, which can be expected normally to come into contact with the tank contents, are to be immune to the attack by the tank contents, properly passivated or neutralized by chemical reaction with the tank contents or lined with a corrosion-resistant, durable material.

2.2.18 If corrosion-resisting lining is applied, the lining and its fittings, including pipings is to be continuous and is to extend around the face of any flanges.

The lining material is to be homogeneous (non-porous) and is to have thermal-expansion and elasticity characteristics compatible with the shell and pipings.

2.2.19 Gaskets are to be made of materials immune to the attack by the contents of the tank.

2.2.20 The free capacity of the tank, depending on the transported cargo, is to be determined according to the IMDG Code, but in no case is the tank to be fully filled at the ambient temperature of 50 °C (323 K).

2.2.21 Tanks or tank compartments are to be provided with manholes of at least 500 mm in diameter to allow for internal inspection, maintenance and repair of the tank or compartment.

2.2.22 The manholes are to be fitted with suitable closures to prevent accidental escape of the tank (compartment) contents.

2.2.23 All closures of openings and parts of service equipment mounted on the tank are to enable the Customs sealing of the tank unless other means of the tank sealing to preclude access to the cargo have been provided.

2.3 Fittings and their Arrangement

2.3.1 General

2.3.1.1 All fittings are to be located as close to the tank as practicable and are to be grouped in the smallest number possible. They are to be adequately protected against mechanical damage.

2.3.1.2 Pressure relief devices are to be situated on top of the shell in a position as near the longitudinal and transverse centre of the shell as practicable, in the vapour space of the shell.

All pressure relief devices inlets are to be situated in the vapour space of the tank or tank compartment.

2.3.1.3 No stop-valve is to be installed between the tank and the pressure-relief devices.

2.3.1.4 Fittings are to be made of materials that would ensure their reliable operation in predicted temperatures and which are immune to attack by the substance being transported.

2.3.2 Pressure-Relief Devices

2.3.2.1 Each tank/compartment intended for the carriage of dangerous goods is to be provided with at least two pressure-relief devices, one of them being the spring-loaded valve, the other a frangible disc or fusible element integrated with a spring loaded valve.

2.3.2.2 All pressure-relief devices are to fully open at a pressure not higher than the maximum allowable working pressure of the tank/compartment.

2.3.2.3 Tanks intended for the transport of certain highly toxic substances or vapours are to be provided with a pressure-relief arrangement comprising a spring-loaded pressure relief valve integrated with a frangible disc. The space between the frangible disc and the valve is to be provided with a pressure gauge or a suitable telltale indicator for the detection of disc rupture.

2.3.2.4 Tank containers intended for the carriage of gases may only be fitted with a spring-loaded pressure-relief valve integrated with a frangible disc.

2.3.2.5 Tanks intended for the carriage of non-dangerous cargo need not be fitted with pressure-relief devices, except where such devices would be required due to the transported goods which may constitute a hazard to the tank or the tank compartment.

2.3.3 Design of Pressure-Relief Devices

2.3.3.1 Pressure-relief devices are to be so designed as to prevent the leakage of liquid or vapours and the development of any dangerous excess of pressure or vacuum in the tank (the tank compartment).

2.3.3.2 Spring loaded pressure relief valves are to be so designed as to preclude their adjustment without the knowledge of the competent authority. The valve diameter is not to be less than 31.75 mm.

2.3.3.3 Spring loaded pressure-relief valves used to prevent excessive pressure in tanks intended for the transport of flammable liquids are to be fitted with flame arresters unless the valves themselves are so designed that the passage of flame is precluded.

2.3.3.4 Spring-vacuum valves are to be so designed as to enable the competent authority to adjust their start-to-discharge pressure, depending on the carried cargo and the tank strength, but not lower than 0.021 MPa (0.21 bar) and the cross-sectional flow area of the valves is to be not less than 284 mm^2. Connection of relief valve with the vacuum-relief valve is permitted.

Vacuum relief valves used on the tank containers for the transport of liquids with the flash point below +61 ^{o}C (334 K) are to be fitted with flame arresters.

2.3.3.5 The through capacity of pressure-relief devices is to be calculated according to IMDG Code.

2.3.3.6 In the case of tanks having a test pressure up to and including 0.45 MPa (4.5 bar), spring-loaded valves are to start to discharge at a nominal pressure of five-sixths of the test pressure. In the case of tanks having a test pressure of more than 0.45 MPa (4.5 bar), spring-loaded valves are to start to discharge at two-thirds plus 10 per cent of the test pressure. At a pressure equal to the test pressure, the valves should be completely open. At a pressure lower, by 10%, than the start-to-discharge pressure, the valves should remain closed.

2.3.3.7 Tank containers designed to be filled or discharged under pressure are to be fitted with pressure-relief devices to prevent the tank overload unless other tank overload protection has been provided.

2.3.3.8 Frangible discs should rupture at a nominal pressure equal to the tank test pressure. If the tank is fitted with spring-loaded valves and frangible discs, the frangible discs should rupture at a nominal pressure that is 10% above the start-to-discharge pressure of the valve.

2.3.3.9 Fusible elements should operate at a temperature between 110 °C (383 K) and 149 °C (422 K), provided the developed pressure in the tank at the fusing temperature of the element does not exceed the test pressure of the tank. The fusible elements cannot be shielded from external heat.

2.3.3.10 Pressure-relief devices, frangible discs and fusible elements are to be marked with the following particulars:

- **.1** the manufacturer's name and catalogue number;
- **.2** the start-to-discharge pressure for pressure-relief device, the frangible disc rupture pressure or fusible element operation temperature – including the allowable pressure or temperature tolerances in MPa (bar) or °C (K);
- **.3** free-air delivery of the device at +15 °C (288 K) and the normal pressure, in m^3/min;
- **.4** the validity date of frangible disc or fusible element.

2.4 Valves

2.4.1 All tank (compartment) openings, except those intended for pressure-relief devices, measuring instruments and manholes are to be closed by stop and/or gate valves capable of being operated manually.

2.4.2 The discharge pipes outlets are to be provided with ends capable of being fitted with screw caps or bolted blank flanges to prevent accidental escape of the tank or compartment contents.

2.4.3 Depending on the degree of hazard associated with the cargo, each container tank or compartment is to be provided with a shut-off valve fitted inside the tank or in a special well and a screw cap or a bolted blank flange, or the shut-off valve fitted as above and a gate valve fitted on service pipeline and a screw cap or bolted blank flange.

The number of valves and screw caps or bolted blank flanges to be fitted is specified in the IMDG Code, RID and ADR, referred to in 1.1.1.

2.4.4 Shut-off valves are to be operable from above or below the tank container.

2.4.5 The internal stop valve control devices are to be so designed as to prevent an unintended opening of the valve. The external shut-off/gate valves are also to be protected against an unintended opening.

2.4.6 Shut off/gate valves and their control devices are to be so arranged or protected that they cannot be damaged during service.

2.4.7 Valves, screw caps and bolted blank flanges are to be so designed as to enable Customs seals to be affixed thereto.

2.4.8 Cargo level indicators which are in direct contact with cargo are not to be made of glass or other breakable materials.

2.5 Piping

2.5.1 The strength of all pipes is to be at least four times the maximum allowable working pressure.

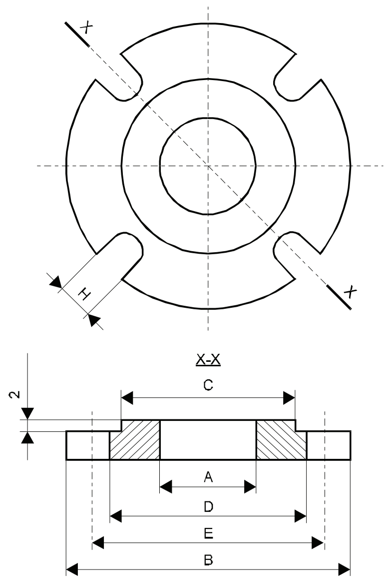
2.5.2 Pipe joints are to be free from residual stresses due to assembly.

2.5.3 Pipes and the pipe joints are to be protected against damage or leakage due to vibrations arising in container transportation means and are to be resistant to variable transport temperatures.

2.5.4 Where cargoes having a flash point below +61 °C (334 K) are to be carried, the tank container and the container framework are to be appropriately earthed.`

2.5.5 Flanges for the attachment of blanks, provided at the ends of pipes, are to have dimensions according to Fig. 2.5.5.

The flanges are to be made of steel with a minimum tensile strength of 430 N/mm^2 and the thickness of 20 mm or of stainless steel with a minimum tensile strength of 537 N/mm^2 and the thickness of 16 mm.



A	B	C	D	E	H
40	150	82	82.4	101.4	19
50	165	101	101	120	19
80	200	130	131	150	19

Fig. 2.5.5. Pipe flange dimensions

3 TESTS

3.1 General Requirements

3.1.1 The requirements of the present Chapter apply to all tank containers, irrespective of their design, type and materials used.

3.1.2 Tank containers are to be tested before being covered with insulation, protective paint coating and prior to the tank shot blasting.

3.1.3 To obtain the test loads required at particular tests, the container tanks are to be filled with the liquid of a proper mass.

Where the suitable liquid is not available, a lighter liquid may be used and supplementary external loading distributed as uniformly as possible. When the load is not uniformly distributed, the actual bending moments are not to differ from those calculated by more than 20 per cent.

3.1.4 Upon completion of each test, the container is to show neither permanent deformations nor other damages which would render it unsuitable for use.

3.1.5 Tank containers are to be submitted to lifting, stacking and structure rigidity tests applying the loadings and methods specified in Chapter 3, Part II. The stacking test is to be carried out with containers in tare condition.

3.2 Walkways Strength

The container is to be submitted to this test with no internal loading. The external force is to be represented by a gravity force of 300 kg uniformly distributed over an area of 300 x 600 mm at the weakest section of the walkway.

3.3 Ladder Strength

The container is to be submitted to this test with no internal loading. The external force is to be represented by a gravity force of 200 kg applied vertically downwards to the centre of each step of the ladder.

3.4 Longitudinal Strength

3.4.1 The tank container, loaded in such a way that the combined mass of the tank container and test load is equal to *R*, is to be positioned with its longitudinal axis vertical (a tolerance of 3^o is acceptable) and is to be supported by two corner fittings in the base of the frame and secured against turning round by two top corner fittings of the bottom. The container is to be held in this position for a period of not less than 5 minutes (Fig. 3.4). No external forces are to be applied to the container.

During the test, attention is to be paid to the container behaviour and possible elastic and permanent deformations.

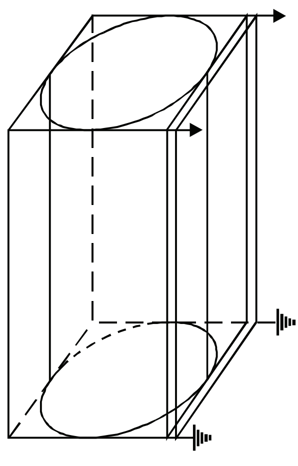


Fig. 3.4. Longitudinal strength test

3.4.2 Alternative test procedure may be by means of supports under the four downward facing corner fittings. This procedure may be used only for those types of tank containers where the tank is supported solely by the bottom and/or base structure of the container or where, in the opinion of PRS, the tank container is adequately tested in respect of tank-to-framework connections.

3.4.3 Tank containers which are not structurally symmetrical with respect to internal divisions or tank-to-framework connections are to have both ends tested.

3.5 Transverse Strength

3.5.1 A uniformly loaded tank container having a combined mass equal to *R* is to be positioned with its transverse axis vertical (a tolerance of 3° is acceptable) and is to be supported by two corner fittings in the base of the frame and secured against turning round by two top corner fittings of the bottom.

The tank container is to be held in this position for a period not less than 5 minutes (Fig. 3.5). No external forces are to be applied to the container.

During the test, attention is to be paid to the container behaviour and possible elastic and permanent deformations.

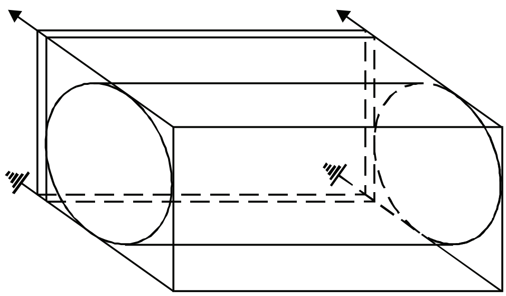


Fig. 3.5. Transverse strength test

3.5.2 Alternative test procedure may be by means of supports under the four downward facing corner fittings. This procedure may be used only for those types of tank containers where the tank is supported solely by the bottom and/or base structure of the container or where, in the opinion of PRS, the tank container is adequately tested in respect of tank-to-framework connections.

3.5.3 Tank containers which are structurally symmetrical with respect to internal divisions or tank-to-framework connections are to have both ends tested.

3.6 Load-Transfer Area Test

3.6.1 The tank container loaded in such way that the combined mass of the tank container and test load is equal to 2*R* is to be supported by means of four supports, each with a supporting area of 150 mm x 150 mm and positioned at load transfer zones on the end transverse member and at the load transfer areas situated farthest of the supported member (Fig. 3.6).

The container should remain supported in this way for a minimum of 5 minutes.

Where the load-transfer areas are not symmetrical, both ends are to be tested.

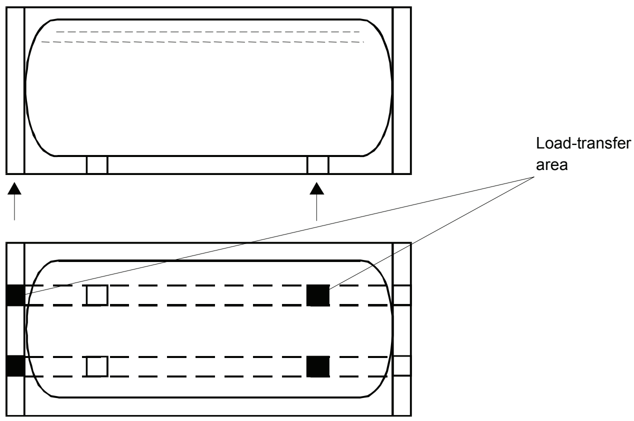


Fig. 3.6. Load-transfer area test

3.6.2 Upon completion of the test, the tank container is not to show leakage, permanent deformation of transverse members, supports of load-transfer areas and other deformations which will render the tank container unsuitable for use.

3.7 Longitudinal Restraint (Dynamic) Test

3.7.1 Tank container is to be subjected to longitudinal restraint (dynamic) test in accordance with the requirements of ISO 1496-3 Amendment 1: *Testing of the external restraint (longitudinal) dynamic*.

3.8 Hydraulic Test

3.8.1 The hydraulic test is to be carried out on completion of the tests specified in 3.1.5 to 3.7.

3.8.2 Each tank container is to be subjected to the hydraulic test.

3.8.3 Prior to the test, the safety valve and the vacuum relief valve are to be removed and the valves openings are to be blanked off.

3.8.4 The tank container or containers, together with the associated pipework and valves, are to be submitted to the hydraulic test with a pressure specified in Table 1.1.1 or a pressure equal to 1.5 times the design pressure of the tank (compartment). The pressure is to be maintained for a period sufficient to allow thorough examination of the tank and its fittings, but in no case less than 30 minutes.

3.8.5 If the tank is divided into compartments, each compartment is to be submitted to the hydraulic test. Compartments adjacent to the compartment tested are to be empty and at atmospheric pressure.

3.8.6 The pressure is to be measured at the top of the tank with the container in its normal position.

3.9 Checking

The tank container is to be checked in accordance with 3.11, Part II.

4 MARKING

4.1 Data Plate

4.1.1 The plate, made of non-corrosive metal, containing the following particulars is to be permanently attached to the container frame:

.1 country of manufacture,
.2 the manufacturer's name,
.3 container serial number,
.4 approval country and the approving authority name,
.5 tank type acc. to the IMDG Code, RID and ADR;
.6 Approval Certificate No.,
.7 year of manufacture,
.8 Rules, which were the basis for tank container approval,
.9 maximum allowable working pressure, MPa (bar),
.10 test pressure, MPa (bar),
.11 design vacuum pressure, MPa (bar),
.12 maximum allowable working pressure of heating coils (where provided), MPa (bar),
.13 tank container water capacity at +20 ^{o}C (293 K), *l*,
.14 water capacity of each compartment of the tank at +20 ^{o}C (293 K), *l*,
.15 maximum allowable gross mass, kg (lb),
.16 tare weight, kg (lb),
.17 maximum weight of cargo, kg (lb),
.18 tank material and the shell thickness, mm,
.19 equivalent mild steel shell thickness, mm,
.20 material of the protective lining (where fitted),
.21 tank diameter, mm,
.22 design temperature (maximum/minimum), ^{o}C,
.23 date (month and year) of the first hydraulic test and stamp of the expert who performed the test,
.24 date of periodic tests (month and year) – every 30 months and stamp of the expert who performed the tests,
.25 date of periodic hydraulic tests (month and year) – every 5 years and stamp of the expert who performed the tests.

4.1.2 A suitable place is to be provided on the plate for stamping the dates of subsequent hydraulic tests.

4.1.3 Data on the plate are to be embossed or distinctly and durably marked by other method.

4.1.4 Where practicable, the plate is to be attached close to the Approval Plate (see 4.1, Part I).

4.2 Additional Marking

4.2.1 In addition to the requirements of Chapter 4 of the present Part, a plate containing operating instruction is to be permanently fitted at the filling/emptying valves in a conspicuous place.

4.2.2 Designation of a device and direction of its closing and opening are to be marked on all fittings such as valves and shut-off devices.

4.2.3 If a tank container is provided with ladders giving access to the container roof, a sign warning of overhead electrical danger is to be placed in an area adjacent to the ladder.

PART V

PLATFORM AND PLATFORM-BASED CONTAINERS

1 GENERAL

1.1 Application

1.1.1 The requirements of Part V are applicable to platform containers, platform-based containers with fixed or folding end structures, or with fixed or folding side posts, with a roof without side walls or without a roof and side walls or without a roof, side walls and end walls. They apply also to any modifications of these containers.

1.2 Definitions and Explanations

Definitions and explanations relating to the general terminology used in the *Rules* are given in Part I.

The following definitions have been adopted in the present Part:

Platform-based container with open top and open sides – a container with dimensions as those of a general-purpose container, fitted with the top and bottom corner fittings, with no roof and side walls.

Platform-based container (skeletal) – a container with dimensions as those of a general-purpose container, fitted with the top and bottom corner fittings, with no roof, side and end walls.

Platform-based container with the roof – a container with dimensions as those of a general-purpose container, fitted with the top and bottom corner fittings, with no side walls.

Platform-based container with corner posts – a container having the base and the floor, whose width, length and height conform to the dimensions of a general-purpose container, fitted with fixed or folding corner posts and with the top and bottom corner fittings, with no top longitudinal members.

Platform-based container with end structure – a container having the base and the floor, whose width, length and height correspond to the dimensions of a general-purpose container, fitted with fixed or folding end structures and with the top and bottom corner fittings, but with no top longitudinal members.

Platform container – a container having only the base and the floor, whose width and length correspond to the dimensions of a general-purpose container, fitted with the top and bottom corner fittings.

Pack forming device – a device used to connect empty and folded containers to form one pack of cargo unit for conveyance or storage purposes.

End structure or corner post fixing device – a device for fixing folding end structures or corner posts in the vertical service position.

1.3 Scope of Survey

1.3.1 PRS' technical survey covers the following:
- framework (supporting structure),
- corner fittings,
- closing devices (where provided),
- pack forming devices (where provided),
- end structures or corner posts fixing devices.

1.4 Technical Documentation

In addition to technical documentation, required in 1.4.1, Part I, the following documentation, in triplicate, is to be submitted to PRS for approval:
- drawings of devices for fixing end structures or corner posts,
- drawings of pack forming devices.

2 TECHNICAL REQUIREMENTS

In addition to the requirements of the present Chapter, containers are to comply with the applicable requirements specified in Chapter 3, Part I.

2.1 Dimensions

2.1.1 The length, width and height of all types of containers, except platform containers, are to comply with the values given in Table 3.1.2, Part I.

2.1.2 Where design dimensions other than those specified in Table 3.1.2, Part I are provided, the overall top length of container in tare condition ($L_{max.}$) and the length of container loaded to 1*R* ($L_{min.}$) are not to exceed the values given in Table 2.1.2.

The top length of container is measured between the planes passing through the ends of the top corner fittings at the joint with the upper faces of the top corner fittings.

Table 2.1.2

Type of container	$L_{max.}$ [mm]	$L_{min.}$ [mm]
1AAA, 1AA, 1A, 1AX	12202	12172
1BBB, 1BB, 1B, 1BX	9135	9105
1CC, 1C, 1CX	6068	6042

2.2 End Structures

2.2.1 Fixed or folding end structures may be formed by corner posts connected by top transverse member and other members connecting corner posts or end walls.

2.2.2 End structures or transverse members of the base are to be provided with pack forming devices.

2.3 Base Structure

2.3.1 The upper surfaces of the top corner fittings are to protrude by at least 6 mm:

– in platform containers – above the highest upper surface of the floor,
– platform-based containers with end walls – above the surfaces of the upper members of the end wall structures.

In platform-based containers with folding end walls or folding corner posts, the upper surfaces of the structures supporting the stacked container are to protrude by at least 6 mm above the highest upper surface of the container structure.

2.3.2 The distance between the lower surfaces of the cross-bars and cross-ribs of the base and the plane passing through the lower surfaces of the bottom corner fittings is to be $12{,}5^{+5}_{-1{,}5}$ mm.

2.3.3 The container is to be fitted with suitable lash points. Ropes and other lashing devices cannot protrude above the nominal dimensions of the container. Cargo lash points are not to protrude above the floor surface.

2.3.4 Any movable element of the container which, if not secured, can lead to a hazardous situation, is to be provided with a suitable securing system having external indication of the positive securing of that closure in the appropriate operating position.

3 TESTS

3.1 General Requirements

3.1.1 Containers, detailed in 1.1.1, irrespective of their design, type or materials used, are to be subjected to tests and loads specified in Chapter 3, Part II if the test loads and other test data are not modified in the present Chapter, as well as to additional tests specified in the present Chapter.

3.1.2 On completion of each test, the containers are not to show any deformations which would render them unsuitable for use.

3.1.3 During the test, folding end walls or corner posts in platform-based containers are to be in operating position.

3.2 Container Lifting

3.2.1 Lifting from the Top Corner Fittings

All platform-based containers are to be subjected to this test according to the procedure specified for general-purpose containers.

3.2.2 Lifting from the Bottom Corner Fittings

All containers are to be subjected to this test according to the procedure specified for general-purpose containers.

3.2.3 Lifting from Fork-Lift Pockets

1CC, 1C, 1CX, 1D, 1DX containers are to be subjected to this test according to the procedure specified for general-purpose containers.

3.2.4 Lifting by Means of Grappler Arm Positions

All containers are to be subjected to this test according to the procedure specified for general-purpose containers.

3.3 Stacking Strength

All containers are to be subjected to this test according to the procedure specified for general-purpose containers. An exception to this are platform-based containers with folding end structures or corner posts which are to be tested without internal loading.

3.4 Roof Strength

Platform-based containers are to be subjected to this test according to the procedure specified for general-purpose containers.

3.5 Floor Strength

All containers are to be subjected to this test according to the procedure specified for general-purpose containers.

3.6 Transverse Rigidity Test

All containers are to be subjected to this test according to the procedure for general-purpose containers. An exception to this are platform-based and platform containers with fixed or folding corner posts.

Prior to the test, the top corner fittings of the platform-based containers with fixed or folding corner posts are to be connected by top front and rear headers and loaded with a force of 150 kN. Where corner posts are not connected by headers, they are to be loaded by 75 kN each.

3.7 Longitudinal Strength

All platform-based containers, except 1D type containers, are to be tested according to the procedure specified for general-purpose containers.

When testing platform-based containers with end structure or corner posts, the force of 50 kN is to be applied instead of 75 kN. The deflection of the upper surfaces of the top corner fittings with respect to the base of the container of all containers under test conditions is not to exceed 42 mm.

3.8 Restraint in Longitudinal Direction

All platform-based containers are be tested according to the procedure for general-purpose containers.

3.9 Strength of End Walls

All platform-based containers with end structures in the form of walls or end walls are to be tested according to the procedure for general-purpose containers.

3.10 Weatherproofness

At the request of the container purchaser, PRS may – within the scope as found practicable – carry out this test according to the procedure for general-purpose containers.

3.11 Stacking Strength of Platform-Based Containers with Folding End Structures or Corner Posts

Platform-based containers are to be subjected to the test with end structures or corner posts folded, without test load applied.

The container under test is to be subjected to a force specified in Table 3.3.4, Part II applied simultaneously and uniformly to each of the four top corner fittings or a pair of corner fittings of one end or equivalent test fittings or pads of the same dimensions. The test corner fittings or pads are to be so positioned with respect to the corner fittings or similar arrangements as to cover all possible offsets by 25.4 mm laterally and 38 mm longitudinally.

3.12 Lifting the Pack of Empty Containers

The test is to prove the ability of the container and its pack forming devices to support, under acceleration conditions, a pack of empty folded containers.

The container under test is to be simultaneously and uniformly loaded by a force equal to $(2n\text{-}1)Tg$ (n – number of containers in a pack, T– tare mass), applied to the pack forming arrangement and is to be lifted from four corner fittings in such a way as to avoid the acceleration forces imposed.

Permanent deformation or any damages to the pack forming arrangements are not allowed.

4 CHECKING

Platform and platform-based containers are to be checked within the scope specified in sub-chapter 3.11, Part II.

PART VI

NON-PRESSURIZED CONTAINERS FOR DRY BULK CARGOES

1 GENERAL

1.1 Application

1.1.1 The requirements of Part VI are applicable to containers intended for the carriage of non-dangerous dry bulk cargoes.

1.1.2 Containers intended for the transport of non-dangerous dry bulk cargoes are to comply also with the requirements of Part I.

1.2 Definitions

For the purpose of the present Part, the following definitions have been adopted:

Bulk density – the mass per unit volume of a dry bulk solid measured when the dry solid is in a loose or non-compacted condition.

Non-pressurized dry bulk container – a container intended for the transport of dry bulk cargoes, capable of withstanding the loads resulting from filling, transport motions and discharging non-packaged dry bulk cargoes, provided with filling and discharge apertures and fittings:

– box type – dry bulk non-pressurized container for tipping discharge, having a parallelpiped cargo space and a door opening at least at one end. Such container may be used as a general-purpose container;
– hopper type – dry bulk non-pressurized container for horizontal discharge, having no door opening. Such container cannot be used as a general-purpose container.

Interface for external fumigation device – point(s) at which the connection between the container and any external fumigation device is connected or disconnected.

Non-dangerous cargoes – substances not included in the list of dangerous cargoes.

Dangerous cargoes – the substances classified as dangerous by the IMDG Code, ADR or RID.

Openings for cargo discharging – openings provided in a container for the discharge of dry bulk cargoes.

Openings for cargo loading – openings provided in a container for the filling with dry bulk cargoes.

Cargo space – the space bounded by the container walls or shell when all apertures are closed.

Dry bulk cargoes – assemblies of separate solid particles normally substantially in contact with one another which are, or which may be rendered capable of fluid flow.

1.3 Scope of Survey

PRS' technical survey covers the following:

.1 framework (supporting structure),
.2 corner fittings,
.3 doors and door closures,
.4 closures of the loading and discharging openings.

2 TECHNICAL REQUIREMENTS

2.1 Internal Dimensions

Internal dimensions of box containers are to be as large as possible; the internal width of 1AA, 1A, 1BB, 1CC, 1C and 1D containers is not to be less than 2330 mm.

2.2 Closures

Any closure in a container, which, if not secured can lead to a hazardous situation, is to be provided with an adequate securing system having external indication of the positive securement of that closure in the appropriate operating position.

2.3 Roof

Any removable roof or roof section is to be fitted with a locking device such that the observer at ground level can check – when the container is on a rail or road vehicle – that the roof is secured.

2.4 Door Opening

Box type containers are to be provided with a door opening at least at one end. Door opening dimensions are to comply with the requirements specified in 2.1.2, Part II.

2.5 Openings for Loading

2.5.1 All containers are to be provided with at least one opening for loading.

2.5.2 The design of the openings for loading is to be such as to permit proper distribution of dry bulk cargo which is loaded into the container by natural gravity or any other means which does not produce any internal pressure (vacuum) within the cargo space.

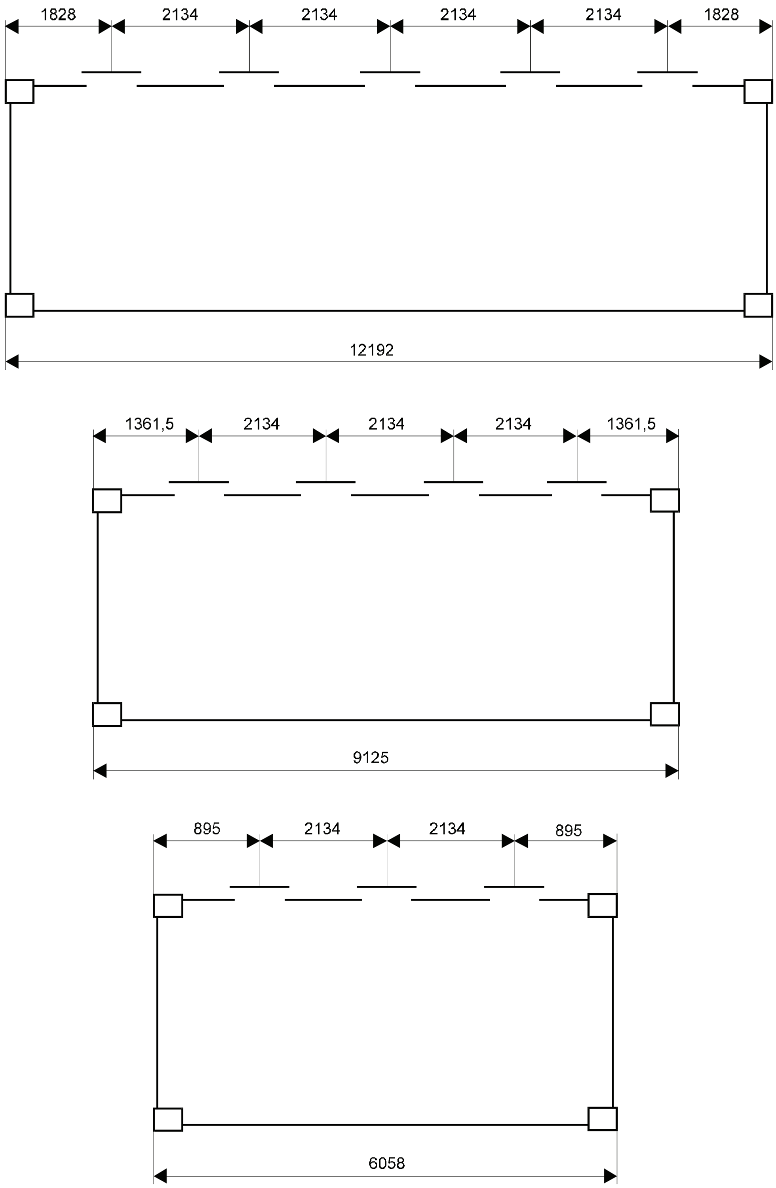


Fig. 2.5.1. Examples of the arrangement of openings for loading dry bulk cargo in non-pressurized box type containers

2.6 Openings for Discharging

2.6.1 All containers are to be provided with at least one opening for discharging.

2.6.2 The design of openings for discharge is to be such as to allow complete discharge by natural gravity or any other means which does not produce any internal pressure (vacuum) within the cargo space.

2.7 Inspection and Maintenance Openings in Hopper Type Containers

2.7.1 Hopper type containers are to be provided with manholes or other openings to allow for inspection and maintenance of the container interior. The diameter of manholes is to be not less than 500 mm.

2.7.2 If openings for loading or discharging comply with the requirements of 2.7.1, they may also serve as inspection and maintenance openings.

2.8 Shell of Hopper Type Container

The shell of hopper type containers is to be capable of withstanding the effects of the inertia of its contents resulting from transport motion and loading operations, equivalent to a loading of:
– $2Rg$ longitudinally,
– $2Rg$ vertically,
– $1Rg$ laterally.

3 TESTS

3.1 General Requirements

3.1.1 Containers intended for the carriage of dry bulk cargoes are to be subjected to lifting, stacking, restraint (longitudinal) rigidity test and, where possible, the strength of the floor and roof tests. The test forces, loads and methods, specified in Part II, are to be applied.

3.1.2 The hopper type containers under test are to be loaded with a suitable fluid or dry bulk to achieve the test load or loadings required in particular tests.

If the test load or loadings cannot readily be met by the above method, the hopper type container is to be loaded with a suitable fluid/dry bulk and a supplementary load or loading is to be applied. The total load or loading thus applied is to be such as to simulate uniform loading. Variations of 20% of the calculated bending moment of the uniformly loaded hopper-type container are acceptable.

3.2 Strength of End Walls (Box Type Container)

3.2.1 The container end walls are to be able to withstand forces distributed uniformly over the wall, equal to:

.1 0.4 Pg for 1AAA, 1AA, 1A, 1AX, 1BB, 1B and 1BX containers,

.2 0.6 Pg for 1CC, 1C, 1CX, 1D and 1DX containers.

3.2.2 The container end wall is to be subjected to an internal loading specified in 3.2.1. The loading is to be uniformly distributed over the wall under test and arranged to allow free deflection of the wall.

3.2.3 The container is to have each end wall tested. In the case of symmetrical construction, one end only need be tested.

3.3 Strength of Side Walls (Box Type Container)

3.3.1 The container side walls are to be subjected to strength test, applying the forces and methods specified in 3.9, Part II.

3.3.2 For container subjected to side walls strength test, the deflection of the side walls in relation to the plane formed by the external faces of the four corner fittings of each side is not to exceed 40 mm.

3.4 Internal Longitudinal Restraint (Hopper Type Container)

3.4.1 The container is to be uniformly loaded in such a way that the combined mass of the container and test load is equal to *R*. The container is to be positioned with its longitudinal axis vertical (a tolerance of 3^{o} is acceptable).

3.4.2 The container is to be held in this position by means of supports at the lower end of the base structure of the container acting only through the two bottom corner fittings and by means of anchor devices acting through the corner fittings at the upper end of the base structure so as to provide horizontal restraint.

3.4.3 An alternative test procedure may be by means of supports under the four downward-facing corner fittings. This test procedure may be used only for those types of containers where the hopper is supported solely by the base structure of the container or where, in the opinion of PRS, the container has been adequately tested in respect of hopper-to-framework connections by appropriate tests.

The container is to be held in this position for at least 5 minutes.

3.4.4 Containers which are not structurally symmetrical are to have both ends tested.

3.5 Internal Lateral Restraint (Hopper Type Container)

3.5.1 The container is to be uniformly loaded in such a way that the combined mass of the container and test load is equal to *R*. The container is to be positioned with its transverse axis vertical (a tolerance of 3^{o} is acceptable).

3.5.2 The container is to be held in this position by means of supports at the lower end of the base structure of the container acting only through the two bottom corner fittings and by means of anchor devices acting through the corner fittings at the upper end of the base structure so as to provide horizontal restraint.

3.5.3 An alternative test procedure may be by means of supports under the four downward-facing corner fittings. This test procedure may be used only for those types of containers where the hopper is supported solely by the base structure of the container or where, in the opinion of PRS, the container has been adequately tested in respect of hopper-to-framework connections by appropriate tests.

The container is to be held in this position for at least 5 minutes.

3.5.4 For container under internal lateral restraint test, the deflection of any part thereof in relation to the plane formed by the external faces of the four corner fittings of each side is not to exceed 50 mm.

3.6 Walkways Strength

The container is to be subjected to this test without internal loading. The external force is to be represented by the gravity force of 300 kg, uniformly distributed over an area of 300 mm x 600 mm at the weakest section of the walkways.

3.7 Ladder Strength

The container is to be subjected to this test without internal loading. The external force is to be represented by the gravity force of 200 kg applied vertically downwards to the centre of each step of the ladder.

3.8 Weatherproofness Test

This test is to be carried out on completion of the tests specified in 3.1.1 and in 3.2 to 3.7. The procedure, as well as the water stream parameters are to be in accordance with 3.10, Part II.

3.9 Airtightness Test

3.9.1 This test is to be carried out on completion of the tests specified in 3.1.1 and in 3.2 to 3.7. Both box type containers and hopper type containers (airtight) are to be subjected to this test.

3.9.2 The container is to be in its normal operating condition and is to be closed in the normal manner.

3.9.3 The air pipe connected to the container is to be provided with a reducing pipe, manometer and flow measuring device. The manometer is to be fitted directly on the container and is not to be part of the air supply system. The flow measuring device is to be accurate to ±3% of the measured flow rate and the manometer on the container is to be accurate to ±5%.

3.9.4 Air is to be admitted to the container to raise the internal pressure to 250 Pa ± 10 Pa (25 ± 1 mm H_2O) and the air supply regulated to maintain this pressure.

3.9.5 The air leakage rate is not to be greater than the values given in Table 3.9.5.

Table 3.9.5

Type of container	1AAA, 1AA,1A,1AX	1BBB, 1BB,1B,1BX	1CC,1C,1CX	1D,1DX
Air leakage rate, [m^3/h]	30	25	20	15

Listing of Changes effective on the 1 July 2014

Item	*Title/Subject*	*Source*
5.1.1.6	Change of the unit of measure	IMO Rez. MSC 355(92)
Fig. 5.1.2	Model of the Safety Approval Plate	IMO Rez. MSC 355(92)
5.1,6	Changes in the Safety Approval Plate	IMO Rez. MSC 355(92)
