Guidelines For Classification And Construction

Part 6 Statutory

Volume 8

GUIDELINES FOR FREIGHT CONTAINER

2018

Biro Klasifikasi Indonesia

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The following Guidelines come into force on 1st January 2019.

Foreword

The “Guidelines for Freight Container” has been developed for certification of new and existing freight container. This Guidelines provides requirements for design, construction and periodic surveys required for maintenance of classification that would be applicable to freight container and these Guidelines are required by the relevant requirements in Rules for Seagoing Ship. This Guidelines divided into four sections and three annex as follows:

Section 1. General Provisions

Section 2. Requirement and Tests

Section 3. Type of Container

Section 4. Repairing of Containers

Annex A

Annex B

Annex C

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Any quires or comments concerning these Rules are welcomed through communication (either phone call or email) with BKI Head Office.

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Section 1 General Instructions and Guidance

A. General Test Conditions

1. Scope

1.1 This Guidelines apply to freight containers and their built in or built on refrigerating, heating, filling, emptying, and safety equipment.

1.2 Containers within the scope of this guidelines are freight containers that can be used repeatedly and which are :

- suitable for intercontinental traffic,
- of open or closed box or tank configuration- or platform-based design,
- of a durable nature and so resistant as to withstand all loads to be expected during transportation,
- specially design to facility the carriage of goods by one or more modes of transport, without an intermediate reloading,
- provided with equipment permitting their easy handling, in particular during their transfer from one means of transportation to another.
- such size that the area enclosed by the four outer bottom corner is at least 14 m^2 or 7 m^2 if it is fitted with top corner fittings.

1.3 This Guidelines refer both to the building and testing of new containers and to the testing of existing containers and their repair. Excluding containers specially designed for air transport.

1.4 Containers that do not fully correspond to the definition given in 1.2 or which are subject to special conditions of use may be tested in general accordance with this Guidelines and /or in accordance with an agreed specification.

2. Rules and standards also applicable

2.1 For the construction of containers with all their equipment, the following rules are to be applied correspondingly:

Rules for Machinery Installation (Pt.1, Vol.III) Sec. 1, Rules for Electrical Installation (Pt.1, Vol.IV) Sec. 2. Rules for Refrigerating Installations (Pt.1, Vol.VIII), Rules for Materials (Pt.1, Vol.V), and Rules for Welding (Pt.1, Vol.VI).

2.2 Reference is made to the international container standards, especially ISO 1496 "Series 1 Freight Containers - Specification and Testing" and to the corresponding EN standards.

2.3 The conditions for approval of containers according to the Convention for Safe Containers (CSC) of December 2nd, 1972, with amandments and supplements are, in principle, fulfilled if the containers are constructed and tested in accordance with this guidelines.

2.4 The national and/or international rules as may be applicable are to be complied with where the transportation of dangerous goods in containers is concerned.

3. Testing procedure

3.1 Container testing by BKI normally covers the design documents, trials, and production (for types of tests, see B.).

3.2 A certificate is issued by Head Office on the results of the tests. Depending on the type of container and test concerned, plates, the stampings and labels serve as test evidence on the container itself (see F.).

4. Works approvals

4.1 Works where containers or ancillary parts intended for them are manufactured or where containers are repaired must be qualified in respect of shop facilities, quality control, production methods and workmanship for the work to be carried out. Qualification is certified to the works in the form of an approval.

4.2 General representation of the process of container testing & certification (Fig 1.1)

General representation of the process of container testing & certification, see Fig 1.1.

4.3 The application for approval to be made by the works shall contain particulars of the scope of production, organization, technical facilities and production methods as well as of the qualifications of the working staff including supervisors (see Rules for Welding (Pt.1, Vol.VI) Annex 1). Approval may be granted following scrutiny of the application and inspection.

4.4 The validity period of an approval granted in accordance with this Guidelines is 3 years. If work is regularly performed under BKI's supervision during the validity of the approval, the validity period may be extended on application by 3 years at a time without further checking.

4.5 If no work has been performed under BKI's supervision for more than one year, the approval may be granted a new on expiry of its validity period only if the conditions for doing so continue to exist and this is demonstrated during a further works inspection. The approval may then again be granted for a validity period of 3 years.

4.6 BKI is to be informed about any changes in works facilities, in production methods or in the composition and qualification of the staff which affect the conditions for approval.

4.7 With regard to qualification and approval in respect of welding practice, see also E.1.

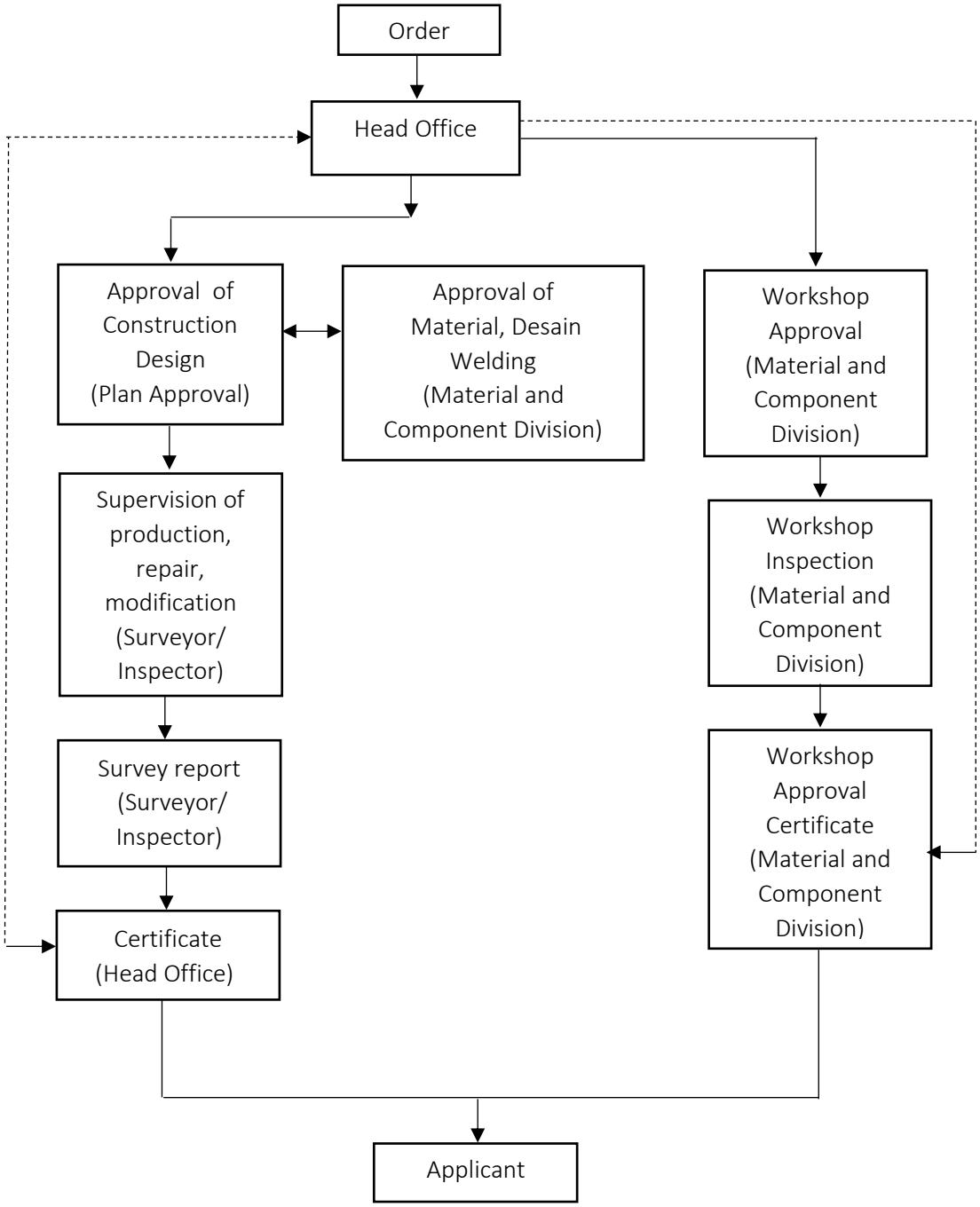

Fig. 1.1 General Representation of the Process of Container Testing & Certification.

B. Types of tests

1. Examination of design and construction documents

1.1 The documents required for examination are to be submitted in electronic format to BKI's Head Office in first occasion before the commencement of production and testing.

1.2 The documents to be sent in for examination shall comprise:

a) Drawings showing the arrangement, dimensions, and materials of the structural components of the container;

b) Particulars of jointing methods (welding) and connections envisaged;

c) Particulars of the origin of important ancillary parts (such as fittings, bottom and wall elements);

d) Proof calculations insofar as customary or necessary for the type of container concerned;

e) For thermal containers, additional documents in accordance with Section 3, C.1;

f) For CSC approval, additional documents depending on BKI.

1.3 The examined documents are sent, marked with BKI's inspection stamp, to:

– the manufacturer

– the competent BKI Branch Office

The modifications to be effected or the guidance to be complied with are notified by being entered in the examined documents and/or BKI's covering letter. The drawings must be clearly assigned to the type of container to be tested so that they may serve as supporting documents for the Surveyor / Inspector when carrying out the test and issuing certificates.

1.4 Where other testing bodies are involved, the documents shall be submitted in a number to be agreed on beforehand.

2. Type tests

2.1 The ''type test" following the examination of the documents serves to furnish proof that the container type complies with the requirements in respect of mechanical strength and function. The necessary tests are described in Sections 2 and 3 and are carried out in the presence of a BKI surveyor / Inspector.

2.2 A report of the type test will be prepared if the results are satisfactory, a certificate will be issued (see F.). A printed form issued by BKI is to be used for the test report.

2.3 The type tests may be carried out at different times and frequencies. BKI differentiates as follows:

2.3.1 The Prototype Test is the initial test of a novelty or it greatly modified design. The container is generally fabricated as a single item. However, evidence of the materials used must be at hand and the construction and materials must correspond to those of the planned series.

2.3.2 The Type Test serves to furnish the proof mentioned in 2.1, especially in cases where design modifications are put into effect subsequent to the prototype test (2.3.1). The container to be tested must be a product from the series concerned and should be taken from the first ten containers. BKI reserves the right to recognize the prototype test as a type test, provided that no substantial modifications have been made.

2.3.3 Repeat Type Tests are a repetition of the type test and may become necessary in the case of large construction series, reorganization of fabrication or extended interruptions in the fabrication of a series.

Repeat type tests will be stipulated on a case-by-case basis.

3. In-production tests

3.1 Supervision of production

In order to check the conformity of the containers of a series with the container tested in conformity with 2., BKI carries out the supervision of production through its Surveyors / Inspector. The frequency of the checks depends on the requirements the containers are subject to and on the nature of the test order. The type of supervision is indicated on the certificates issued and on the individual containers; see F.

3.2 In order to furnish evidence of the construction remaining uniform within the series, BKI's Surveyor / Inspector shall be given access to the records of the in-plant quality control system.

3.3 Apart from the checks in accordance with 3.2, repeat tests may be necessary as strength and operational tests. The nature and frequency of these tests depend on the container type, the cargo to be transported, and the number of containers in the series; further particulars herein are contained in Sections 2 and 3.

4. Testing of impregnations and coatings

4.1 Impregnations

4.1.1 Upon application, BKI will test for compliance with impregnation specifications issued by certain authorities such as the Australian Quarantine and Inspection Service (protection against infestation see D.4.5). The test specimens are selected at random by the Surveyor / Inspector and shall be unambiguously marked (BKI test specimen stamp). The test specimens shall, if possible, be cut in such a way that their volumes can be calculated.

4.1.2 The test specimens are to be sent to BKI's Head Office together with a list containing the following details:

- Serial test specimen number
- Lot or batch number
- Brief designation of the structural component (roof, end or side walls, bottom)
- Supplier of the structural component
- Recipient (container manufacturer)
- Designation of the impregnating agent
- Sampling date.

The test specimen need bear only the serial test specimen number, the sampling date and the BKI test specimen stamp.

4.1.3 In order to reduce the testing expenditure, documents furnished by the manufacturer, in particular certificates issued by independent institutions, may be recognized. It must be possible to associate the documents with the lots or batches supplied.

4.1.4 The test results concerning satisfactory impregnation will be confirmed in the certificates.

4.2 Coatings The testing of the structure of a coat of paint or other surface treatment and the associated preparatory works (sandblasting etc.) during the production of containers or on existing containers necessitates a special order to BKI and will be carried out only by arrangement.

5. Testing of suitability for certain cargoes

5.1 To ascertain the suitability of a container for being loaded with a sensitive, aggressive or otherwise unusual cargo, e.g. in respect of tightness, cleanliness, insulation, refrigerating machinery or other equipment as well as construction in general, BKI carries out surveys upon special request.

5.2 Where the loading of such cargo is subject to the approval procedure of an official authority, the application for testing is to be routed via this authority.

6. Testing of existing containers

6.1 Testing to ascertain the state of conservation

6.1.1 Individual containers, parts of series or series of containers may be checked by BKI for their state of conservation and operational safety and reliability within the scope of existing rules (e.g. CSC)

6.1.2 Apart from a close visual inspection (especially of the base structure), testing may also include load and operational tests. The selection of the containers to be tested (in the case of random tests) and the frequency of the tests are to be agreed upon in each individual case while having regard to the container type, their age, and the number of containers in the series.

6.1.3 BKI may, by special arrangement, carry out the regular supervision of the condition of containers (series), e.g. in conjunction with repair supervision in accordance with 6.3.

6.2 Testing for certificate renewal In the case of containers where the validity of the certificate depends on repeat tests at certain intervals, e.g. on hydrostatic pressure tests where tank containers are concerned, testing shall be carried out in the presence of a BKI Surveyor / Inspector.

6.3 Testing of repairs

6.3.1 A BKI Surveyor / Inspector may be called in to establish and assess a case of damage as well as to test a container upon completion of a repair.

6.3.2 In the case of heavy damage to tank containers, where the validity of the certificate depends on their safe condition, BKI's Head Office shall be informed. Repair drawings showing arrangement, dimensions and materials shall be submitted to Head Office. A Surveyor / Inspector shall be called in to supervise the necessary tests prior to re-commissioning the container.

6.3.3 BKI monitors the quality of container repairs in shops inspected and authorized by it. This supervision of repair standards is carried out at random and is independent of surveys of individual containers in accordance with 6.3.1 and 6.3.2 (see Section 4.).

C. Construction characteristics (design principles)

1. General

The principles mentioned hereafter apply to freight containers and, where applicable, to swap bodies of all sizes and types. They are essentially in agreement with the relevant standards (ISO and EN).

2. Dimensions, weights, tolerances

2.1 The tables given in Appendix A show the main dimensions, total weights and most important tolerances of the containers standardized by ISO 1496 (Series 1). References to possible deviations in connection with individual types of construction are contained to the necessary extent in Section 2 under "Design Requirements".

2.2 The maximum permissible gross weights indicated in Appendix A are maximum weights laid down by standardization. In keeping with normal practice, gross, net and tare weights are defined as follows:

$$R = P + T$$

where

R : the maximum permissible gross weight of the container including cargo,

P : the maximum permissible payload (maximum net weight) and

T : the weight of the empty container or the average tare weight of a container series.

Equipment parts (such as lashing elements, refrigerating equipment) normally remaining attached to the container even when transported empty are included in T.

2.3 The laying down of an (ISO) gross weight rating for a container or a container series does not preclude prototypes or certain containers of a series or even certain structural components of containers from being designed and tested for higher maximum permissible gross weights.

2.4 Details of dimensions and weights on the containers and in certificates shall be harmonized with the specification concerned and, if possible, standardized within anyone constructional series. Where major weight deviations cannot be avoided owing to the construction, the manner of marking and the documentation are to be specially agreed upon. In the case of tank containers it may be advisable, depending on the cargo, to ascertain and document the individual deadweight.

2.5 No parts projecting beyond the rated external dimensions (length, width, height) of the container are to be permanently attached to it.

3. Construction

3.1 Main elements

3.1.1 A container consists, as a rule, of a base frame and a roof frame connected to each other by corner posts.

3.1.2 The corner structure serving as a support for transportation, for lifting and clamping purposes and as a platform for stacking may be constructed as part of the corner post or as an independent structural element connected in a positive way with the corner post.

3.1.3 Bottom, walls, doors, and roof as far as provided are laid or hung in the framework and welded, bolted, riveted, screwed or glued to the latter, depending on the material and construction used. Stiffeners may be provided to absorb loads acting at right angles to the surfaces unless the plating is capable of doing so.

3.2 Design details

3.2.1 Corner posts and corner fittings

.1 The corner posts shall feature a sufficient plate thickness or be reinforced by corrugations or other stiffening means in such a way that the compressive and bending stresses resulting from the stacking load can be safely absorbed without buckling. The corner post must be connected to the corner fittings over its full cross section, either a sufficient projection length of the corner fittings with respect to the corner post flanks being chosen or an adequate welding joint being ensured by chamfering (single bevel butt joint). (See also Section 1, E.1.5).

.2 Such materials and dimensions shall be chosen for the corner structures (corner fittings) that the high, even shocklike operating loads are safely absorbed. Cast corner fittings corresponding to international standards are shown in Annex A (Figs. A.1 and A.2). Welded corner and securing fittings shall conform to the standards currently in force with regard to strength and dimensions. The chosen method of welding execution shall ensure that no crevice corrosion can occur. Methods of welding execution require the approval of BKI. The quality assurance procedure shall be agreed withBKI. The projection length of the corner fittings with regard to the roof and base structures shall equal: 11 mm - 17,5 mm relative to the lowest point of the base structure including the end transverse members but exclusive of the bottom side rails. In respect of the bottom side rails, a 4 mm projection length should remain. 6 mm relative to the uppermost point of the roof including the top side rails and any screw or rivet heads.

3.2.2 Base structure

.1 The bottom corner fittings shall be capable of bearing and transmitting, by themselves, all loads in the container

.2 Cross members and floor plates or planks shall withstand the loads due to cargo and vehicles (fork lift trucks). When dimensioning a wooden floor, in particular a plank floor, due regard shall be paid to the frequently repeated (wheel) loads with regard to the fact that the bearing strength of the wood does not remain constant and to the possible variation of the wood quality.

.3 No part of the base structure shall deflect more than 6 mm below the lower support surfaces of the bottom corner fittings under a dynamic load or a corresponding static load (1,8 R) acting uniformly on the floor (see Section 2, A.2.2). The base structure shall resist all forces, especially transverse forces, which arise from the cargo in service.

.4 The base shall be tight against transient under flooding and sufficiently protected against corrosion and rot. Gaps between metal parts and wooden flooring, especially at the ends of wooden members, shall be filled with a suitable sealing compound which does not become brittle.

.5 In view of the high level of wear, it is recommended to reinforce or cover the floor (with an entrance plate) in the vicinity of the door.

.6 Reinforcements shall be provided in the area of the recess for semitrailers (gooseneck tunnel) to absorb the wheel loads and cargo pressure. As a rule, these reinforcements shall consist of longitudinal and transverse tunnel members with further reinforcement being brought about by constructing the tunnel roof as a load-bearing membrane. The standardized dimensions of the gooseneck tunnel are shown in Fig. A. 3 of Annex A.

.7 If cut-outs for fork lift pockets or other openings are provided in the bottom side rails, adequate overlapping of the reinforcing plates shall be ensured. The standardized dimensions and spacings of fork lift pockets are shown in Fig. A.4 of Annex A.

.8 If lifting edges are provided on the bottom side rails, they shall be constructed to the standard represented by Fig. A.5 of Annex A .

.9 With regard to the local stressing of the bottom side rails by shunting shocks during transportation by rail, the connections of the bottom side rails to the corner fittings shall be made with special care and, where necessary, be reinforced or stiffened.

.10 In order to prevent the base structure and transverse members of the container on the one hand and the longitudinal members of the vehicle on the other from being stressed too much during road transportation, there shall be provided either

- sufficient contact surface according to Fig. A.6 in Annex A or
- a sufficient number of adequately strong transverse members which, however, may project relative to the other transverse members.

The prescribed number and spacings of these transverse members are shown in Fig. A.7 and A.15 of Annex A. The maximum load to be transmitted by the support areas shall not exceed the value 2 R including the augmentation for dynamic load cases. The contact surfaces of a smooth base structure or the bottom faces of those transverse members forming part of a base structure and serving for load transfer to a vehicle shall lie in a plane, the design distance of which from the bottom faces of the corner fittings shall amount to between 11 mm and 17,5 mm in accordance with 3.2.1.2.

3.2.3 Roof

.1 Roofs shall be shaped in such a way that as little water as possible may collect on them. Cambering is recommended. Where roofs are to be capable of supporting not only persons but also cargo, attention shall expressly be drawn to this fact, giving details of the surface pressure to be expected, and a corresponding test shall be conducted.

.2 In the area of corner fittings, reinforcements such as laminations of at least 4 mm thickness shall be provided in such a way that the roofing will still be protected with the spreaders offset by 200 mm in transverse direction and by 225 mm in longitudinal direction.

.3 The support frames for tarpaulins covering open-top containers shall be so designed or dimensioned as to ensure a positive connection between the top side rails (see Section 2, B.2.6).

.4 It must be possible so to clamp and secure detachable roof elements as to preclude any incorrect handling and/or to permit the condition of the means of clamping and securing to be visually checked from the ground (outside) even if the container is on a railway wagon.

3.2.4 Walls

.1 Wall elements shall be so connected with each other and with the surrounding frames that strength, dimensional stability and weather proofness are sufficiently maintained under the repeated loads to be expected (see also E.)

.2 Hinged or detachable walls or wall sections shall be so clamped and secured as to preclude any incorrect handling and/or to permit the condition of the clamps and securements to be visually checked from the ground (outside).

3.2.5 Doors, flaps and manholes

.1 Doors, flaps and manholes form part of the surrounding structural elements such as walls, roofs, bottoms, tank shells, etc. In certain cases they replace these structural elements, e.g. the double-leaf door of a general cargo container replaces an end wall. As a consequence, doors, flaps and manholes as well as their locking elements are required to withstand all loads that the associated structural elements are subject to according to Section 2.

.2 If flaps or manhole covers cannot be positively fitted into the surrounding structural element, the opening shall be stiffened as necessary.

.3 The necessary seals shall be robust, flexible and durable; they shall not become brittle even under heavy solar irradiation and shall be resistant to the cargo to be carried.

3.2.6 Other guidance

A sufficient number of suitable lashings shall in general be provided in the container in order to secure the cargo against displacement due to the state of the sea or due to inclinations attributable to other sources. The construction and extent of these appliances are subject to the conditions imposed by the user.

D. Materials

1. General guidance

1.1 Only materials with guaranteed properties (strength; low-temperature toughness where applicable; bending properties; weldability; resistance to corrosion and/or rot; etc.) are to be used for all

load-bearing components of containers as well as for tanks, piping, valves and fittings of containers intended for liquid or gaseous cargo. Unless otherwise provided hereinafter or unless special arrangements have been made, Rules for Materials (Pt. 1, Vol.V), recognized standards (e.g. EN 10025) or other equivalent standards shall be taken as a basis in this respect. As regards tank containers intended for the transportation of dangerous goods, the respective legal provisions shall additionally be complied with.

1.2 In general, only materials which have been made by manufacturers approved by BKI may be used. Approval is granted in accordance with BKI's Rules; application for approval is to be made to BKI's Head Office. Upon application, BKI may recognize approvals granted by neutral other testing authorities or grant approval on the basis of regular tests of the products.

1.3 Unless otherwise required hereinafter, the materials shall be covered at least by works test certificates conforming, at present, to EN 10204, 3.1.C or BKI acceptance test certificates conforming to EN 10204 shall be produced for cast steel as well as for materials intended for containers for dangerous goods. In special cases or at the explicit request of the purchaser, check tests of the actual material supplied shall be carried out under BKI's supervision. All materials and structural components shall be marked in such a way that an unambiguous identification of the manufacturing mill or plant, the material grade and the heat or batch is possible. With regard to the marking of castings, see 2.2.9.

1.4 Thermal containers shall in addition comply with the requirements according to Section 3, A.2.2.

2. Steel materials

2.1 Rolled steels

2.1.1 Ordinary and higher strength hull structural steels satisfying Rules for Materials (Pt. 1, Vol.V) as well as weldable structural steels, e.g. conforming to EN 10025, or pipe materials, e.g. conforming to EN 1626, EN 1629, may be used for the components mentioned in 1.1. Other equivalent structural steels with a minimum yield point of 235 N/mm^2 may be used with BKI's consent. The requirements for special steels (such as weather-resistant structural steels, steels tough at sub-zero temperatures or high-strength steels with minimum yield points above 355 N/mm^2) will be laid down from case to case.

2.1.2 Structural steels showing, apart from sufficient strength, the properties required for the respective application (e.g. good bending properties, weldability) shall be used for secondary, non-load-bearing components of containers. Welded connections between these steels and those specified in 2.1.1 shall not negatively affect the structural components.

2.2 Cast steel

2.2.1 Cast steel grades GS-200, GS-240 and GS-G28Mn6 to EN 10293 and cast steel grades conforming to EN 10213 may be used for castings for the components specified in 1.1. Cast steel for corner fittings shall meet the requirements of paragraph 2.2.3. Cast steel grades satisfying other rules or standards may also be used with BKI's consent, provided that they are equivalent to the foregoing grades in respect of mechanical characteristics and weldability.

2.2.2 Unless otherwise agreed on, steel castings (except those for corner fittings) are subject to the quality requirements and test conditions contained in Rules for Materials (Pt.1, Vol.V) in association with the standards.

2.2.3 Steel castings for corner fittings shall conform to the following requirements:

– The composition of each charge shall conform to Table 1.1 and shall be certified by the manufacturer. Deviations from the chemical composition require BKI's consent.

– The mechanical properties shall meet the requirements of Table 1.2. Deviations require BKI's consent.

Table 1.1 Chemical composition (melt analysis)[1]

Composition (%)										
C max	Mn	Si max	P max	S max	Cr max	Ni max	Cu max	Mo max	Al_{sol}[2] min	Cr+Ni+Cu+Mo max
0,20	0,9 to 1.50	0,50	0,035	0,035	0,25	0,30	0,20	0,08	0,015	0,70

1) The carbon equivalent

$$C_{eq} = C + \frac{Mn}{6} - \frac{Cr+Mo+V}{5} + \frac{Ni+Cu}{15}, \text{ shall not exceed } 0{,}45\%$$

2) Aluminium may be partly or completely replaced by other fine-grain-forming elements.

2.2.4 The steel castings shall be supplied in either normalized or heat-treated condition, depending on the cast steel grade.

2.2.5 Steel castings shall not exhibit any defects (such as shrinkholes, blowholes or cracks) which may adversely affect their use and adequate working. Unimportant sand marks and slag spots, small cold shuts and minor scabs shall be gouged out if necessary.

Table 1.2 Mechanical properties

Yield Point R_{eH} [N/mm²] min.	Tensile strength R_m [N/mm²]	Elongation A_5 [%] min.	Reduction in cross-section Z [%] min.	Impact energy KV [1] [Joule] min. at -20°C[2]
220	430 to 600	25	40	27

1. Average value from three specimens: One individual value may be lower than, but not less than 70 % of the average value.
2. If lower testing temperatures are demanded by the purchaser in special cases, these are to be agreed with BKI

2.2.6 Elimination of defects (including so-called blemishes) by welding is permissible only with BKI's consent[1]. In observance of BKI's Rules for Materials (Pt 1, Vol.V), Sec.7.A., the welding process, heat treatment process and scope of testing shall be agreed with BKI prior to the commencement of such welding work.

2.2.7 With all cast steel grades, testing shall consist of tensile and notched bar impact tests. For sampling, pieces shall be grouped into test lots according to melting and heat treatment batches. The test specimens shall in general be cast integrally with the casting and may be cut off only after final heat treatment and stamping. Where integral casting is not possible, test specimens shall be taken from odd pieces or separately cast test specimen coupons, by agreement with the Surveyor / Inspector.

2.2.8 Where the material is tested byBKI, all castings shall be presented to the Surveyor / Inspector for checking in respect of their as-cast condition and their dimensions. Dimensional and visual checks are

[1] Preconditions for the granting of the welding permission are: employment of trained welders supervised during work, use of suitable, approved welding filler metals, workmanlike removal and crack detection testing of the defect area, preheating for welding to approx. 100°C if necessary, subsequent stress-relief annealing; in the case of major defects, renewed normalizing, machining of the welded areas and crack detection testing by means of non-destructive testing methods.

usually carried out at random. At the request of the Surveyor / Inspector, non-destructive tests, e.g. by means of magnetic particle or dye penetrant methods, shall be carried out should serious defects be suspected. In the case of container corner fittings, one out of every 400 castings originating from the same charge shall be tested for internal defects by an appropriate method.

2.2.9 Each casting shall be marked with the manufacturer's symbol and the charge number (at least the last three digits). Agreements between purchaser and foundry shall be reached as regards additional markings such as drawing or item numbers. Where the material testing is carried out byBKI, each casting tested by the Surveyor / Inspector shall be marked with the KI test stamp; all other castings forming part of the delivery in question shall be marked with the stamp for batch testing KI[2]. Test specimens and castings from which test specimens have been taken shall be marked with the test specimen stamp KI.

2.3 Stainless steels

2.3.1 Stainless steels shall be selected with respect to their resistance to corrosion considering the cargo to be transported and the conditions of working (welding). Unless otherwise agreed upon in detail, steels conforming to EN 10088 or, equivalent steels conforming to other recognized rules or standards may be considered.

2.3.2 Only grades suitable for welding applications and with guaranteed resistance to intercrystalline corrosion in the welded condition (without heat treatment) may be used for weldments. These are in general the titanium- or tantalum/niobium-stabilized grades or those with a reduced carbon content (approx. 0,02% - 0,05% C).

3. Aluminium alloys

3.1 Wrought alloys

3.1.1 Wrought aluminium alloys must show sufficient resistance to corrosion in a seawater-laden atmosphere. Unless otherwise agreed upon in a particular case, the alloys KI AW-5754 (Al Mg 3), KI AW-5083(AlMg4.5Mn0.7), KI AW-5383(AlMg4.5Mn0.9) , KI AW-6005(AlSiMg(A)), EN AW-6063(AlMgSi 0.7) or EN AW-6060(AlMgSi) to EN 573 shall be used.

3.1.2 The chemical composition and mechanical properties shall conform to BKI's Rules for Materials (Pt.1, Vol.V) and the relevant standards. In respect of weldments, only the strength in the soft condition may be taken into account. BKI may agree to the use of a higher strength value if corresponding evidence is furnished, e.g. in an approval test.

3.2 Cast alloys

3.2.1 3.1.1 applies as appropriate to the corrosion resistance of cast aluminium alloys. The following cast alloys to EN 1706 may be used; see Table 1.3.

3.2.2 Cast aluminium alloys shall have quality properties sufficient for the relevant application. Corner fittings made from cast aluminium alloys are subject to BKI's special approval, evidence of sufficient strength properties having to be furnished.

[2] In place of the stamp, another type of marking such as the cast-in letters "KI" may be used for identifying BKI tested castings provided that the Society has consented hereto.

Table 1.3 Cast aluminium alloys

Designation of alloy	Sea water suitability
EN AC-41000 (AlSi2MgTi)	Good
EN AC-42100 (AlSi7Mg0.3)	Good
EN AC-42200 (AlSi7Mg0.6)	Good
EN AC-43100 (AlSi10Mg(b))	Good/Moderate
EN AC-44100 (AlSi12(b))	Good/Moderate
EN AC-51000 (AlMg3(b))	Very Good
EN AC-51300 (AlMg5)	Very Good
EN AC-51400 (AlMg5(Si)	Very Good

4. Wooden materials

4.1 Manufacturers of wooden components for containers (solid wood, laminwood or plywood) shall have an independent works control department. A laboratory equipped with suitable, calibrated testing instruments must be available.

4.2 Only service-proven species of timber, that is, timber featuring good resistance to water, atmospheric conditions, fungi and insect infestations as well as good mechanical properties appropriate to the application and a low swelling and shrinking tendency shall be used for any wooden components used in the manufacture of containers.

4.3 Solid wood

Grown wood used in container construction must be long-fibred and of good quality, that is, free from sap, deleterious knots and other defects. Twisted grain timber or wood cut across the grain shall not be used. The timber used must either be well seasoned and sufficiently dry or be expertly dried in suitable drying kilns.

4.4 Plywood, laminwood

Plywood and other wooden elements made up of parts glued together shall consist, in all their layers, plies or parts, of timber of a strength sufficient for the application concerned. The quality requirements for plywood boards shall be laid down in accordance with recognized standard.

4.5 Wood protection

All wood should be protected against infestation by fungi and/or insects by impregnating it with a service-proven wood preservative (see B.4). The underside of wooden floor parts should, if possible, be sealed by suitable means (e.g. phenolic resin) to protect them against moisture.

5. Plastic materials

5.1 Glass-fibre-reinforced plastics used as linings or coatings of wall and roof elements shall be of service-proven quality and applied in accordance with proven methods. The strength of the coating and of the core layers (wood, plastic, etc.) shall be adapted to one another in accordance with the requirements in Section 2, B.2. BKI reserves the right to require special proof.

5.2 Plastic materials used as coatings, linings or insulation in containers shall withstand the climatic and mechanical stresses occurring and shall not give off any substances detrimental to health or the cargo (see also Section 3, C.2).

5.3 For requirements in respect of sealing elements, see C.3.2.5.

E. Jointing methods

1. Welding

1.1 Conditions applying to works and shops

1.1.1 Works and shops wishing to carry out welding work on containers shall be approved by BKI in this respect (see also Section 1, A.4.). The Tank Container Approval Regulations (such as IMDG Code, etc) shall be complied with in respect of tank containers for the transportation of dangerous goods. The works and shops shall possess appropriate facilities permitting expert welding work of high-quality workmanship. These facilities shall include working places protected against atmospheric influences, machinery and equipment for expert preparation of the joints to be welded, safe and reliable welding machinery and equipment, and stationary or portable drying spaces or cabinets for storing the welding filler metals and consumables.

1.1.2 For assembly and welding, it is advisable to use jigs in order to ensure dimensional stability of the structural components. These jigs shall be of such a configuration that the weld seams are easily accessible and can be welded in the most favourable position possible (see also 1.6.5). Tack welds shall be avoided wherever possible.

1.2 Welders, welding supervisors

1.2.1 All welding work on structural parts in accordance with Section 1, D.1.1 may only be carried out only by adequately qualified welders approved by BKI who hold valid welder's qualification certificates. The welders shall have been qualified in accordance with Rules for Welding (Pt. 1, Vol. VI), Sec. 3 or other equivalent recognized standards in one or more qualification groups in such a way that the field of work in question (materials, thicknesses of structural components, welding process and positions, welding filler metals, etc.) is covered thereby. The supplementary provisions in Rules for Welding (Pt. 1, Vol.VI) with regard to inclusions and exclusions shall be observed (e.g. the requirement for additional fillet weld test pieces if fillet welds are to be made as well). Welders who are to weld vertical downward seams shall have been qualified in this position as well (see 1.3.1 and 1.6.5).

1.2.2 The validity of a welder's certificate (normally two years), the conditions for maintaining the validity of certificates and the re-examinations are governed by the particulars of Rules for Welding (Pt. 1, Vol.VI), Sec. 3.

1.2.3 Every works or shop carrying out welding work shall have in its employ a welding supervisor, proof of whose professional qualifications shall be furnished toBKI. Depending on the type and scope of the welding work to be carried out, the welding supervision may be performed by, e.g., a welding specialist or a welding engineer. The welding supervision is to be approved byBKI.

Changes in respect of the welding supervisors shall be communicated to BKI without delay. The welding supervisor shall responsibly supervise the preparation and execution of the welding work (see also 1.6.8).

1.3 Welding processes, procedure testing

1.3.1 Only welding processes, the suitability of which for the application concerned is accepted on the basis of general experience or has been proved in a procedure test shall be used. Procedure tests supervised by BKI shall in any case be conducted on corner fittings for vertical downward welding and single-side welding of hollow metal sections to furnish proof of satisfactory shop procedures and adequate qualitative properties under production conditions in the user's works. Moreover, BKI is also entitled to call for procedure testing for other welding processes or materials (e.g. special structural steels).

1.3.2 The scope of testing, samples, test specimens and requirements are laid down on a case-by-case basis by analogy with Rules for Welding (Pt. 1, Vol.VI) in accordance with the range of application applied for. Welders employed in procedure tests are considered qualified in the welding technique concerned and/or in connection with the respective materials, provided that the procedure tests have been successfully completed. Where further welders or operator groups are to be employed in the case of a subsequently enlarged range of application, the welders and operator groups are to be adequately trained and tested (see 1.2.1).

1.4 Welding filler metals and consumables

1.4.1 All welding filler metals and consumables used (such as rod electrodes, gas-shielded welding wires, etc.) shall have been approved by BKI in accordance with Rules for Welding (Pt. 1, Vol.VI). Sec. 5 The required quality grade depends on the base materials to be welded.

1.4.2 Filler metals and consumables of any quality grade may be used for ordinary-strength hull structural steels and equivalent structural steels such as steel grades Fe 360 or Fe 430 to EN 10025 (see Section 1, D.2.1.1). Grade 2 Y and 3 Y filler metals and consumables (where necessary, those with the extension H 15, H 10 or H 5) shall be used for higher-strength hull structural steels and equivalent structural steels such as Fe 510 to EN 10025. The filler metals and consumables last mentioned shall be preferred for welding rimming structural steels and cast steels.

1.4.3 Particulars of the range of application of the approvals of welding filler metals and consumables for other materials (such as austenitic stainless steels or aluminium alloys) are contained in Rules for Welding (Pt 1, Vol.VI).

1.4.4 Welding filler metals and consumables for other materials may also be tested and approved in conjunction with the procedure in question. However, such approvals remain restricted to the user's works and have a maximum validity period of one year unless repeat tests are carried out. Filler metals and consumables included in the procedure test in this way may be replaced with other equivalent filler metals and consumables of corresponding quality, approved as such byBKI.

1.5 Configuration of welded joints

1.5.1 The welded joints shall be designed from the outset in such a way that they are easily accessible during manufacture and can be made in the most favourable welding sequence and welding position possible. Care shall be taken that only the inevitable minimum of residual welding stresses and distortions will remain ill the structural components after manufacture. Small distances of the welded joints from one another and local accumulations of welds shall be avoided.

1.5.2 Welding in cold-formed areas with more than 5 % permanent elongation is to be avoided as far as possible in the case of structural steels susceptible to strain ageing. Welding work may be carried out in cold-formed and adjacent areas of hull structural steels and equivalent structural steels (e.g. of quality groups B, D, D I, D 2, DD 1 and DD2 to EN 10025) provided that the following minimum bending radii (inside) are adhered to (Table 1.4).

Table 1.3

Sheet/plate thickness range	Minimum bending radius (internal)
upto 4mm over 4 to 8 mm over 8 to 12 mm	1 x sheet thickness 1,5 x sheet/plate thickness 2,0 x plate thickness

Depending on the bending process, a larger bending radius than that indicated above may be necessary.

1.5.3 Butt-welded joints (such as straight butt welds, V- or double-V welds) and corner or cross joints (such as single-bevel butt welds) shall normally be designed in such a way that the full plate or shape cross section is fused. To achieve this, the structural components shall be prepared with appropriate weld shapes to ISO standards (e.g. ISO 9692 etc.), being given a sufficient included angle between the planes of the fusion faces, a sufficient air gap, and the smallest possible depth of the root faces, depending on the sheet or plate thickness. Special weld shapes require BKI's approval; where necessary, the weld shapes are laid down in connection with a procedure test.

1.5.4 Fillet welds shall, wherever possible, be so designed as to be continuous on both sides (see C.3.2.1). Welds intermittent on the inside may be chosen for welding walls etc. to the inside of the framework. Only fillet welds continuous on both sides or intermittent fillet welds with scallops in the webs may be provided for tanks, with the fillet welds taken around the stiffener or scallop ends to seal them. The fillet throat depends on the load in each case, and calculated proof of its adequacy. Shall be furnished in cases of doubt. The "a" dimension shall not exceed 0,7 t (t = thickness of the thinner part). With the exception of fillet welds on walls and similar structural components made of sheet metal, the fillet weld throat "a" shall be not less than 2,5 mm and, on corner fittings, not less than 3,5 mm.

1.5.5 Overlapped welded joints shall be used only in connection with structural components subject to relatively small loads and shall, wherever possible, be used only parallel to the direction of the main stress. The overlap width shall be at least 1,5 t + 15 mm, t being the thickness of the thinner plate. The fillet welds shall be executed in accordance with 1.5.4.

1.6 Manufacture and testing

1.6.1 The structural components shall be clean and dry in the area of the weld. Any scale, rust, flame-cutting slag, grease, paint (with the exception of permitted production coatings with a film thickness of up to 20 μ approx.) and dirt shall be thoroughly removed prior to welding. Where plates, shapes or structural components are provided with a corrosion-reducing production coating (shop primer) prior to welding, this coating shall not affect the quality of the welded joints.

1.6.2 When preparing and fitting together the structural components, care shall be taken to comply with the specified weld shapes and gap widths (air gaps). If the permissible gap width is slightly exceeded, it may be reduced by deposit welding on the fusion faces of the joint. Filling pieces or wires shall not be welded in. Larger gaps may be closed by welding in a sufficiently large metal strip or shaped section.

1.6.3 Plates and sections shall be accurately aligned, in particular in structures interrupted by crossing members. A displacement of the edges relative to one another of more than 15 % of the plate or section thickness or more than 3 mm, whichever is the smaller, is not acceptable.

1.6.4 During welding operations, the areas where work is carried out shall be protected against atmospheric influences. In cold air (below 0 °C) suitable measures shall be taken (covering, heating the corner fittings) to ensure satisfactory execution of the welded joints. Welding shall cease at temperatures below – 10 °C. Any rapid cooling down shall be avoided, especially when welding corner fittings.

1.6.5 Welding work shall be carried out in the most favourable welding position possible. Welding in a vertical downward position shall be avoided wherever possible on corner fittings and is not to be carried out at the corner fitting/corner post connection, even after a procedure test for vertical downward welding in general and irrespective of the approval of the welding metals and consumables. The use of a suitable welding sequence shall ensure the least possible restriction of the shrinkage of the weld seams.

1.6.6 In welding operations, care shall be taken to achieve uniform penetration, perfect fusion down to the root, and uniform, not excessively convex weld surfaces. In the case of multi-pass welding, slag originating from the preceding runs shall be thoroughly removed. Cracks (including broken tack welds), larger pores or slag inclusions etc. are not to be welded over but shall be gouged out.

1.6.7 The repair of major material or workmanship defects may be carried out only after BKI has given its consent. Minor surface defects shall, wherever possible, be eliminated only by shallow grinding. Defects which reach deeper into the weld shall be cleanly gouged out and rewelded. Where in the case of cracks total or partial replacement of the structural component concerned is not demanded or the cracks may be closed by welding with BKI's consent, the length and configuration of the crack shall be unambiguously ascertained by means of a suitable crack detection technique, the crack cut out to beyond its ends and subsequently welded up.

1.6.8 Workmanlike accomplishment of the welding shall be ensured by careful control carried out by the shop concerned (see 1.2.2). BKI will check the welding work at random during fabrication and, where necessary, during the final inspection after completion. BKI is entitled to reject insufficiently checked structural components and to require them to be submitted anew following a successful in-shop check and on completion of any repairs necessary.

1.6.9 In cases of doubt, BKI is entitled to demand that additional tests (such as non-destructive tests to furnish evidence of the satisfactory weld quality) be carried out on important structural components. The type and scope of the tests will be laid down by BKI from case to case. For testing of tank containers, see Section 2, D.

2. Bolted and riveted connections

2.1 It is assumed that jointing elements conforming to the relevant standards and laid down in the purchaser's specification will be used and the connections made in accordance with current engineering practice.

2.2 The adequate strength of a connection is in general considered proven if the tests in Section 2 have been conducted without giving cause for complaint. BKI is entitled to call for a procedure test in special cases. Where necessary, calculations serving as evidence shall be submitted together with the documents subject to examination.

2.3 All the elements of the connection shall be resistant to seawater. Subsequent application of a coat of anti-corrosive paint is not considered sufficient. The possibility of contact corrosion is especially to be reckoned with. In the case of tank and bulk containers, the jointing elements shall moreover be resistant to the substances intended to be carried in these containers.

2.4 Connections between steel and aluminium structural components shall be made in such a way as to be corrosion-inhibiting in a service-proven manner.

2.5 Bolted connections shall be locked in certain cases. This may in particular apply to the mounting of refrigerating machinery sets or parts thereof as well as to safety valves and fittings.

2.6 With regard to the locking of bolted connections for customs purposes, the official regulations shall apply.

2.7 Proof shall be furnished that the rivet material is not embrittled by clinching the rivets.

3. Adhesive joints

3.1 The suitability (durability) of adhesive joints (e.g. for fixing of wall panels) shall be proved in a procedure test. The type and scope of this test shall be agreed in each individual case. Previous experience may be taken into account.

3.2 In respect of joint preparation and handling conditions, the instructions given by the adhesive manufacturer shall be complied with.

3.3 The components of the adhesive joints shall be insensitive to the climatic and chemical actions to be expected and harmless with respect to the cargo to be transported.

F. Marking and documentations

1. Marking

1.1 Containers which have been tested in accordance with B.3.1 are marked with:

a) An adhesive label in conformity with Annex B, B., normally on the left door. (Tank containers: beside the tank rating plate)

b) The number of the type certificate (FC No.), the BKI stamp, and the tank test number are additionally die-stamped into the rating plate of the tank of tank containers.

1.2 BKI stamps and labels refer to the as-manufactured (as-delivered) condition of the container. Their renewal after repair or loss is permitted only in consultation with the BKI. Labels are issued only by BKI.

1.3 CSC plate: The Safety Approval Plate required by the Law covering the Convention for Safe Containers (CSC) of December 2nd, 1972 shall be durably fixed, be resistant to fire and corrosion, and contain the particulars shown in Annex B, B.2. The Approval Reference will be laid down by BKI.

1.3.1 The plate shall be permanently affixed to every approved container at a readily visible place, adjacent to any other approval plate issued for official purposes, where it would not be easily damaged.

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

2. Additional Marking

2.1 Markings relating to checking by the customs authorities shall be affixed in accordance with the provisions issued by the competent authority.

2.2 In respect of the transportation of dangerous goods, the marking is to be made in accordance with the legal provisions (e.g. IMDG Code).

2.3 Markings in connection with approval for railway traffic (e.g. in accordance with UIC conditions) shall be made in accordance with the provisions issued by the railway administrations.

2.4 Where wooden structural components have been impregnated and tested on the basis of special rules or regulations, the containers may be marked with a permanently affixed label corresponding to the national provisions in question.

2.5 In all other respects, for marking of containers, ISO 6346 "Freight containers - Coding, identification and marking" is to be complied with.

2.6 Regarding requirement in 1.8, the following inscriptions are to be placed on the container:

– owner code, serial number and check digit,
– letters and numbers indicating the kind and type of container,
– maximum gross weight and tare weight of the container.

Inscriptions, referred to above, 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.

2.6.1 If stacking loads and transverse rigidity test loads are less than 213000 kg and 150 kN, respectively, this is to be clearly indicated on the container.

2.6.2 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.

2.6.3 These inscriptions are to be made in English and additionally, they may be made in other languages. See Annex B, Fig. B.4

3. Marking relating to repair of container.

3.1 During examination it is to be checked whether the container is provided with the valid CSC plate, customs plate and timber or plywood impregnation plate, as well as with the relevant additional marking required by adequate ISO standard for containers employed in the international container transport.

3.2 The Owner (Lessor) of containers surveyed in service, according to the Approved Periodic Examination Scheme may have the date of the next container examination marked, instead of an imprint on the CSC plate, with a sticker or otherwise, as agreed with BKI. This marking is to include month (in figures or in words) and year (in figures) of the subsequent periodic examination.

3.3 Stickers are to be affixed to or near to CSC plate and should have a white background and the letters may be in a color corresponding to the year of the next examination as set out below:

COLOUR	YEARS			
BROWN	2004	2010	2016	2022
BLUE	2005	2011	2017	2023
YELLOW	2006	2012	2018	2024
RED	2007	2013	2019	2025
BLACK	2008	2014	2020	2026
GREEN	2009	2015	2021	2027

3.4 Containers in service surveyed according to the Approved Continuous Examination Programme are to be provided with the CSC plate, durably stamped, or well affixed sticker containing the following data;

- letters ACEP (Approved Continuous Examination Programme),
- abbreviated name of the country where the Programme was approved,
- year of the approval of the Examination Programme,
- number of the Approved Programme,
- Owner's name in the abbreviated form (at the Owner's request).

3.5 The sticker may be affixed on the CSC plate or next to it, in a conspicuous place.

4 Documentation

4.1 Type certificate

4.1.1 The testing of the container type, that is, the scrutiny of the documentation (drawings etc.) and the load and operating tests, is certified in the type certificate (see Annex B, C.1.). This certificate also contains the most important particulars of type and design, manufacturer and purchaser.

4.1.2 In the case of small series, the results obtained while testing a preceding series may be referred to as regards the type certificate, by agreement with the BKI`s Head Office.

4.2 Individual certificates

4.2.1 The testing of the individual containers of a series (supervision of production and individual testing in accordance with B.3.1) is confirmed by an individual certificate (see Annex B, C.2. or C.3, as applicable).

4.2.2 The individual certificates covering containers subjected to regular checks in accordance with B.6.1.3 may be renewed or their validity may be extended.

4.2.3 Special tests and repair or damage surveys of containers may be informally certified by the BKI`s Head Office or the Branch Office that has carried out the tests or surveys.

4.3 Repair Report

4.3.1 Upon completion of the direct examination of a container or after the direct survey of the container repair, BKI issues the Survey Report on Container.

4.3.2 A record defined in 2.3.5 is the due document of the container examination carried out by the Owner (Lessor), repair works or other institution.

4.3.3 A record of the repairs as follow is the due document of the container repair carried out by the approved repair works:

- type, kind and identification number of container,
- dates of commencement and completion of the repair,
- note on the carried out repair,
- name and address of the Owner (Lessor),

G. Surveys

1. Survey during construction

1.1 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.

1.2 Checking

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

1.2.1 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 Guidelines. During visual inspection, operation of the container doors at their closing and opening is to be checked.

1.2.2 Standardized dimensions check is to be made before and after the tests.

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

1.3 The survey is carried out according to the provisions of the present Guidelines, with due regard paid to the applicable requirements of BKI Rules.

2. Survey after construction and repairing

2.1 Examination of containers, as well as the survey of the repairs and tests of containers are to be carried out by BKI.

2.2 Survey of the containers in service covers the following:

1) examination of the containers and survey of the repairs and tests of containers;
2) approval of the Periodic Examination Schemes (PES) or Approved Continuous Examination Programmes (ACEP);
3) approval of repair works and testing stations;
4) periodical inspections of activities of the container Owners (Lessors), other institutions and the approved repair works in order to check if the surveys and repairs of containers are duly performed according to the *Guidelines*;
5) other kinds of survey carried out to the separate order of the container Owners (Lessors);
6) issue of BKI documents.

2.3 Type of container examination

2.3.1 There are the following types of examinations of the containers in service:

.1 periodic examinations carried out according to the Periodic Examination Scheme approved by BKI at the following intervals:

- first periodic examination – within the period not exceeding 5 years from the date of manufacture of the container; for tank containers this period is not to exceed 30 months, except for hydraulic tests of tanks and container fittings which are to be carried out every 5 years;
- subsequent periodic examination – at intervals not exceeding 30 months from the date of the last examination, except for hydraulic tests of tanks and container fittings which are to be carried out every 5 years;

.2 continuous examination (ACEP) – carried out at intervals not exceeding 30 months from the date of the last examination. According to the Approved Continuous Examination Programme the following continuous examinations are taken into account:

- thorough examination – carried out after a major repair, refurbishment or on-hire/off-hire interchange;
- routine operating inspection–carried out when the container is in service to detect any damage to be repaired.

2.3.2 Container Owners (Lessors) are allowed to choose the type of examination (periodic or continuous) for all or part of containers owned by them. The Container Owner or the Lessor is also allowed to change the type of examination for all or only a part of his containers, provided it is agreed with BKI. Every examination should include detailed inspection for faults, other deficiencies or damages affecting container safety that cause that the container is no longer safe

2.3.3 Irrespective of the kind of examination, all safety valves are to be examined, tested and inspected at intervals not exceeding 30 months.

2.4 Scope of Examinations

2.4.1. The scope of periodic and continuous (ACEP) examinations of all types of containers is as follows:

.1 visual inspection – at least external checking of the technical state of all the container surfaces is to be carried out; the internal surfaces are to be checked when the container is unloaded, and, where necessary, exposing and dismounting of components of the container is subject to inspection;

.2 examination of the shape or dimensions of the container, should any deviation be suspected;

.3 weathertightness test, should any leakage be suspected;

.4 examinations of the doors and their locking hardware in operation, openings, as well as other container devices;

.5 checking of the container marking.

2.4.2 For thermal containers the following is to be checked additionally: technical condition of thermal insulation and air ducts, affecting container strength and tightness, should insulating properties decrease or integrity loss be suspected.

2.4.3 Each tank of the tank containers is to be checked additionally in respect of the general technical condition (inside and outside), its strength and tightness, technical condition and operation of loading – discharging equipment, condition and validity of tank safety devices, validity of hydraulic tests and operation of measuring – monitoring instruments if such are installed on the tanks.

Examinations of tanks, fittings and safety devices are to be carried out at intervals specified in 2.3.1 and 2.3.3.

2.4.4 For other special types of containers all their structures and gears affecting safety of their handling and operation are to be examined.

2.4.5 Institution which performs periodic or continuous examinations is to keep a record of the carried out examinations specifying at least:

- the owner's unique serial number of the container;
- date on which the examinations was carried out;
- identification of the competent person who carried out the examination;
- the name and location of the organization where the examination was carried out;
- the results of the examination, and
- in the case of permanent survey (PES) the next examination date.

2.4.6 BKI does not keep a record of the carried out examinations, but issues the Container Examination Certificate following each examination.

2.5 Prescribed Periodic and Approved Continouse Examination Programme (ACEP)

2.5.1 The Container Owner (Lessor), applying for carrying out the periodic or continuous examination of containers in service, is to submit to BKI , in electronic format, the Periodic Examination Scheme for review or Continuous Examination Programme for Approval. .

The Scheme/Programme shall specify:

.1 the methods, scope and criteria used in assessing the technical condition of the containers;

.2 frequency of examinations;

.3 qualifications of personnel performing examinations;

.4 a system of records including:

- the owner's unique serial number of the container;
- date on which the examinations was carried out;
- identification of the competent person who carried out the examinations;
- the name and location of the organization where the examination was carried out;
- the results of the examination, and
- in the case of permanent survey (PES) the next examination date;

.5 system for recording and updating the identification numbers of all containers covered by the appropriate examination scheme;

.6 methods and systems for maintenance criteria that addresses the design characteristics of the specific containers;

.7 the provisions for maintaining leased containers if different than those used for owned containers;

.8 conditions and procedures for adding new containers into an already approved programme;

Approved Continuous Examination Programme (ACEP) are subject to verification by the BKI at least once every 10 years.

2.5.2. BKI approval to carry out container examinations may be granted to persons who prove their knowledge and experience in evaluation of the container technical condition with respect to safety.

2.6. Checking

2.6.1 Upon completion of the container repair, a visual inspection is to be carried out, aimed at checking the repair quality. The container dimensions and other important parameters are to be checked, if necessary.

2.6.2 When necessary, or at BKI request, the repair works is obliged to carry out indispensable strength, weathertightness and other tests and checks of a container, according to the scope of examinations depending on the kind of container, damage and the scope of repair.

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Section 2 Requirements and Tests

A. General Requirements

1. Load assumptions

1.1 The loads relevant for the individual structural components follow from the test conditions contained in B., unless different details are furnished by the purchaser. When choosing the safety margins in respect of the possible failures, material fatigue, normal manufacturing inaccuracies, and possible differences in quality of the materials (wood) shall be taken into account.

1.2 Where BKI is requested to certify for conforming with the requirements of the convention for safe containers (CSC) and with the ISO standards, at least the test loads according to B. shall be applied in the type test.

1.3 Where roofs are to be capable of supporting not only persons but also cargo (e.g. thermal containers for hanging cargo), the load indicated by the purchaser shall be taken into account when designing and testing the container (see Section 3, C.4.2.2).

2. Deformations

2.1 On completion of the load tests in accordance with B.2.1 to 2.13, the container shall show neither permanent deformation which will render it unsuitable for use nor abnormality which will render it unsuitable for use, and the dimensional requirements affecting handling, securing and interchange shall be satisfied.

2.2 Elastic deformations under load depend on the construction; their admissibility is governed by the individual transportation conditions. The recess of the base structure as per Section 1, C.3.2.2.3 shall be so chosen within the range indicated therein that the lower face of the base structure does not deflect more than 6 mm below the lower bearing planes of the corner fittings with the container loaded to 1,8 R.

2.3 The end structure shall be sufficiently rigid to ensure that a transverse force of 150 kN applied to the highest point of this plane does not cause the sum of the changes in length of the diagonals to exceed 60 mm.

2.4 The side structure shall be sufficiently rigid to ensure that a 75 kN shear force applied to the highest point of this plane does not cause the point of application of this force to shift longitudinally by more than 25 mm.

2.5 Platform containers with fixed or foldable end walls shall be sufficiently rigid to ensure that a shear force of 50 kN applied at the top corner fitting does not cause a longitudinal deflection of more than 42 mm.

B. Tests

1. General guidance

1.1 The tests indicated below are the minimum requirements in respect of ISO general cargo containers and, where applicable, in respect of all special types of ISO Series I freight containers (see Table A.1). They should also form the basis for testing containers not conforming to the standards.

1.2 The strength tests according to these Guidelines shall be carried out exclusively as static tests in order to obtain comparable and reproducible test data. Allowances have been made in the test loads for dynamic load components. Accordingly, care shall be taken to apply the test loads slowly (without noticeable delay or acceleration) and to keep them effective for at least 5 minutes.

1.3 During the tests, deformation measurements shall be carried out at certain points of the container under test. Care shall be taken to carry out zero measurements prior to, and after, the application of loads or forces. It is recommend that the BKI type testing report, in which the aforementioned measuring points are indicated, be used for recording the test results.

1.4 Repeat tests (see Section 1, B.3.3). Table A.3 furnishes a basis for the frequency of repetition of individual tests during fabrication. The exact test programme shall be laid down in each individual case.

1.5 The routine testing (identity of materials, workmanship, dimensional stability, operational testing of closures and locks, tightness) is carried out at random at the Surveyor's discretion during fabrication.

1.6 The tests detailed in B.2. may be carried out in any sequence within a complete type test, with the following exceptions: Test no. 1 (stacking) shall be carried out before tests no. 2 and 3 (lifting from the top and bottom corner fittings). Test No. 13 (weatherproofness) shall be carried out last.

1.7 With the door-fitted wall under transverse loading, tightness of the door seal to spray shall be proved under half the test load (see Section 2, B.2.9 and B.2.13).

1.8 The test loads shall be applied in such a way that the rigidity of the structural component under load is not changed and the effect intended (uniformly distributed or point load) is achieved.

2. Description of the tests

2.1 Test No.1 - Stacking

This test is intended to show whether a fully loaded container can support the total weight stacked on top of it as per the Table 2.1. The accelerations of the vessel and the relative misalignment of containers due to clearances in the guide rails shall be taken into account. The container under test shall be placed on four level pads, one under each bottom corner fitting or equivalent corner structure. The pads shall be positioned centrally under the corner fittings and have approximately the same base area as the corner fittings. The container shall have a load uniformly distributed over its floor in such a way that the total weight of the container equals 1,8 R. The container are to be subjected to vertical forces specified in Table 2.1 which are applied either to all four corner fittings simultaneously or at each pair of end fittings.

Care shall be taken to ensure that the plane of application of forces and the plane of the supports under the container remain horizontal and unchanged during testing. The force shall be applied through an intermediate pad with the same base area as a corner fitting. Each corner fitting or pad shall be offset in the same direction by 25,4 mm laterally and 38 mm longitudinally. When testing platform containers with foldable end walls, the stacking test shall also be performed with the end walls folded.

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 (72000 kg).

Table 2.1 Forces to be applied in stacking test

Type of container	Test force per container (all four corners simultaneously) (kN)	Test force per pair of end fittings (kN)	Superimposed mass represented by test force (kg)
1 EEE, 1 EE	3767	1883	213360 (see NOTE)
1 A,1 AA , 1 AAA, 1 AX	3767	1883	213360
1 B, 1 BB, 1 BBB, 1 BX	3767	1883	213360
1 C, 1 CC, 1 CX	3767	1883	213360
1 D, 1 DX	896	448	50800

Note :

The test force of 3767 kN per container is derived from 9-high stacking, i.e. 8 containers each weighting 26670 kg at an acceleration of 1,8 g are stacked on top of a container. (The comer posts of such containers are tested with a test force of 942 kN).

The following specifies the stacking loads for 1EEE/1EE containers in different modes:

1) *Stacking at 1EEE/1EE position and supported in 1EEE/1EE position (96000 kg);*
2) *Stacking at 1AAA/1AA/1A position and supported in 1AAA/1AA/1A position (41150 kg);*
3) *Stacking at 1AAA/1AA/1A position and supported in 1EEE/1EE position (27430 kg); and*
4) *Stacking at 1EEE/1EE position and supported in 1AAA/1AA/1A position (41150 kg).*

2.2 Test No.2 - Lifting from the four top comer fittings

This test shall be carried out to prove the ability of a container, other than a ID or a 1 DX container, to withstand being lifted, from appropriate set of four corner fittings, with the lifting forces applied vertically, and the ability of a 1 D or a 1 DX container to withstand being lifted from appropriate set of tour top corner fittings with the lifting forces applied at any angle between the vertical and 60° to the horizontal, these being the only recognized methods of lifting these containers by the appropriate set of four corner fittings. This test is also intended to show whether the loading capability of the floor is adequate to withstand the acceleration forces encountered in loaded containers when handled by cranes. The container under test shall have a load uniformly distributed over the floor in such a way that the combined weight of the container and test load equals 2 R. The container shall be lifted at the four top corners in such a way that no substantial acceleration or deceleration forces occur.

For a container other than a 1 D or a 1 DX container, the lifting forces shall be applied vertically.

For a 1 D or a 1 DX container, lifting shall be carried out by means of slings, the angle of each leg being at 60° from the horizontal.

For 1 EEE, 1 EE containers, the lifting forces shall be applied vertically from the 1 EEE, 1 EE position and separately from the 1 AAA, 1 AA, 1 A position.After lifting, the container shall be suspended for 5 min and then lowered to the ground.

Platform containers with fixed and foldable end walls shall keep the dimensions as per Table 2.2 (measured over the top corner fittings) at a loading of 1 R.

Table 2.2 Dimension for platform containers with fixed and foldable end

Type of container	L max. empty (mm)	L min. loaded to 1 R (mm)
1 AAA, 1 AA, 1 A and 1 AX 1 BBB, 1 BB, 1 B and 1 BX 1 CC, 1 C and 1 CX	12202 9135 6068	12172 9105 6042
L : longitudinal distance between outer edges of comer fittings		

2.3 Test No.3 - Lifting from the four bottom corner fittings

This test is intended to prove that the container can be lifted by means of lifting devices bearing on the bottom comer fittings only and attached to a single transverse central spreader beam above the container. The container under test shall have a load uniformly distributed over its floor in such a way that the combined weight of the container and the test load equals 2 R. The container shall be carefully lifted by its four bottom comer fittings in such a way that no noticeable acceleration or deceleration forces occur. The lifting forces shall be applied at an angle of:

- 30° to the horizontal for 1 EEE, 1 EE containers with internal load of 2 R-T.
- 30° to the horizontal for 1 AAA, 1 AA, 1 A and 1 AX containers
- 37° to the horizontal for 1 BBB, 1 BB, 1 B and 1 BX containers
- 45° to the horizontal for 1 CC, 1 C and 1 CX containers
- 60° to the horizontal for 1 D and 1 DX containers.

The lines of action of the lifting forces and the outer faces of the comer fittings are to be no farther apart than 38 mm. During lifting, the lifting equipment shall bear on the bottom corner fittings only. The lifting equipment shall be similar to the lifting devices customary in handling practice.

The container shall be suspended for 5 min and then lowered to the ground.

2.4 Test No.4 - Restraint test (longitudinal)

This test is intended to prove the ability of the container to withstand longitudinal external restraint caused by dynamic acceleration loads of up to 2 g during movement by rail. The container shall have a load uniformly distributed over the floor in such a way that the combined weight of the container and the test load equals 1 R. The container is to be anchored at one end through the bottom apertures of the bottom corner fittings. A force of 2 Rg shall 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.

2.5 Test No.5. - Strength of end wall

This test is intended to prove the ability of the container to withstand longitudinal external forces which are imposed by dynamic loads up to 2 g during movement by rail. Each end of a container is to be tested when one end is blind and the other is equipped with a door. In the case of symmetrical construction, one end only need be tested. Containers shall be subjected to an internal load of 0,4 Pg. The internal load shall be uniformly distributed over the wall under test. The arrangement shall allow free deflection of the wall.

2.6 Test no. 6 - Strength of side walls

This test is intended to prove the ability of the container to withstand the forces resulting from ship movements. Each side wall (or only one in the case of symmetrical construction) shall be separately subjected to a uniformly distributed internal load of 0,6 Pg. The load shall be applied in such a way as to allow free deflection of the side wall and the top and bottom side rails. Open top containers shall be tested

in the state in which they are used in service, e.g. with removable roof bows in position. Special arrangements may be made for 40' containers.

2.7 Test No.7 - Strength of the roof

This test is intended to show whether a rigid roof

a) is capable of withstanding the loads imposed by persons working on it, or

b) if intended to carry hanging loads, has a loading capability corresponding to the load, but at least 1490 kg per meter of usable internal container length, if a vertical acceleration of 2 g is taken into account.

The tests shall be carried out as follows:

a) A load of 300 kg shall be uniformly distributed over an area of 600 mm by 300 mm located at the weakest point of the container roof.

b) The roof shall be loaded with twice the weight of the intended hanging cargo, but with at least 2 x 1490 kg/m, with the container resting only on its four bottom corner fittings.

2.8 Test No.8 – Floor strength

This test is intended to prove the ability of the container floor to withstand the concentrated dynamic loads imposed by fork lift trucks or similar devices during loading and unloading operations. The test is carried out on containers of all sizes. The test shall be performed using a rubber-tyred test vehicle loaded to an axle load of 7260 kg, that is, 3630 kg per wheel. The nominal wheel width shall be 180 mm and the centers of the two wheels shall be 760 mm apart. The contact area of anyone wheel shall be circumscribed by a rectangle measuring 185 mm by 100 mm. Each wheel shall have an actual contact area of not more than 142 cm^2 lying within the above mentioned rectangle. The vehicle is to be manoeuvred over the entire floor area. No external forces are to be applied to the container.

2.9 Test No.9 - Transverse rigidity

Transverse rigidity test is to be performed for all types of containers, other than 1D and 1DX containers. This test is intended to prove the ability of containers to withstand the transverse racking forces in the end frames resulting from ship movements. The container under test is to be placed in unladen (tare) condition on four level pads, one under each bottom corner fitting, and shall be restrained against lateral and vertical movement by means of anchor devices acting through the bottom apertures of the bottom corner fittings. Lateral restraint of an end wall is to be provided only at the bottom corner fitting diagonally opposite to, and in the same end frame as, the top corner fitting to which force is applied. Where the two end frames are tested separately, vertical anchoring shall be provided only at the end frame under test. Forces of 150 kN shall be applied either separately or simultaneously to each of the top corner fittings on one side of the container parallel to both the end wall and the base plane.

The forces shall be applied first towards and then away from the top corner fittings. Where the end walls of the containers are identical, only one end wall need be tested. Where an end wall is essentially asymmetrical about its own vertical centre line, the end wall shall be tested from both sides. For all containers other than 1D and 1DX, the sideways deflection of the top of the container with respect to the bottom of the container, at the time it is under full transverse rigidity test conditions, shall not cause the sum of the changes in length of the two diagonals to exceed 60 mm.

2.10 Test No. 10 - longitudinal rigidity

Longitudinal rigidity test is to be performed for all types of containers, other than 1D and 1DX containers. This test is intended to prove the ability of containers to withstand the longitudinal racking forces in the side frames resulting from ship movements. The container under test is to be placed in unladen (tare)

condition on four level pads, one under each bottom corner fitting, and to be anchored through the bottom apertures in such a way that no vertical movement is possible. Longitudinal restraint of a side wall is to be provided only at the bottom comer fitting opposite to, and in the same side frame as, the top corner fitting to which force is applied. Forces of 75 kN shall be applied either separately or simultaneously to each of the top corner fittings at one end of the container parallel to both the side wall and the base plane. The forces shall be applied first towards and then away from the top corner fittings. Platform containers with fixed or foldable end walls shall be loaded with a force of 50 kN on one or both/top corner fittings of an end wall, parallel to the side and base planes. The forces shall be applied first towards and then away from the bottom corner fittings. The deflection of the end wall shall not exceed 42 mm. In the case of a container with two identical side walls, only one side wall need be tested.

For all containers other than 1D and lDX, the longitudinal deflection of the top of the container with respect to the bottom of the container, at the time it is under full longitudinal rigidity test conditions, shall not exceed 25 mm.

2.11 Test No. 11 - Lifting from fork-lift pockets (where fitted)

This test is intended to prove the ability of 1 CC, 1 C, 1 CX, 1 D, or 1 DX containers to withstand the loads encountered when being lifted and transported by fork lift trucks.

a) 1 CC, 1 C, 1 CX, 1 D, or 1 DX containers equipped with only one set of fork lift:

The container shall have a load uniformly distributed over its floor in such a way that the combined weight of the container and the test load equals 1,6 R. The container shall be supported on two horizontal bars, each 200 mm wide and projecting 1828 mm ± 3 mm into the fork lift pockets, measured from the outside face of the container side wall. The bars shall be centred within the pockets.

b) 1 CC, 1 C and 1 CX containers equipped with two sets of fork lift pockets:

The procedure in a) applies to the outer fork lift pockets, while the inner ones are subject to the following procedure:

The container shall have a load uniformly distributed over its floor in such a way that the combined weight of the container and the test load equals 0,625 R. The container shall be supported on two horizontal bars as in a), inserted into the additional inner fork lift pockets.

2.12 Test No. 12 - Shoring slots (where fitted)

A 50 mm wide, rigid metal bar is to be inserted in each pair of shoring slot supports so that it runs transversely across the container between the two supports. A load equal to 0,6 P is to be distributed across the middle 915 mm of the bar such that the load is applied horizontally towards the container's doors. The doors shall be fully opened during this test. This load shall be maintained on the bar for at least 2 min.

At the end of the test neither the shoring slots, the shoring slot supports nor the container itself shall show any permanent deformation or abnormality that will render it unsuitable for continuous service at full load. The container shall be supported for 5 min and then lowered to the ground.

2.13 Test No. 13 - Weatherproofness

This test is intended to prove the ability of the container to protect its cargo adequately against external moisture. All the exterior joints and seams shall be tested by means of a jet of water from a nozzle of 12,5 mm inside diameter, at a pressure of approx. 1 bar corresponding to a head of water of 10 m. The nozzle shall be held at a distance of 1,5 m from the container under test. The jet shall be traversed at a rate of 100 mm/s. The angle between the water jet and the tested surface 90^{o}. Procedures involving the use of several nozzles are acceptable only on condition that each joint or seam is covered in the same way as

when using a single nozzle. Concerning the combination of this test with test no. 9, see Section 2, B.1.7. On completion of the test, the interior of the container is to be dry. Upon completion of the test, no water shall have leaked into the container.

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

2.14 Test No. 14 - Lifting by means of grappler arms

This test is intended to prove the ability of suitably equipped containers to withstand the loads encountered when being handled by means of grappler arms. The container under test shall have a load uniformly distributed over its floor in such a way that the combined weight of the container and the test load equals 1,25 R. The container shall be supported at the four positions where provision has been made four the grappler arms. Each of the support surfaces shall measure 32 mm by 254 mm and be located clear of the safety lip.

Table 2.3 Diagrammatic representation of capabilities appropriate to all types and sizes of general purpose containers, except otherwise stated

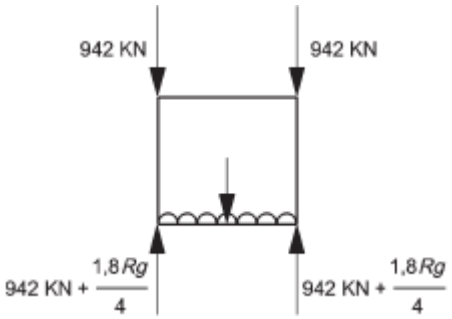
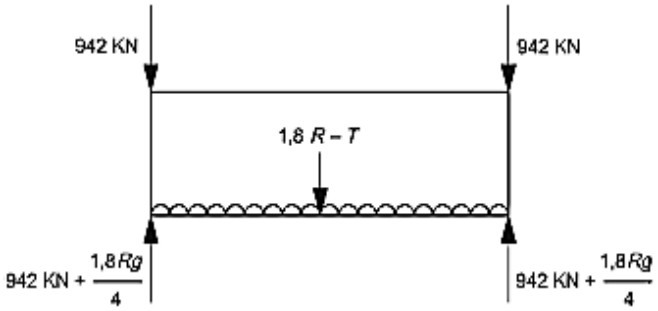
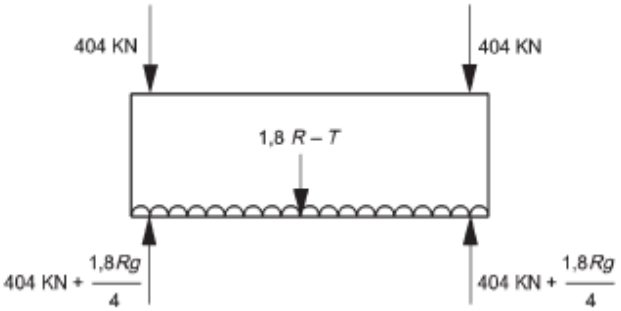
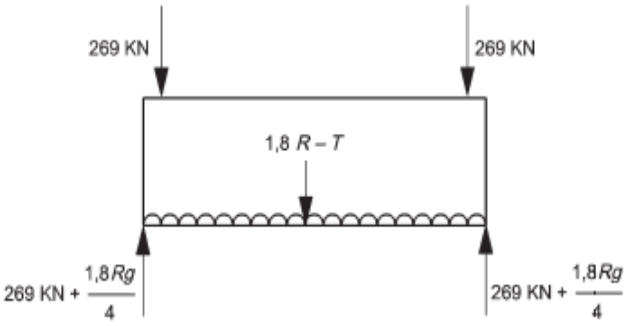
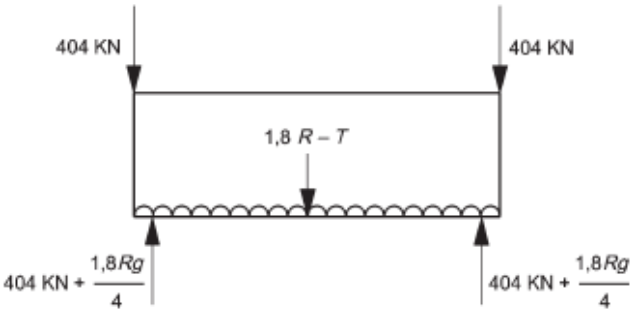
Figure No.	End elevations	Side elevations
A.1a		
	Not Applicable to 1 D and 1DX containers	Not Applicable to 1 D and 1DX containers
A.1b		
		Applicable to 1 EE and 1 EEE containers only
A.1c		
		Applicable to 1 EE and 1 EEE containers only
A.1d		
		Applicable to 1 EE and 1 EEE containers only

Table 2.3 Diagrammatic representation of capabilities appropriate to all types and sizes of general purpose containers, except otherwise stated (*continued*)

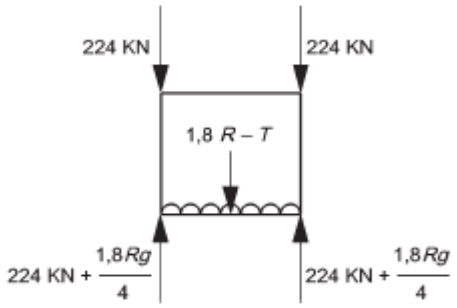
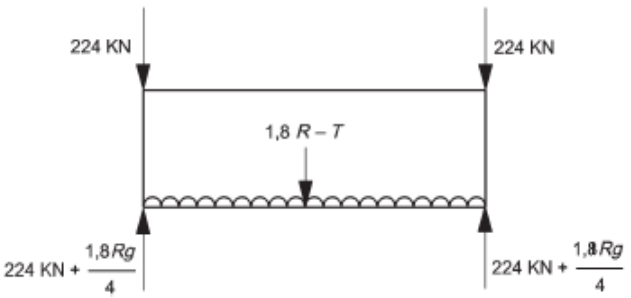
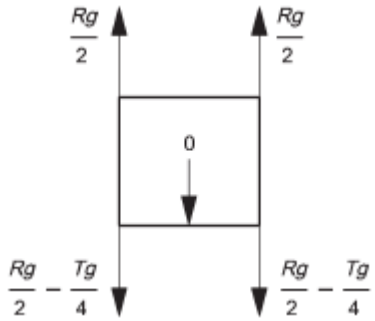
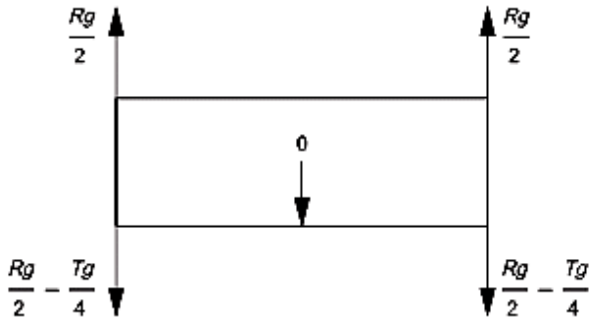
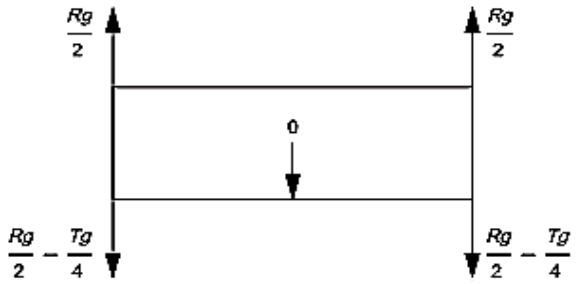
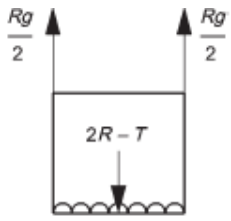
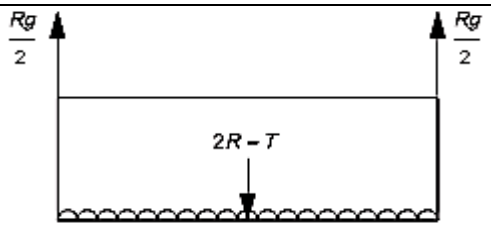
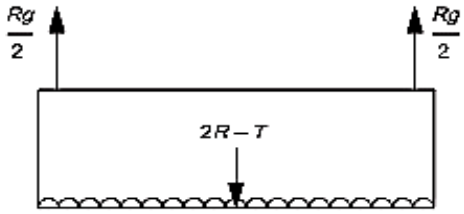
Figure No.	End elevations	Side elevations
A.1e		
	Applicable to 1D and 1DX containers only	Applicable to 1 D and 1DX containers only
	Top lift	
A.2a		
A.2b		
		Applicable to 1 EE and 1 EEE containers only
	Top lift Test No. 2	
A.3a		
	Not applicable to 1 D and 1 DX containers	Not applicable to 1D and 1DX containers
A.3b		
		Applicable to 1 EE and 1 EEE containers only

Table 2.3 Diagrammatic representation of capabilities appropriate to all types and sizes of general purpose containers, except otherwise stated (*continued*)

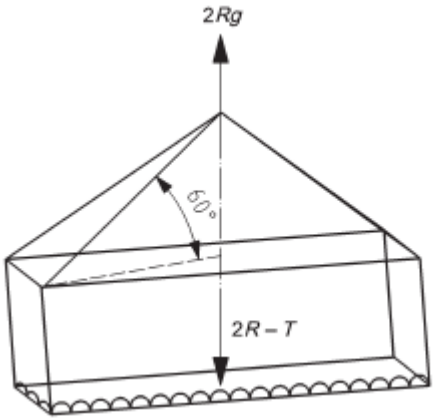
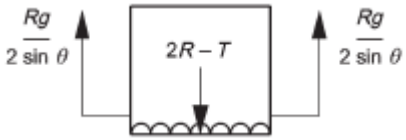
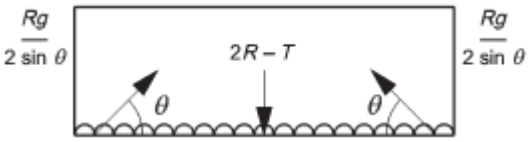
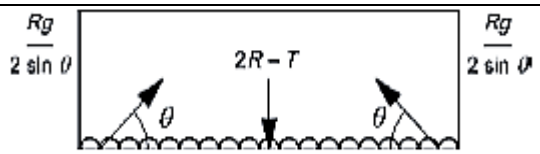
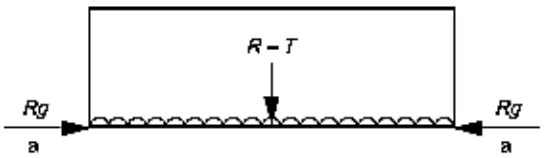
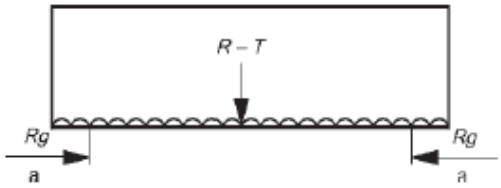
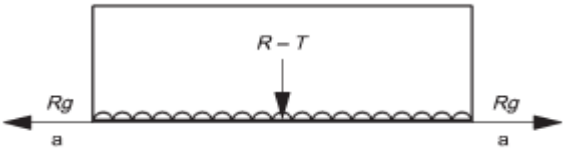
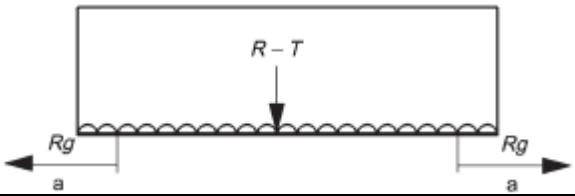
Figure No.	End elevations	Side elevations
	Top lift Test No. 2	
A.3c		
	Applicable to 1 D and 1DX containers only	
A.4a		
A.4b		
		Applicable to 1 EE and 1 EEE containers only
A.5a	Restraint (longitudinal)	
A.5b		
		Applicable to 1 EE and 1 EEE containers only
A.6a		
A.6b		
		Applicable to 1 EE and 1 EEE containers only

Table 2.3 Diagrammatic representation of capabilities appropriate to all types and sizes of general purpose containers, except otherwise stated (*continued*)

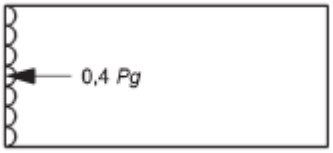
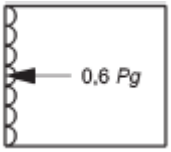
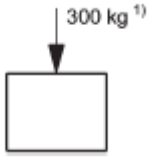
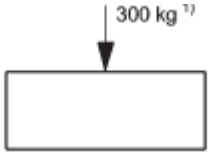
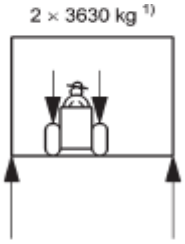
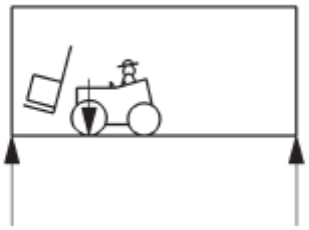
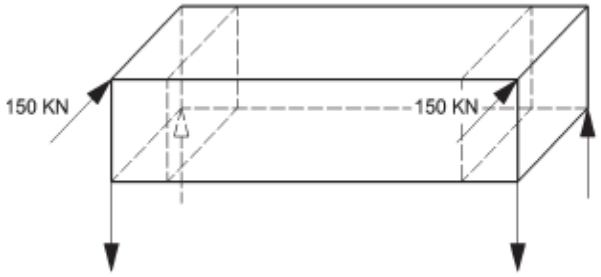
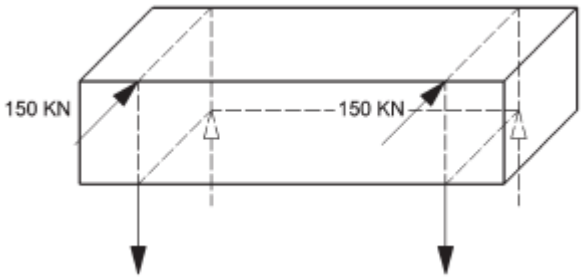
Figure No.	End elevations	Side elevations
A.7	End loading Test No. 5	
A.8	Side loading Test No. 6	
	Roof load Test No. 7	
A.9		
	Applicable where a rigid roof is provided	Applicable where a rigid roof is provided
	Wheel load Test No. 8	
A.10		
A.11a	Rigidity (transverse) Test no 9 Test force = 150 kN	
		End frame Forced at 45’ position (top corner fitting) and secured at 45’ position (bottom corner fitting)
A.11b		
		End frame Forced at 40’ position (top intermediate fitting) and secured at 40’ position (bottom intermediate fitting)

Table 2.3 Diagrammatic representation of capabilities appropriate to all types and sizes of general purpose containers, except otherwise stated (*continued*)

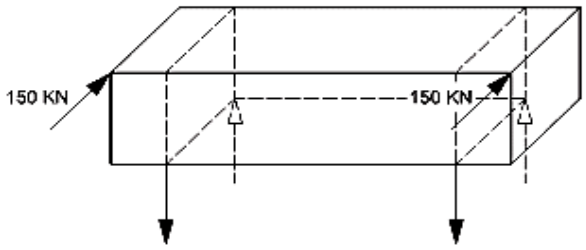
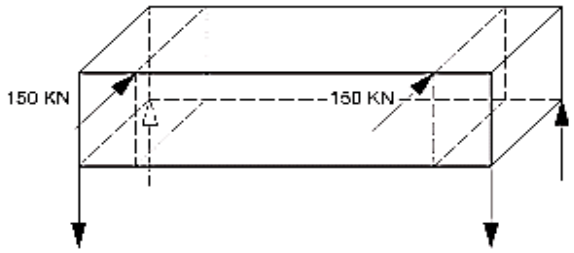
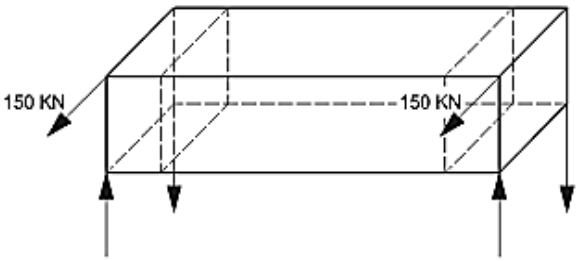
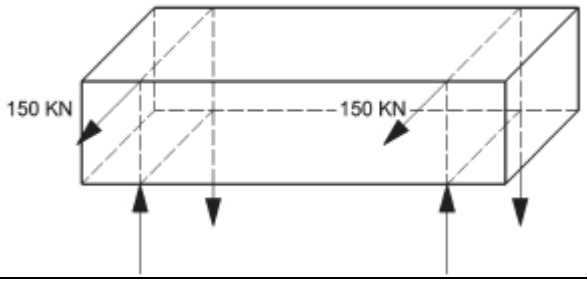
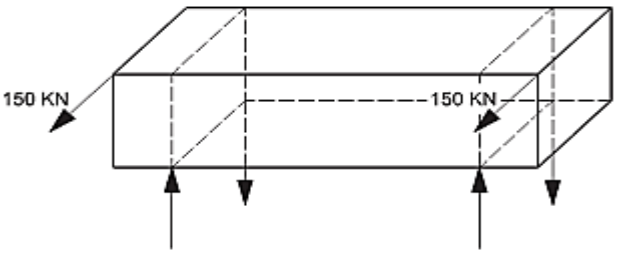
Figure No.	End elevations	Side elevations
A.11c		
		Forced at 45’ position (top corner fitting) and secured at 40’ position (bottom intermediate fitting)
A.11d		
		Forced at 40’ position (top intermediate fitting) and secured at 45’ position (bottom corner fitting)
A.12a	Rigidity (transverse) Test no. 9 Test force = 150 kN	
		Forced at 45’ position (top corner fitting) and secured at 45’ position (bottom corner fitting)
A.12b		
		Forced at 40’ position (top intermediate fitting) and secured at 40’ position (bottom intermediate fitting)
A.12c		
		Forced at 45’ position (top corner fitting) and secured at 40’ position (bottom intermediate fitting)

Table 2.3 Diagrammatic representation of capabilities appropriate to all types and sizes of general purpose containers, except otherwise stated (*continued*)

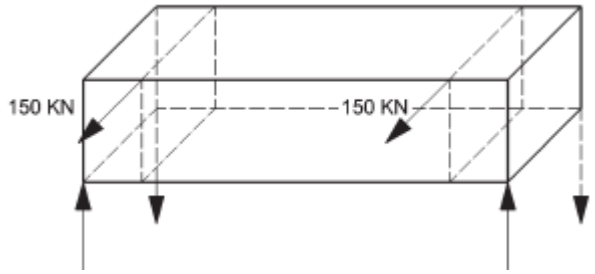
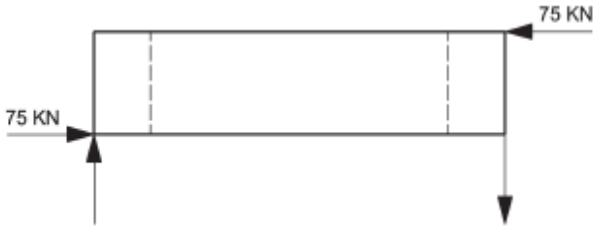
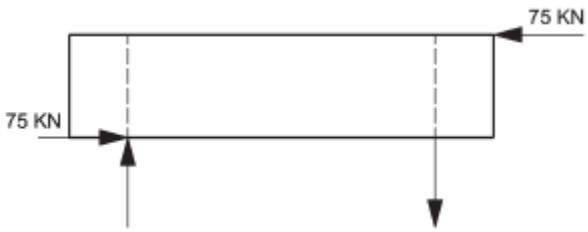
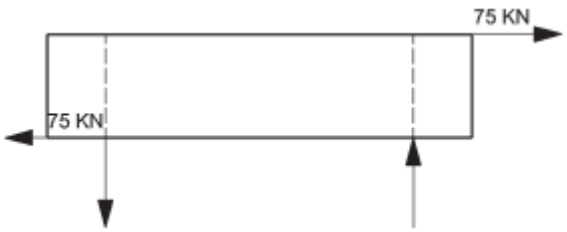
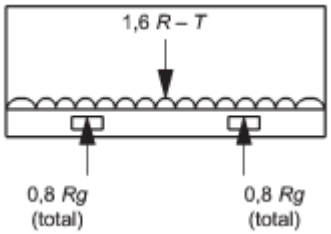
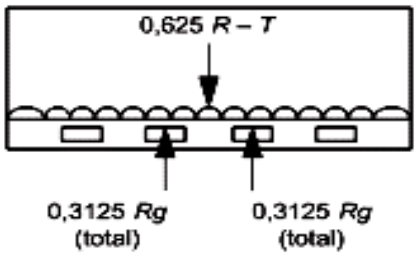
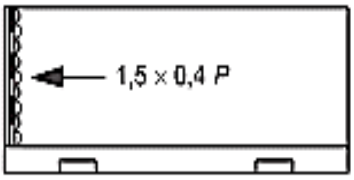
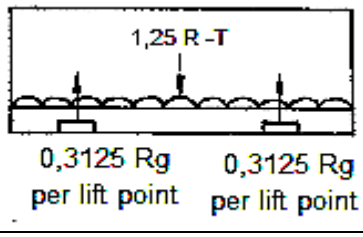
Figure No.	End elevations	Side elevations
A.12d		
		Forced at 40’ position (top intermediate fitting) and secured at 45’ position (bottom corner fitting)
A.13a	Rigidity (longitudinal) Test no. 10 Test force = 75 kN	
		Forced at 45’ position (top corner fitting) and secured at 45’ position (bottom corner fitting)
A.13b		
		Forced at 45’ position (top corner fitting) and secured at 40’ position (bottom intermediate fitting)
A.14a		
		Forced at 45’ position (top corner fitting) and secured at 45’ position (bottom corner fitting)
A.14b		
		Forced at 45’ position (top corner fitting) and secured at 40’ position (bottom intermediate fitting)

Table 2.3 Diagrammatic representation of capabilities appropriate to all types and sizes of general purpose containers, except otherwise stated (*continued*)

Figure No.	End elevations	Side elevations
A.15	Lashing/securement (The type of loading is inadmissible except an applied in A.3a)	
A.16	Lashing / securement Not applicable to 10 and 1DX containrers.	
A.17	Fork-lift pockets Test No. 11 Applicable to 1CC, 1C, 1CX and 1DX container when fitted with one set of fork-lift pockets.	
A.18	Fork-lift pockets Test No. 11 Applicable to 1CC, 1C, and 1CX containers when fitted with a second set of fork-lift pockets.	
A.19	Test No. 12 Shoring slot (where fitted)	
A.20	Test No. 14 - Lifting by means of grappler arms Applicable to all sizes when fitted with grappler arm lift positions/	

Note :

1) The externally applied forces shown below are for one end or one side only. The loads shown within the containers represent uniformly distributed internal loads only, and such loads are for the whole container.

2) The figures in this annex correspond to the tests described in B.2.12 to B.2.14 only where marked.

3) For definitions of R, P and T, see Section 1,C.

Section 3 Type of Container

A. General Requirements

1. Application

The requirements in this Section apply to :

- general purpose containers,
- thermal container,
- tank container, as specified in Table 3.4
- platform and platform – based container,
- non pressurized container for dry bulk cargoes, intended for carriage non-dangerous dry bulk cargo
- special container for use on seagoing ship and offshore installation

2. Definition

2.1 General purpose

General purpose container :

a container intended for the carriage and storage of unit loads and loos materials.

2.2 Thermal containers

Thermal containers :

are freight containers with insulated walls, doors, floor and roof or with these elements made of insulated materials which is retard the rate of heat transmission between the inside and outside boundary surfaces of the container and should be maintained the specific inside temperature, with specific thermal containers as the following :

1) Insulated containers are thermal containers without cooling or heating appliances.
2) Refrigerated containers are thermal containers cooled by an expendable refrigerant such as ice, dry ice or liquefied gas or by a mechanical refrigerating machinery set or an absorption-type refrigerating system.
3) Heated containers are thermal containers with a heat- producing appliances.
4) Cooled container are 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.
5) Cooled and heated container or Refrigerated and heated containers are thermal containers equipped with heat- producing appliance and refrigerating appliance.

6) MA containers are refrigerated and heated containers which are suitable for refrigerated transport in a modified atmosphere, whereby the gas concentration to which a cargo are different to that which normally occur at Standard Temperature and Pressure (STP).

7) CA containers are refrigerated and heated containers equipped with appliances for producing and regulating the atmosphere, whereby the gas concentration to which a cargo are different to that which normally occur at Standard Temperature and Pressure (STP) .

Removable refrigerating units :

are cold- or heat-producing sets or appliances designed for temporary attachment to insulation containers (clip-on units).

Batten :

are 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 :

are 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.

Floor air duct :

are passages located beneath the cargo support surface or on that surface to direct air flow.

Drainage :

are 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.

Refrigerating units room :

are a compartment or an enclosed space housing compressors and other components of refrigerating units.

Ceiling air duct :

are a passage or passages located in proximity to the ceiling to direct air flow.

Refrigerating plant :

are 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.

Refrigerating unit :

are 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).

2.3 Tank container

Compartment

A section of the tank formed by the shell, ends or complete bulkheads.

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.

Dangerous cargoes

Substances classified as dangerous according to IMDG Code.

Dry bulk

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

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.

Gas

Fluid substance having a vapour pressure greater than an absolute pressure of 0,3 MPa (3 bar) at 50 °C.

Liquid

Fluid substance having a vapour pressure not greater than an absolute pressure of 0,3 MPa (3 bar) at 50 °C.

Maximum allowable working pressure

The pressure assigned by either a competent authority or other responsible person to a particular tank, above which that tank is not intended to be operated

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%.

Tank(s)

For definition of tank container below, tank(s) means vessel(s) and associated piping and fittings which are designed to contain the cargo carried.

Tank container

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

Test pressure

the gauge pressure at which the tank is tested, measured in [MPa], [bar].

Total capacity

The volume of water which will completely fill the tank at +20 °C.

Ullage

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

2.4 Non pressurized container for dry bulk container

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 parallel piped 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.

3. Scope of survey

Survey covers the whole container: framework (supporting structure), floor, corner fittings and locking devices. The requirement specified in Section 1, G are to be considered.

The scope of survey may be extended depending on the type of container.

4. Technical documentation

Prior to construction of a single container or a prototype of container design type, technical documentation, specified in Section 1, B is to be submitted to BKI for approval.

B. General Purpose Container

1. Technical requirement

1.1 Door opening

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

1.1.2 It is recommended that the door opening in general purpose containers should correspond to the container internal dimensions, but in no case the dimensions of the door opening and the container internal dimensions can be less than those given in Table 3.1.

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

Table 3.1 Minimum dimension of internal and door opening

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	

1.2 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° and in a side wall 180°.

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 17712 (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.

2. Test

Testings required to this type of container as prescribed in Section 2. are to be carried out.

3. Marking

Marking for general purpose container shall be in accordance with Section 1, F.

C. Thermal Container

1. Technical documentation

In addition to the documents listed in Section 1, B.1, the following shall be submitted for approval of thermal containers:

- Technical description of refrigerating plant, diagrams and drawings of refrigerating plant and/or heating appliance indicating thermal, mechanical and other characteristics
- Drawings and data relating to the specification of thermal insulation
- Specification, diagrams and drawings of electrical source of power, together with its drive
- Thermal calculation
- Particulars of the manufacturer, type and rating of the intended refrigerating and heating appliances
- Programme and methods of thermal tests, indicating the predicted values
- Specification of electrical equipment indicating the characteristics of protection and control devices, drawings of jointing plugs, wiring and mounting diagrams.

2. Technical requirement

2.1 The materials used for the construction of thermal containers shall be resistant to corrosion or be durably protected against corrosion by adequate measures. Only materials which do not adversely affect the cargo may be used for the parts of the container interior which are in contact with the refrigerating air and for the corresponding structural components of the refrigerating and/or heating appliances.

2.2 Every thermal container shall be so constructed as to enable it to be closed in an airtight manner. The standard type is equipped with a double-leaf end wall door. Except in the case of insulated thermal containers without cooling or heating appliances, the other end wall shall be designed and constructed in such a way that it can be fitted within the standardized container dimensions with the necessary refrigerating and/or heating appliances or possesses the closable openings, standardized by position and size, for the temporary air-side connection of removable refrigerating units. After connection of these appliances the standardized dimensions of the container may be exceeded.

2.3 The internal surface shall be of such a nature as to permit thorough cleaning to be easily carried out. The detergents and cleaning methods normally used shall have no adverse effect on the lining.

2.4 The minimum internal dimension of thermal container are given in Tabel 3.2.

2.5 Provisions shall be made to ensure that cleaning water can drain away completely.

2.6 Insulation

2.6.1 Insulation materials for thermal containers shall be odourless and, if possible, non-hygroscopic.

2.6.2 The insulation on the side which is warmer in normal operation shall be provided with a watervapour-proof lining.

2.6.3 The insulation of the individual limiting surfaces shall be equal with regard to their heat-restraining capacity. In designing the roof insulation, the greater level of insulation shall be taken into account.

Table 3.2

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 height2) (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 BKI.

2) Part of the container height and length may be used for air circulation.

2.7 Ventilation

2.7.1. Where ventilation of the inner space is provided, the air inlets and outlets shall be protected against the ingress of water. The inlets and outlets shall be located in the upper part of the container where possible and shall be provided with a means of closure.

2.7.2 The opening design for ventilation of the container inside shall be provided mean of external air is to ensure their easy opening and closing from outside.

2.7.3 Applicable for 1AA, 1CC and 1C containers of type Container Structure Rigidity, the openings for cooling or heating air circulation from removable units are to comply with the following requirements (see Fig. 3.1:

1) projections around the openings are to be either circular or square with th 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 corner fittings; mm from the front faces of the
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 BKI.

2.8 Drainage system

2.8.1 The air coolers shall be provided with drip trays and adequate water outlets.

2.8.2 Operationally necessary drainage equipment shall operate in all operating and temperature conditions with fitting which open automatically above normal internal operating pressure;

2.8.3 Drains that can be shut off shall be capable of being operated from the outside.

2.8.4 Cleaning system for the interior of the container shall be provided with manual closures

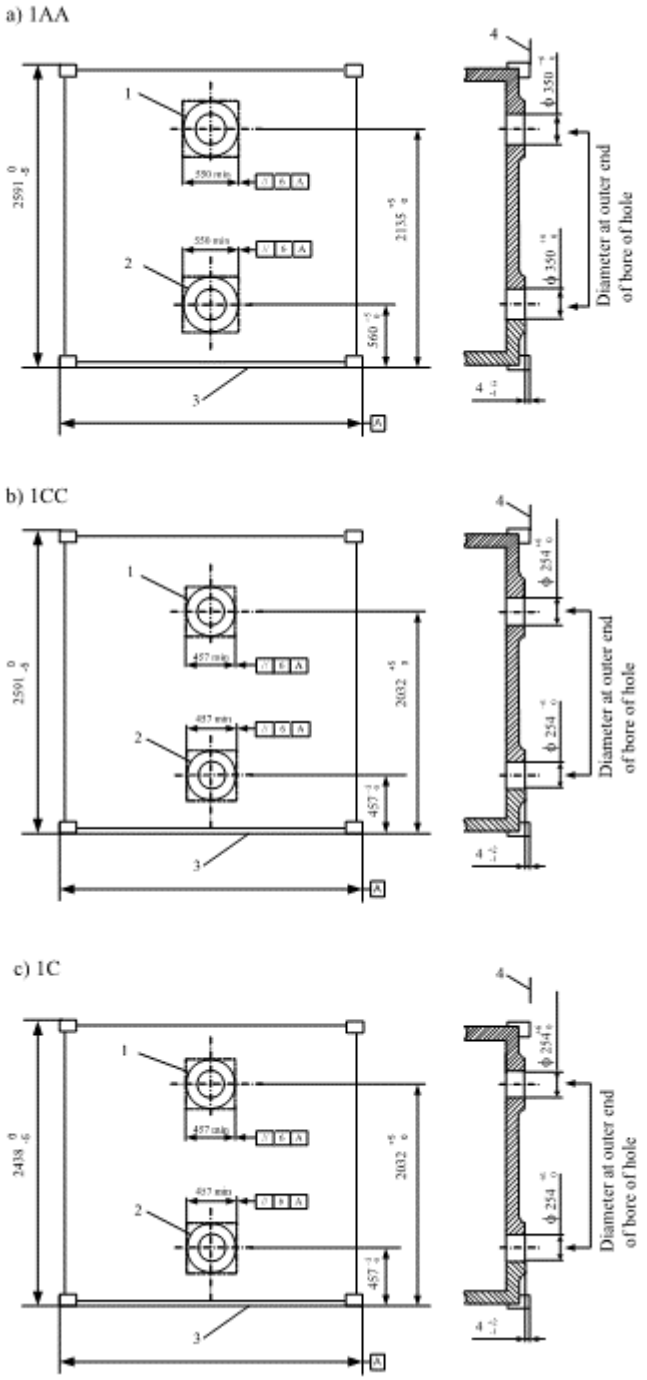


Fig. 3.1. Ventilation openings in the end wall of 1AA, 1CC and 1C containers

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.

2.9 Temperature monitoring equipment

2.9.1 At least two independent measuring points with separate readouts shall be provided for measuring the internal container temperature, so that the temperatures can be monitored from the outside.

2.9.2 Unless special requirements apply, a maximum total error of 0,5°C is permissible in respect of the indication and measuring accuracy.

2.9.3 Thermal container without insulated and cooled containers are to be fitted with a thermograph recording internal temperature.

2.10 Thermal Characteristics

The design of thermal containers shall be maintained with ensure that thermal characteristic specified in Table 3.3

Table 3.3 Thermal Characteristic Specification

Item	Type of Container	Umax [W/K]								Temperature			
		ID	1CC, 1C	1BB, 1B	1BBB	1AA, 1A	1AAAA	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	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-	13	22	31	33	40	42	44	46	255	–18	318	+45
6	Cooled and heated or refrigerated and heated,	13	22	31	33	40	42	44	46	289 255	+16 –18	253 318	–20 +45
7	Heated, self-powered	13	22	31	33	40	42	44	46	289	+16	253	–20
8	Cooled and/or heated, refrigerated and/or heated container, with	13	22	31	33	40	42	44	46				
9	Cooled and/or heated, refrigerated and/or heated container, with	13	22	31	33	40	42	44	46				

2.11 Using Intermediate Socket for Clip-On Unit

Arrangement of intermediate sockets for use of clip-on unit shall comply with Fig. 3.2

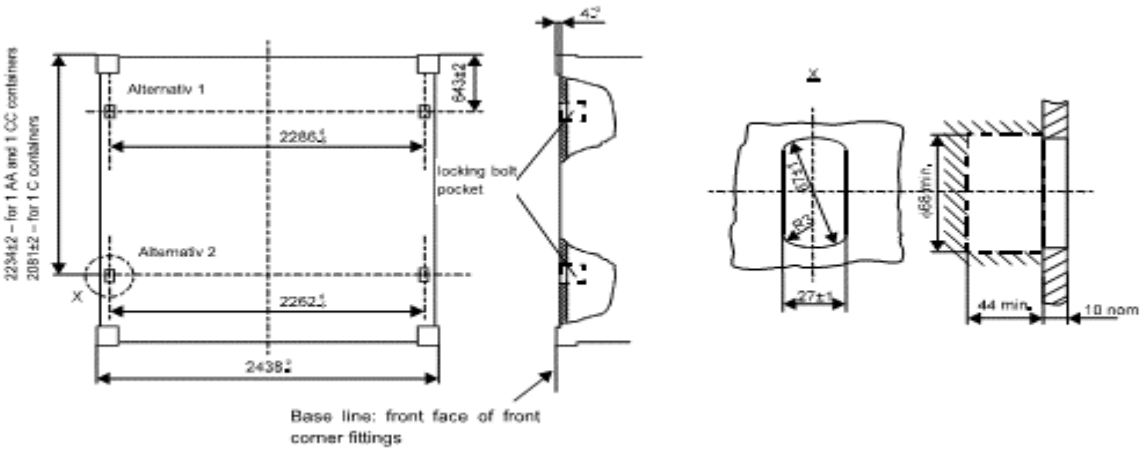


Fig. 3.2 Arrangement of intermediate sockets for clip-on unit

2.12 Electrical Equipment

2.12.1 Operation design for electrical equipment installation in thermal container shall use three-phase current supply sources when 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.

2.12.2 Correct operation with deviations from the rated frequency within ±2,5% shall be implemented for electric equipment and the degree of protection of electric equipment is at least IP 56.

2.12.3 Maximum electrical loading of electrical equipment is unit exceeding 15 KW (18,75 kVA)

2.12.4 Electrical equipment shall have insulation resistance that is not less than 1 MΩ.

2.12.5 Using of the earthing of electrical equipment, shall be implemented for the case of power supply as following:

- if power supply from an external sources of power, a separated earth strand in a flexible feeding power cable shall be used.
- if 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 shall be used.

2.12.6 A change-over switch that used as disconnection from an external power source and switching to its own power source shall be provided to electric installation of container.

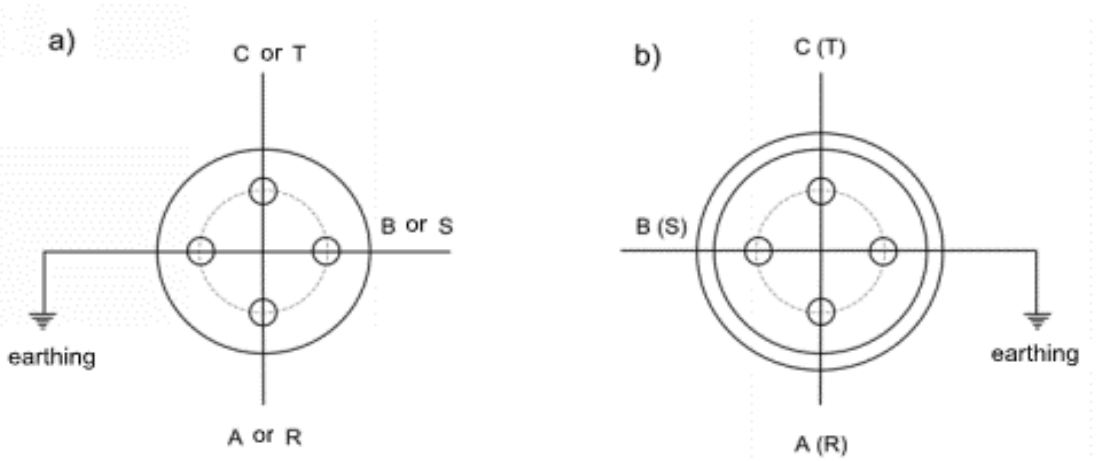
2.12.7 Plug and plug in sockets design shall comply with IEC 60947-1.

2.13 Cables for electrical installation

2.13.1 A flexible four-core cable is to be used with the core cross-section sufficient for the simultaneous supply of all receivers. 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.

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

2.13.3 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. 3.3.



a: plug (front view) ; b : plug – in socket (front view)

Fig. 3.3. Phase-sequence on plug and plug-in socket

2.14 Switch Gear, Starting and Protection Device

2.14.1 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.

2.14.2 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.

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

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

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

3. Scope of survey

In addition to scope of surveys specified in A.3, the thermal container have complied with this guidelines, shall also cover to all part of the thermal container, as following :

– Fixed refrigerating units and/or heating appliances of the container;

– Electric equipment;

– Source of powers supply, including prime mover.

4. Test

4.1 General

4.1.1 The thermal container and the built-in or built-on appliances shall be checked for the quality of the workmanship. The protection of sensitive structural components against damage shall be checked at the same time (see also Section 1, B.).

4.1.2 Each testing of container will be completion when the container is not show permanent deformation or abnormally condition to all part of container

4.1.3 The measuring devices to be used for the tests are subject to the following tolerances:

– Temperature measuring devices ± 0,5 °C
– Power measuring devices ± 2%
– Flow measuring devices ± 3%
– Pressure measuring devices ± 5%

4.2 Strength tests

4.2.1 The strength testing of thermal containers is governed where applicable by the particulars contained in Section 2, B.2.1 to B.2.13.

4.2.2 Where thermal containers are also intended for the carriage of hanging cargo, the suitability of the roof structure for carrying such a load shall be ascertained (see also Section 2, B.2.7).

4.2.3 Strength tests shall be carried out with built-in refrigerating and/or heating appliances or equivalent appliances in cases where such appliances contribute to the strength of the container.

4.3 Tightness test

4.3.1 The tightness test shall in principle be carried out only after completion of all the strength tests in accordance with 4.2, but before the tests to determine the coefficient of heat transfer in accordance with 4.4.

4.3.2 During the tightness test the inside and outside temperatures of the container shall be between 15°C and 25 °C; the difference between the two shall not however exceed 3°C.

4.3.3 The thermal container to be tested shall be in a normally equipped condition and shall be closed in the usual manner.

4.3.4 Refrigerating and/or heating appliances positioned inside the standardized container dimensions shall be in place during testing.

4.3.5 Containers equipped with apertures in one end wall that can be shut off for the temporary air-side attachment of removable refrigerating units are to be tested without these units and with normally closed apertures.

4.3.6 Procedure

The tightness test shall be carried out at an internal gauge pressure of 250 Pa ± 10 Pa. The air flow measured in m^3/h required to maintain this pressure is designated the air leakage rate.

4.3.7 Requirements

.1 Refrigerated and heated containers according to 4.3.4 constructed as described in 2.2 shall have an air leakage rate not exceeding 10 m^3/h.

.2 Insulated containers according to 4.3.5 shall have an air leakage rate not exceeding 8 m^3/h.

.3 For each door installed additionally compared with 2.2, the value given in 4.3.7.1 or 4.3.7.2, as applicable, may be exceeded by 5 m^3/h.

.4 The air leakage rates for MA/CA containers shall be agreed on individually from case to case.

4.4 Determination of the heat transfer coefficient

4.4.1 The heat transfer coefficient shall be determined only when the strength tests and the tightness test have been carried out.

4.4.2 The thermal container to be tested shall be in a normally equipped condition and shall be closed in the usual manner. Refrigerating and/or heating appliances positioned inside the standardized container dimensions shall be in place during testing.

4.4.3 Due to the lower cost, the heat transfer coefficient is usually determined by means of an internal heating test. However, if the test is to be carried out using the internal cooling method, special arrangements shall be made with BKI.

4.4.4 The internal heating test shall be carried out in a test room protected from direct sunlight and arranged in such a way that the temperature differences stated in 4.4.7.b) and d) can be maintained. The surfaces of the test room shall not have any particular radiation- reflecting properties.

4.4.5 The total heat transfer rate U is defined by the equation

$$U = \frac{Q}{\theta_e - \theta_i} \qquad [W/^oC]$$

Where

Q	[W]	electrical heat output including ventilator heat
θ_e	[°C]	average exterior temperature of the container
θ_i	[°C]	average interior temperature of the container

The average exterior temperature θ_e of the container is the arithmetic mean of the 12 temperature values measured at a distance of 10 cm from the exterior walls at the 8 comers and at the centres of the side walls, roof and floor. The average interior temperature θ_i of the container is the arithmetic mean of the 12 temperature values measured at a distance of 10 cm from the interior walls at the 8 comers and at the centres of the side walls, roof and floor.

4.4.6 The average wall temperature θ is derived from:

$$\theta = \frac{\theta_i + \theta_e}{2} \qquad [^\circ C]$$

It shall be between 20°C and 32°C in steady-state condition, with the difference between the interior and exterior temperatures being not less than 20°C.

4.4.7 The steady-state condition is achieved when, in addition to 4.4.6, the following requirements are met:

a) The maximum difference between the coldest and the warmest measuring point inside the container equals, at anyone time, 3°C.

b) The maximum difference between the coldest and the warmest measuring point outside the container equals, at anyone time, 3°C.

c) The maximum difference between any two average interior temperature values θ_i equals 1,5°C.

d) The maximum difference between any two average exterior temperature values θ_e equals 1,5°C.

e) The maximum difference between the lowest and the highest heat output Q equals 3 % of the lowest figure.

f) The test is to be performed with a mean wall temperature between +20°C and +32°C and a temperature difference between inside and outside of not less than 20°C

4.4.8 The heat transfer coefficient K is derived from:

$$K = \frac{U}{A} \qquad [W/m^2 \quad ^\circ C]$$

where

$$A = \sqrt{A_e \cdot A_i} \qquad [m^2]$$

that is, the geometric mean of the exterior surface area A_e and the interior surface area A_i of the container.

4.4.9 Procedure

.1 The container, which is equipped with appliances for heating and air circulation, shall be set up in the test room in such a way that air can flow around all sides of it

.2 The air flow outside the container shall be as uniform as possible everywhere and shall not exceed 2 m/s at a distance of 10 cm from the roof and the side walls, measured halfway along the container.

.3 The air flow within the container shall reach such a value that the conditions indicated in 4.4.7.a) are met.

.4 The container shall be heated electrically. The heating shall be adjusted in such a way as to fulfill the requirements according to 4.4.7. However, under no circumstances shall the interior temperature reach values which are unacceptable with regard to the materials used.

.5 All temperature measuring points and the container walls shall be protected from thermal radiation.

.6 After the steady-state condition defined in 4.4.7 has been reached, the temperatures and the heat output values shall be measured every half hour for a period of 8 hours.

4.4.10 Requirements

The overall heat transfer rate shall be determined according to the formula indicated in 5.4.2 and shall not exceed the value laid down for the individual application by the purchaser. The heat transfer coefficient may likewise be determined in accordance with 4.4.8.

4.4.11 Equivalent test methods

If the heat transfer of thermal containers is determined on the basis of other testing standards or codes, the test results will be confirmed by BKI, indicating the standard or code used, provided that the test method in question is equivalent to that prescribed by BKI.

4.5 Testing of series-manufactured thermal containers

4.5.1 Prototype testing of a thermal container shall be carried out in accordance with 4. If the thermal container is to be tested together with its refrigerating and/or heating appliances, an operational test in accordance with 11 shall also be carried out. If arrangements are made with regard to certification of the refrigerating performance, an additional performance test shall be carried out in accordance with 10.

4.5.2 The repetition of individual tests within a production series is in general to be done according to Table A.3. This results in the following arrangement:

.1 The tightness test according to 4.3 is performed on each container of a series.

.2 The operational test according to 11 is performed on each refrigerating and/or heating appliance.

.3 The determination of the heat transfer carried out according to 4.4 for one container of a series is regarded as adequate for production series of 100 containers, if within such a series no changes take place in the design, the materials used or the production methods.

.4 In the case of production series of more than 100 containers, the number of heat transfer measurements according to 4.4 shall be agreed with the Society.

.5 In the case of production series of more than 100 containers, the Society may, upon application by the manufacturer, accept the heat transfer measurement carried out for one container of this series as adequate for a maximum of 200 containers if the manufacturer has established and maintains a quality assurance system in accordance with a recognized standard (e.g. ISO 9000).

.6 The number of performance tests to be carried out on refrigerating and/or heating appliances is governed by 12.2.

5. Guidance concerning the arrangement of thermal containers on board ship

5.1 Prior to arranging thermal containers on board ship, a check shall be made to ascertain whether the ship's electricity supply is adequate for the additional operation of these containers.

5.2 Thermal containers and their equipment shall also be suitable for carriage on deck.

5.3 The containers shall be arranged in such a way that temperature checks can also be made in bad weather.

5.4 Arrangement on deck

When arranged on deck, the containers shall as far as possible be protected against the wash of the sea.

5.5 Arrangement below deck

5.5.1 When arranging thermal containers below deck, it shall be borne in mind that refrigerating systems equipped with air-cooled condensers require a large quantity of fresh air. The calculation of the minimum air requirement may be based on the following power specifications:

- 20'-refrigerated container: approx. 7,5 kW
- 40'-refrigerated container: approx. 11,0 kW

In the case of a mixed cargo (frozen cargo/fruit cargo), a power-reducing factor of approx. 0,7 can generally be reckoned with. Appropriate measures, e.g. air duct systems, shall be taken to ensure that the temperature distribution inside such cargo spaces is as uniform as possible.

5.5.2 Refrigerated containers, the refrigerating appliances of which operate on dry ice or liquefied gas, are not to be taken below deck.

5.6 Internal combustion engine drives

5.6.1 Thermal containers equipped with an internal combustion engine may be arranged below deck, provided that the flash point of the liquid fuel used is 60°C or above.

5.6.2 Where internal combustion engines operate on liquid fuels, the flash point of which is below 60°C, they may be arranged below deck together with the containers only on condition that the fuel tanks have been completely emptied or removed. The removed fuel tanks or the drained fuel shall be stored in a space approved for this particular purpose.

5.6.3 Even where arrangement below deck is permitted in accordance with 5.6.1, the operation of internal combustion engines is not permissible there.

5.6.4 The operation of internal combustion engines, the liquid fuel of which has a flash point below 60°C, is permitted on the open deck provided that such operation is not at variance with legal provisions of the national authorities having competence in respect of accident prevention and safety in shipping. Tanks for these fuels may be refilled only with the engines stopped and cold and under the supervision of the responsible officer.

5.6.5 Operation on board of internal combustion engines operating on gaseous fuels is not permitted. Prior to arranging such units on board, all fuel tanks which have not been fully drained or fully purged of gas shall be removed and stored in a well restrained manner in spaces specially approved for this purpose.

6. Construction and design of the refrigerating appliances

6.1 Number of refrigerator sets and design principles

6.1.1 Every refrigerated container shall be provided with a refrigerating appliance which apart from the electric power supply – operates independently.

6.1.2 Where only one refrigerator set is provided, it shall be so designed as to be capable of maintaining the required lowest internal temperature of the container at maximum ambient temperature on the basis of a daily service period not exceeding 18 hours. The ambient temperature shall be taken as 38 °C unless higher temperatures have been specified.

6.1.3 Where two or more refrigerator sets are provided for one container, the required lowest internal temperature shall be capable of being maintained in continuous operation even after failure of anyone refrigerator set.

6.1.4 Where two entirely independent refrigerator systems, each equipped with its own evaporator, are provided for refrigerating the container, they may be jointly considered as one refrigerator set for the purpose of 6.1.3, that is, they shall jointly maintain the required lowest internal temperature on the basis of a daily service period not exceeding 18 hours.

6.1.5 Refrigerated containers for the transport of dangerous goods (e.g. peroxide) are to be equipped with two entirely independent refrigerating units. Each of these units shall be capable of fulfilling the requirements under 6.1.3 independently. If the unit in service fails or cannot maintain the required internal temperature because of a fault, the spare unit shall automatically take over the refrigeration of the container. Where faults developed by a refrigerating unit in service are reported to a permanently manned station, this automatic changeover facility may be dispensed with.

6.2 Working pressures

6.2.1 The following maximum permitted working pressures apply to refrigerator sets equipped with air-cooled condensers and using the normal refrigerants:

- Refrigerant R 22 : 25 bar
- Refrigerant R 134 a : 17 bar

6.3 Safety equipment

6.3.1 Measures shall be taken which cause the compressor drive to be automatically switched off if the maximum permissible working pressure is exceeded

6.3.2 Vessels and units under pressure which can be isolated in normal operation and which contain liquid refrigerant shall be equipped with a safety valve. Blown-off refrigerant must be safely drained away.

6.3.3 Where a group 1 refrigerant is used in systems with a weight of charge not exceeding 25 kg, the installation of a maximum pressure governor that automatically cuts off the compressor drive irrespective of the type of drive - whenever the maximum permissible working pressure is exceeded may be accepted as an adequate safety device. However, this requires that the shut-off devices of refrigerant -containing vessels that can be completely isolated are not equipped for actuation in normal operation.

6.4 Pressure gauges

Suction and delivery pressure gauges are required only for the performance test or the operating trials, provided that group I refrigerants are used and that the weight of charge does not exceed 50 kg. The pressure gauges may be removed on completion of testing; however, the connections shall remain accessible for subsequent check measurements.

6.5 Other particulars

The particulars indicated in 6.1 to 6.4, 8 and 13 apply by analogy, where applicable, to any types of appliances not expressly mentioned.

7. Construction and design of heating appliances

7.1 Design basis

Heating appliances shall be so designed as to be capable of maintaining an internal temperature of +16°C at an ambient temperature of -20°C on the basis of a daily service period of 18 hours, unless special requirements of the purchaser are to be taken into account.

8. Electrical equipment

8.1 All parts of the electrical equipment shall conform to the latest state of the art with respect to their use aboard seagoing ships (see also Rules for Electrical Installations (Pt.1, Vol.IV) and ISO 1496-2, Section 7 "Electrical aspects of thermal containers").

8.2 All electrical equipment components intended to be used aboard seagoing ships shall be chosen and designed in such a way that they remain operational at the voltage and frequency variations occurring in normal ship service.

8.3 All electric motors used shall be designed for continuous duty and shall be tested on a suitable test bed.

8.4 The power consumption per refrigerated container shall not exceed 15 kW.

8.5 The length of the flexible connecting cable shall be at least 15 m or shall equal one container length plus 6 m, as required. Rubber sheathed cables of type" H07RN-F" or an equivalent type shall be used.

9. Remote monitoring of thermal containers

9.1 Where remote monitoring of thermal containers is effected by means of data transmission via electrical cable, the requirements of ISO standard 10368 shall be complied with.

10. Performance testing of the refrigerating and/or heating appliances

10.1 The purpose of the performance test is to prove the sufficiency of the refrigerating and/or heating appliance design for the intended application of the thermal container

10.2 The refrigerating and/or heating appliances which arc to undergo performance testing shall in general be tested in combination with a thermal container with a known rate of heat transfer.

10.3 The container shall be set up in a test room in which temperatures which correspond to the subsequent conditions of service of the container can be maintained. If this is not possible, the Society will decide on the method to be used for the conversion from the test conditions to the normal operating conditions.

10.4. 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.

10.5 Procedure

10.5.1 After the ambient conditions indicated have been reached, the refrigerating or heating equipment shall be started up. After the steady-state condition has been reached, the following measurement data shall be recorded at intervals of 30 minutes:

- Temperatures inside and outside the container
- Power consumption of the supplementary heating including the fans.

10.5.2 After the steady-state condition has been reached, the design temperatures shall be kept constant for a period of at least 8 hours.

10.5.3 For the performance test of a refrigerating appliance, following this an additional heating load of at least 25% of the total heat transfer valid for the reference data shall be applied in the interior of the container. The required interior temperatures shall be kept constant for a further 4 hours.

10.5.4 Details of performance testing of refrigerating appliances not operating on the principle of a refrigerator with a pressure-cooled evaporator shall be agreed with the Society in each individual case.

10.6 Requirements

10.6.1 Refrigerating appliances

It shall be proved that the required interior temperatures can be maintained under the conditions indicated in 8.2.3.

10.6.2 Heating appliances

It shall be proved that the required interior temperatures can be maintained for a period of at least 4 hours at a maximum running time of 75 %. Allowance is to be made for the difference in the rate of heat transfer between the container used for testing and the reference data for the type of container in question.

11. Operational testing of the refrigerating and/or heating appliances

11.1 The operational test shall be carried out to prove that the modes of operation "refrigerating", "defrosting" and, where provided, "heating" can be effected properly and with each type of drive proposed.

11.2 The automatic operation of the refrigerating and/or heating appliances shall be tested by changing the setting of the space thermostat.

11.3 The satisfactory functioning of the safety devices (e.g. overpressure and under pressure cut-outs) and the temperature measurement and recording devices is to be proved.

12. Scope of testing of refrigerating and heating appliances in the case of series production

12.1 Prototype testing of a refrigerating and/or heating appliance shall be carried out in accordance with 10. and 11., shall be carried out if performance data of cold- or heat-producing appliances are to be certified by the Society. Such certificates may be issued either in conjunction with the thermal container or separately.

12.2 Tests within a production series

12.2.1 The number of performance tests to be carried out on refrigerating and/or heating appliances in accordance with 10. and 11. shall be agreed with the Society. Existing experience and the spare capacity measured in respect of the prototype will be taken into account.

12.2.2 The operational test described in 11. shall as a rule be performed on every refrigerating and/or heating appliance. For large production series, on application by the manufacturer tests may be conducted according to an agreed random sampling system, provided that: the manufacturer maintains an approved quality assurance system, reports of the operational tests on the individual refrigerating and heating appliances are prepared by the manufacturer.

13. Marking

13.1 With regard to the marking of thermal containers, in addition to the requirements in Section 1, F. of the following guidelines shall be complied with:

1) Name plate with containing technical data of the refrigerating and/or heating plant is to be attached to the plant in a conspicuous place and shall be provided by manufacturers
2) The usable cubic capacity is to be stated on the outside of the container.
3) If refrigerated containers are cooled by dry ice or liquefied gas, a notice to this effect is to be applied to the outside of the container in a clearly visible manner.
4) MA/CA containers shall display a notice drawing attention to the risk of suffocation due to lack of oxygen.
5) Where thermal containers are intended and equipped for the transport of hanging cargo, the maximum allowable payload for such cargo is to be stated near the door inside the container.
6) A circuit diagram and placard instruction shall be attached to refrigerating and / or heating plant.
7) An indicator of the minimum and the maximum inside temperature of the container design shall use the national or the English language, and are to be placed on the door of the container.

13.2 Marking for refrigerator manufacture

The refrigerator manufacturer shall furnish at least the following information on a permanently attached name plate:

- Maker, year of manufacture, type designation and serial number,
- Refrigerant and weight of charge,
- Electrical connection data

and, if internal combustion engines are present:

- Flash point of the liquid fuel used.

D. Tank Container

This sub-section specifies the basic specification and testing requirements for tank container suitable for the carriage of gases, liquid and solid substances (dry bulk) which may be loaded or unloaded by gravity or pressure discharge. Additionally, tank containers are to meet the requirements of International Maritime Dangerous Goods Code (IMDG Code), European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR), European Agreement Concerning the Carriage of Dangerous Goods by Rails (RID) as applicable.

The container types covered by this section are given in Table 3.4.

Table 3.4 Type of Tank Container

Type of cargo and ISO tank type					Minimum test pressure	
Liquids		Gases	Dry Bulk		Mpa	Bar
Non-dangerous	Dangerous		Horizontal Discharge	Tipping DIscharge		
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
	T5				0,6	6,0
		T7			1,05	10,5
		T8			2,2	22,0
		T9			Not specified	

The overall external dimensions and tolerances of tank containers covered by this section shall be those established in Annex A.

The ratings given in Table A.1 , are applicable to all type of tank containers, except that for particular traffic higher values are permissible for type of 1 BBB, 1 BB, 1 B, 1 BX, 1 CC, 1 C and 1 CX.

The design of tank containers of types 1AAA and 1 BBB shall take into special account the problems of the dynamic instability of these containers, compared with 1 AA and 1 BB tank containers, when operating in the road/rail environment in a partially laden condition.

1. Technical documentation

In addition to technical documentation specified in A.4, the following documentations are to be submitted in electronic format to BKI 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 BKI;
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 requirement

2.1 General

2.1.1 Tank container 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:

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

Unless the requirements are specified below, the requirements of corner fitting, base structure, end structure and side structure in Section 1, C shall be applied as appropriate.

When the tank container is loaded to its rating *R,* no part of the tank or its associated shell fittings shall project downwards below a plane situated 25 mm above the base plane (bottom faces of the bottom corner fittings).

2.1.2 All tank containers shall be capable of being supported only by load-transfer areas in its base structure, except for 1CC, 1C and 1CX, 1D and 1DX.

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

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

2.1.4 Each pair of load transfer areas associated with an end transverse member shall be capable of transferring load of not less than R. For intermediate load transfer area, each pair shall be capable of transferring load of not less than 2*R/n,* where n is the number of pairs of intermediate load transfer area.

2.1.5 The load transfer zones shall lie within the two 250 mm wide zones defined in Fig. A.6. Each load transfer areas shall have a longitudinal dimension of at least 75 mm.

2.1.6 For each load transfer area of gooseneck tunnel as defined in Fig. A.15 the sum of upper part A and lower part B shall not be less than 1250 mm^2.

2.1.7 Fork-lift pockets shall not be provided in tank containers.

2.2 Tanks

2.2.1 Tank or tanks shall be designed and constructed with a support structure to provide a secure base during transport. The tank or tanks shall be capable of being filled and emptied without removal from the framework.

The combined stresses caused by tank mountings and their attachments shall not cause excessive stress in any portion of the tank shell.

2.2.2 Tanks or tank compartments without vacuum relief devices shall be designed to withstand, without permanent deformation, an external pressure of at least 40 kPa above the internal pressure.

2.2.3 Tanks equipped with vacuum relief valves shall be designed to withstand, without permanent deformation, an external overpressure of 21 kPa or greater.

2.2.4 Under each load specified in 2.1.1, the safety factors to be observed shall be as follows:

- For metals with clearly defined yield stress (R_e) – a safety factor of 1,5 in relation to the determined yield stress;
- For metals not exhibiting clearly defined yield stress – a safety factor 1,5 in relation to 0,2% proof stress and 1% proof stress for austenitic steel.

2.2.5 For metals with clearly defined yield point or characterized by 0,2% proof strength, generally, or 1% proof strength for austenitic steels, stress in the tank shell shall not exceed $0,75R_e$ or $0,50R_m$, whichever is lower, at the test pressure

2.2.6 Steels used in the construction of the tank shall have an elongation at fracture, in %, of not less than $10,000/R_m$ with an absolute minimum of 16% for fine-grain steels and 20% for other steels. Aluminium and aluminium alloys, elongation at fracture, in %, of not less than $10,000/6R_m$ with an absolute minimum of 12%.

For the purpose of determining actual values, the axis of the tensile test specimen shall be at right angles (transversely) to the direction of rolling. The permanent elongation at fracture shall be measured on test specimens of rectangular cross-section in accordance with ISO 6892:1998 using a 50 mm gauge length.

2.2.7 The cylindrical portions, ends (heads) and manhole covers of tanks not more than 1,80 m in diameter shall be not less than 5 mm thick in the reference steel or of equivalent thickness (see 2.2.10) if other metal is to be used.

For tanks more than 1,80 m in diameter, the shell is to be not less than 6 mm in the reference steel or is to be of equivalent thickness if other metal is to be used, except that for powdered or granular solid substances of packing group II or III as defined in IMDG Code, the minimum 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.

2.2.8 When additional protection against tank damage is provided, the tank with test pressures less than 2,65 bar may have the minimum shell thickness reduced, in proportion to the protection provided, as approved by the competent authority. However, tanks not more than 1,80 m in diameter shall be not less than 3 mm thick in the reference steel or of equivalent thickness in the metal to be used. Tanks more than 1,80 m in diameter shall be not less than 4 mm thick in the reference steel or of equivalent thickness if other metal is to be used.

2.2.9 The additional protection referred to in 2.2.8 may be provided by overall external structural protection, such as suitable "sandwich" construction with the outer shielding secured to the tank, double-wall construction or by enclosing the tank in a complete framework with longitudinal and transverse structural members or other method approved by

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

$$e_1 = \frac{21,4 \cdot e_0}{\sqrt[3]{R_{m1} \cdot A_1}} \quad [\text{mm}]$$

where:

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

e_0 : minimum thickness of the reference steel specified in column 13 or 14 of 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, [%].

2.2.11 When, in the IMDG Code Dangerous Lists, a minimum thickness of 8 mm, 10 mm or 12 mm is specified, it shall be noted that these thicknesses are based on the properties of the reference steel and a tank diameter of 1,80 m. When a metal other than mild steel is used or the tank has a diameter of more than 1,80 m, the thickness shall be determined using the following formula:

$$e_1 = \frac{21{,}4 \cdot e_0 \cdot d_1}{1{,}8 \cdot \sqrt[3]{R_{m1} \cdot A_1}} \quad [\text{mm}]$$

where:

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

e_0 : minimum thickness of the reference steel specified in column 13 or 14 of 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].

2.2.12 The cylindrical portions, ends (heads) and manhole covers of all tanks shall be not less than 3 mm thick regardless of the material of construction. The calculating method for material made of other than metal is subject to BKI satisfactory.

2.2.13 In no case shall the wall thickness be less than that prescribed in 2.2.7, 2.2.8 and 2.2.12. This thickness shall be exclusive of any corrosion allowance. An allowance for corrosion shall be taken into consideration where necessary.

2.2.14 There shall be no sudden change of plate thickness at the attachment of the ends to the cylindrical portion of the tank.

2.2.15 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 BKI. Percentage of the welded joints to be inspected in tanks intended for the carriage of other cargoes is to be agreed with BKI in each particular case.

2.2.16 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.

2.2.17 Tank, fittings, and pipework shall be constructed from materials which are:

1) substantially immune to attack by the tank contents
2) properly passivated or neutralized by chemical reaction; or
3) lined with corrosion-resistant material directly bonded to the tank shell or attached by equivalent means.

2.2.18 When tank are lined, the lining shall be substantially immune to attack by the tank contents, homogeneous, non-porous, free from perforations, sufficiently elastic and compatible with the thermal expansion characteristics of the tank. The lining of tank, fittings and piping shall be continuous, and shall extend around the face of any flange. Where external fittings are welded to the tank, the lining shall be continuous through the fitting and around the face of external flanges

2.2.19 Gaskets shall be made of materials not subject to the attack by the tank contents.

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 the tank is to be fully filled at the ambient temperature of 50°C (323 K).

2.2.21 Tanks or compartments tank shall be provided with manholes for complete internal inspection. The size of manholes shall be a minimum of 500 mm in diameter and shall be determined by the need for men and machines to enter the tank to inspect, maintain or repair the inside.

2.2.22 Manholes shall be provided with adequate closures to prevent accidental escape of the tank contents.

2.2.23 Adequate provision shall be made for the sealing of the tank in accordance with international customs agreements.

2.3 Fittings and their Arrangement

2.3.1 General

.1 All openings in the tank, intended for filling or discharging the tank, shall be fitted with a manually operated stop-valve as close to the tank shell as reasonably practicable. Other openings, except for openings leading to venting or pressure relief devices, shall be equipped with a stop-valve or another suitable means of closure located as close to the tank shell as reasonably practicable.

As far as reasonably practicable, those fitting shall be grouped together.

Fitting shall be so arranged as to be protected against the risk of being wrenched off or damaged during handling and transport.

.2 Each pressure relief device inlet shall be situated on top of the tank in a position as near the longitudinal and transverse center of the tank as reasonably practicable. All pressure relief device inlets shall, under maximum filling conditions, be situated in the vapour space of the tank and the devices shall be so arranged as to ensure the escaping vapour is discharged unrestrictedly.

.3 No stop-valve shall be installed between the tank and the pressure relief devices.

.4 Each connection to the tank shall be clearly marked to indicate its function.

2.3.2 Pressure-Relief Devices

.1 Every tank or compartment of a tank with a similar capacity shall be provided with one or more pressure relief devices of the spring-loaded type and may in addition have a frangible disc or fusible element in parallel with the spring-loaded devices.

.2 All pressure relief device shall be set to operate at a pressure not higher than the MAWP of the tank.

.3 Tank as specified in portable tank instruction from IMDG Code for pressure relief provisions other than “normal” shall be provided with pressure relief device comprising a frangible disc preceding a spring-loaded pressure relief device. When a frangible disc is inserted in series with the required pressure relief device, the space between the frangible disc and the pressure relief device shall be provided with a pressure gauge or suitable tell-tale indicator for the detection of disc rupture, pinholing, or leakage which could cause a malfunction of the pressure relief system.

.4 Tanks intended for the transport of gases shall be provided with one or more spring-loaded pressure relief devices.

.5 Each tank or compartment thereof intended to carry non-dangerous cargo shall be fitted with a pressure relief device set to be fully open at a pressure not greater than the tank's test pressure, to prevent excessive internal overpressure. Such devices shall be connected to the vapour space of the tank and

located as near to the top of the tank and as near to the tank's (or tank compartment's) mid-length as practicable.

These pressure relief devices should have a minimum relief capacity of 0,05 m^3/s of standard air (an absolute pressure of 100 kPa at 15°C)

This may be considered as providing overpressure protection under non-emergency conditions. But should not be considered as adequate protection for a tank container, or compartment thereof, against excessive overpressure under full fire exposure conditions, dry bulk dust explosion or higher dry bulk pressurization.

2.3.3 Design of Pressure-Relief Devices

.1 Pressure relief devices shall be designed to prevent the entry of foreign matter, the leakage of liquid or gas and the development of any dangerous excess pressure.

.2 The spring-loaded pressure relief device according to 2.3.2.1 shall have a minimum cross-sectional flow area equivalent to an orifice of 31,75 mm diameter. Vacuum relief devices, when used, shall have a cross-sectional flow area not less than 284 mm^2.

.3 Except for gases as classified by IMDG Code, combined delivery capacity of the pressure relief system (taking into account the reduction of the flow when the tank is fitted with frangible discs preceding spring-loaded pressure relief devices or when the springloaded pressure relief devices are provided with a device to prevent the passage of the flame), in conditions of complete fire engulfment of the tank shall be sufficient to limit the pressure in the tank to 20% above the start-to-discharge pressure of the pressure-limiting device. Emergency pressure relief devices may be used to achieve the full relief capacity prescribed. These devices may be fusible, springloaded or frangible disc components, or a combination of spring-loaded and frangible disc devices.

For gases, the combined delivery capacity of the relief devices shall be sufficient that, in the event of total fire engulfment, the pressure (including accumulation) inside the tank does not exceed 120% of the MAWP. Spring-loaded relief devices shall be used to achieve the full relief capacity prescribed. In the case of multi-purpose tanks, the combined delivery capacity of the pressure relief devices shall be taken for the gas which requires the highest delivery capacity of the gases allowed to be transported in tanks.

.4 The vacuum-relief device shall be set to relieve at a vacuum setting not greater than - 0,21 bar unless the tank is designed for a higher external overpressure, in which case the vacuum-relief pressure of the device to be fitted shall be not greater than the tank design vacuum pressure.

.5 The required pressure relief device shall be set to start to discharge at a nominal pressure of five sixths of the test pressure for tanks having a test pressure of not more than 4,5 bar and 110% of two thirds of the test pressure for tanks having a test pressure of more than 4,5 bar. After discharge, the device shall close at a pressure not more than 10% below the pressure at which the discharge starts. The device shall remain closed at all lower pressures. This requirement does not prevent the use of vacuum relief or combination pressure relief and vacuum relief devices.

.6 Vacuum-relief devices used on tanks intended for tank contents with flashpoint at or below 60 °C, including elevated-temperature substances transported at or above their flashpoint, shall prevent the immediate passage of flame into the tank, or the tank shall have a shell capable of withstanding, without leakage, an internal explosion resulting from the passage of flame into the tank.

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

.8 Frangible discs should rupture at a nominal pressure equal to the tank test pressure. For the tank intended for the carriage as specified in 2.3.2.3, the frangible discs should rupture at a nominal pressure that is 10% above the start-to-discharge pressure of the valve.

.9 Fusible elements shall operate at a temperature between 100°C and 149°C on condition that the pressure in the tank at the fusing temperature will be not more than the test pressure. They shall be placed at the top of the tank with their inlets in the vapour space, and when used for transport safety purposes, they shall not be shielded from external heat.

.10 Every pressure relief device shall be clearly and permanently marked with the following:

1) the pressure (in bar or kPa) or temperature (in ^{o}C) at which it is set to discharge;
2) the allowable tolerance at the discharge pressure, for spring-loaded devices;
3) the reference temperature corresponding to the rated pressure, for frangible discs;
4) the allowable temperature tolerance, for fusible elements;
5) the rated flow capacity of the spring-loaded pressure relief devices, frangible discs or fusible elements in standard cubic metres of air per second (m^3/s); and
6) the cross sectional flow areas of the spring-loaded pressure relief devices, frangible discs and fusible elements in mm^2.
7) the manufacturer's name and relevant catalogue number.

2.4 Valves

2.4.1 For general requirements of stop-valve intended for filling or discharging the tank, see 2.3.1.

2.4.2 Each stop-valve or other means of closure shall be designed and constructed to a rated pressure not less than the MAWP of the tank, taking into account the temperatures expected during transport.

All stop-valves with screwed spindles shall close by a clockwise motion of the handwheel. For other stop-valves, the position (open and closed) and direction of closure shall be clearly indicated.

2.4.3 Certain substances shall not be transported in tanks with bottom openings. When the applicable tank instruction identified in the Dangerous Goods List and indicates that bottom openings are prohibited, there shall be no openings below the liquid level of the tank when it is filled to its maximum permissible filling limit. When an existing opening is closed, it shall be accomplished by internally and externally welding one plate to the tank.

2.4.4 Bottom discharge outlets for tanks carrying certain solid, crystallizable or highly viscous substances shall be equipped with not less than two serially fitted and mutually independent shut-off devices. The design of the equipment shall be to the satisfaction of the competent authority or its authorized body and shall include:

1) an external stop-valve, fitted as close to the tank shell as reasonably practicable, and so designed as to prevent any unintended opening through impact or other inadvertent act; and
2) a liquid-tight closure at the end of the discharge pipe, which may be a bolted blank flange or a screw cap.

2.4.5 For other than specified in paragraph 2.4.4, bottom discharge outlet shall be equipped with three serially fitted and mutually independent shut-off devices. The design of the equipment shall be to the satisfaction of the competent authority or its authorized body and include:

1) a self-closing internal stop-valve, that is a stop-valve within the tank or within a welded flange or its companion flange, such that:
   a) the control devices for the operation of the valve are designed so as to prevent any unintended opening through impact or other inadvertent act;
   b) the valve may be operable from above or below;

c) if possible, the setting of the valve (open or closed) shall be capable of being verified from the ground;

d) except for tanks having a capacity of not more than 1000 L, it shall be possible to close the valve from an accessible position of the tank that is remote from the valve itself; and

e) the valve shall continue to be effective in the event of damage to the external device for controlling the operation of the valve;

2) an external stop-valve fitted as close to the tank shell as reasonably practicable; and

3) a liquid-tight closure at the end of the discharge pipe, which may be a bolted blank flange or a screw cap.

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

2.4.7 Glass level-gauges and gauges made of other fragile material, which are in direct communication with the contents of the tank, shall not be used.

2.5 Piping

2.5.1 The burst pressure of all piping and pipe fittings shall be not less than the highest of four times the MAWP.

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

2.5.3 Piping shall be designed, constructed and installed so as to avoid the risk of damage due to thermal expansion and contraction, mechanical shock and vibration. All piping shall be of a suitable metallic material. Welded pipe joints shall be used wherever possible.

2.5.4 Tanks shall be capable of being electrically earthed when intended for tank contents with flashpoint at or below 60°C, including elevated-temperature substances transported above their flashpoint. Measures shall be taken to prevent dangerous electrostatic discharge.

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

2.6 Optional features

2.6.1 Gooseneck tunnel

Gooseneck tunnels shall be provided as mandatory features in containers 1EEE, 1AAA, and may be provide as optional features in containers 1EE, 1AA, 1A and 1AX. The dimension of gooseneck tunnels shall be in accordance with Fig.A.3 and base structure as specified in 2.1.6

2.6.2 Walkways

Where provided, walkways shall be designed to withstand a loading of not less than 3 kN uniformly distributed over an area of 600 mm x 300 mm. Longitudinal walkways shall have a minimum width of 400 mm

2.6.3 Ladder

Where provided, ladders shall be designed to withstand a load of 200 kg on any rung.

2.6.4 Tank insulation

When insulation is provided, the design and construction shall be such that the insulation will in no way impinge on the specified requirements nor interfere with the proper function of the tank fittings.

Due regard should be given to the problems of variation in ambient temperature, corrosive atmospheres. the possibility of uncontrolled cargo release in fire, etc.

2.6.5 Tank heating and refrigeration

When heating or refrigeration is provided, due consideration shall be given to the safety of the tank and its contents. Suitable safeguards shall be provided to avoid the development of excessive temperature and stresses.

3. Test

3.1 General requirements

3.1.1 The requirements of this sub-section 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.

The tank container under test, unless otherwise stated, shall be loaded with a suitable fluid/dry bulk to achieve the test load or loading specified.

If the test load or loading cannot readily be met by the above method, or if such a method is undesirable, the tank container shall be loaded with a suitable fluid/dry bulk and a supplementary load or loading shall be applied. The total load or loading thus applied shall be such as to simulate uniform loading.

When the load is not uniformly distributed, the actual bending moments are not to differ from those calculated by more than 20 per cent.

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

3.1.4 The tests outlined in this sub-section are to be carried out in the presence of a Surveyor on the tank container that has successfully completed the tests required by Section 2, B. The test required in section 2, B consists of :

1) Stacking, see Section 2, B.1
2) Lifting from the four top corner fittings, see Section 2, B.2
3) Lifting from the four bottom corner fittings, see Section 2, B.3
4) Restraint test (longitudinal), see Section 2, B.4
5) Transverse rigidity, see Section 2, B.9
6) Longitudinal Rigidity, see Section 2, B.10

The stacking test is to be carried out with tank containers filled completely with water.

3.2 Walkways strength

3.2.1 This test shall be carried out on all walkways, where provided on a tank container, to prove the ability of the walkway to withstand the loads imposed by persons working thereon.

3.2.2 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 shall be uniformly distributed over an area of 300 x 600 mm located at the weakest section of the walkway.

3.3 Ladder strength

3.3.1 This test shall be carried out on all ladders, where provided on a tank container, to prove the ability of the ladder to withstand the loads imposed by persons working thereon.

3.3.2 The container is to be submitted to this test with no internal loading. A load of 200 kg shall be positioned at the center of the widest rung.

3.4 Longitudinal strength

3.4.1 The tank container shall be loaded in such a way that the combined mass of the tank container and test load is equal to R. The tank container shall be positioned with its longitudinal axis vertical (a tolerance of 3° is acceptable). The container is to be held in this position for a period of not less than 5 minutes. No external forces are to be applied to the container.

The container is to be supported at the lower end of the base structure of the tank container acting only through the two bottom corner fittings giving both vertical and horizontal securement, and by means of anchor devices acting through the corner fittings at the upper end of the base structure in such a manner as to provide horizontal restraint only, see Fig. 3.4.

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

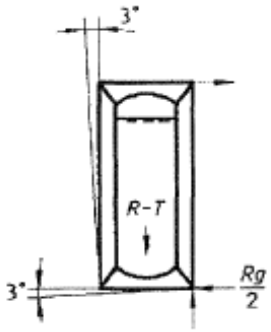


Fig. 3.4.a End elevation

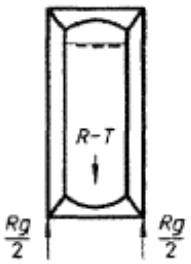


Fig. 3.4.b Side elevation

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 BKI, the tank container is adequately tested in respect of tank-to-framework connections, see Fig. 3.5.

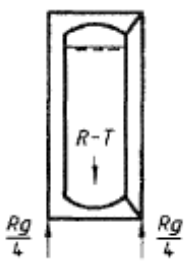


Fig. 3.5.a End elevation

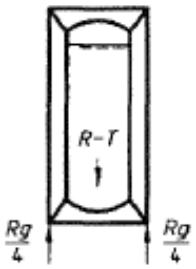


Fig. 3.5.b Side elevation

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

3.5 Transverse strength

3.5.1 A uniformly loaded tank container having a combined mass of the tank container and test load is equal to R. The tank container shall be positioned with its transverse axis vertical (a tolerance of 3° is acceptable).

The tank container is to be held in this position for a period not less than 5 minutes (Fig. 3.6). No external forces are to be applied to the container.

The container is to be supported at the lower end of the base structure of the tank container acting only through the two bottom corner fittings given both vertical and horizontal securement, and by means of anchor devices acting through the corner fittings at the upper end of the base structure in such a manner as to provide horizontal restraint only, see Fig. 3.6.

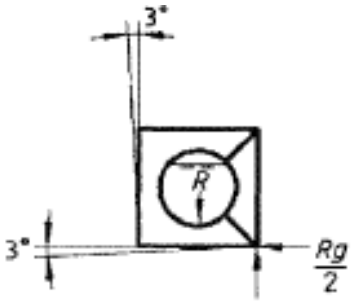


Fig. 3.6.a End elevation

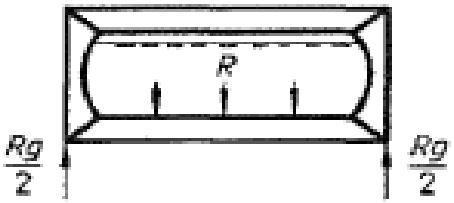


Fig. 3.6.b Side elevation

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

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 BKI, the tank container is adequately tested in respect of tank-to-framework connections, see Fig. 3.7.

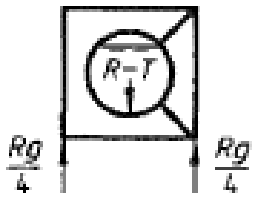


Fig. 3.7.a End elevation

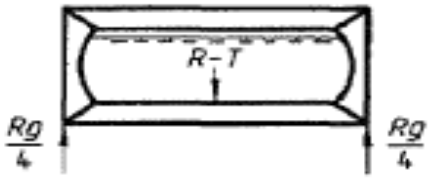


Fig. 3.7.b Side elevation

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 This test shall be carried out to simulate, statically, the known dynamic condition when the load transfer areas are only partially in contact with the carrying vehicle, within the space provided between the twistlock and the bottom corner fitting. This test only confirms the strength of the structure in relation to static load-carrying ability.

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

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

Repeat the test with the supports positioned at the outer ends of the allowable transverse support area.

In the case of tank containers with symmetrical load transfer areas, only one end need be tested. Where the load-transfer areas are not symmetrical, both ends shall be tested.

3.6.3 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 3.1.4 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 3.4 or a pressure equal to 1,5 times the design pressure of the tank (compartment) where the greater value shall be taken. 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.

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°C (293 K), l,
14) water capacity of each compartment of the tank at +20°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), °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 Section 1, F.13.

4.2 Additional marking

4.2.1 In addition to the requirements of Section 1, F, 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.

5. Checking

Tank Containers are to be checked within the scope specified in Section 1, G.1.2.

E. Platform and Platform – based 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. Technical documentation

In addition to technical documentation, required in A.4, the following documentation is to be submitted to BKI for approval in electronic format:

- Drawings of devices for fixing end structures or corner posts,
- Drawings of pack forming devices.

2. Technical requirement

In addition to the requirements of the present Section, containers are to comply with the applicable requirements specified in Section 1, C.

2.1 Dimensions

The overall external dimensions and tolerances of the platform container shall be established in Table A.1, except that the requirement for overall top lengths (L) of platform-based containers with incomplete superstructure may be relaxed to the extreme limits specified in Table 3.5.

For platform-based containers with ends in folded position, the external length and width are to be as specified in Table A.1.

An interlocked pile of folded containers is to be capable of having the plan dimensions established in Table A.1 and a height not exceeding 2591 mm.

Any movable part which, if unsecured, could lead to a hazardous situation shall be provided with an adequate securing system having external indication of the positive securement of that system in the appropriate operating position.

Table 3.5

Type of container	*Overall top dimension in tare condition T* $L_{max.}$ [mm]	*Overall top dimension when loaded to R* $L_{min.}$ [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. Test

3.1 Irrespective of their design, type or materials used, containers are to be subjected to tests and loads specified in Section 2, B if the test loads and other test data are not modified in the present Section, as well as to additional tests specified in the present Section.

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

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

3.4 The following tests for platform and platform-based containers to be carried out in accordance with Section 2,B are as follow :

- Lifting from the Top Corner Fittings,
- Lifting from the Bottom Corner Fittings,
- Lifting from Fork-Lift Pockets,
- Stacking Strength without internal loading,
- Floor Strength,
- Restraint in Longitudinal Direction
- Longitudinal Strength (Rigidity)
- Transverse Rigidity Test (Where corner posts are not connected by headers, they are to be loaded by 75 kN each)

In addition to the tests above, for platform-based container, the strength of end walls and roof strength tests shall also be carried out in accordance with Section 2, B.2.5 and B.2.7

3.5 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 2.1 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.

3.6 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

$(2n - 1)Tg$

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 Section 1, G.1.2

F. Non Pressurized Container for Dry Bulk Cargoes

1. Technical requirement

1.1 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.

1.2 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.

1.3 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.

1.4 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 B.1.1.2

1.5 Openings for loading

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

1.5.2 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.

1.6 Openings for discharging

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

1.6.2 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.

1.7 Inspection and maintenance openings in hopper type containers

1.7.1 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.

1.7.2 If openings for loading or discharging comply with the requirements of 1.7.1, they may also serve as inspection and maintenance openings.

1.8 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.

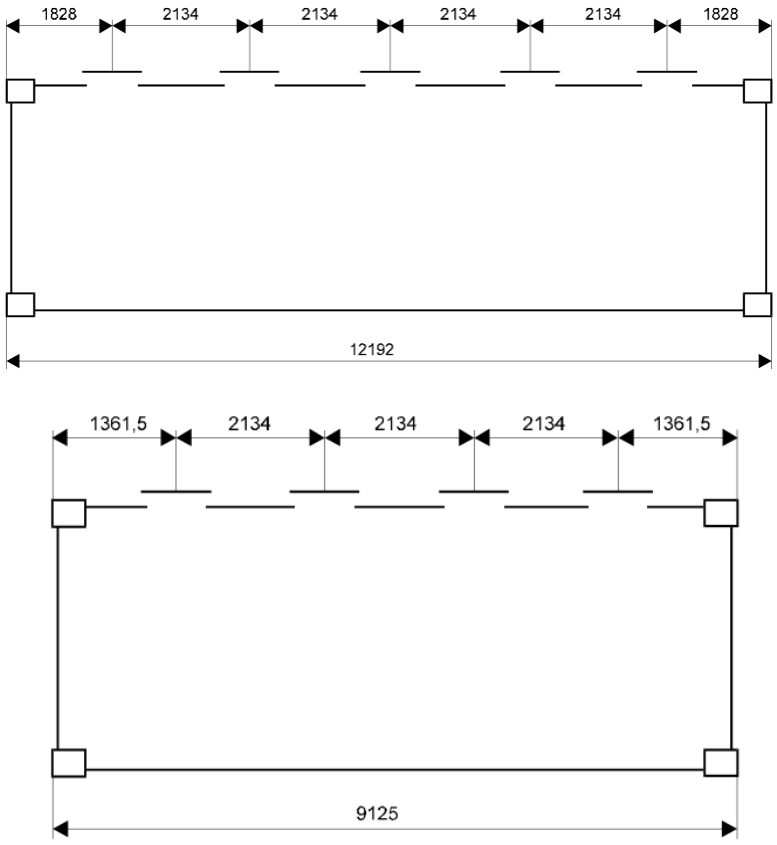


Fig. 3.8. Examples of the arrangement of openings for loading dry bulk cargo in non-pressurized box type containers

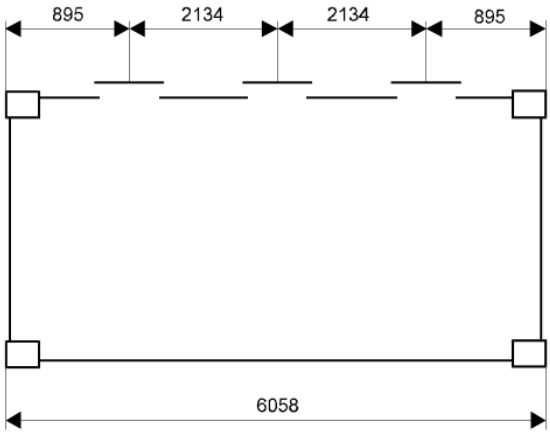


Fig. 3.8. Examples of the arrangement of openings for loading dry bulk cargo in non-pressurized box type containers (continued)

2. Test

2.1 General requirements

2.1.1 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 Section 2 ,B are to be applied.

2.1.2 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.

2.2 Strength of End Walls (Box Type Container)

2.2.1 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.

2.2.2 The container end wall is to be subjected to an internal loading specified in 2.2.1. The loading is to be uniformly distributed over the wall under test and arranged to allow free deflection of the wall.

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

2.3 Strength of side walls (box type container)

2.3.1 The container side walls are to be subjected to strength test, applying the forces and methods specified in Section 2, B.2.6.

2.3.2 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.

2.4 Internal longitudinal restraint (hopper type container)

2.4.1 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° is acceptable).

2.4.2 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.

2.4.3 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 BKI, 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.

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

2.5 Internal lateral restraint (hopper type container)

2.5.1 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° is acceptable).

2.5.2 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.

2.5.3 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 BKI, 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.

2.5.4 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.

2.6 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.

2.7 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.

2.8 Weatherproofness test

This test is to be carried out on completion of the tests specified in 2.1.1 and in 2.2 to 2.7. The procedure, as well as the water stream parameters are to be in accordance with Section 2, B.2.13.

2.9 Airtightness test

2.9.1 This test is to be carried out on completion of the tests specified in 2.1.1 and in 2.2 to 2.7. Both box type containers and hopper type containers (airtight) are to be subjected to this test.

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

2.9.3 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%.

2.9.4 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.

2.9.5 The air leakage rate is not to be greater than the values given in Table 3.6.

Table 3.6

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

3. Scope of survey

BKI`s technical survey covers the following:

closures of the loading and discharging openings.

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Section 4 Repairing of Containers

A. Guidelines for the Authorization of Container Repair Workshops

1. Approval of the workshop

1.1 Workshops desiring to work under the authorization of BKI require approval by BKI in accordance with Section 1, A.4.

1.2 A member of the workshop management and his deputy, who as workshop experts are responsible for ensuring compliance with the approval conditions, shall be designated and their names communicated to BKI. Furthermore, the names of the welding supervisor and his deputy, who are in charge of supervising the workshop's welding operations and are adequately trained for this task, shall be communicated to BKI.

1.3 The workshop, once authorized, undertakes to carry out maintenance and repair work on its own responsibility in accordance with the stipulations of this section.

1.4 The approved repair works is obliged to:

1.4.1 Carry out repairs, perform examinations and keep quality, stowage and transport of the containers in accordance with the approved documentation,

1.4.2 Present containers for BKI visual inspection at various stages of the repair, at the request of BKI,

1.4.3 Agree with BKI any alteration introduced to documentation and bring it up to date due to the changes in international and BKI requirements or in connection with changes introduced both to the arrangement and the repair procedure,

1.4.4 Keep a record of the containers under repair specifying at least:

– Type, kind and identification number of container,

– Dates of commencement and completion of the repair,

– Note on the carried out repair,

– Name and address of the Owner (Lessor),

1.4.5 Observe validity of the Approval Certificate,

1.4.6 Notify BKI, in due term, of the completion of container repair activities.

2. Supervision

2.1 BKI makes sure by means of random visits by its surveyors that the standard of the workshop and the quality of the work as established at the time of approval are maintained.

2.2 The competent BKI Inspection Office or, if need be, BKI's Head Office shall be informed whenever repairs are to be made to a container in respect of which the validity of the certificate depends on regular surveys, inspections and tests, or whenever the customer expressly requests that the damage or the repair be checked by BKI, or whenever a special certificate or attestation is to be issued.

2.3 BKI's surveyor shall at all times be granted access to all shop facilities used for container repairs and, upon demand, be permitted to inspect the material control records insofar as they refer to the technical quality.

2.4 BKI shall be informed of any changes in shop facilities, in working techniques or in the structure and qualifications of the personnel which affect the conditions under which the suitability of the workshop was originally established. New working techniques, in particular the use of a welding technique which is new to the workshop concerned, shall be indicated to BKI.

B. Execution of repairs

1.1 The workshop concerned shall in all cases be responsible for the quality of the repair work and for ensuring conformity with this Guidelines. The correct repair may be certified by BKI on special request.

1.2 Criteria for repair worthy damage and wear of containers

1.2.1 Containers which sustained damages or deformations in service, exceeding those listed in Table 4.1, are included to be repaired under BKI survey or at the works approved by BKI.

1.2.2 Irrespective of type and kind of container, to the damages and stable deformations to be repaired under BKI survey or at the approved repair works are included those listed in Table 4.1.

1.2.3 The following damages of thermal containers, in addition to those specified in Table 4.1, are to be repaired:

- External and internal sheathing of walls, roof, floor and doors disarranging the thermal insulation,
- Integral air ducts affecting the container strength,
- Damages causing the loss of the container airtightness.

1.2.4 The following damages of tank containers, in addition to those specified in Table 4.1, are to be repaired:

- Damage of tank or tanks dangerous during the displacement of a container,
- Damages of supports and brackets,
- Damages of pipings and fittings,
- Damages of cargo refrigerating (heating) appliances (if any),
- Damages of insulation sheathing or of the insulation itself.

1.2.5 Tank which sustained damage in service is to be repaired using procedure approved by PRS. Whenever welding was applied during repair, it is necessary to carry out hydraulic test, with a pressure equal to 1.5 the permissible working pressure.

1.2.6 The following damages of platform containers and platform-based containers, in addition to the damages specified in Table 4.1, are to be repaired:

- Damages of appliances blocking the structure of a container (i.e. folding walls and posts),
- Damages of appliances for stacking of empty containers.

1.2.7 Container affixed with the plate – "Approved for transport of cargo under customs seal" (customs plate) are to comply, on completion of repairs, with the technical requirements of the Customs Convention on Containers.

Table 4.1

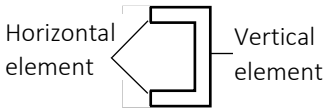
Component [1]	Condition [2]	Action required [3]
1. RAILS		
a) All rails, including side rails, headers, sills	Holed, cut, torn or cracked. Broken component and /or weld. Missing or loose parts or fasteners	REPAIR
	Any deformation such as bend, bow, dent, etc.	If exceeding ISO dimensional tolerances, REPAIR – see item 9 of the Table
b) Top and bottom rails	Bend or dent within 250 mm of a corner fitting	The weld or other connection to the corner fitting must be carefully examined and REPAIRED if it gives any evidence of a break, cut, tear, crack, hole or other damage
c) Front headers and flat-bar top side rails (for open-top containers – see item 10 of the Table)	Any deformation such as bend, bow, dent, etc., except on a header extension plate or corner protection plates	If more than 25 mm deep, REPAIR
d) Box section top side rails (for open-top containers – see item 10 of the Table)	Any deformation such as bend, bow, dent, etc.	If more than 30 mm deep, REPAIR
e) Rear headers (for open-top containers – see item 10 of the Table)	Any deformation such as bend, bow, dent, etc., except on a header extension plate, or corner protection plate	If more than 35 mm deep, REPAIR
f) Rain gutter	Any deformation such as bend, bow, dent, etc.	If door operation or securing is impaired, REPAIR
g) Bottom side rails, front and door sills 	Any deformation such as bend, bow, dent, etc. on a web	If more than 50 mm deep, REPAIR
	Any deformation such as bend, bow, dent, etc. on a flange	In the case of tear, crack, cut, REPAIR
h) Door headers and sills	Impaired door closing, securing and/or loss of weather tightness	REPAIR
2. POSTS		
a) All corner posts, including J-bars	Holed, cut, or torn. Broken component and/or weld. Missing or loose parts or fasteners	REPAIR
	Other deformations such as bend, bow, dent, etc.	If exceeding ISO dimensional tolerances, REPAIR – see item 9 of the Table
b) All corner posts, front and rear	Any single deformation such as bend, bow, dent, etc.	If more than 25 mm deep, regardless of length or location, REPAIR
	Two or more dents on a single post	If each is more than 15 mm deep, regardless of length or location, REPAIR
	Cracks	REPAIR

Table 4.1 *(continued)*

Component [1]	Condition [2]	Action required [3]
c) Rear corner posts	Any deformation impairing door closing, securing and/or causing loss of weathertightness	REPAIR
d) J-bars	Any deformation such as bend, bow, dent, etc.	Door must be able to open fully (270°). If door operation is impaired, REPAIR
3. SIDE/FRONT PANELS		
a) All side/front panels	Holed, cut, cracked, torn. Broken component and/or weld. Missing or loose parts or fasteners	REPAIR
	Any deformation such as bend, bow, dent	If exceeding ISO dimensional tolerances, REPAIR – see item 9 of the Table
	Any deformation such as bend, dent, etc. on a flat portion of a marking panel or on an inboard or outboard face of a corrugation	If more than 35 mm deep, REPAIR
	Any bow involving the length or height of a wall (shell)	If internal dimensions are reduced by more than 50 mm,
b) Internal panel liners	Holes in full-height liners	REPAIR
	Note: Holes in partial-height liners are permitted and do not require repair, provided they do not interfere with cargo. Full-height liners, however, must be repaired in accordance with TIR regulations, i.e. if any hole has a diameter of more than 10 mm	
	Cut, torn, cracked or broken. Missing or loose parts or fasteners	REPAIR
c) Ventilator covers	Broken, missing, etc.	If cracked or broken in raised, nonperforated area of ventilator enclosing air passage, REPAIR, or if damage exceeds TIR opening limit of 10 mm (3/8 in), REPAIR
4. DOOR		
a) Door assembly, including hardware	Holed, cut, torn or cracked. Bro- ken component and/or weld. Missing or loose parts or fasteners	REPAIR
	Any deformation such as bend, bow, dent, etc.	If door operation or securing is impaired or if exceeding ISO dimensional tolerances, REPAIR see item 9 of the Table
	Seized, frozen or stiff	If door operation or securing is impaired, REPAIR
	Lack of weather tightness	REPAIR
b) Door panels	Any deformation such as bend, bow, dent, etc.	If more than 35 mm deep, REPAIR
	Any bow involving the length or height of a panel	If internal dimensions are reduced by more than 50 mm at any point, REPAIR

Table 4.1 *(continued)*

Component [1]	Condition [2]	Action required [3]
c) Door gaskets	Loose or missing	REPAIR
	Cut, torn, cracked or burned	If not light-tight and watertight during tightness test, REPAIR
5. ROOF		
a) Roof panels, header extension plates, corner protection plates and roof bows	Holed, cut, cracked or torn. Broken component and/or weld. Missing or loose parts or fasteners	REPAIR
	Any deformation such as bend, bow, dent, etc.	If exceeding ISO dimensional tolerances, REPAIR, see item 9 of the Table
b) Roof bows	Any deformation such as bend, bow, dent, etc.	If more than 50 mm in any direction, REPAIR
c) Corner protection plates and header extension plates	Any deformation such as bend, bow, dent, etc.	If internal dimensions are reduced by more than 50 mm, REPAIR
d) All roof panels	Any deformation such as bend, dent, etc.	If more than 35 mm deep on flat roofs or on any corrugation, inboard or outboard, REPAIR
	Any bow involving the length or width of the roof	If internal dimensions are reduced by more than 50 mm, REPAIR
6. FLOOR		
a) Floor including threshold plate and center spacer	Holed (including nail holes)	If light leaks, regardless of diameter of hole, REPAIR. Plug nail holes with use of max. 13 mm diameter pins
	Broken component and/or weld. Missing, loose or protruding fasteners	REPAIR Note: No repair is necessary to cracked or broken center spacer welds if light does not leak
	Light leakage gaps between boards	REPAIR
b) Wooden flooring	Delamination, splinters	REPAIR
	Gouges (regardless of length)	If more than 15 mm deep, or if more than 5 mm deep through-out a width of more than 150 mm of the gouge, REPAIR
	Different heights of surfaces of adjacent planks or panels or between top plates of gooseneck tunnel or fork pockets and floor boards	If difference is more than 5 mm, REPAIR Note: For open-top containers – see item 10 of the Table
c) Plank flooring	Cracks or splinters	If light leaks, REPAIR
d) Threshold plate	Bent upwards	If more than 5 mm, REPAIR

Table 4.1 *(continued)*

Component [1]	Condition [2]	Action required [3]
7. CONTAINER UNDERSTRUCTURE		
a) Crossmembers, forklift pocket components, (including straps), outriggers and gooseneck tunnel components ,	Holed, cut, torn or cracked. Broken component and/or weld. Missing or loose parts or fasteners	REPAIR
	Any deformation such as bend, bow, dent, etc.	If exceeding ISO dimensional tolerances, REPAIR – see item 9 of the Table
	Any deformation such as bend, bow, dent, etc. on a web	If more than 50 mm in any direction, REPAIR
	Any deformation such as bend, bow, dent, etc. on a bottom flange	If torn, cracked or cut, REPAIR
	Any deformation such as bend, bow, dent, etc., on a top flange	If more than 50 mm into the container interior, REPAIR
	Top flange separated from bottom of wooden or steel flooring	If separation at point of attachment to floor is more than 10 mm, REPAIR
b) Gooseneck tunnel assembly and forklift pocket top plate	Any deformation such as bend, bow, dent, etc.	If more than 50 mm, REPAIR
8. CONTAINER CLEANLINESS		
a) Container interior and exterior	Labels, including hazardous cargo labels	REMOVE
	Contamination, hazardous or potentially hazardous	If condition could threaten human life or health, container may be rejected at gate. Otherwise, segregate container and contact delivery agent to establish contaminant and appropriate treatment. DO NOT attempt to repair until instructions are received.
	Tape over ventilators	REMOVE
	Paint attack due to corrosive cargoes or spillage	REPAIR
b) Container interior, including walls, ceiling and floor	Organic cargo residues, e.g. beans, grain, etc., within the floor cracks between floor boards or within sidewall corrugations	REMOVE
	Materials (other than normal dust and dirt) stuck to caulking	REMOVE
	Debris or dunnage wood in excess of what would normally remain after a sweep out	REMOVE
	Transferable stains, mould or fungus (except tyre marks)	REMOVE

Table 4.1 *(continued)*

Component [1]	Condition [2]	Action required [3]
b) Container interior, including walls, ceiling and floor *(continued)*	Loose or not fully adhered tape or other material	REMOVE or REPAIR
	Patch (of any size) of sticky glue, including sticky tape and any sticky adhesive residue	REMOVE or REPAIR
	Infestation (except non-transferable mold)	REMOVE
	Persistent odour	REMOVE
	Condensation or standing water	REMOVE
	Cargo securement devices, e.g. metal/wire straps, cables chains, string, rope, etc., left on bars, rings, walls, ceilings, floors, etc.	REMOVE
	Graffiti	If not obviously related to carriage of cargo, REMOVE
c) Container exterior	Graffiti	REMOVE
	Spillage that make the markings required by regulation illegible	REPAIR
9.MISCELLANEOUS		
a) Painted surfaces	Burned	REPAIR
	Contamination due to fire or contact with other substances	REPAIR
	Damage to paint film down to bare metal caused by abrasive bulk cargo that affects the whole of any interior surface	REPAIR
b) Internal floor surfaces	Nails or screws with heads above top of floor	REMOVE, REPAIR
c) Lashing fittings	Broken parts and/or welds. Missing or loose parts or fasteners	REPAIR
	Bent	If more than 50 mm into container interior, REPAIR
d) Markings required by regulations, international standards or container Owner	Missing, loose or defaced	REPAIR
e) Marking plates	Loose, broken, missing plate or fastener, illegible data	REPAIR, REPLACE or COMPLETE
f) Corner fittings and their weld attachments	Cracked, broken, loose, apertures outside ISO dimensional tolerances	REPAIR or REPLACE
g) Entire container	Any deformation such as: bend, bow, dent, etc., that affects ISO required diagonal dimensions measured between corner fitting apertures	If deformation exceeds ISO dimensional tolerances, REPAIR

Table 4.1 *(continued)*

Component [1]	Condition [2]	Action required [3]
h) End frame components (corner posts, front panel, doors, headers, sills, corner fittings)	Any deformation such as bend, bow, dent, etc., that affects other ISO required dimensions	If deformation exceeds ISO tolerances by more than 5 mm, REPAIR
i) Entire container, except end frame components	Any deformation such as bend, bow, dent, etc. that affects ISO required dimensions	If deformation exceeds ISO tolerances plus 10 mm, REPAIR
10. OPEN-TOP CONTAINERS		
a) Top side rails and headers	Dents except on a drip pan or header extension plate	If more than 50 mm deep, REPAIR
	Any deformation such as bend, bow, dent, etc.	If roof bows cannot be fitted, or if exceed ISO tolerances, REPAIR
b) Drip pans and header extension plates	Any deformation such as bend, bow, dent, etc.	If internal dimensions are reduced by more than 50 mm, or if operation or securing of swinging header is impaired, REPAIR, or if the deformation exceeds ISO dimensional tolerances – see item 9 of the Table
	Not weathertight when tarpaulin is installed	REPAIR
c) Swinging headers	Seized or frozen hinges	REPAIR
	Any deformation such as bend, bow, dent, etc. that impaires operation of header assembly or restricts door opening	REPAIR
	Header pins or attachment chains missing or broken	REPAIR or COMPLETE
	Header pins bent to extent that they do not fit over entire length of pin	REPAIR
	Header seals not watertight	REPAIR
d) Roof bows and roof bow holders	Roof bows or roof bow holders that do not mate with each other	REPAIR
e) Tarpaulins	Holed, cut, torn, missing, of improper size or not watertight when installed	REPAIR or REPLACE
	Missing or misaligned grommets	REPAIR or REPLACE
	Patches not installed in accordance with TIR regulations	REPAIR

Table 4.1 *(continued)*

Component [1]	Condition [2]	Action required [3]
f) TIR cord	Cut or bent so that it cannot be threaded into TIR cord rings (eyelets) with tarpaulin installed	REPAIR or REPLACE
	Not long enough to be threaded into all TIR cord rings	REPLACE
	End piece inoperable or unable to seal	REPAIR
g) Wooden flooring	Different heights of surfaces of adjacent planks or pannels or between top plates of gooseneck tunnel or forklift pockets and floor boards	If difference is more than 10 mm, REPAIR

1.2.8 All materials used for the repair of containers are to have their mechanical properties equivalent or similar to those of the materials used for their construction.

Timber and plywood are to be impregnated to the requirements of the competent authority.

1.3 Wooden constructional parts

1.3.1 Repairs to wooden constructional parts, especially plywood elements, shall be carried out according to practice-proven methods which have been agreed with both the customer and BKI. Special guidelines for working with glass - fibre - reinforced plastics (facilities available) shall be observed.

1.3.2 When replacing wooden elements, the regulations with regard to impregnation shall be complied with. Impregnation by means of brush-applied coats is insufficient.

1.4 All repair work shall be done in such a way that the correct bond condition is re- established.

2. Testing, marking

2.1 Strength tests are generally not required for normal general cargo containers on completion of the repair work, since even in the case of new construction not every container of a series is subjected to strength tests. However, BKI's Surveyor may call for a strength test of the constructional part concerned in justified cases after extensive repairs or repairs where the workmanship is questionable.

2.2 In the case of repairs to containers where the validity of the respective certificate depends on regular surveys, random strength tests only are required, unless there are reasonable doubts on the basis of the nature of the damage or the execution of the repair work as to whether the normal load-bearing capacity of the constructional parts in question has been re-established and unless the validity of the certificate depends on the strength testing (e.g. hydrostatic testing of tank containers).

2.3 Weatherproofness or tightness tests, e.g. on completion of door repairs, may in general be carried out in the works without a BKI Surveyor being called in. Exceptions to this are tightness tests of tank containers and refrigerating and heating systems, where a BKI Surveyor shall as a rule be called in connection with the operational test.

2.4 Marking

2.4.1 Markings in connection with a certificate, the validity of which depends on regular surveys and inspections shall, if so desired, be renewed in accordance with the instructions of the Surveyor called in.

2.4.2 If a repair marking is to include a reference to the works authorization, the type of such a marking shall be agreed with BKI's Head Office.

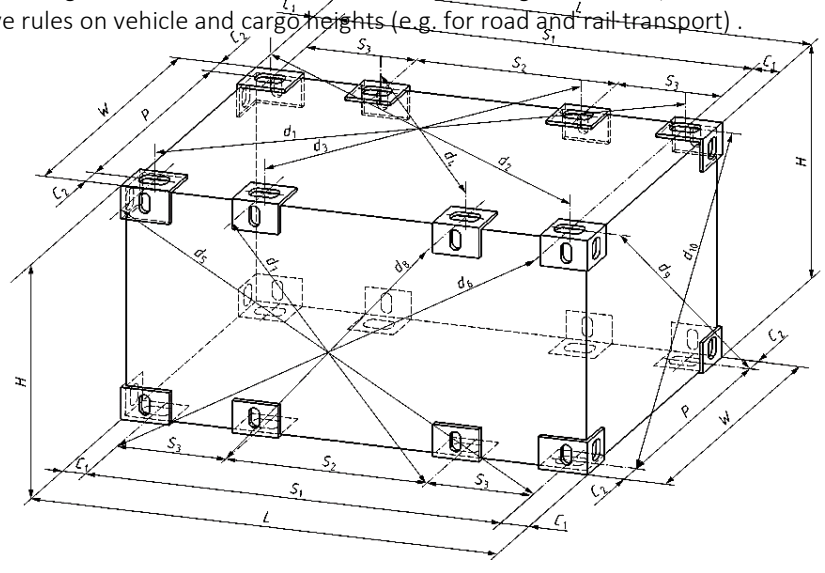
Annex A

Table.A.1 Weights, measurements and tolerances

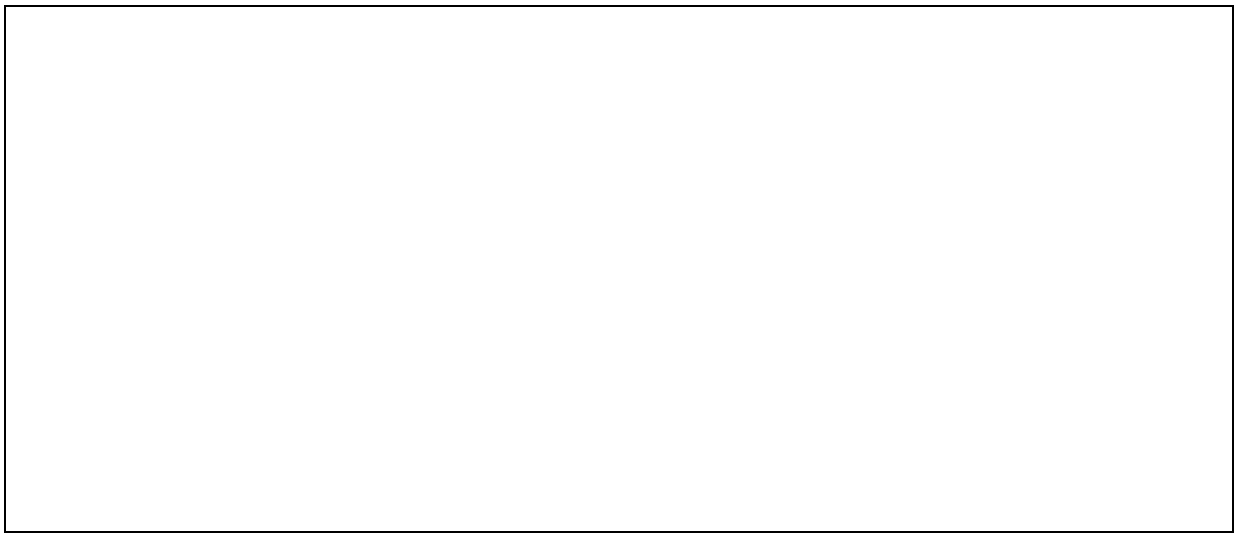
ISO Designation of container	Max. permitted gross weight [kg]	External dimension			Distance between centers of holes in corner fittings			
		Length L [mm]	Height H [mm]	Width W [mm]	Longitudinal S [mm]	Crosswise P [mm]	Permitted distance d^1 of diagonals [mm]	Permitted difference d^2 of diagonals [mm]
1 EEE	30480	13716^{0}_{-10}	2896^{0}_{-5} **	2438^{0}_{-5}	13509	2259	19	10
1 EE			2591^{0}_{-5} **					
1 AAA	30480	12192^{0}_{-10}	2896^{0}_{-5} **	2438^{0}_{-5}	11985	2259	19	10
1 AA			2591^{0}_{-5} **					
1 A			2438^{0}_{-5}					
1 AX			< 2438					
1 BBB	30480	9125^{0}_{-10}	2896^{0}_{-5} **	2438^{0}_{-5}	8918	2259	16	10
1 BB			2591^{0}_{-5} **					
1 B			2438^{0}_{-5}					
1 BX			< 2438					
1 CC	30480	6058^{0}_{-6}	2591^{0}_{-5} **	2438^{0}_{-5}	5853	2259	13	10
1 C			2438^{0}_{-5}					
1 CX			< 2438					
1 D	10160	2991^{0}_{-6}	2438^{0}_{-5}	2438^{0}_{-5}	2787	2259	10	10
1 DX			< 2438					

1. Permissible difference of diagonals between centers of holes in comer fittings of base and roof.
2. Permissible difference of diagonals between centers of holes in comer fittings of end walls, see illustration below.

**Some countries have rules on vehicle and cargo heights (e.g. for road and rail transport) .



Annex A



Note :

C_1 : corner fitting measurement $101{,}5^{\ 0}_{-1{,}5}$ *mm*

C2 : corner fitting measurement $89^{\ 0}_{-1{,}5}$ *mm*

D : distance between centres of apertures, or projected reference points therefrom, of diagonally opposite corner fittings, resulting in six measurements: D_1, D_2, D_5, D_6, D_9 and D_{10} or ten measurements same as before plus D_3, D_4, D_7 and D_8 for 1 EE and 1 EEE container

H : overall height

L : external length of the container

P : width between centres of apertures in corner fittings

S : length between centres of apertures in corner fittings

W : external width of the container

Dimensions L, H and W are measured along the appropriate edges.

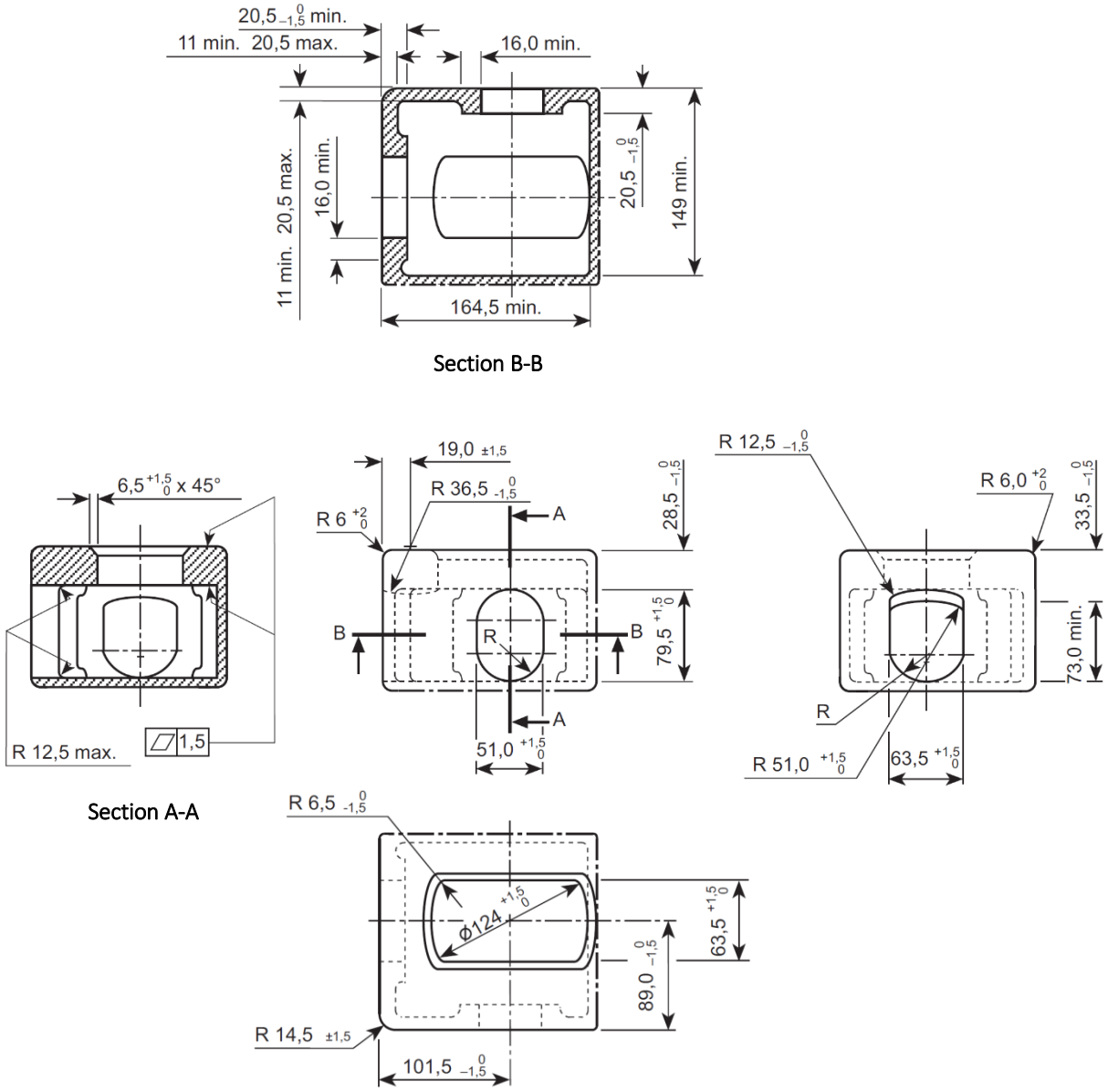
Table A.2

No	Test	Container type					
		General cargo Dry Bulk	Non Pressurized	Platform with end wall	Platform without end wall	Thermal Container	Tank
1	Stacking						
2	Lifting from the four top comer fittings						
3	Lifting from the four bottom corner fittings						
4	Restraint test (longitudinal)						
5	Strength of end wall						x
6	Strength of side walls						
7	Strength of the roof						2
8	Floor strength						
9	Transverse rigidity						
10	longitudinal rigidity						
11	Lifting from fork-lift pockets	1	1	1	1	1	
12	Lifting by grappler arm lifting areas	1	1	1	1	1	1
13	Weatherproofness	1					
14	Shoring slots (where fitted)						
15	U value determination						
16	Refrigeration						
17	Longitudinal Inertia						x
18	Lateral inertia						
19	Restraint in Longitudinal Direction						
20	Airtightness test						
21	Hydraulic Test						
22	Walkways strength						
23	Ladder strength						
24	Dynamic external restraint	As substitute for tests marked x					

1) if provided
2) Walkways and ladders

Table A.3

Type of repeat or intermediate test	Number of containers produced					
	1	10	50	100	250	1000
Weatherproofness test of door in accordance with Section 2, B.2.13	X					
Measurement of air leakage rate in accordance with Section 3, A.5.3	X					
Weatherproofness test of entire container in accordance with Section 2, B.2.13 (guide value)		X				
Lifting test in accordance with Section 2, B.2.2 or ensile test on corner post with load 0,5R			X			
Loading the floor in accordance with Section 2, B.2.8			X			
Repeat type test for thermal containers (guide value). For series of over 100, see Section 3, A.6.2.5				X		
Stacking test for general cargo containers (guide value)					X	
Repeat type test for general cargo containers (guide value)						X



Excerpt from ISO 1161

Fig. A.1. Standard Corner Fittings – Top Corner Fitting

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

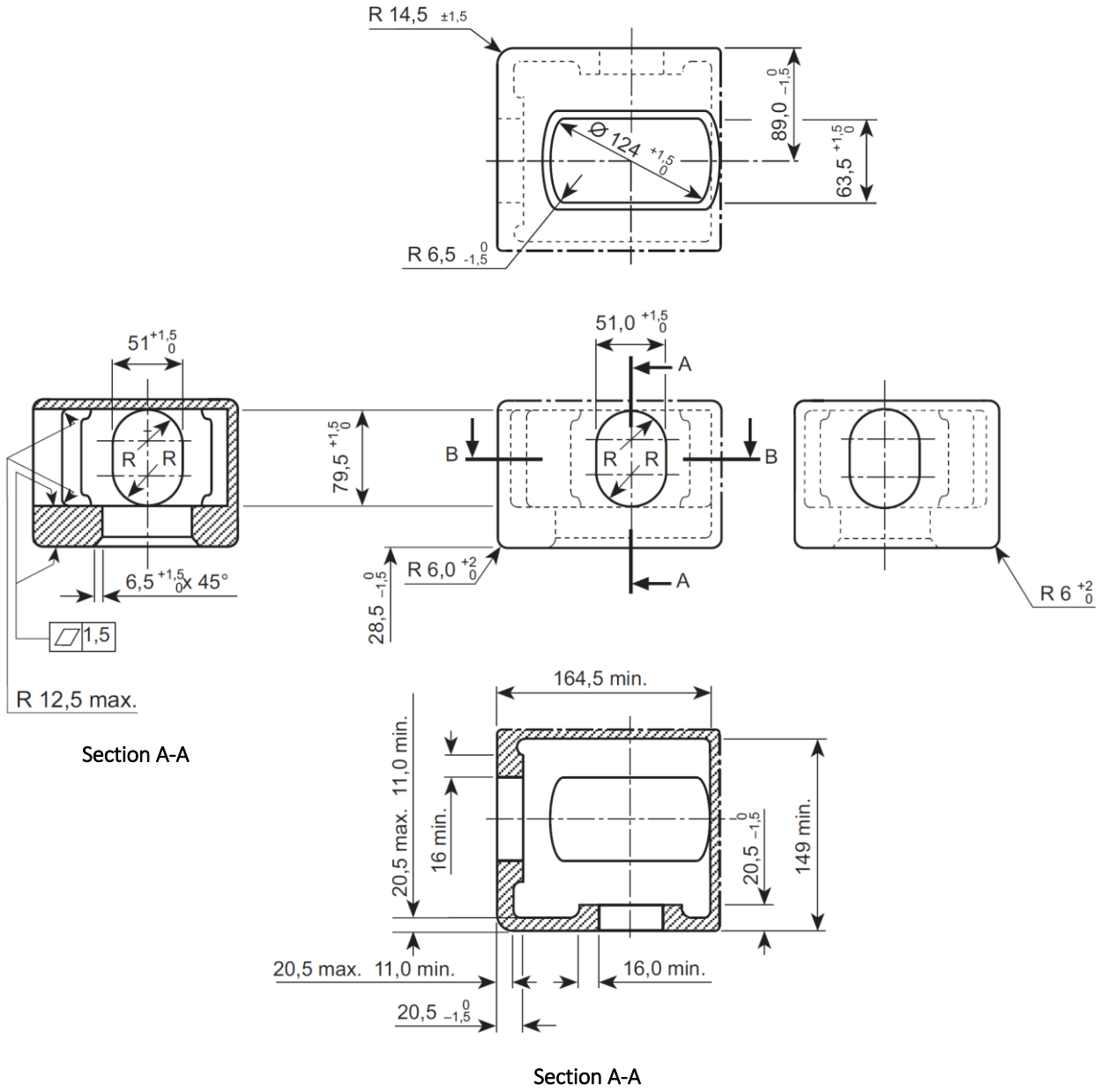
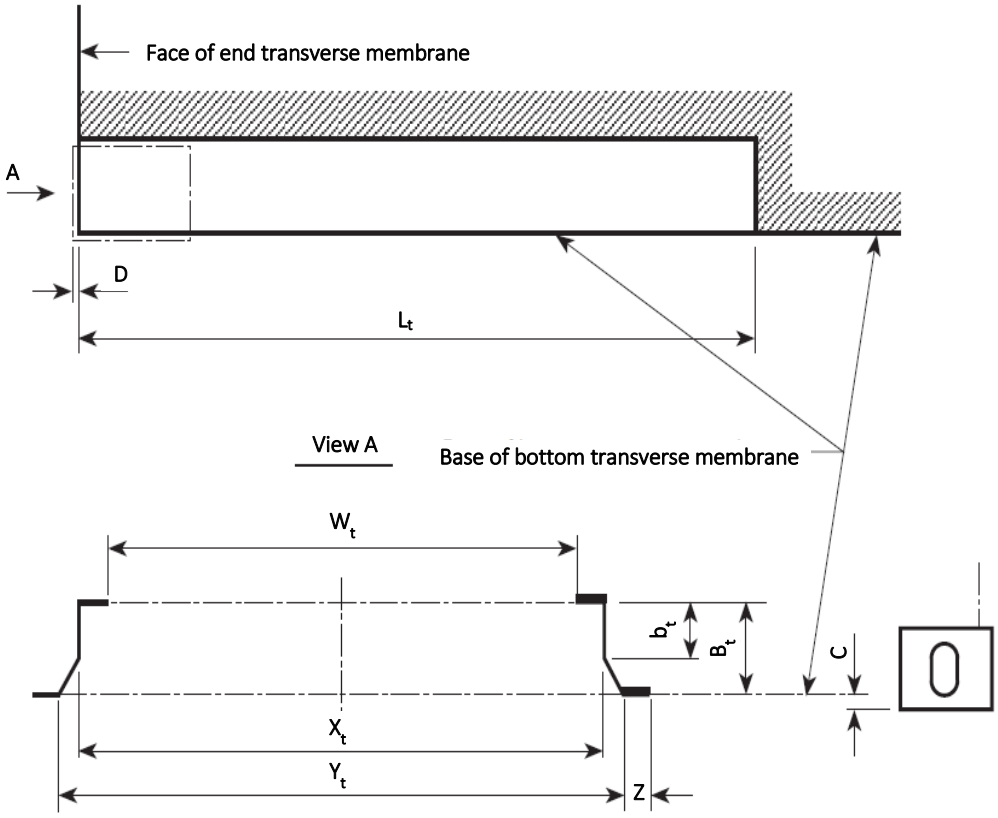


Fig. A.2. Standard Corner Fittings – Bottom Corner Fitting

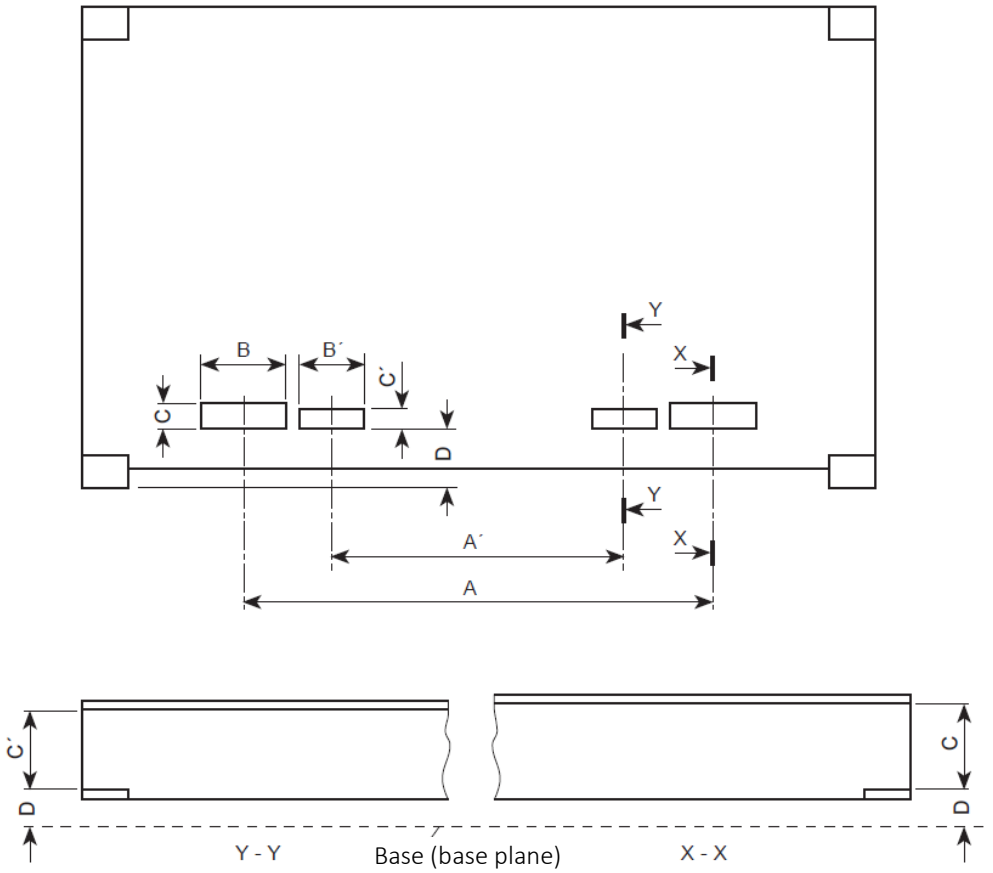
The external and internal rounding radii, not shown in the figure, are not to be greater than 3 mm.



		Dimension [mm]
Length	L_t	3150 to 3500
	D	$6\ ^{+1}_{-2}$
Width	W_t	930 max
	X_t	$1029\ ^{+3}_{-0}$
	Y_t	1070 min
		1130 max
	Z	25 min
Height	B_t	$120^{\ 0}_{-3}$
	b_t	35 min
		70 max
	C	$12{,}5\ ^{+5}_{-1{,}5}$

Excerpt from ISO 1496/1

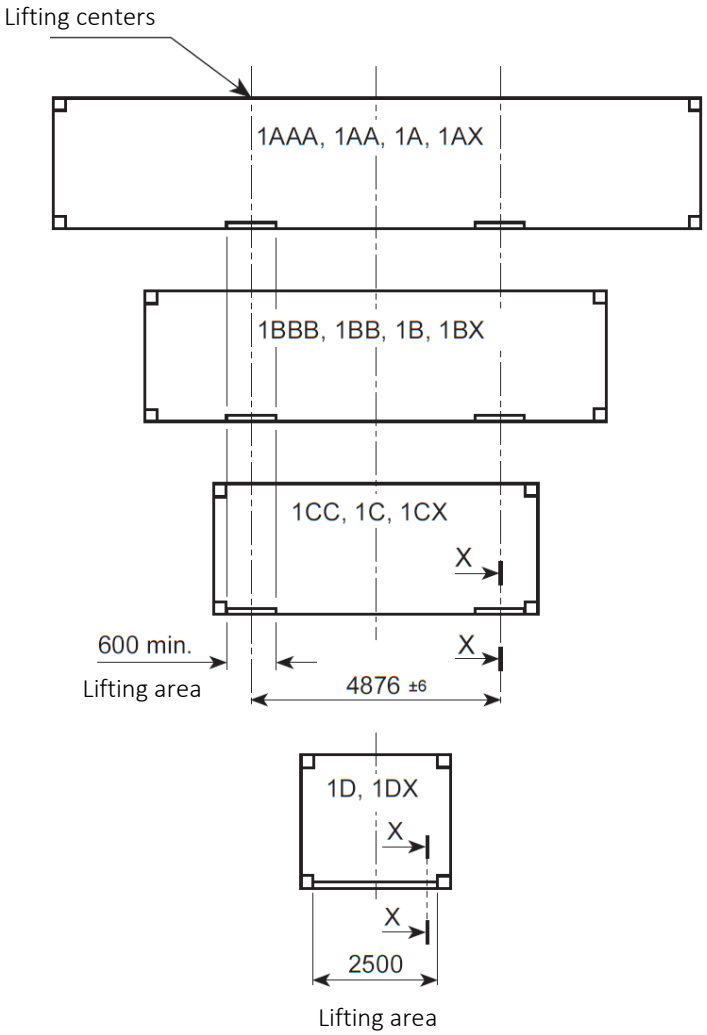
Fig.A.3 Gooseneck Tunnel

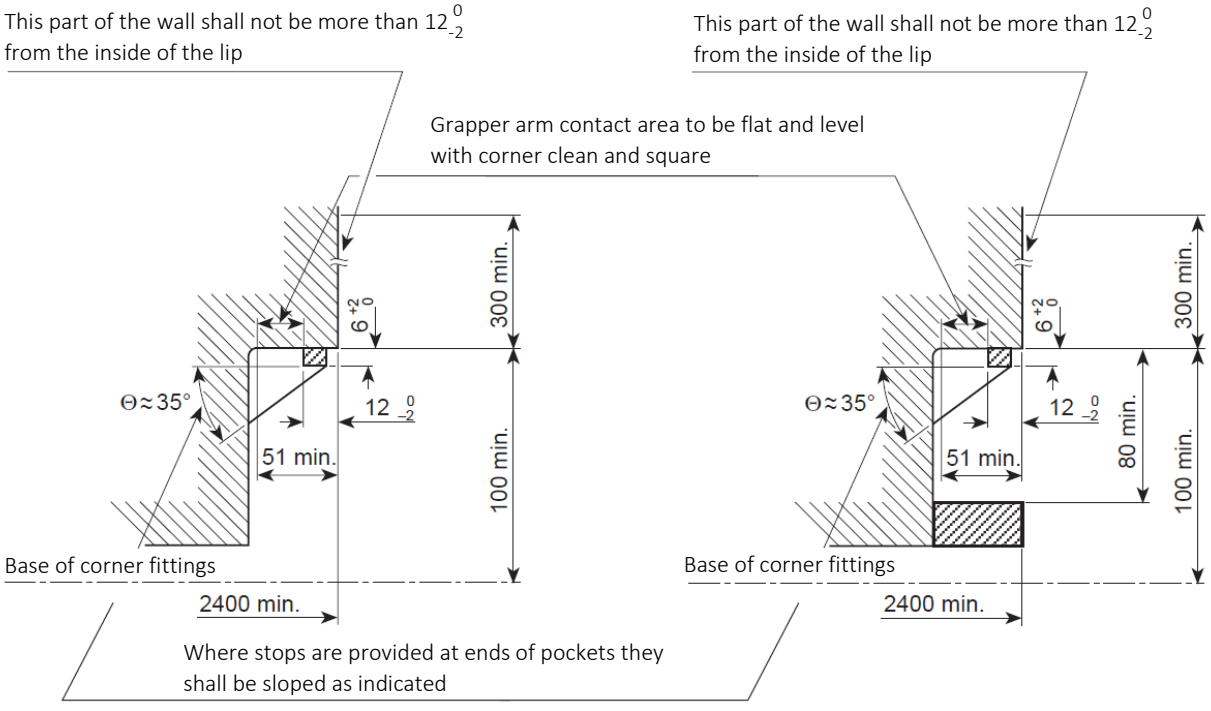


Container	Dimension						
	Pockets (loaded container)				Pockets (empty container)		
	[mm]				[mm]		
	A	B	C	D	A'	B'	C'
ICC IC, ICX	2050 ± 50	355 min	115 min	20 min	900 ± 50	305 min	102 min
ID IDX	900 ± 50	305 min	102 min	20 min			

Excerpt from ISO 1496/1

Fig.A.4 Fork Lift Pockets


Lifting centers
1AAA, 1AA, 1A, 1AX
1BBB, 1BB, 1B, 1BX
1CC, 1C, 1CX
X
600 min.
Lifting area
X
4876 ±6
1D, 1DX
X
X
2500
Lifting area


This part of the wall shall not be more than 12 0 -2 from the inside of the lip
This part of the wall shall not be more than 12 0 -2 from the inside of the lip
Grapper arm contact area to be flat and level with corner clean and square
300 min.
6 +2 0
Θ≈35°
12 0 -2
51 min.
100 min.
Base of corner fittings
2400 min.
300 min.
6 +2 0
Θ≈35°
12 0 -2
51 min.
80 min.
100 min.
Base of corner fittings
2400 min.
Where stops are provided at ends of pockets they shall be sloped as indicated

s

Details or requirements for transfer areas in base structure of containers for vehicle transport

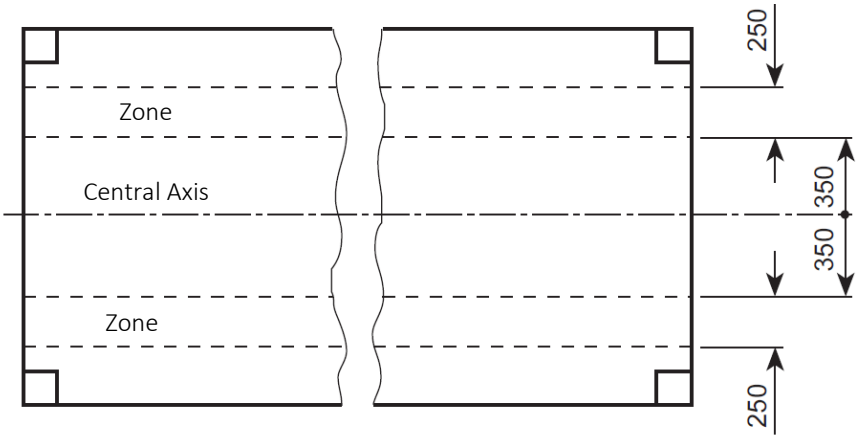
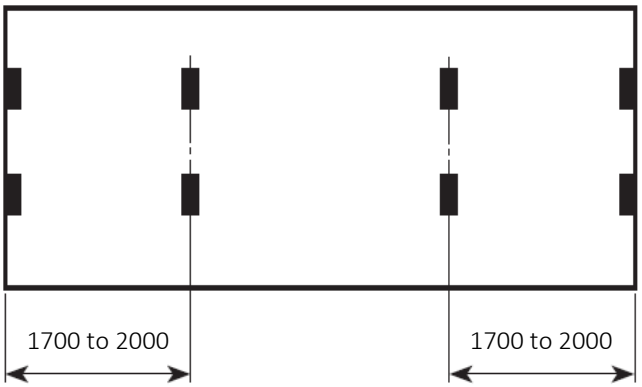


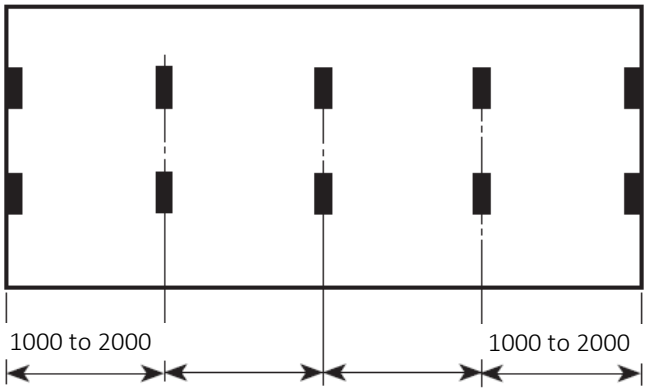
Fig.A.6

Load transfer areas for 1CC, 1C or 1CX containers



Minimum requirement with regard to pairs of load transfer areas

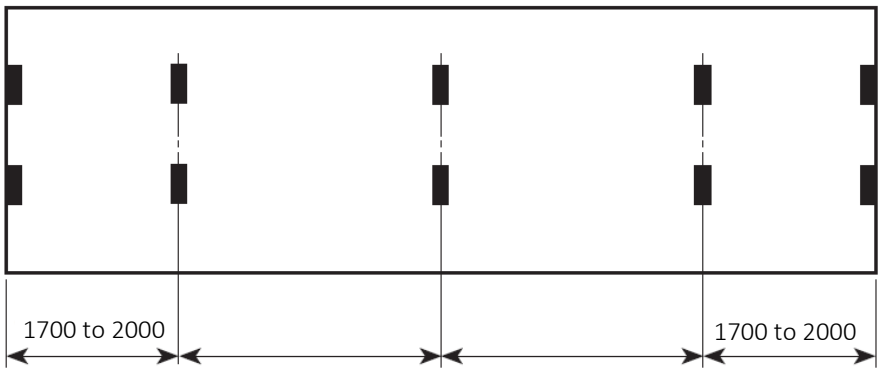
Fig.A.7



Requirements applicable if 5 pairs of load transfer areas are to be fitted

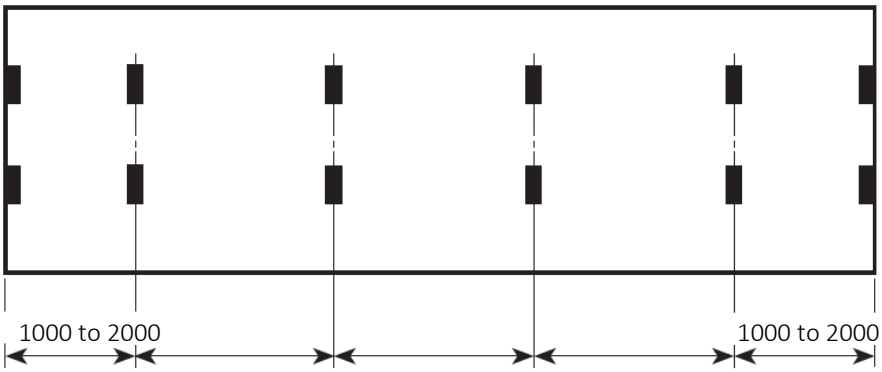
Fig.A.8

Load transfer areas for 1BBB, 1BB, 1B or 1BX containers



Minimum requirement: 5 pairs of load transfer areas

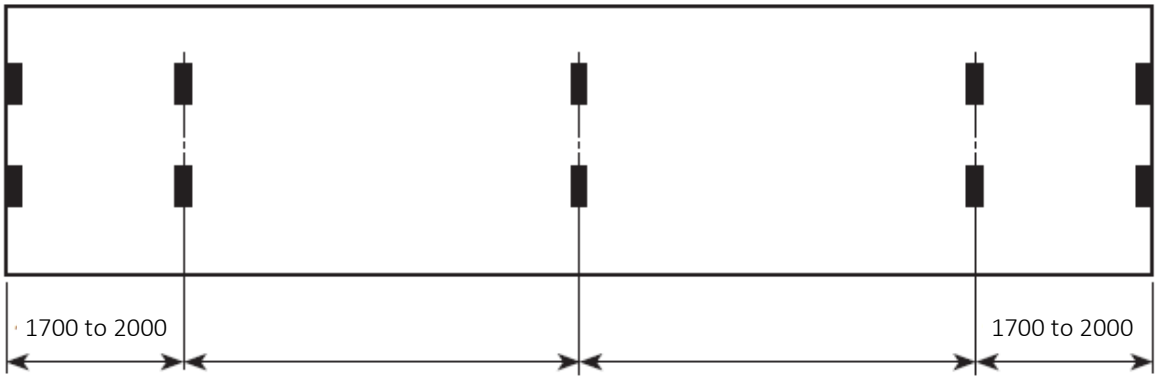
Fig.A.9



Requirement if 6 pairs of load transfer areas are to be fitted

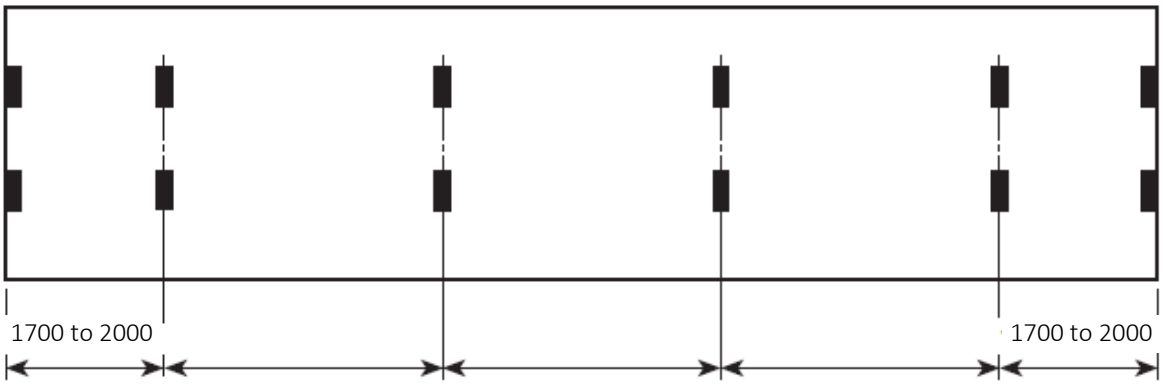
Fig.A.10

Load transfer areas for 1AAA, 1AA, 1A or 1AX containers



Minimum requirement: 5 pairs of load transfer areas

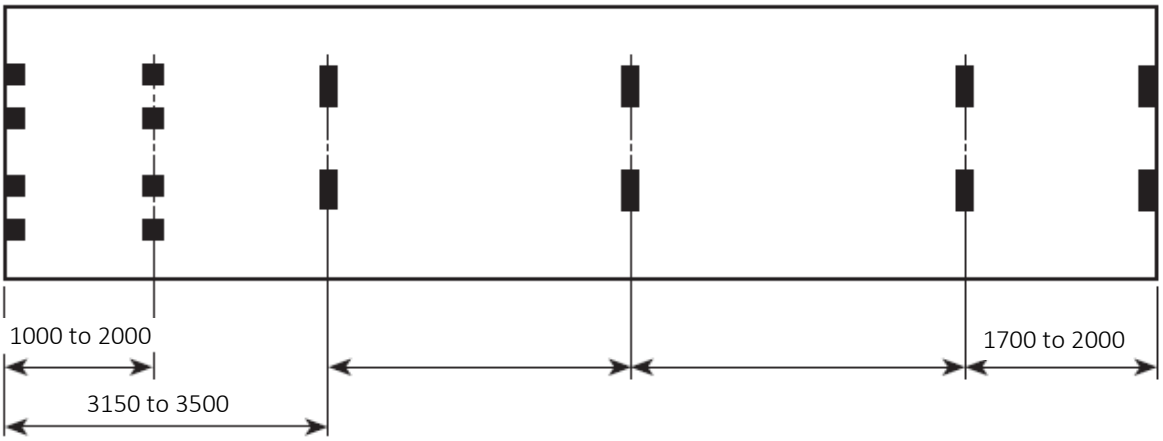
Fig.A.11



Requirement applicable if 6 pairs of load transfer areas are to be fitted

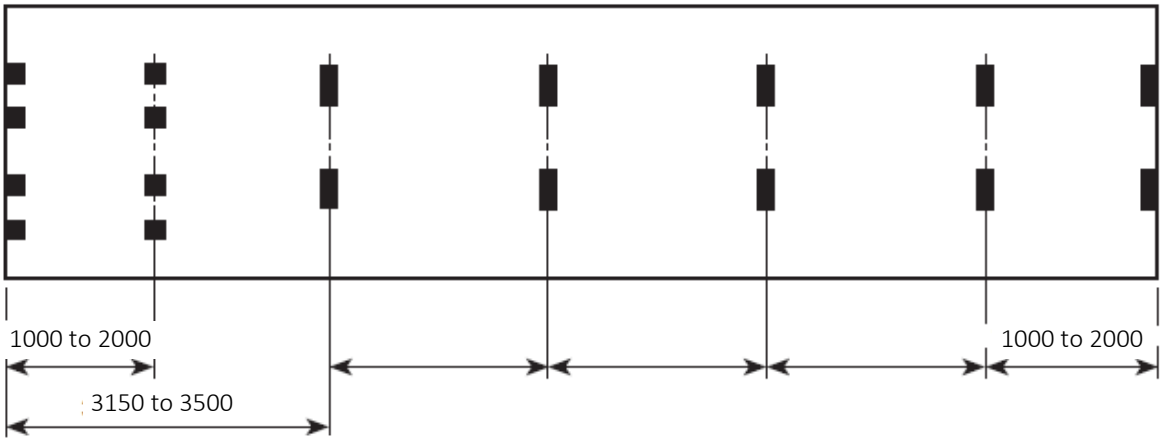
Fig.A.12

Load transfer areas for 1AAA, 1AA, 1A or 1AX containers with gooseneck tunnel



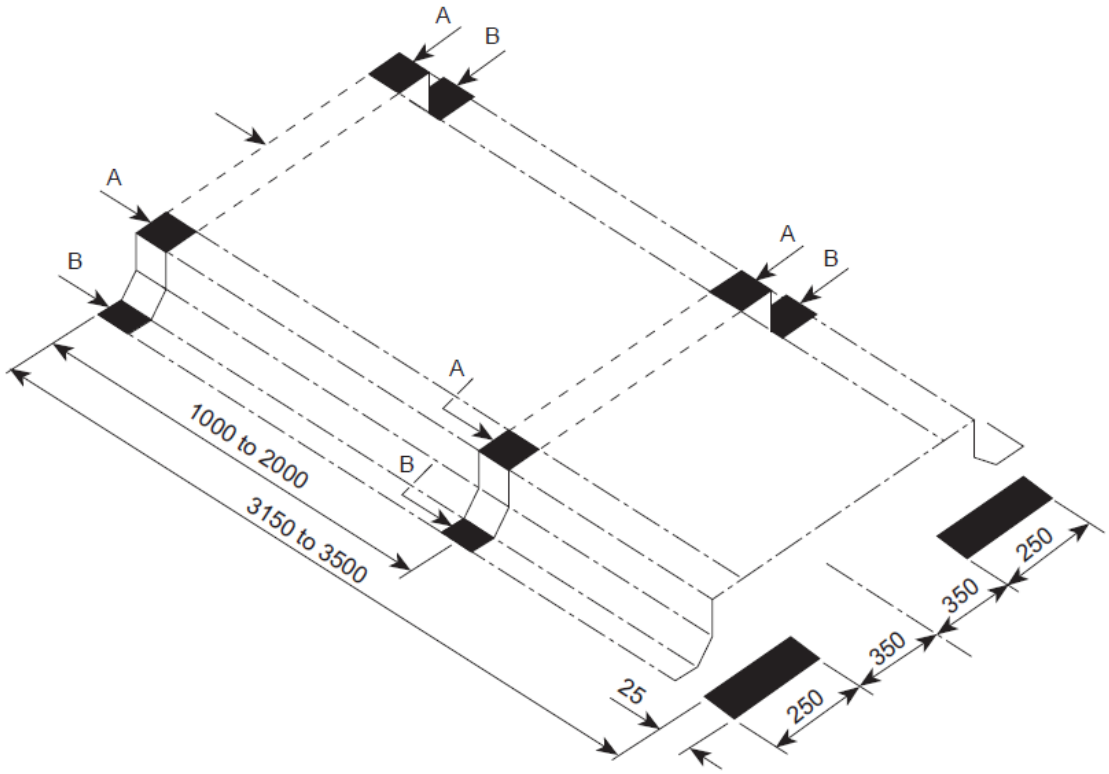
Minimum requirement: 6 pairs of load transfer areas

Fig.A.13



Requirement applicable if 7 pairs of load transfer areas are to be fitted

Fig.A.14



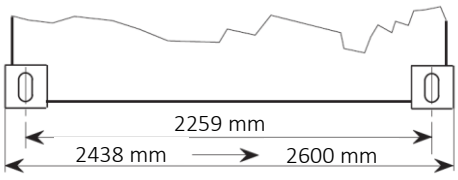
Minimum requirement for load transfer areas in the vicinity of the gooseneck tunnel

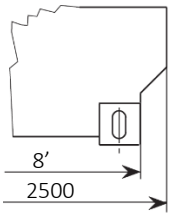
Fig.A.15

Size	Length (side view)	Width	Height
53’ (16150 mm)		8’6” (2591 mm)	9’6 ½“
49’ (14935 mm)		2600 mm	9’6” (2896 mm)
2 x 24½’ (2 x 7442 mm)	51	2600 mm	9’6” (2896 mm)
48’ (14630 mm)		8’6” (2591 mm)	9’6 ½“
45’ (13720 mm)		8’ (2438 mm)	9’6” 9’6 ½“
43’ (13103 mm)		8’ (2438 mm)	
40’ ISO (12192 mm)		8’ (2438 mm)	8’ 9’ 8’6” 9’6”
40’ EURO (12192 mm)	*	2500 mm	8’6” 9’6”
40’ Bell Lines (12192 mm)	*	2500 mm	
35’ (10660 mm)		8’ (2438 mm)	8’6”
30’ (9125 mm)		8’ (2438 mm)	8’ 8’6”
24’ (Matson) (7430 mm)		8’ or 8’6” (2438 mm or 2591 mm)	8’6” 9’6”
2 x 20’ (2 x 6058 mm)	76	8’ (2438 mm)	8’ 9’6” 8’6”

Common for all containers in the transverse measure from center to center points of the hole of corner castings = 2259 mm

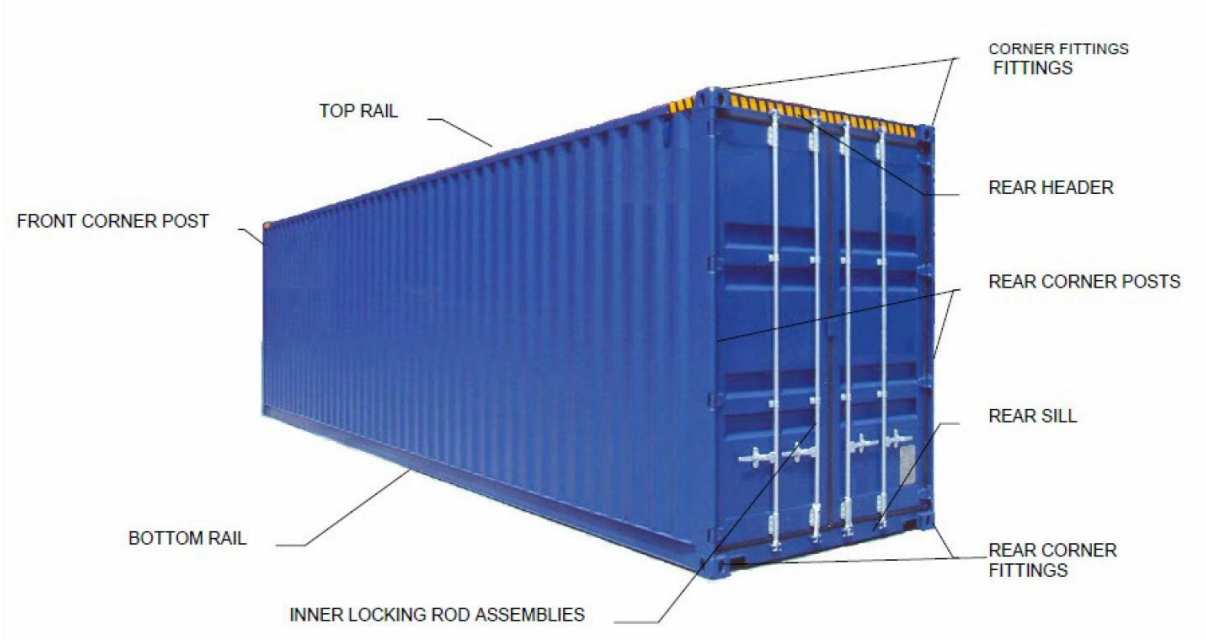
* to EURO/”Bell Lines” Container view on top





The indicated dimension of the container sizes not covered by ISO standards are provisional

Fig. A.16


CORNER FITTINGS
FITTINGS
TOP RAIL
REAR HEADER
FRONT CORNER POST
REAR CORNER POSTS
REAR SILL
BOTTOM RAIL
REAR CORNER
FITTINGS
INNER LOCKING ROD ASSEMBLIES

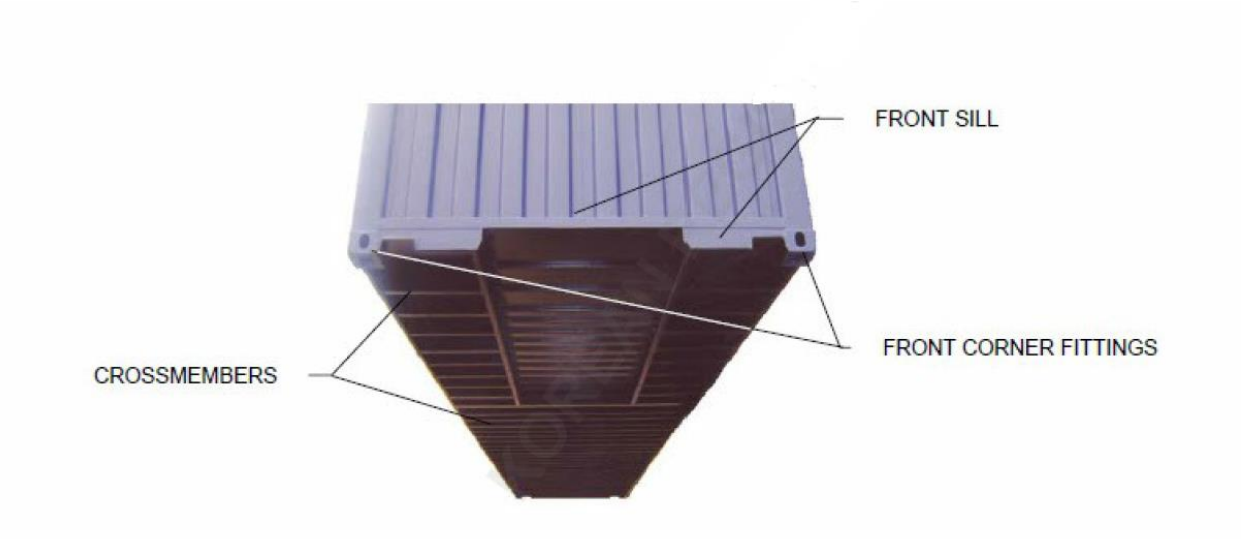

FRONT SILL
FRONT CORNER FITTINGS
CROSSMEMBERS

Fig. A.17

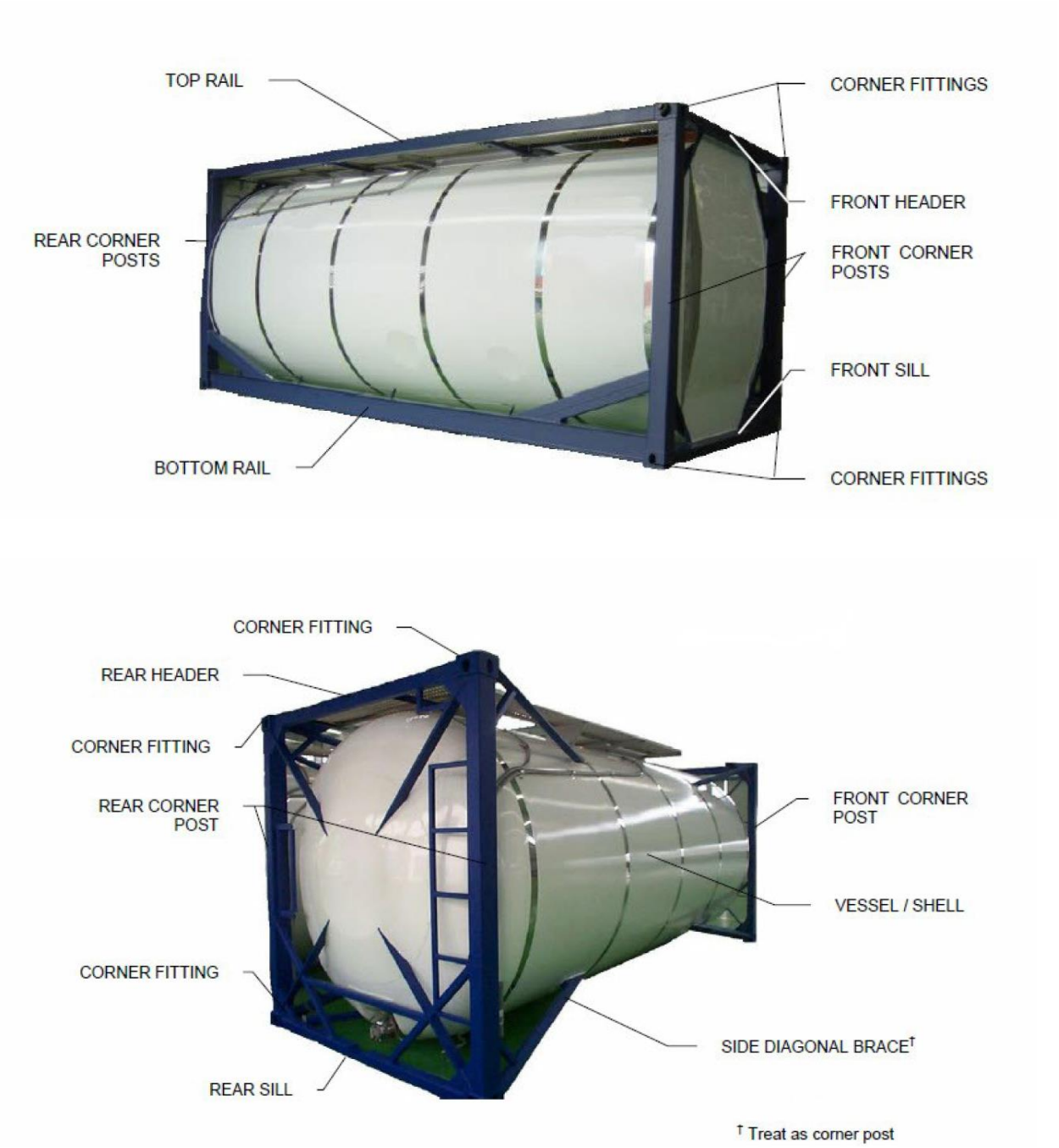

TOP RAIL
CORNER FITTINGS
FRONT HEADER
REAR CORNER POSTS
FRONT CORNER POSTS
FRONT SILL
BOTTOM RAIL
CORNER FITTINGS
CORNER FITTING
REAR HEADER
CORNER FITTING
REAR CORNER POST
FRONT CORNER POST
VESSEL / SHELL
CORNER FITTING
SIDE DIAGONAL BRACE†
REAR SILL
† Treat as corner post

Fig. A.18

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Annex B

A. Stamp

1.  on the bottom left corner fitting at the door-side, see Fig. B.4.

B. Label

Fig. B.1

1. If possible on the left door of standard containers (box containers);on platform containers and flats, protected, see Fig. B.3.

1.1 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 BKI label shown in Fig. B.1.

2. CSC plate

The Safety Approval Plate, conforming to the model reproduced below, shall take the form of a permanent, non-corroding, fire-proof rectangular plate measuring not less than 200 mm x 100 mm. The words "CSC Safety Approval" with a minimum letter height of 8 mm shall be stamped into, embossed on or indicated in any other permanent and legible way on its surface; all other words and numbers shall have a minimum height of 5 mm.

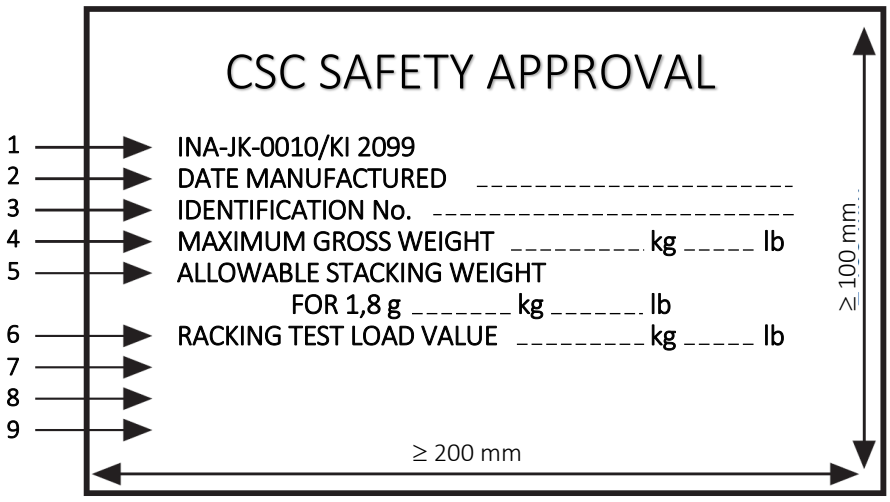

Fig. B.2

1. Country of approval and approval reference according to the example in line 1. (The country of approval shall be indicated by means of the distinguishing letters used to indicate the country of registration of motor vehicles in international road traffic.)
2. Date (month and year) of manufacture.
3. Manufacturer's identification number of the container or, in the case of existing containers for which this number is unknown, the number allocated by the Administration.
4. Maximum operating gross weight (kg and lb).
5. Permitted stacking weight at 1,8 g (kg and lb).
6. Load value for transverse racking test (kg and lb).
7. The end wall strength is to be indicated on the plate only if the end walls are designed to withstand a load of less or greater than 0,4 times the maximum permitted payload, i.e. 0,4P.
8. The side wall strength is to be indicated on the plate only if the side walls are designed to withstand a load of less or greater than 0,6 times the maximum permitted payload, i.e. 0,6P.
9. First maintenance examination date (month and year) for new containers and subsequent maintenance examination dates (month and year) if plate is used for this purpose.
10. One door off stacking strength to be indicated on plate only if the container is approved for one door off operation. The marking shall show: ALLOWABLE STACKING LOAD ONE DOOR OFF FOR 1.8 g (... kg ... lb). This marking shall be displayed immediately near the stacking test value (see line 5).
11. One door off racking strength to be indicated on plate only if the container is approved for one door off operation. The marking shall show: TRANSVERSE RACKING TEST FORCE (... newtons). This marking shall be displayed immediately near the racking test value (see line 6).

ONE DOOR – OFF OPERATION		
ALLOWABLE STACKING LOAD FOR 1,8 g	kg	lb
RACKING TEST LOAD VALUE	kg	

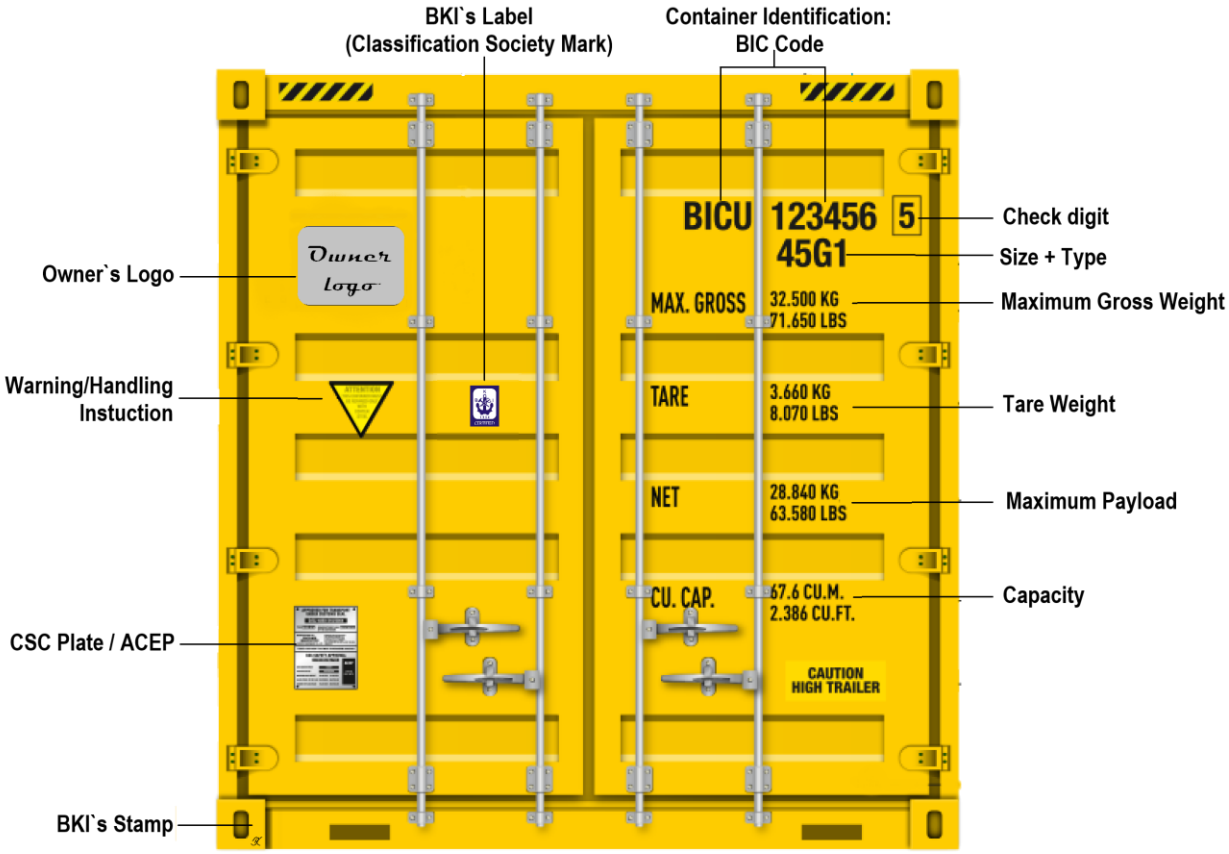

Fig. B.3 Marking

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Annex C

Reference

ISO 668	Series 1 freight containers - Classification dimensions and ratings
ISO 830	Freight containers - Terminology
ISO 1161	Series 1 Freight containers - Comer fittings - Specification
ISO 1894	General purpose Series 1 freight containers - Minimum internal dimensions
ISO 6346	Freight containers - Coding, identification and marking
ISO 6359	Freight containers - Consolidated data plate
ISO 3874	Series 1 Freight containers - Handling and securing
ISO 8323	Freight containers – Air/surface (intermodel) general purpose containers – Specification and tests
ISO 1496-1	Series 1 freight containers - Specification and testing
	Part 1 : General cargo containers for general purposes
ISO 1496-2	Series 1 freight containers - Specification and tasting
	Part 2: Thermal containers
ISO 1496-3	Series 1 freight containers - Specification and testing
	Part 3: Tank containers for liquids, gases and pressurized dry bulk
ISO 1496-4	Series 1 freight containers - Specification and testing
	Part 4: Non-pressurized containers for dry bulk
ISO 1496-5	Series 1 freight containers - Specification and testing
	Part 5: Platform and platform - based containers

List of the most important standards for swap body construction

EN 283	Swap bodies; testing
EN 284	Class C swap bodies, dimensions and general requirements
EN 452	Class A swap bodies
DIN 15190	Part 101 Land containers
	Principal dimensions, comer fittings, tests

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