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RULES FOR THE CONSTRUCTION AND CERTIFICATION OF FREIGHT CONTAINERS

Chapter 1 GENERAL

1.1 General

1.1.1 Application*

- 1 The tests and inspections of containers are to be as prescribed in these Rules.
- 2 At the request of applicants, international conventions, international standards, etc. regarding freight containers are applicable in addition to these Rules.

1.1.2 Equivalency*

- 1 Containers with an effective Safety Approval Plate as considered appropriate by the Society may be regarded as those conforming to these Rules.
- 2 Containers of alternative design type are to be in accordance with the discretion of the Society.

1.1.3 Precautions for Application

- 1 Precautions are to be taken on the fact that containers are subject to additional requirements, which are not specified in these Rules, imposed by the administration of a country in which they serve.
- 2 Precautions are to be taken on the fact that tank containers used for the carriage of dangerous goods are to be in accordance with the relevant laws and regulations as well.

1.1.4 Definitions

Terms used in these Rules are defined as follows unless otherwise specially provided:

- (1) “Tare” (“*T*”) is the mass in kilograms of the empty container including permanently affixed ancillary equipment.
- (2) “Load”, when used to describe a physical quantity to which units may be ascribed, signifies mass in kilograms.
- (3) “The standard acceleration of gravity” (“*g*”) is to be equal to 9.8 m/sec^2 .
- (4) “Maximum operating gross mass” or “Rating” (“*R*”) is the maximum allowable sum of the mass in kilograms of the container and its cargo. Gravitational forces derived from this value are indicated in newtons as *Rg*.
- (5) “Maximum permissible payload” (“*P*”) is the difference in kilograms between the maximum operating gross mass and the tare. Gravitational forces derived from this value are indicated in newtons as *Pg*.
- (6) “Height”, “Width” and “Length” are overall external dimensions measured in vertical, transverse and longitudinal directions respectively.
- (7) “Overall external dimensions” are the maximum external overall dimensions of the container including any permanent attachments, and are designated by *H*, *W* and *L* respectively.
- (8) “Internal dimensions” are the internal dimensions of the container including any permanent attachments except top cover fitting.
- (9) “Type-series containers” are the containers manufactured under a sole design type.
- (10) “*ISO* standards” are the International Standards regarding containers which have been adopted by TC104 of the International Standardization Organization.
- (11) “*CSC*” is the International Convention for Safe Containers.

1.1.5 Inspection*

- 1 The inspection during production of containers is to be carried out in accordance with the requirements in [Chapter 4](#).
- 2 The maintenances and examinations of containers after production are to be carried out in accordance with the requirements of *CSC*.
- 3 For containers which have not been inspected during production according to *CSC*, or containers on which any alterations have been made, etc., inspections are to be in accordance with the discretion of the Society.

- 4 Otherwise in case the Society requires, containers are to be inspected accordingly.

1.1.6 Certification

1 The Society will issue a Certificate for an individual container coming under either of the followings, having satisfactorily undergone the tests and inspections by the Surveyor.

- (1) Type-series containers which have been built under the supervision by the Surveyor.
- (2) Other containers

2 Containers in use will be examined at the request of the Owners of containers and a proper Certificate will be issued to them.

If the container has a certificate mentioned above, endorsement may be made accordingly instead of issuing the Certificate.

1.1.7 Safety Approval Plate

1 Containers, which have been inspected in accordance with the requirements in **1.1.5-1** or **-3** and found satisfactory, are to be affixed with a Safety Approval Plate prescribed in **Chapter 9**.

2 Regarding containers which have been inspected in accordance with the requirements in **1.1.5-1** or **-3**, the Society assigns the Maximum Operating Gross Mass, Allowable Stacking Load, Transverse Racking Test Force and Values of End Wall Strength and/or Side Wall Strength only if the test forces for the end wall and/or side wall are different from the values specified in **Table 5.1**. And those assigned values are to be indicated on the Safety Approval Plate required in the preceding **-1**.

1.1.8 Design Type Approval

1 The Society will approve the type of containers conforming to the requirements in **Chapter 2** and issue a Notification of Design Type Approval.

2 The Society will withdraw the Design Type Approval when the Society considers that part of the approved design type has become non-conforming due to amendments to these Rules.

1.1.9 Approval of Manufacturing Procedure

1 The Society will inspect the manufacturing plant and manufacturing procedure at the plant according to the requirements in **Chapter 3**, approve them when the Society considers them to be satisfactory, and issue a Notification of Approval of Manufacturing Procedure.

2 The Society will withdraw the Approval of Manufacturing Procedure when the Society considers that part of the approved manufacturing procedure has become non-conforming to the requirements in **3.1.1-1**.

1.1.10 Submission of Application*

Anyone who wishes to receive the inspection under these Rules (hereinafter, referred to as the “Applicant”) is to submit an Application for Inspection to the Society.

1.1.11 Preparation for Surveys and Others

1 All such preparations as required for the survey to be carried out as well as those which may be required by the Surveyor as necessary in accordance with the requirements in the Rules are to be made by the applicant of the survey. The preparations are to include provisions of an easy and safe access, necessary facilities and necessary records for the execution of the survey. Inspection, measuring and test equipment, which Surveyors rely on to make decisions affecting certification are to be individually identified and calibrated to a standard deemed appropriate by the Society. However, the Surveyor may accept simple measuring equipment (*e.g.* rulers, measuring tapes, weld gauges, micrometers) without individual identification or confirmation of calibration, provided they are of standard commercial design, properly maintained and periodically compared with other similar equipment or test pieces.

2 The applicant for the survey is to arrange a supervisor who is well conversant with the survey items intended for the preparation of the survey to provide the necessary assistance to the Surveyor according to his requests during the survey.

3 The survey may be suspended where necessary preparations have not been made, any appropriate attendant mentioned in the previous **-2** is not present, or the Surveyor considers that the safety for execution of the survey is not ensured.

4 Where repairs are deemed necessary as a result of the survey, the Surveyor will notify his recommendations to the applicant of the survey. Upon this notification, the repair is to be made to the satisfaction of the Surveyor.

Chapter 2 DESIGN TYPE APPROVAL

2.1 General

2.1.1 General*

1 Each type of container proposed for Design Type Approval is to comply with the relevant requirements in **Chapters 5, 6 and 7** in respect to its structural arrangements, scantlings, materials etc. and a sample unit of the type is to undergo the tests and inspections specified in **Chapters 5 to 7**. However, in case where any container has the Design Type Approval of **CSC**, the Society will examine the specified documents and omit part or whole of the required tests and inspection.

2 For containers constructed to other standards than those in these Rules, the test and inspection are to be in accordance with the discretion of the Society. Special conditions, if adopted, will be entered in the Notification of Design Type Approval to such containers.

3 The Society may require further tests and inspections in addition to those specified in the Rules and/or alterations to the design depending upon the circumstances.

2.1.2 Type of Container

A type of container is assumed to include those built in accordance with the same basic design and specifications. However, the Society may consider it the same type as the original one even if minor alterations to the structural arrangements or variations in the fittings are made in containers with Design Type Approval provided that no substantial effect is made on the performance.

2.1.3 Plans and Documents to be Submitted

For Design Type Approval, the following documents are to be submitted to the Society.

- (1) Specifications in duplicate;
- (2) Plans indicating in detail the quality of materials to be used, scantlings and arrangements of structural members and their connections as well as the plans prescribed in **Chapters 6 and 7** all in triplicate;
- (3) Testing manual in duplicate;
- (4) Any other documents as required by the Society in duplicate.

2.1.4 Manufacture Record

The applicant is to keep a record of containers manufactured to the approved design type. This record shall at least contain the manufacturer's identification numbers, dates of delivery and names and addresses of customers to whom the containers are delivered.

Chapter 3 APPROVAL OF MANUFACTURING PROCEDURE

3.1 General

3.1.1 General

1 For Approval of Manufacturing Procedure, the Society shall be satisfied that the manufacturer has the technical ability for the series production of containers of consistent quality.

2 Any alterations to the approved manufacturing procedure are to be inspected and approved by the Society. If the alteration is of major significance, the Society will carry out general examination at the site of the works.

3.1.2 Documents to be Submitted

For Approval of Manufacturing Procedure, documents showing the following items concerning the production of containers are to be submitted to the Society in duplicate.

- (1) An outline of the works;
- (2) An outline of containers intended to be built and the manufacturing procedure;
- (3) Main facilities for the production;
- (4) Facilities for testing;
- (5) Process of the quality control, including the manufacturer's standards for inspection;
- (6) Any other matters which may be required by the Society.

3.1.3 Maintenance of Approval

Where production of containers at works with Approval of Manufacturing Procedure is interrupted for more than one year, the works will be subjected to inspection and examination in accordance with the provisions of this Chapter before production is reopened.

Chapter 4 TESTS AND INSPECTIONS DURING PRODUCTION

4.1 General

4.1.1 General

1 Tests and inspections during production are to be carried out as required by 4.2. For containers of special types not fully covered in the Rules, tests and inspections will be carried out in general in accordance with these regulations and/or an agreed specification.

2 The Society may require other tests and inspections than specified in 4.2 depending upon the circumstances.

4.1.2 Plans and Documents to be Submitted

1 When containers are intruded to be tested and inspected, following plans and documents are to be submitted to the Society.

(1) For type series containers

(a) Plans and documents specified in 2.1.3

(b) Plans or documents indicating minor alterations, if any, to the structural arrangements or variations in the fitting of the approved design type.

(2) For other containers

(a) Specifications of the containers;

(b) Plans indicating in detail the quality of materials used, scantlings and arrangements of structural members and their connections, as well as the plans required by the relevant provisions of Chapters 6 and 7. Submission of above-mentioned plans or documents, however, may be dispensed with if the Society considers that it is difficult to prepare them.

2 Submission of other plans and documents than specified above may be requires where considers necessary by the Society.

4.2 Tests and Inspections for Type-series Containers

4.2.1 Type-series Containers Manufactured in Works with Approval of Manufacturing Procedure

1 For type-series containers manufactured in the works with Approval of Manufacturing Procedure, the following tests and inspections are to be carried out to the satisfaction of the Surveyor.

(1) Visual and dimensional inspection specified in 5.5 for each container.

(2) Mass measurement specified in 5.5 for containers of a certain number accepted by the Society.

(3) Weatherproofness test specified in 5.5 for each general cargo container.

(4) Airtightness test specified in 6.5 as well as weatherproofness test in 5.5 for each thermal container. The test hours and the test condition of airtightness test may be modified under acceptance of the Society.

(5) Operation test for each refrigerating unit or heating appliance of thermal containers.

(6) Pressure test specified in 7.5 for each tank or tank compartment of tank containers.

(7) Stacking, lifting from top corner fittings and floor tests specified in 5.5 or 6.5 or 7.5 for one container selected at random from every fifty container. For thermal containers, thermal and performance tests specified in 6.5 are to be added to the above mentioned tests.

The kinds of tests and their frequencies may be modified depending on the test results previously obtained.

The test hours of the thermal test and the performance test of refrigerating unit may by modified under acceptance of the Society.

2 For the tests and inspection required in the preceding -1, the tests and inspection procedures may by modified when the Society considers that the tests and examinations carried out by the manufacturer are appropriate.

3 Records of tests and inspections, quality control and results of checks and corrections are to be complete and reliable for each container and submitted for the Survey's review when requested.

4.2.2 Type-series Containers Manufactured in Works without Approval of Manufacturing Procedure

The following tests and inspections are to be carried out to the satisfaction of the Surveyor.

(1) Visual and dimensional inspection specified in 5.5 for each container.

(2) Mass measurement specified in 5.5 for containers of a certain number accepted by the Society.

- (3) Weatherproofness test specified in 5.5 for each general cargo container.
- (4) Airtightness test specified in 6.5 as well as weatherproofness test in 5.5 for each thermal container. The test hours and the test condition of airtightness test may be modified under acceptance of the Society.
- (5) Operation test for each refrigerating unit or heating appliance of thermal containers.
- (6) Pressure test specified in 7.5 for each tank or tank compartment of tank container.
- (7) Strength tests specified in 5.5 or 6.5 or 7.5 for one container selected at random from every fifty containers which have been built at the same period to the same design and specifications. For thermal containers, thermal and performance tests specified in 6.5 are to be added to the above mentioned tests. The kind of test and their frequency may be modified depending on the test results previously obtained.

Chapter 5 GENERAL CARGO CONTAINERS

5.1 General

5.1.1 Application

The provisions of this Chapter apply to general cargo containers of closed type and open top type.

5.2 Dimensions, Ratings and Structural Arrangements

5.2.1 Design Load

Each structural member of the container is to be so designed as to be capable of withstanding the following conditions, and for this purpose the loads specified in [Table 5.1](#) are to be taken into consideration.

- (1) Stacking: Stacking to 6-high.
- (2) Lifting: Vertical lifting from all four top corners, and lifting from all four bottom corners by means of suitable slings.
- (3) Transportation: Restraint and lashing in transit under dynamic loading resulting from road or railway operations or the ship motions.
- (4) Loading and Unloading: Concentrated loading due to the cargo handling apparatus etc. during loading or unloading operation.

5.2.2 Dimensions and Ratings

1 Dimensions and their tolerances as well as the rating of the container of each designation are shown in [Table 8.1](#) and [Fig. 8.1](#) of [Chapter 8](#). However, the maximum operating gross mass used in tests may be greater than the value obtained from the table. In this case, the maximum operating gross mass to be indicated according to the requirement in [1.1.7-2](#) and [5.4\(2\)](#) is to be of the value used in the test.

2 Minimum internal dimensions for *ISO* containers are given in [Table 8.2](#) of [Chapter 8](#).

3 No part of the container shall project beyond the overall external dimensions.

5.2.3 Corner Fittings

1 Each container is to be equipped with corner fittings at the top and bottom corners, the dimensions of which are given in [Fig. 8.2](#) and [Fig. 8.3](#) of [Chapter 8](#).

2 The upper faces of top corner fittings are to protrude above the upper face of the roof plating by a minimum of 6 mm.

5.2.4 Base Structure

1 All containers are to be capable of being supported by their bottom corner fittings only.

2 Containers 1A, 1AA, 1B, 1BB, 1C and 1CC shall also be capable of being supported on load transferring areas in their base structures only. These areas are to be provided with intermediate transverse members having a spacing of 1,000 mm or less or structural members giving load-transferring areas at the positions shown in [Fig. 8.4](#) of [Chapter 8](#).

The maximum load to be transferred at the load transfer zone should not exceed 2.0R.

3 For containers 1A, 1AA, 1B, 1BB, 1C and 1CC, the lower faces of the load transferring areas in their bases, including their end transverse members above the base plane shall be 12.5 mm (+ 5 mm -1.5 mm).

4 *ISO* containers shall be designed so that no part of the base structures shall deflect more than 6 mm below the bottom faces of the bottom corner fittings under a uniformly distributed load equal to 1.8R-T.

5 The base structures of the containers are not to protrude below the corner fittings under a uniformly distributed load equal to the maximum payload.

5.2.5 End Structure

For containers 1A, 1AA, 1B, 1BB, 1C and 1CC, the sideways deflection of the top of the container with respect to the bottom of the container at the time when it is under transverse racking force of 150 kN shall not cause the sum of the changes in length of the two diagonals in each end wall to exceed 60 mm.

5.2.6 Side Structure

For containers 1A, 1AA, 1B, 1BB, 1C and 1CC, the longitudinal deflection of the top of the container with respect to the bottom

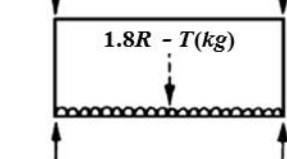
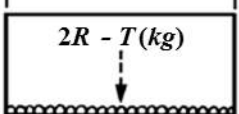
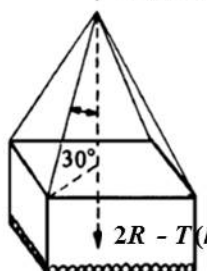
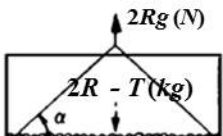
of the container at the time when it is under longitudinal racking force of $75kN$ shall not exceed 25 mm .

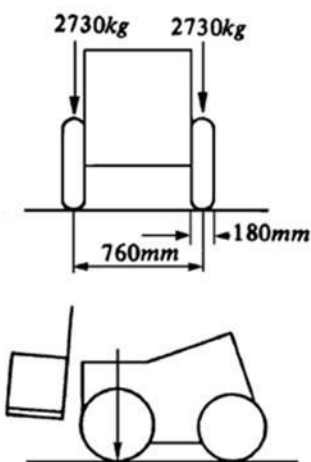
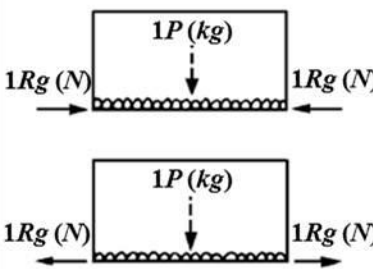
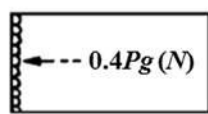
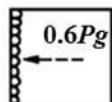

5.2.7 Doors and Door Openings

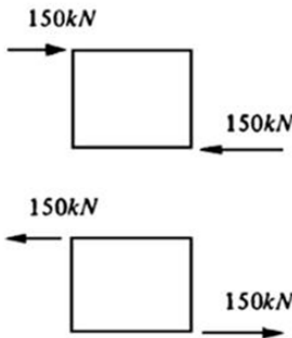
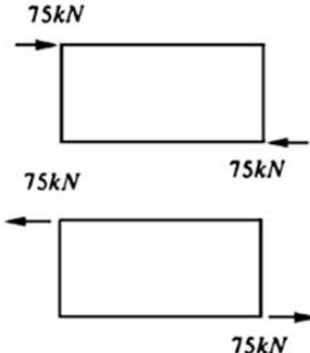
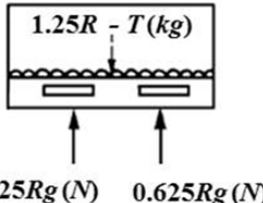
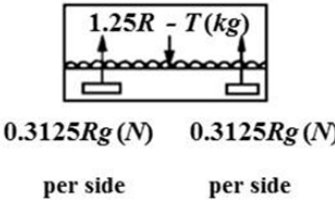
- 1** All door openings are to be as large as possible. For *ISO* containers, dimensions of door openings at ends are given in [Table 8.2 of Chapter 8](#).
- 2** Doors are to be equipped with securing devices of capable being sealed up.
- 3** All doors are to be capable of being clasped properly when opened.

Table 5.1 Loads and Forces to be Applied

Table 5.1 Loads and Forces to be Applied

Item	Where Applied	Direction	Notes										
Stacking	Top corner fittings Off-set by 38mm longitudinally and 25,4mm laterally	<p>Vertical downwards</p> <p>$2.25Rg (N)$ $2.25Rg (N)$</p>  <p>$1.8R - T (kg)$</p> <p>$2.70Rg (N)$ $2.70Rg (N)$</p>	Concentrated eccentrically applied load $9Rg (N)$ ($\frac{9}{4}Rg (N)$ per top corner fitting)										
Top Lifting	Top corner fittings	<p>Vertically upwards for containers 1A, 1AA, 1B, 1BB, 1C and 1CC</p> <p>$Rg/2 (N)$ $Rg/2 (N)$</p>  <p>$2R - T (kg)$</p> <p>30° to the vertical for containers 1D</p>  <p>$2Rg (N)$</p> <p>$2R - T (kg)$</p>	Lifting force $2Rg (N)$ ($\frac{2}{4}Rg (N)$ per top corner fitting)										
Bottom Lifting	Bottom corner fittings Spacing between the line of action of the lifting force and the outer face of the corner fitting is not further than 38mm,	<p>a : Angle to the horizontal</p>  <p>$2Rg (N)$</p> <p>$2R - T (kg)$</p> <p>α</p> <table border="1"> <thead> <tr> <th></th><th>a</th></tr> </thead> <tbody> <tr> <td>1A, 1AA</td><td>30°</td></tr> <tr> <td>1B, 1BB</td><td>37°</td></tr> <tr> <td>1C, 1CC</td><td>45°</td></tr> <tr> <td>1D</td><td>60°</td></tr> </tbody> </table>		a	1A, 1AA	30°	1B, 1BB	37°	1C, 1CC	45°	1D	60°	Lifting force $2Rg (N)$
	a												
1A, 1AA	30°												
1B, 1BB	37°												
1C, 1CC	45°												
1D	60°												

Item	Where Applied	Direction	Notes
Wheel loading	Floor	Vertically downward 	5460kg per an axle (2730kg per a wheel) wheel width: 180mm contact area: 142cm ² wheel centers: 760mm
Restraint	Bottom corner fittings	Longitudinal 	Concentrated force $2Rg(N)$ ($\frac{2}{2} Rg(N)$ per one side)
End wall	End wall	Outwards normal to the end 	Uniformly distributed load 0.4Pg(N)
Side wall	Side wall	Outwards normal to the side 	Uniformly distributed load 0.6Pg(N)
Roof	An area of 600mm×300mm located at the weakest area	Downwards normal to the roof 	Uniformly distributed load 300kg

Item	Where Applied	Direction	Notes
Rigidity (transverse) For containers 1A, 1AA, 1B 1BB, 1C and 1CC	Top corner fittings	Transverse 	Concentrated force 150kN per top corner fitting
Rigidity (longitudinal) For containers 1A, 1AA, 1B 1BB, 1C and 1CC	Top corner fittings	Longitudinal 	Concentrated force 75kN per top corner fittings
For lift pocket For 1C, 1CC and 1D containers (when fitted)	Fork lift pockets	Vertically upwards 	Distributed load $\frac{1.25}{2} Rg$ (N) per fork lift pocket
Grappler lifting position (when fitted)	Grappler lifting position	Vertically upwards 	Distributed load $\frac{1.25}{4} Rg$ (N) per grapple lifting position

5.2.8 Optional Features

1 Containers 1A and 1AA may be provided with gooseneck tunnels. The dimensional requirements for *ISO* containers are specified in Fig. 8.5 of Chapter 8 and, in addition, all other parts of the base structure should be as specified in 5.2.4.

2 Containers 1C, 1CC and 1D may be provided with fork lift pocket. The dimensional requirements for *ISO* containers are specified in Fig. 8.6 of Chapter 8 and, in addition, the base structure should be as specified in 5.2.4.

3 Containers may be provided with the features for handling at the base by means of grappler arms or similar devices. The dimensional requirements for *ISO* containers are specified in Fig. 8.7 of Chapter 8, in addition, the base structure should be as specified in 5.2.4.

5.3 Materials and Workmanship

5.3.1 Materials

1 The structural members of containers are to be of incorrodible materials or subjected to a suitable anticorrosive treatment.

2 Corner fittings are to be of cast steel or materials with equivalent ductility, and further where welding is intended these are to be of weldable quality.

3 Caulking materials filled in the joints are to be of acceptable types.

4 Materials used for the main structural members of containers which come under 1.1.6-1(1) are to be of the quality conforming to the approved specifications and to be satisfactorily tested and inspected in the presence of the Surveyor. The Society may consider omission of the test on materials for which and acceptable certificate has been issued.

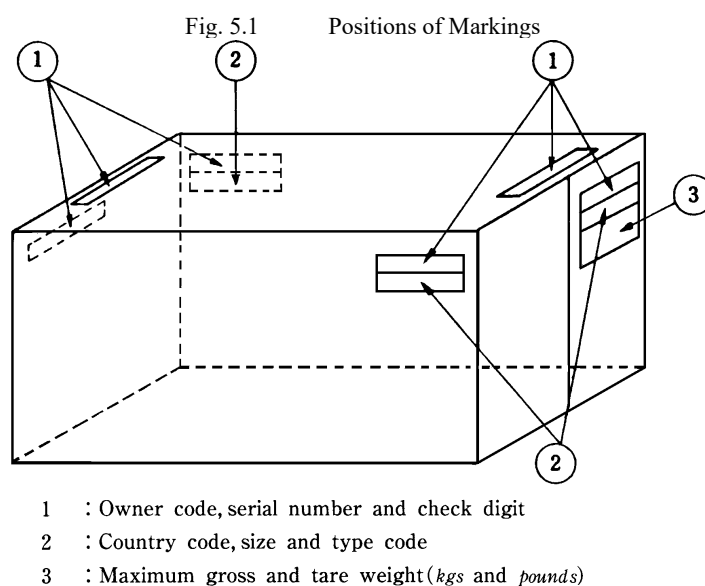
5.3.2 Workmanship

Welding for containers which come under 1.1.6-1(1) is to be carried out in accordance with the procedures approved and by the welding operators qualified by the Society or possessing the equivalent qualification.

5.4 Marking

Each container is to carry at least the following markings as shown in Fig. 5.1.

- (1) Owner's mark and serial number
- (2) Maximum operating gross mass (*kg*)
- (3) Tare (*kg*)
- (4) Type of container (Manufacturer's model)
- (5) Name of manufacturer



5.5 Tests and Inspections

5.5.1 General

1 The tests and inspections include the following:

- (1) Visual inspection
- (2) Dimensional inspection
- (3) Mass measurement
- (4) Strength tests
- (5) Weathertightness test

2 Measuring instruments to be used for the tests and inspections of the container are to be duly calibrated.

3 Where the requirements of this Chapter are not applicable, the Society may specially consider the requirements for tests and inspections referring to standards deemed appropriate.

4 Alternative test procedures to those specified in this Chapter will be accepted if considered to be equivalent.

5.5.2 Visual Inspection

1 Visual inspection is to be carried out at a proper stage and period during production and/or after completion ascertaining that the constructions, materials and workmanship of the container are in compliance with the requirements of the Rules without any visual defects in each component of the container.

2 In the visual inspection, it is to be ascertained that the door can be smoothly operated and secured.

5.5.3 Dimensional Inspection

Dimensional inspection is to be carried out after the completion of all the works in order to ascertain that the container meets the dimensional requirements of the Rules.

5.5.4 Mass measurement

Mass measurement is to be carried out after the completion of all the works in order to determine the tare of the container.

5.5.5 Strength Tests

1 Strength tests are to be carried out as specified in [Table 5.2](#) after the completion of all the works.

2 In the strength tests measurement shall be taken as required in [Table 5.2](#). Additional measurements may be required depending upon the circumstances.

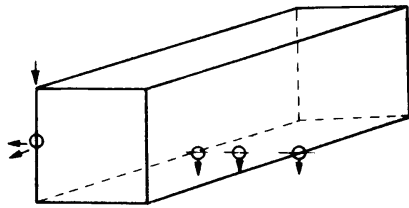
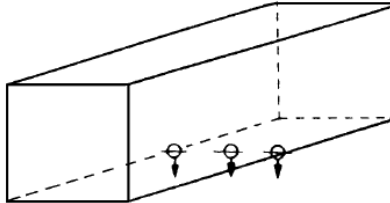
3 On completion of the tests, the container shall show neither permanent deformation nor abnormality which will render it unsuitable for use.

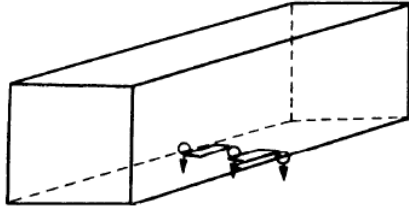
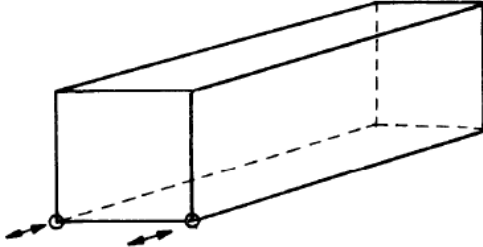
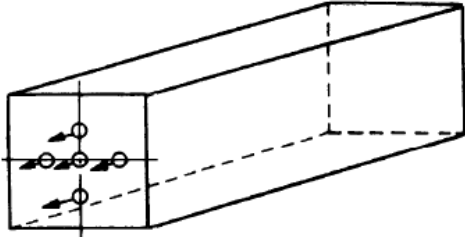
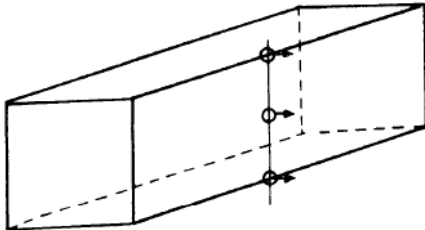
5.5.6 Weatherightness Test

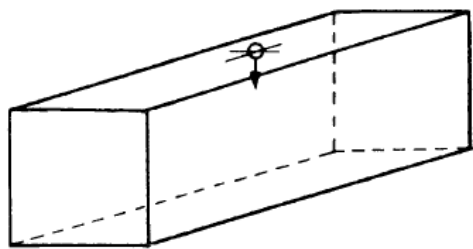
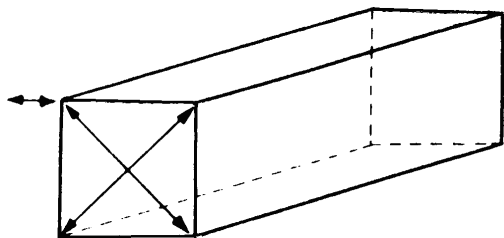
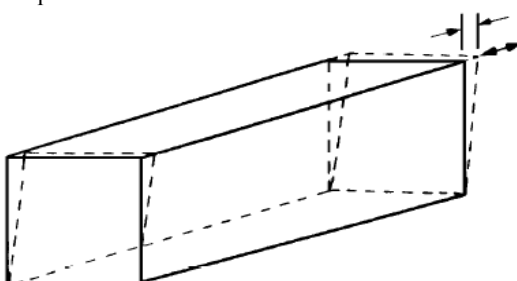
1 Weatherightness test is to be carried out as specified in [Table 5.2](#). In testing the sample unit for Design Type Approval the weathertightness test is recommended to be conducted after all strength tests have been completed. For containers coming under [4.2.1](#) the weathertightness test is to be carried out at a reasonable stage during production.

2 On completion of the test, the container is to be free from penetration of water.

Table 5.2 Test Procedures and Measurements

Tests	Procedures and Measurements										
Stacking	<p>Procedure</p> <p>- Internal load: 1.8 R-T(kg) uniformly distributed over the base.</p> <p>- Applied forces: With the container in the normal position supported at the base corner fittings, compressive forces equivalent to 2.25 R(kg) are to be applied to each corner post through rigidly held dummy corner fittings arranged to simulate an overstowed corner base. The test is to be repeated to cover for all positions of offset namely 38 mm longitudinally and 25.4 mm laterally.</p> <p>For containers with doors, stacking loads are also to be added under the one door off condition.</p> <p>Measurements:</p> <p>i) Deflections at lowest point of both side rails and at the longitudinal centre line of the base which may be taken before the application of axial loads.</p> <p>ii) Deflections in two directions at midheight, or other point of maximum deflection of the corner posts.</p> <p>iii) Permanent set remaining on removal of the load.</p> 										
Top Lifting	<p>Procedure</p> <p>- Internal load: 2R-T(kg) uniformly distributed over the base.</p> <p>- Applied forces: With the container in the normal position, lifting forces are to be applied gradually to the top corner fittings.</p> <p>i) Vertically to 1A, 1AA, 1B, 1BB, 1C and 1CC containers.</p> <p>ii) At 30 to the vertical in the case of 1D containers.</p> <p>The container shall be supported for 5 minutes.</p> <p>Measurements:</p> <p>i) While loaded and supported by the four bottom corner fittings before lifting clear, the deflection at lowest points of both side rails and at the longitudinal centre line of the base.</p> <p>ii) Any distress due to lifting.</p> <p>iii) Permanent set remaining on removal of the load.</p> 										
Bottom Lifting	<p>Procedure</p> <p>- Internal load: 2 R-T(kg) uniformly distributed over the base.</p> <p>- Applied forces: With the container in the normal position, lifting forces are to be applied gradually through the bottom corner fitting side apertures as follows:</p> <table border="1" data-bbox="588 1671 1217 1879"> <thead> <tr> <th></th><th>Direction of applied forces</th></tr> </thead> <tbody> <tr> <td>1A, 1AA</td><td>30° to horizontal</td></tr> <tr> <td>1B, 1BB</td><td>37° to horizontal</td></tr> <tr> <td>1C, 1CC</td><td>45° to horizontal</td></tr> <tr> <td>1D</td><td>60° to horizontal</td></tr> </tbody> </table> <p>The container shall be supported for 5 minutes.</p> <p>Measurements: Any distress due to lifting.</p>		Direction of applied forces	1A, 1AA	30° to horizontal	1B, 1BB	37° to horizontal	1C, 1CC	45° to horizontal	1D	60° to horizontal
	Direction of applied forces										
1A, 1AA	30° to horizontal										
1B, 1BB	37° to horizontal										
1C, 1CC	45° to horizontal										
1D	60° to horizontal										

Tests	Procedures and Measurements
Floor Strength	<p>Procedure</p> <ul style="list-style-type: none"> - Internal load: Nil. - Applied forces: With container supported at the bottom corner fittings, a vehicle equipped with 180 mm wide wheels at 760 mm centres each having a contact area of 142 cm² loaded to an axle load of 5,460 kg is to be manoeuvred over the entire floor area. <p>Measurements: Deflections and permanent set in three locations of the base.</p> 
Restraint	<p>Procedure</p> <ul style="list-style-type: none"> - Internal load: $R-T(kg)$ uniformly distributed over the base. - Applied forces: With the container in the normal position, anchored by locking devices through the bottom apertures in the bottom corner fittings at one end, loads equivalent to R (kg) are to be applied to each side rail through the bottom apertures in the bottom corner fittings at the other end first in compression then in tension. <p>Measurements: The change in length of both bottom side rails during and after the test (in each direction).</p> 
End Wall	<p>Procedure</p> <ul style="list-style-type: none"> - Internal load and application: 0.4 $P(kg)$ uniformly distributed over the wall under test in such a way as to allow free deflection of the end wall. <p>Measurements: Deflection and permanent set at the centre and at least two other locations.</p> 
Side Wall	<p>Procedure</p> <ul style="list-style-type: none"> - Internal load and application: 0.6 $P(kg)$ uniformly distributed over the wall under test in such a way as to allow free deflection of the side wall and its top and bottom side rails. Each side is to be tested separately but only one side need to be tested when both are similar in construction. <p>Measurements: Deflection and permanent set at the centre of the side wall and the centre of the top and bottom side rails.</p> 

Tests	Procedures and Measurements	
Roof Panel	<p>Procedure</p> <ul style="list-style-type: none"> - Internal load: Nil. - Applied forces: 300 kg uniformly distributed over a 600 mm × 300 mm are at the weakest section of the roof. <p>Measurements: Maximum deflection and permanent set of the section under test.</p>	
Transverse Racking	<p>Procedure</p> <ul style="list-style-type: none"> - Internal load: Nil. - Applied forces: With the container in the normal position anchored by locking devices through the apertures in the bottom corner fittings, transverse racking forces of 150 kN (15000 kgf) are to be applied separately or simultaneously to each top corner fitting on one side. Lateral restraint is to be taken up by the anchor devices diagonally opposite to the applied forces. The force (s) shall be applied first towards then away from the container. <p>For containers with doors, transverse racking loads are also to be added under the one door off condition.</p> <p>Measurements: Difference in diagonals before, during and after testing.</p>	
Longitudinal Racking	<p>Procedure</p> <ul style="list-style-type: none"> - Internal load: Nil. - Applied forces: With the container in the normal position anchored by locking devices through the apertures in the bottom corner fittings, longitudinal racking forces of 75 kN (7500 kgf) are to be applied separately or simultaneously to each top corner fitting on one end. Longitudinal restraint is to be taken up by the anchor devices diagonally opposite to the applied forces. The force (s) shall be applied first towards then away from the container. <p>Measurements: Longitudinal displacement of top side rails.</p>	
Lifting from Fork Lift Pockets	<p>Procedure</p> <ul style="list-style-type: none"> - Internal load: 1.25 R-T(kg) uniformly distributed over the base. - Applied forces: The container shall be supported for 5 minutes by two bars 200 mm wide inserted in the fork pockets to a depth of 1,828 ± 3 mm. <p>Measurements: Undue local distortion during the test and any permanent distortion.</p>	

Tests	Procedures and Measurements	
Lifting from side Grappler Lift Positions	<p>Procedure</p> <p>-Internal load: 1.25 $R-T(kg)$ uniformly distributed over the base.</p> <p>-Applied forces: The container shall be supported for 5 <i>minutes</i> by pads at the four grapppler arm positions. The pads shall be of the same area as the grapppler arms intended to be used.</p> <p>Measurements: Undue local distortion during the test and any permanent distortion.</p>	
Weathertightness	<p>Procedure</p> <p>All surfaces of the container are to be subjected to a water test from a 12.5 <i>mm</i> nozzle, with a water pressure of 1 <i>bar</i> at the nozzle, which is to be traversed at a speed of approximately 100 <i>mm</i> per second at a distance of 1.5 <i>m</i> from the surface under test.</p>	

Chapter 6 THERMAL CONTAINERS

6.1 General

6.1.1 Application

1 The provisions of this Chapter apply to containers which are built with insulated walls, doors, floor and roof so as to retard the rate of heat transmission between inside and outside of the container.

(hereinafter referred to as “thermal container”)

2 Design Type Approval, Approval of Manufacturing Procedure and Tests and Inspections during production in respect of refrigerating units and/or heatproducing appliances intended for thermal containers will be made at the request of the Owners.

6.1.2 Plans and Documents

When containers are intended to be tested and inspected, following plans and documents are to be submitted to the Society in triplicate in addition to those prescribed in 2.1.3 or 4.1.2.

- (1) Insulating Construction (Including kinds of material of insulation, date of heat transmission and details on method of insulating work).
- (2) Ventilating devices and Drainage.
- (3) Location of thermometers and temperature recording arrangements.

6.2 Structural Arrangements and Capacity of Refrigerating Units

6.2.1 General

1 Requirements in Chapter 5 are to be applied to thermal containers unless otherwise prescribed in this Chapter.

2 Thermal containers are to comply with the following specification.

- (1) The inside and outside temperatures for thermal containers provided with refrigerating units are to be -18°C and 38°C respectively. Besides, the inside and outside temperatures for insulated containers may be the designed temperatures.
- (2) The coefficient of heat transfer (hereinafter referred to as “ K ”) of thermal containers is to be not more than $0.4\text{ W/m}^2\text{C}$.
- (3) Electrical aspects are to be in accordance with *ISO /IS* 1496/II so far as applicable.

6.2.2 Insulating Construction

The insulating constructions are not to be functionally affected by cleaning methods, such as water cleaning, wet steam cleaning and detergents normally used.

6.2.3 Airtightness

Thermal containers are to be of airtight construction and to be complied with the requirement in 6.5.3.

6.2.4 Refrigerating Appliances

1 Refrigerating units are to comply with following requirements and to have a sufficient capacity taking into consideration the service condition of containers.

- (1) Refrigerating units are to have a capacity to run without a hitch and to be capable of efficiently maintaining the specified minimum inside temperature under the test prescribed in 6.5.5(1)(d).
- (2) Refrigerating units are also to be capable of efficiently maintaining the specified minimum temperature for a period of at least 4 hours under the test prescribed in 6.5.5(1)(e).

2 Where the condensers are of water cooled type, the design temperature of cooling water for refrigerating units is to be 36°C . The structure is to be designed to allow draining to prevent the water from freezing.

3 For appliances requiring water connections the inlet and outlet interfaces of them are to conform to the Fig.8.8 and Fig.8.9 of Chapter 8.

The water inlet and outlet connections are to be so located at the machinery end of the container that, to an observer facing that end, they appear in the lower right-hand quarter.

4 The containers are to be of such construction that cooled air be permitted to circulate between the inner lining panels, floors

and cargoes.

5 As for 1AA, 1CC and 1C thermal containers with the design intended for ducted air systems or for use with externally located removable equipment, the air inlet and outlet openings are to conform to the Fig.8.10, Fig.8.11 and Fig.8.12 of Chapter 8.

6.2.5 Sanitary Requirements and Drains

1 The interior surface and structure of the thermal container are to be so constructed as to facilitate cleaning, and adequate provision to be made to ensure that cleaning water can drain satisfactorily from the inside of the container.

Where cargo space drains are required for cleaning of the interior of the container, they are to be provided with manual closures.

2 When provision of drains is made on the floor of the container, such drains are to have a closing device operable from outside the container or an arrangement to protect against intrusion of water. Further, the drains are to be so constructed as not to worsen the airtightness of the container remarkably.

3 Where operation of cargo space drains is required for the thermal containers when carrying cargo, the drains are to be protected by fittings which open automatically above normal internal operating pressure.

6.2.6 Arrangements for Hanging Cargo

Where on the ceiling of the thermal containers is provided the cargo hanging arrangements, the containers are to be so designed as to be capable of suspending a load of twice the maximum service load or 3,000kg per metre of the usable container length, whichever is the greater.

6.2.7 Temperature Measuring Device

1 The suitable instruments are to be provided for measuring the internal temperature of the thermal containers.

The use of automatic temperature recorders is recommended.

2 Where automatic temperature indicator is used, a suitable device is to be provided for its calibration.

6.3 Materials and Workmanship

Requirements for materials and workmanship of thermal containers are as follows in addition to the requirements prescribed in 5.3.

(1) Proper choice of materials intended for thermal containers and refrigerating units or heating appliances are to be made so as to produce no harmful effects on cargoes.

No damage is to be caused on the materials by carrying out the tests prescribed in 6.5.4 and 6.5.5.

(2) The quality of insulating materials is to be accepted by the Society.

(3) Insulating work is to be carried out with a scrupulous care.

(4) When the insulating material is intended to be foamed at the site, the method of foaming is to be approved by the Society.

6.4 Marking

1 In addition to the markings prescribed in 5.3, the following items are to be indicated on the exterior of thermal containers provided with refrigerating units.

(1) Type of refrigerating unit, date of manufacture, and kind of refrigerant.

(2) Output and revolution of the electric motor for refrigerant compressor.

(3) Rated voltage, frequency and serial number of phases of the electric motor for refrigerant compressor.

(4) Type of electric source (Classification of electric source, I, II, or III prescribed in ISO /IS 1496/II).

(5) Full load current and Total starting current.

(6) Minimum internal temperature and ambient temperature (when the condenser is of aircooled)

2 Where the thermal containers are provided with cargo hanging arrangements, the maximum service load is to be marked at easily visual position on the internal wall of the containers.

6.5 Tests and Inspections

6.5.1 General

1 Requirements of Tests and Inspections prescribed in [Chapter 5](#) are also applied in addition to those of this chapter.

2 The tests and inspections for thermal containers include the following:

- (1) Visual inspection
- (2) Dimensional inspection
- (3) Mass measurement
- (4) Weathertightness
- (5) Strength tests
- (6) Airtightness test
- (7) Thermal test
- (8) Performance test for refrigerating unit

3 Performance tests are to be carried out after successful completion of strength tests.

4 All instruments and devices to be used for performance tests are to be properly selected and calibrated to the precision as follows:

- (1) Temperature measuring devices: $\pm 0.5^{\circ}\text{C}$
- (2) Power measuring system: $\pm 2\%$ of the quantity measured.
- (3) Flow meter system: $\pm 3\%$
- (4) Manometer $\pm 5\%$

6.5.2 Strength Test

Roof strength test for hanging cargo (Where provided) is to be carried out as follows:

(1) Procedure:

A load of twice the maximum service load *or* 3,000kg/m of usable container length, whichever is greater, is to be attached to the roof in a manner simulating normal service loadings, while the container is supported by its fourcorner fittings only.

(2) Measurements:

Maximum deflection and permanent set of the section under test.

(3) Requirements:

On completion of the test, the container shall show neither permanent deformation nor abnormality which will make it unsuitable for use.

6.5.3 Airtightness Test

Airtightness test is to be carried out as follows:

(1) Procedure:

- (a) The test is to be carried out prior to thermal test.
- (b) The container is to be in its normal operating condition and to be closed in the normal manner.
- (c) Temperatures inside and outside the container are both to be within the range of 15°C to 25°C and temperatures are to be stabilized within 3°C of each other.
- (d) The refrigerating unit and/or heating equipment are to be fitted in place, except for the container provided with the removable equipment and having closures at the interfaces. In this case, the equipment is to be removed and the closures are to be shut.
- (e) All drain openings are to be closed.
- (f) An air supply through a metering device and a suitable manometer are to be connected to the container by a leakproof connection.
The manometer is not to be fitted direct to the air supply pipe.
- (g) Air is to be admitted to the container to raise the internal pressure to $250 \pm 10\text{Pa}$ ($25\text{mm} \pm 1\text{mm}$ water head height) and the air supply to be regulated to maintain this pressure.

After the steady test conditions are established, the test pressure is to be maintained for not less than 30 minutes.

(2) Measurements:

- (a) Internal and ambient temperatures are to be measured.
- (b) Air flow required to maintain the test pressure is to be measured.

(3) Requirements:

The air leakage rate, expressed in standard atmospheric conditions is to be no more than the values given in following [Table 6.1](#).

If the measured air leakage exceeds these values, the maximum air leakage rate may be in accordance with the requirement of *ISO /IS 1496/II*.

For those series ICC and 1C containers covered by the exclusion clause in [6.5.3\(1\)\(d\)](#) which, in addition, have air inlet and outlet openings as envisaged in [6.2.4-5](#) the maximum permitted air leakage rate expressed in standard atmospheric conditions is to be less than $8m^3/h$.

Table 6.1 Air Leakage rate				
Designation	1AA, 1A	1BB, 1B	1CC, 1C	1D
Air Leakage rate m^3/h	30	23	16	9

6.5.4 Thermal Test

Thermal test is to be carried out as follows:

(1) Procedure:

- (a) The test is to be carried out after successful completion of airtightness test.
- (b) The test is to be performed with the refrigerating unit and/or heating equipment fitted in place, except that, where the container is designed for use with removable equipment, the equipment is not to be in position but the closures are to be shut.
- (c) The test is to be performed under steady state conditions applying either the internal heating or internal cooling method.
- (d) The test is to be performed for a continuous period of not less than 8 hours and sets of reading are to be recorded at intervals of not more than 30 minutes.
- (e) The following conditions are to be satisfied during the test.
 - i) Mean wall temperature is to be in the range minimum 20°C and maximum 32°C, and a temperature difference between inside and outside to be not less than 20°C
 - ii) Maximum temperature difference between any two inside points at any one time during the test is to be 3°C.
 - iii) Maximum temperature difference between any two outside points at any one time during the test is to be 3°C.
 - iv) Maximum difference between any two average inside air temperatures θ_i at different times of measurement is to be 1.5°C.
 - v) Maximum difference between any two average outside air temperatures θ_e at difference times of measurements is to be 1.5°C.
 - vi) Maximum percentage difference between lowest and highest power dissipation values is not to exceed 3% of the lowest figure.
 - vii) All temperature-measuring instruments placed inside and outside the container are to be protected against radiation.
- (f) Temperature-measuring points
Temperature are to be measured at the points shown in [Fig.8.13](#) of [Chapter 8](#).
- (g) For the electrical heating method, a nonradiant heater suitably shielded and circulating fan(s) are to be positioned at the geometric center of the container.
- (h) No test method used shall result in frost build-up which could affect the test results in any way.

(2) Measurements:

- (a) Data of outside and inside temperatures of the container and power dissipation value to determine K value are to be taken at intervals of not more than 30 minutes and for a continuous period of not less than 8 hours.
- (b) The mean wall temperature is defined by the following formula.

$$\theta = \frac{\theta_e + \theta_i}{2}$$

- (c) The coefficient of heat transfer (K) is defined by the following formula.

$$K = \frac{U}{S}$$

$$U = \left| \frac{Q}{\theta_e - \theta_i} \right|$$

$$S = \sqrt{S_e \cdot S_i}$$

where;

K : The coefficient of heat transfer ($W/m^2\text{°C}$)

U : The total heat transfer rate ($W/\text{°C}$)

S : The mean surface area of the container (m^2)

S_e : The outside surface area of the container (m^2)*

S_i : The inside surface area of the container (m^2)*

Q : The power dissipated or absorbed by the operation of internal heaters and fans or internal cooling units (W)

θ : The mean wall temperature (°C)

θ_e : The average outside temperature of the container (°C)

θ_i : The average inside temperature of the container (°C)

Notes:* If areas are corrugated, the projected area is to be used.

- (3) Requirements:

K value which is obtained from this test is to be not more than the value prescribed in [6.2.1-2\(2\)](#).

6.5.5 Performance Test of Refrigerating Unit

Performance test of refrigerating unit is to be carried out as follows:

- (1) Procedure:

- The container is to be placed in test chamber where the temperature is held constant at the outside temperature prescribed in [6.2.1-2\(1\)](#).
- The measuring points of temperature for outside of the container are to be the places prescribed in [Fig.8.13](#) of [Chapter 8](#) and for inside of the container the temperatures at air inlet and air outlet are to be recorded at least.
- The test is to be performed on the container in its normal operating condition but ventilating devices are to be closed.
- Using the refrigerating unit, the inside temperature of the container is to be cooled down to the temperature prescribed in [6.2.1-2\(1\)](#) and then maintain this temperature for a period of 8 *hours*.
- After completion of above mentioned test, a non-radiant heater placed in the air stream inside the container is to be turned on, having a capacity of at least 25% of the total heat transfer rate (U) of the container established by the thermal test prescribed in [6.5.4](#) With the heater in operation the refrigerating unit is to be operated for a period of at least 4 *hours*.
- The capacity of the heater is defined by the formula below;

$$\text{Heating Capacity} = 0.25K \cdot S(\theta_e - \theta_i)$$

where:

K : The coefficient of heat transfer established by the Thermal test in [6.5.4](#) ($W/m^2\text{°C}$)

S : The mean surface area of the container (m^2)

θ_i : Inside temperature prescribed in [6.2.1-2\(1\)](#) (°C)

θ_e : Outside temperature prescribed in [6.2.1-2\(1\)](#) (°C)

- (2) Measurements:

- Inside and outside temperatures are to be recorded.
- The power dissipated of electrical heater is to be recorded.

- (3) Requirements:

It is to be confirmed that the average inside temperature of the container is to be maintained at the specified temperature during the test.

Chapter 7 TANK CONTAINERS

7.1 General

7.1.1 Application

The provisions of this Chapter apply to the tank containers for the carriage of liquids and gases with a maximum allowable working pressure of $29.4kPa$ gauge or above.

7.1.2 Plans and Documents

When containers are intended to be tested and inspected, following plans and documents are to be submitted to the Society in addition to those prescribed in [2.1.3](#) or [4.1.2](#).

- (1) Specifications of the tank in duplicate;
- (2) Drawings of the tank in triplicate showing full details of materials, scantlings, weld procedures and fitting details of valves, nozzles and other fittings;
- (3) Arrangement and full details of the valves, nozzles and other fittings in triplicate;
- (4) Full details of the pressure relief devices in triplicate.

7.2 Dimensions, Ratings and Structural Arrangements

7.2.1 General

1 Provisions in [5.2](#) of [Chapter 5](#) except [5.2.2-2](#), [5.2.7](#) and [5.2.8-2](#) also apply to the tank containers unless otherwise prescribed in this Section.

2 Tanks and fittings are to be designed, constructed and tested in accordance with a recognized pressure vessel code and the requirements of this Chapter.

7.2.2 Design Loads

Each structural member of the container is to be designed taking into consideration the loads specified in [Table 7.2](#).

7.2.3 Framework

The upper faces of the top corner fittings are to protrude above the top of the tank shell and its associated piping and fittings by a minimum of 6 mm .

7.2.4 Base Structure

When the tank container is loaded to R , no part of the tank and its associated shell fittings should project below a plane 25 mm above the bottom faces of the lower corner fittings.

7.2.5 Optional Features for Framework

1 Fork lift pockets for handling in the loaded condition should not be provided, as fork lift transport of tank containers being considered dangerous because of stability problems with loaded or partly loaded tanks. For **ISO** containers, fork lift pockets shall not be provided.

2 Walkways (where provided) are to be designed to withstand a loading of $300kg$ uniformly distributed over an area of $600\text{ mm} \times 300\text{ mm}$.

3 Ladders (where provided) are to be designed to withstand a loading of $200kg$ on any rung.

7.2.6 Tank

1 Each tank or tanks shall be firmly secured to structural elements of the tank framework. The tank or tanks should be capable of being filled and emptied without removal from the tank container.

2 Tanks or tank compartments without vacuum relief devices are to be designed to withstand an external pressure of at least $39kPa$ above the internal pressure without permanent deformation.

7.2.7 Tank Fittings

1 All tank openings except pressure relief devices are to be provided with adequate closures of capable of being sealed up, to prevent accidental escape of the contents.

2 Tank nozzles and outlet fittings are to be substantially made and attached to the tank in such a manner as to minimize the risks of breakage. Protective covers or housings are to be employed as necessary.

3 All tank openings located below the normal liquid level of the contents and fitted with a valve capable of being operated manually are to be provided with an additional means of closure on the outlet side of the valve. Such additional means of closure may be a fluid-tight cap, bolted blank flange or other suitable protection against accidental escape of the contents.

4 All valves, whether fitted internally or externally, are to be located as close to the tank shell as practicable.

5 Stop valves with screwed spindles are to be closed by clockwise motion of handwheel.

6 All tank connections are to be clearly marked to indicate their functions.

7.2.8 Pressure Relief Devices

1 Each tank of fluid-tight compartment is to be fitted with a pressure relief device set to be fully open at a pressure not greater than the tank's test pressure.

2 Pressure relief devices installed on *ISO* containers shall have a minimum relief capacity specified in the following [Table 7.1](#) to prevent excessive internal overpressure.

3 Pressure relief devices are to be connected to the vapour space of the tank and be located on the top of the tank or tank compartment nearby in its mid-place where inspection can be readily conducted.

4 Each pressure relief device is to be plainly and permanently marked with the pressure at which it is set to operate.

5 When a vacuum relief device is required, it should be designed to prevent permanent deformation of the tank or tank compartments caused by external pressure.

Table 7.1 Minimum Pressure Relief Capacity

Type designation	Minimum pressure relief capacity <i>m³/min</i>
1AA	6.4
1A	5.7
1B	4.8
1C	3.8
1D	2.8

7.2.9 Manholes

Each tank is to be provided with manholes or other openings of a minimum diameter of 450 *mm* to permit internal inspections and repairs.

7.2.10 Gauging Devices

Gauging devices which may be in direct communication with the contents of the tank are not to be made of easily destructible material.

7.2.11 Optional Features for Tank

1 When insulation is required, due regard should be given to the requirements of [7.3](#), and the design and construction are to be such that the insulation may in no way interfere with the proper function of the tank fittings.

2 When heating or refrigeration provisions are required, consideration should be given to providing suitable operational safeguards having regard to the avoidance of the development of excessive temperatures and stresses. Such safeguards should be easily operable.

7.3 Material and Workmanship

In addition to the requirements of [5.3](#), the following requirements apply to the tank containers.

(1) The materials selected for the tank are not to cause a dangerous reaction when in contact with the contents, Allowance for

corrosion prescribed by the governing competent authority should be taken into consideration.

- (2) For **ISO** containers, the minimum temperature range over which materials shall be suitable is -10°C to 50°C.

7.4 Marking

In addition to the requirements of 5.4, the following data is to be permanently marked or stamped.

- (1) Date of hydrostatic test
- (2) Test pressure
- (3) Maximum allowable working pressure
- (4) Total capacity

7.5 Tests and Inspections

7.5.1 General

- 1 Provisions of 5.5 of Chapter 5 apply to the tank containers unless otherwise prescribed in this Section.
- 2 The tests and inspections for the tank containers include the following:

- (1) Visual inspection
- (2) Dimensional inspection
- (3) Mass measurement
- (4) Strength test
- (5) Pressure test

7.5.2 Visual Inspection

For insulated tank containers, the visual inspection is to be conducted prior to commencement of the insulating work.

7.5.3 Strength Tests

- 1 Strength tests are to be carried out as specified in Table 7.3 after completion of all the work.
- 2 In the strength tests measurements shall be taken required in Table 7.3. Additional measurements may be required depending upon the circumstances.
- 3 The required loading in each test should be applied in such a manner as to allow free deflection of the container section under test.
- 4 The internal loading is to be obtained by filling the tank and a supplementary external loading may be provided, when necessary, in order to achieve the specified loading. The test loading thus applied is to be such as to simulate uniform loading.
- 5 Upon completion of the test, the container shall show neither permanent deformation nor abnormality which will render it unsuitable for use.

7.5.4 Pressure Test

- 1 The pressure test is to be carried out as specified in Table 7.3. In testing the containers for Design Type Approval, the pressure test should be carried out after all strength tests have been completed. For production line containers, the pressure test is to be carried out at a reasonable stage during production.
- 2 For insulated tank containers, the pressure test is to be carried out prior to commencement of the insulating work.
- 3 Upon completion of the test, the container shall show no leakage, no permanent deformation or abnormality which will render it unsuitable for use.

Table 7.2 Loads and Forces to be Applied

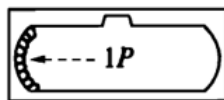

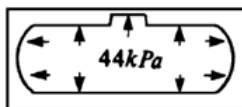
Items	Where applied	Directions	Notes
Stacking	As specified in Table 5.1 .		
Top Lifting	As specified in Table 5.1 .		
Bottom Lifting	As specified in Table 5.1 .		
Restraint	As specified in Table 5.1 .		
Inertia (longitudinal)	End wall	Outwards normal to the end 	Uniformly distributed load 1P
Inertia (lateral)	Side of barrel wall	Outwards normal to the side 	Uniformly distributed load 1P
Rigidity (transverse)	As specified in Table 5.1 .		
Rigidity (longitudinal)	As specified in Table 5.1 .		
Internal Pressure	Tank or fluid-tight compartment		44 kPa or above
Grappler arm lift positions	As specified in Table 5.1 .		

Table 7.3 Test Procedures and Measurements

Tests	Procedures and Measurements
Stacking	<p>Procedure: As specified in Table 5.2</p> <p>Internal loading need not be provided during this test.</p> <p>Measurements: As specified Table 5.2</p>
Top Lifting	As specified in Table 5.2
Bottom Lifting	As specified in Table 5.2
Restraint	As specified in Table 5.2
Inertia (longitudinal)	<p>Procedure:</p> <p>-Internal load and application: With $R-T(kg)$ internal load, the container is to be positioned with its longitudinal axis vertical and supported by its four bottom corner fittings.</p> <p>Measurements: The container is to be supported for 5 <i>minutes</i>. Any distress due to the test is to be recorded.</p>
Inertia (lateral)	<p>Procedure:</p> <p>-Internal load and application: With $R-T(kg)$ internal load, the container is to be positioned with its transverse axis vertical and supported by its four bottom corner fittings.</p> <p>Measurements: The container is to be supported for 5 <i>minutes</i>. Any distress due to the test is to be recorded.</p>
Walkway	<p>Procedure:</p> <p>-Internal load: Nil.</p> <p>-Added loads: 300 <i>kg</i> uniformly distributed over a 600 <i>mm</i>×300 <i>mm</i> area at the weakest section of the walkway.</p> <p>Measurements: Maximum deflection and permanent set of the walkway under test.</p>
Rigidity(transverse)	As specified in Table 5.2
Rigidity(longitudinal)	As specified in Table 5.2
Grappler arm lift positions	As specified in Table 5.2
Pressure	<p>Procedure:</p> <p>(1) The tank container together with its associated pipework and fittings is to be hydrostatically tested to a test pressure not less than 1.5 times the maximum allowable working pressure or design pressure.</p> <p>(2) The test pressure is to be measured at the top of the tank in its normal position and is to be maintained to enable a complete examination of the tank. For <i>ISO</i> containers, the test pressure to be maintained for not less than 30 <i>minutes</i>.</p> <p>(3) Relief devices, where fitted, are to be rendered inoperative or removed.</p>

Chapter 8 FIGURES, DIMENSIONS AND OTHERS

8.1 General

8.1.1 General

Dimensions of containers and fittings are to be in accordance with this Chapter.

8.2 Figures, Dimensions and Others

8.2.1 Dimensions, Tolerances and Maximum Operating Gross Mass

Dimensions of containers are to be in accordance with [Table 8.1](#), [Fig. 8.1](#) and [Table 8.2](#).

8.2.2 Corner Fittings

Dimensions of Corner Fittings are to be in accordance with [Fig. 8.2](#) and [Fig. 8.3](#).

8.2.3 Load Transferring Areas in Base Structures

Dimensions of load transferring areas in base structures are to be in accordance with [Fig. 8.4](#).

8.2.4 Tunnel Recess

Dimensions and tolerances of tunnel recess are to be in accordance with [Fig. 8.5](#).

8.2.5 Fork Lift Pockets

Dimensions and tolerances of fork lift pockets are to be in accordance with [Fig. 8.6](#).

8.2.6 Dimensions of Grappler Arm Lifting Areas

Dimensions of Grappler arm lifting areas are to be in accordance with [Fig. 8.7](#).

8.2.7 Cooling Water Connections

Dimensions of cooling water connections are to be in accordance with [Fig. 8.8](#) and [Fig. 8.9](#).

8.2.8 Air Inlets and Outlets

Dimensions of air inlets and outlets are to be in accordance with [Fig. 8.10](#), [Fig. 8.11](#) and [Fig. 8.12](#).

8.2.9 Air Temperature Measurement Points

Air temperature measurement points are to be in accordance with [Fig. 8.13](#).

Table 8.1 Overall External Dimensions and Tolerances, etc.

Designation	Height <i>H</i>		Width <i>W</i>		Length <i>L</i>		<i>K</i> ₁ (mm)	<i>K</i> ₂ (mm)	Maximum operating gross mass (kg) <i>R</i>
	mm	Tolerances mm	mm	Tolerances mm	mm	Tolerances mm	Max.	Max.	
1A	2,438	0-5	2,438	0-5	12,192	0-10	19	10	30,480
1AA	2,591	0-5	2,438	0-5	12,192	0-10	19	10	30,480
1B	2,438	0-5	2,438	0-5	9,125	0-10	16	10	25,400
1BB	2,591	0-5	2,438	0-5	9,125	0-10	16	10	25,400
1C	2,438	0-5	2,438	0-5	6,058	0-6	13	10	20,320
1CC	2,591	0-5	2,438	0-5	6,058	0-6	13	10	20,320
1D	2,438	0-5	2,438	0-5	2,991	0-5	10	10	10,160

Note:

The dimensions and tolerances shown in the table apply when measured at the temperature of 20°C and measurements taken at temperatures other than 20°C are to be adjusted accordingly.

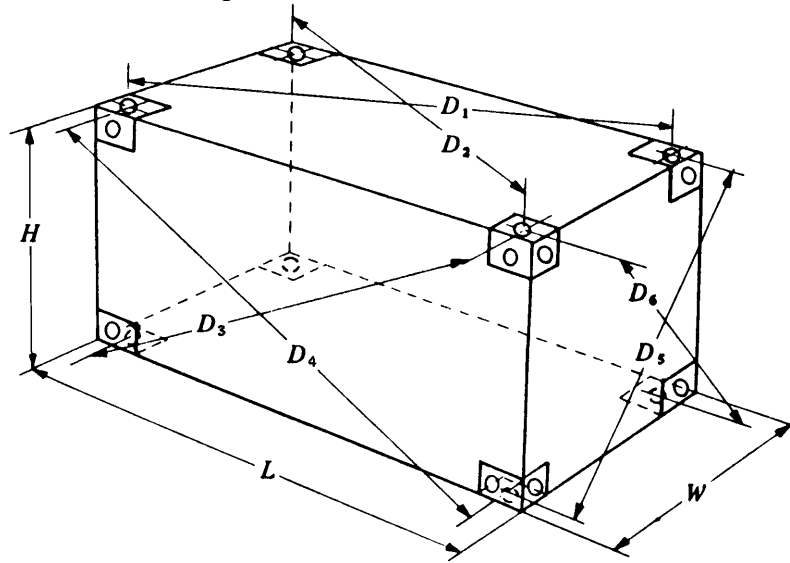
Table 8.2 Minimum Internal Dimensions and Door Opening's Size

	Designation	Internal Height mm	Internal Width mm	Internal Length mm	Door Opening	
					Width mm	Height mm
General Cargo Container	1A	2,197	2,330	11,998	2,286	2,134
	1AA	2,350		11,998		2,261
	1B	2,197		8,931		2,134
	1BB	2,350		8,931		2,261
	1C	2,197		5,867		2,134
	1CC	2,350		5,867		2,261
	1D	2,197		2,802		2,134
Thermal Container	1A		2,200			
	1AA					
	1B					
	1BB					
	1C					
	1CC					
	1D					

Notes:

- Containers, having partial opening(s) in the side(s), may not comply with the minimum internal width given in [Table 8.2](#).
- Containers, having an opening roof, may not comply with the maximum internal height given in [Table 8.2](#).
- Containers, having openings in the side(s), and roof, may not comply with the minimum internal width and height given in [Table 8.2](#).
- Internal height and width and door openings of thermal containers are to be as large as possible. And door openings should preferably be equal to the internal cross-sectional dimensions of the container.

Fig. 8.1 Dimensions and Tolerances



Note:

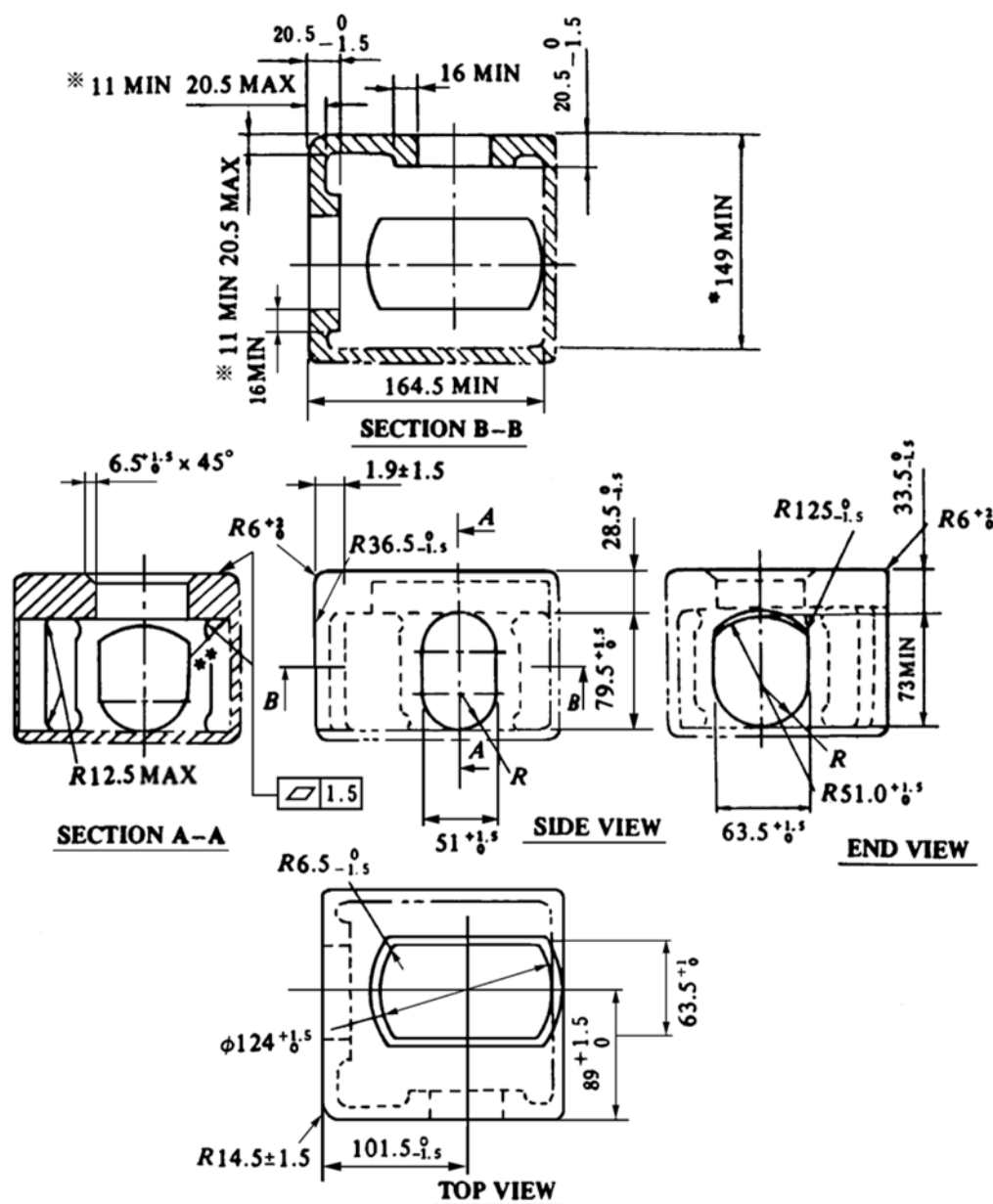
$$K_1 = |D_1 - D_2| \text{ or } |D_3 - D_4|$$

$$K_2 = |D_5 - D_6|$$

D_1, D_2, D_3, D_4, D_5 and D_6 are the distance between centres of apertures of diagonally opposite corner fittings.

Fig. 8.2 Top Corner Fitting

Dimensions are in millimetres.



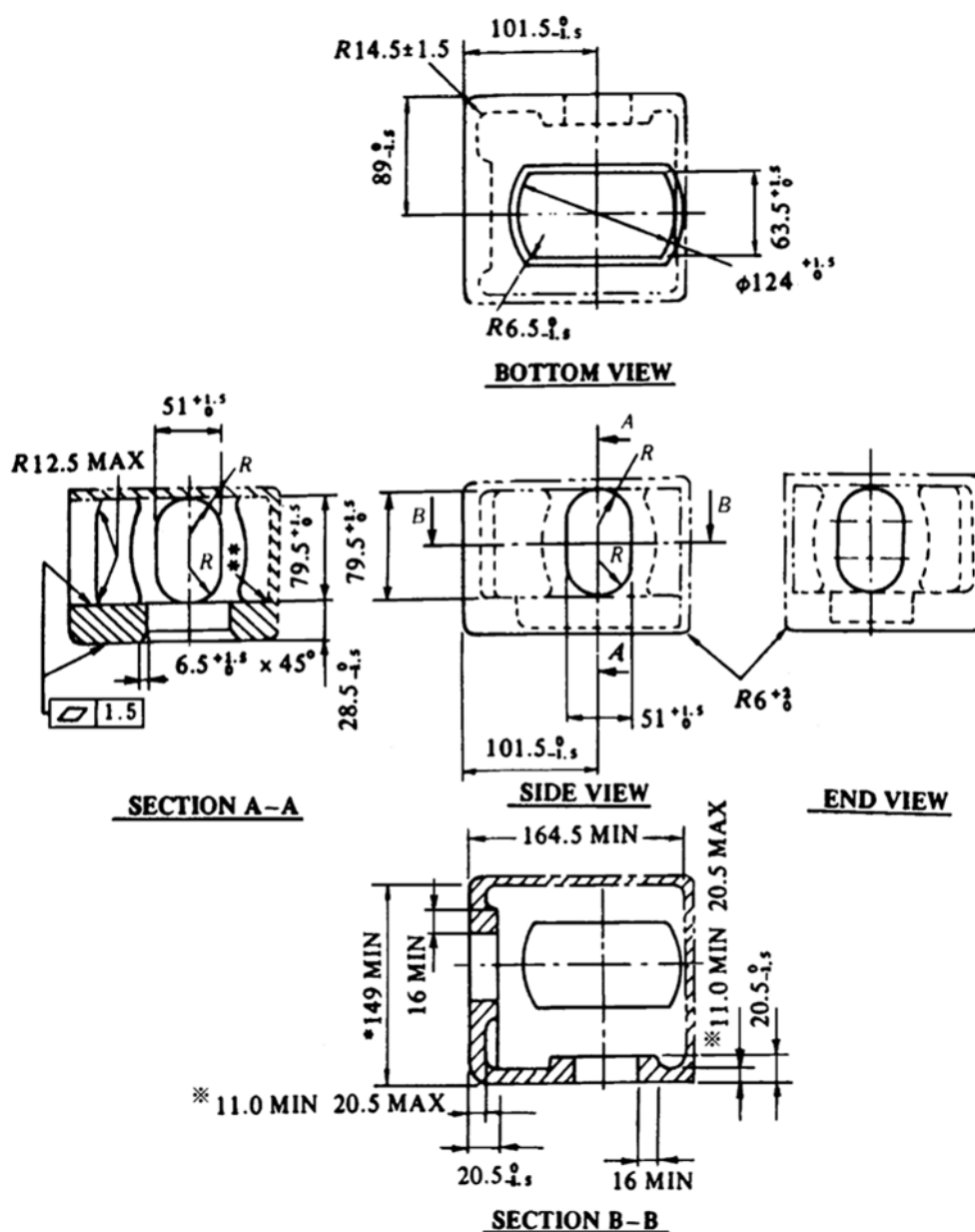
Notes:

- (1) Left hand fitting of fore end and right hand fitting of aft end are shown. Others are symmetrical to these.
- (2) Phantom lines (---) show optional walls which may be used to develop a boxed shaped fitting.
- (3) Where dimensions are not specified for inner and outer edges of apertures, these edges are to given a radius of $3 \begin{smallmatrix} 0 \\ -1.5 \end{smallmatrix} \text{ mm}$.
- (4) Scantlings indicated by ※ are not to be more than the thickness of the adjacent part surrounding a hole at the side or end.
- (5) In case of corner fittings having the minimum dimension of 149 mm indicated by *, the radius indicated by ** (where provided) is not to exceed 5.5 mm.

Where a greater radius is provided, the dimension of 149 mm indicated by * is to be increased accordingly.

Fig. 8.3 Bottom Corner Fitting

Dimensions are in millimetres.



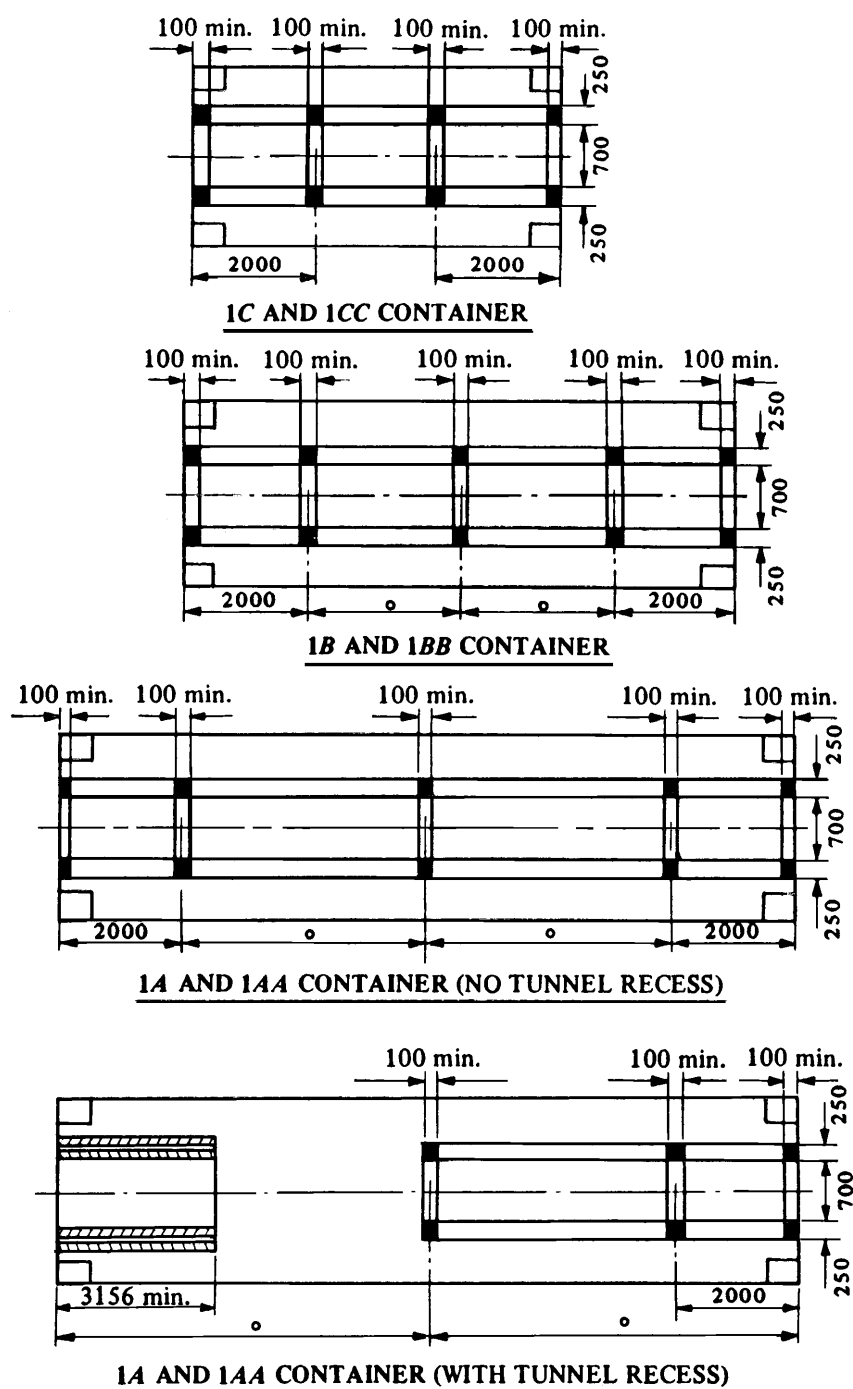
Notes:

- (1) Left hand fitting of fore end and right hand fitting of aft end are shown, Others are symmetrical to these.
- (2) Phantom lines (---) show optional walls which may be used to develop a boxed shaped fitting.
- (3) Where dimensions are not specified for inner and outer edges of apertures, these edges are to be given a radius of $3^{+0}_{-1.5} \text{ mm}$.
- (4) Scantlings indicated by \times are not to be more than the thickness of the adjacent part surrounding a hole at the side or end.
- (5) In case of corner fittings having the minimum dimension of 149 mm indicated by $*$, the radius indicated by $**$ (where provided) is not to exceed 5.5 mm .

Where a greater radius is provided, the dimension of 149 mm indicated by $*$ is to be increased accordingly.

Fig. 8.4 Load Transferring Areas

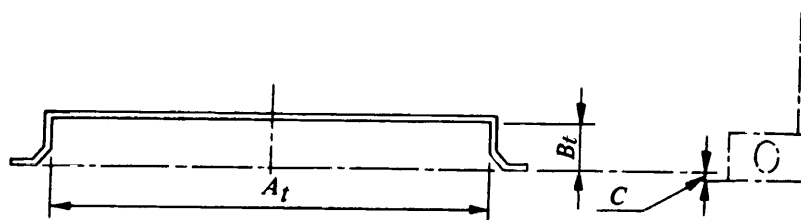
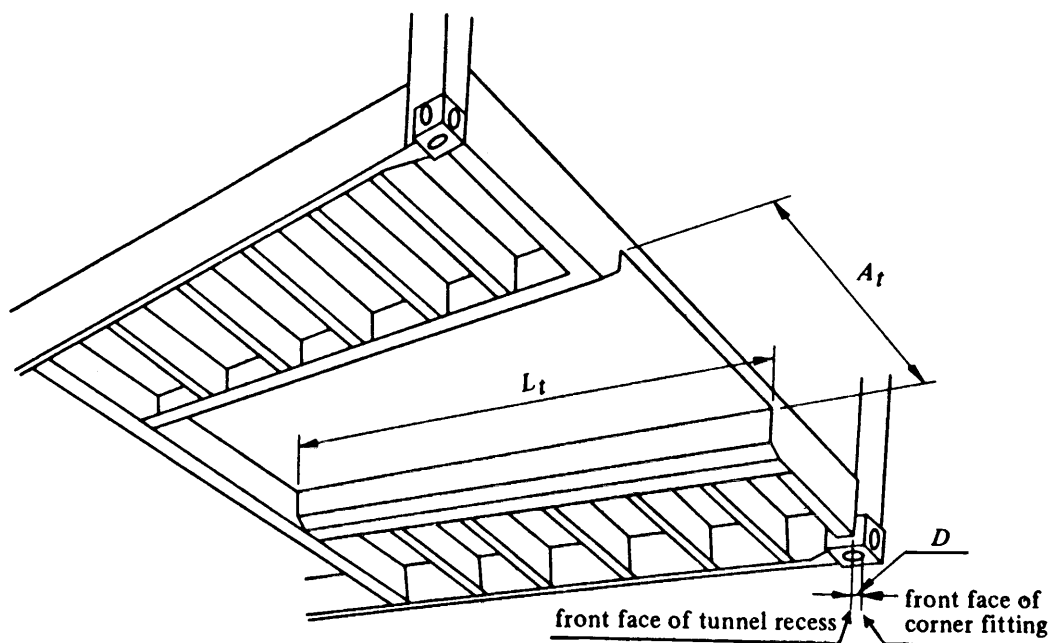
Dimensions are in millimetres.



Notes:

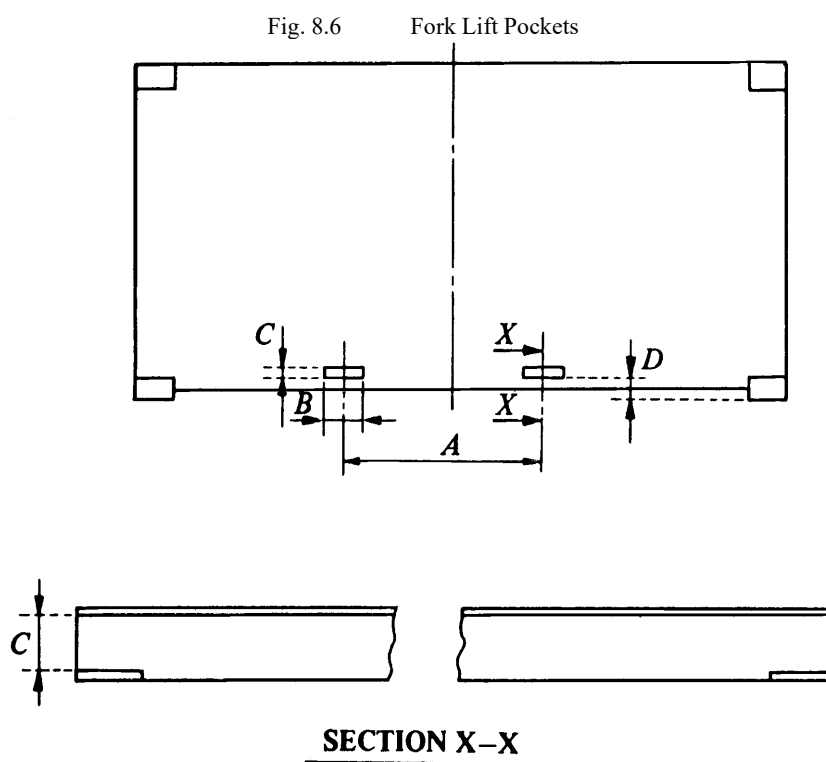
- (1) The figures show container's intermediate transverse members having a spacing of more than 1,000 mm.
- (2) The load transferring areas associated with the container base are shown in black.
- (3) Tunnel recess transfer areas are shown shaded.
- (4) For tunnel recess transfer areas, either or both surfaces may be used.

Fig. 8.5 Tunnel Recess



TRANSVERSE SECTION OF TUNNEL RECESS

Symbols	Dimensions and tolerances (mm)
C	$12.5^{+5}_{-1.5}$
B_t	120^{0}_{-3}
A_t	1029^{+3}_{0}
L_t	3150 min.
D	6^{+1}_{-2}



Symbols	Dimensions and Tolerances(<i>mm</i>)	
	1C and 1CC Container	1D Container
<i>A</i>	2050 ± 50	900 ± 50
<i>B</i>	355 min.	305 min.
<i>C</i>	115 min.	102 min.
<i>D</i>	20 min.	20 min.

Fig. 8.7 Grappler Arm Lifting Areas

Dimensions are in millimetres.

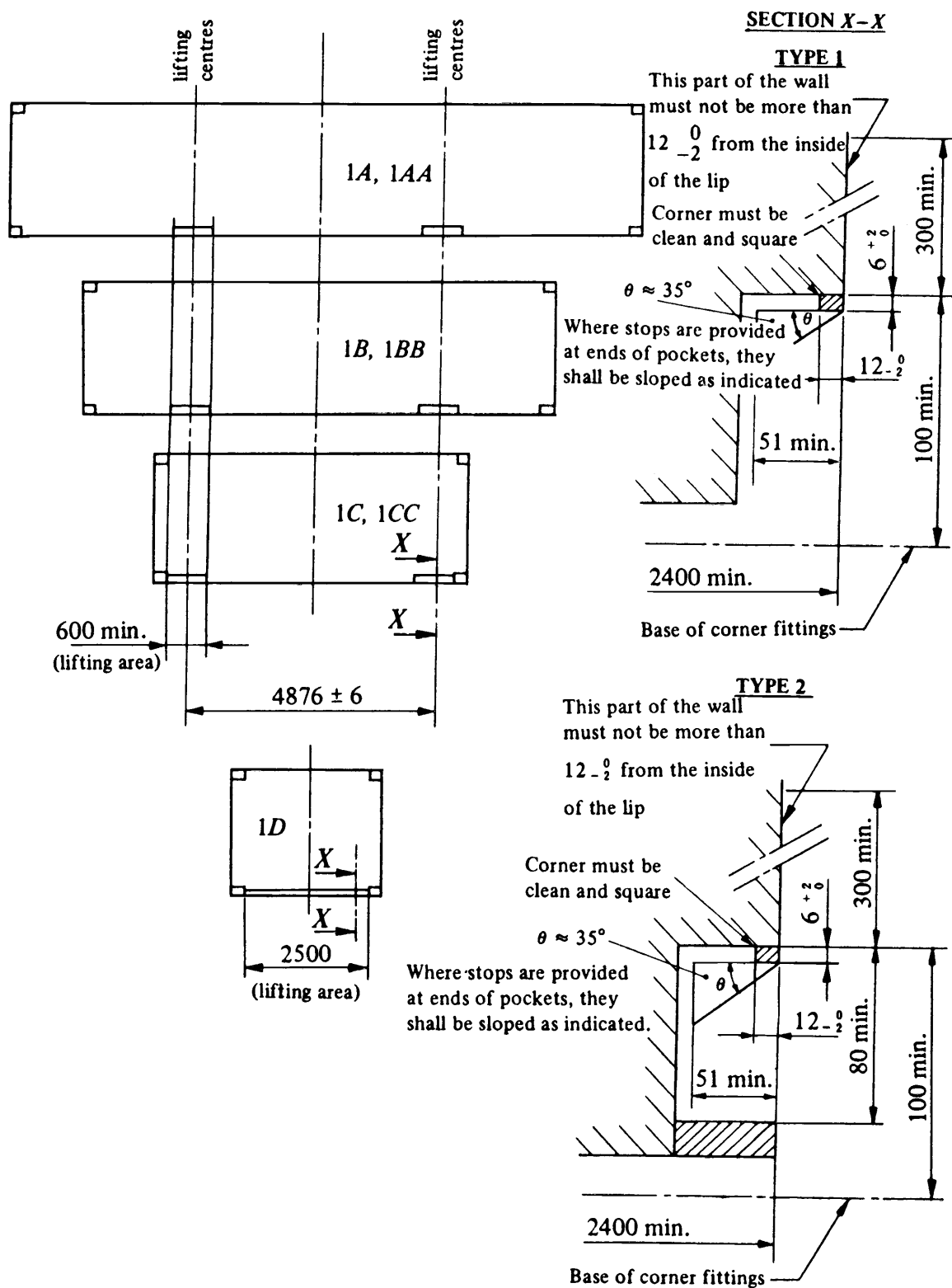
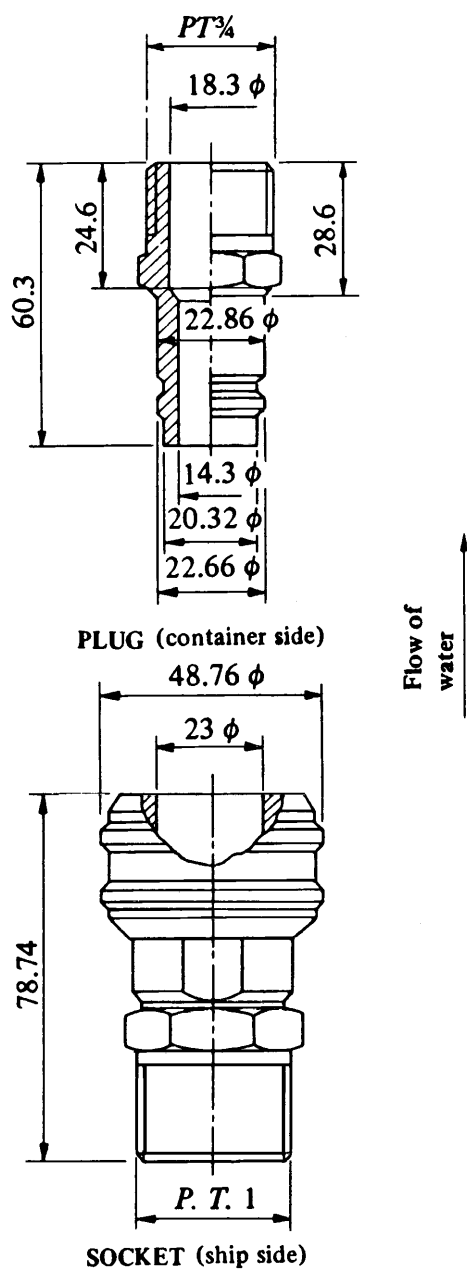


Fig. 8.8 Cooling Water Connections-inlet Side

Dimensions are in millimetres.



Pressures	Connected	Disconnected
	<i>MPa</i>	<i>MPa</i>
Operating pressure	10.5	2.8
Burst pressure	63	6.3

Fig. 8.9 Cooling Water Connections-outlet Side

Dimensions are in millimetres.

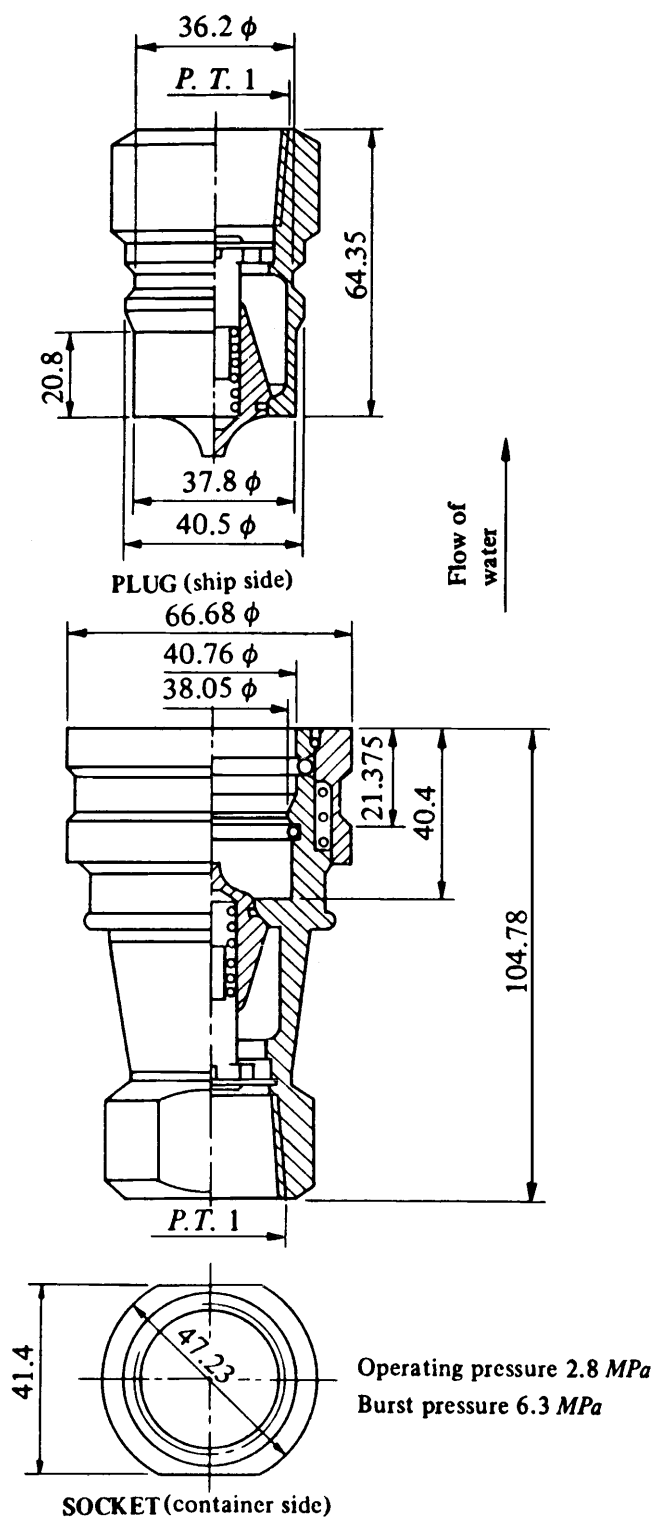
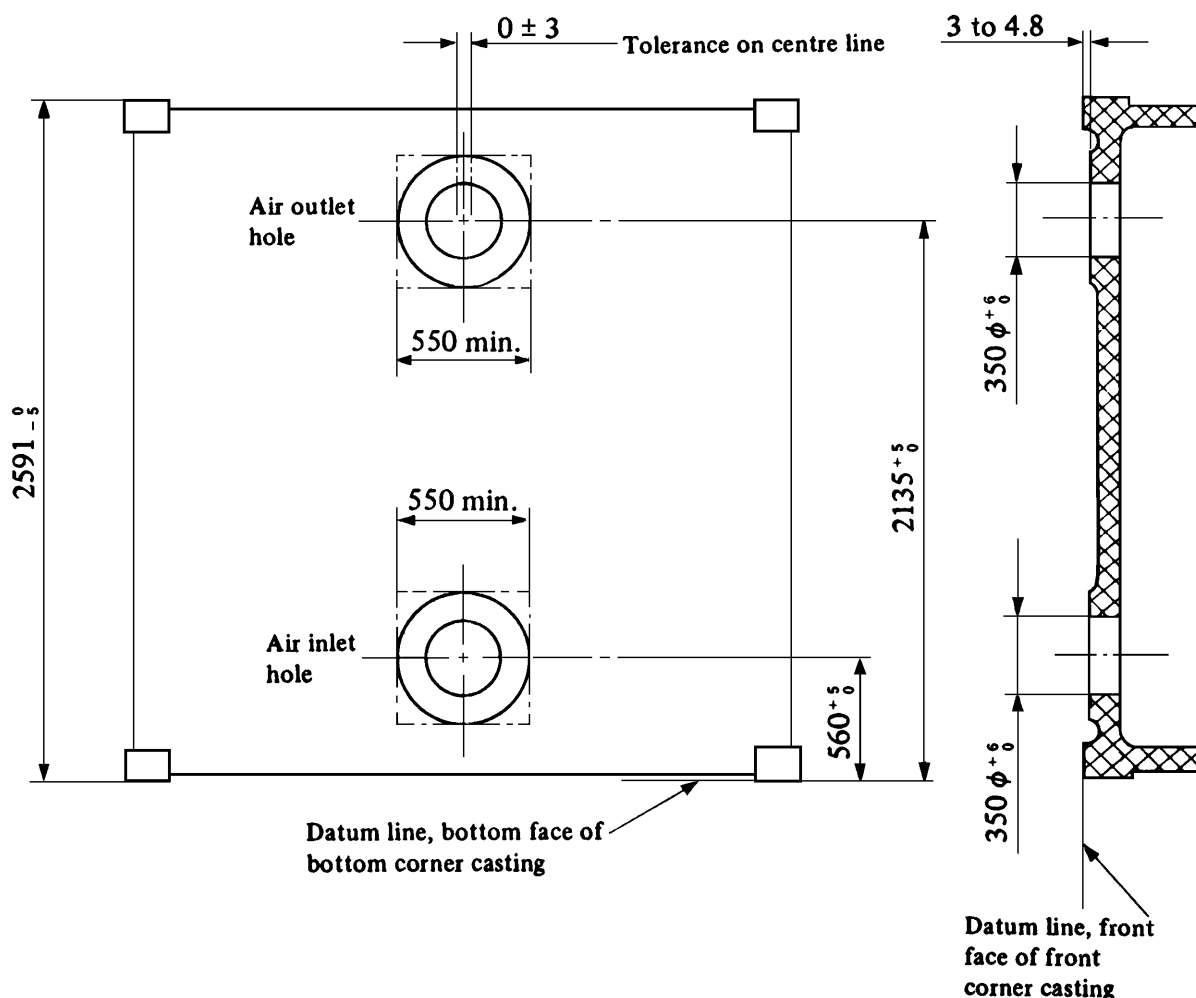


Fig. 8.10 Air Apertures in End Wall of 1AA Thermal Containers

Dimensions are in millimetres.



Notes:

1. Area about air circulation openings
 - (1) Bosses 550 mm diameter or square.
 - (2) Face of bosses to be plane to a tolerance of 0.25 mm and smooth.
 - (3) Faces of bosses to be parallel to a plane determined by front faces of the front corner fittings and recessed 3 to 4.8 mm from this plane.
 - (4) Holes may have a mould draw taper but no part of the bore of the hole may have a diameter less than 350 mm.
2. Closures for apertures
 - (1) Closure devices that are captive to the container should be provided for closing off the air circulation openings when the container is not connected to a cold air supply.
 - (2) Closure devices should be capable of being sealed.

Fig. 8.11 Air Apertures in End Wall of ICC Thermal Containers

Dimensions are in millimetres.

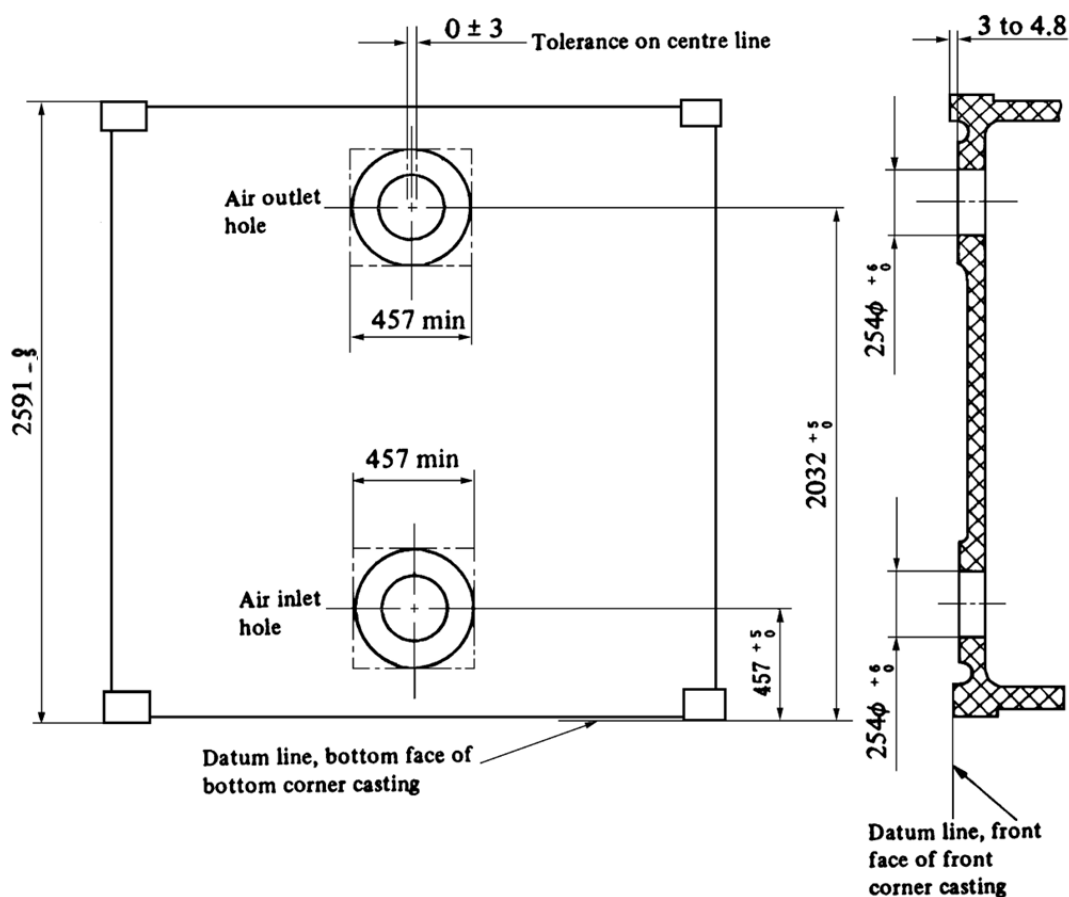
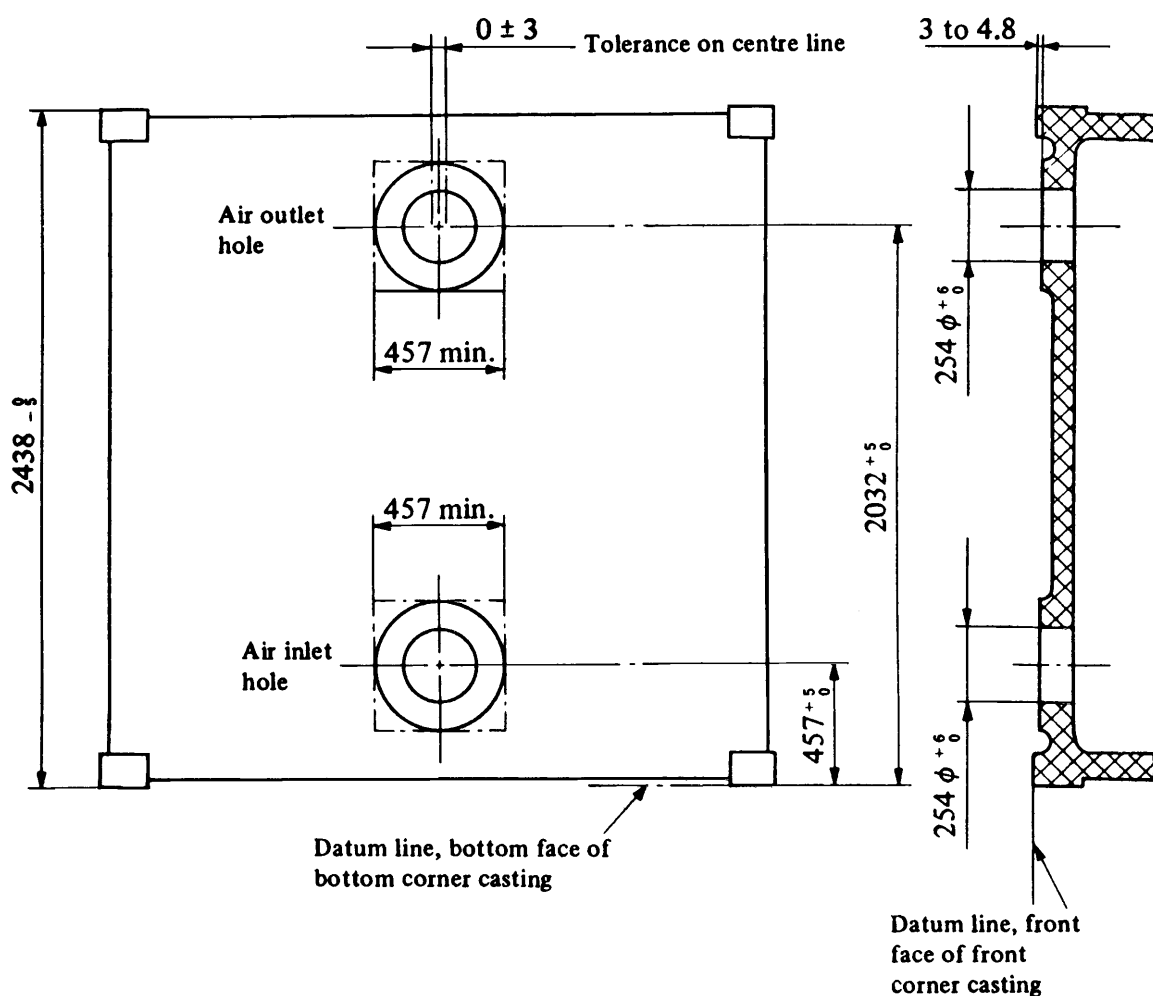


Fig. 8.12 Air Apertures in End Wall of 1C Thermal Containers
Dimensions are in millimetres.

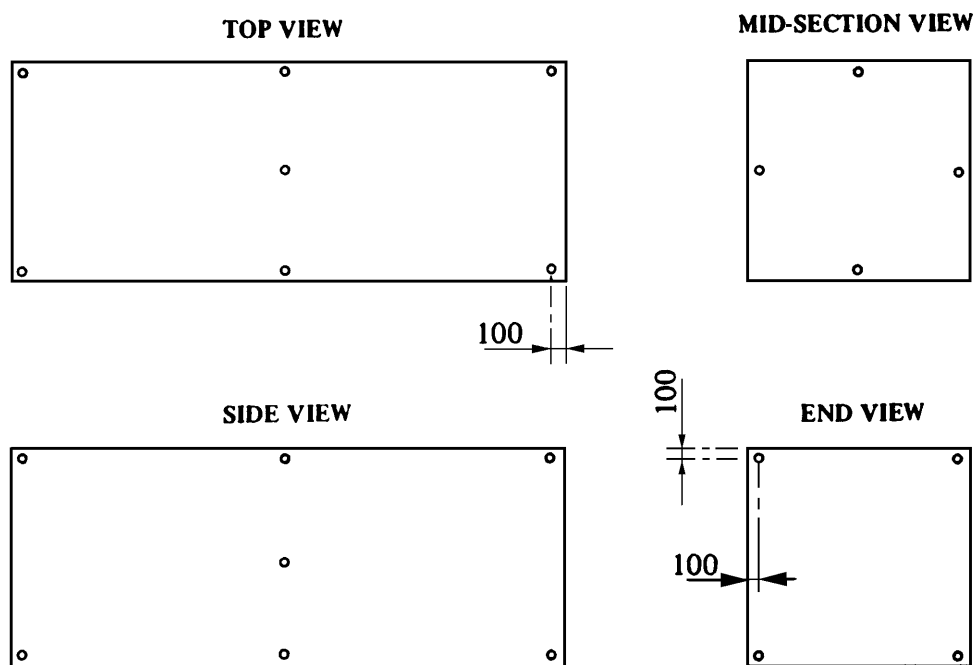
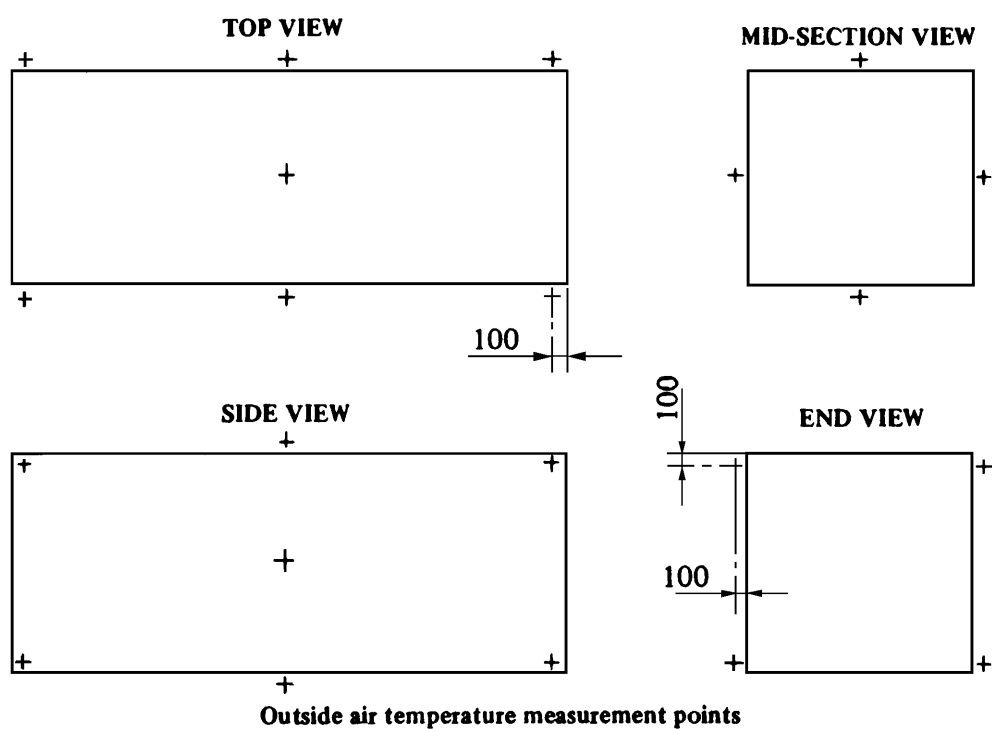


Notes:

1. Area about air circulation openings
 - (1) Bosses 457 mm diameter or square.
 - (2) Face of bosses to be plane to a tolerance of 0.25 mm and smooth.
 - (3) Faces of bosses to be parallel to a plane determined by front faces of the front corner fittings and recessed 3 to 4.8 mm from this plane.
 - (4) Holes may have a mould draw taper but no part of the bore of the hole may have a diameter less than 254 mm.
2. Closure for apertures
 - (1) Closure devices that are captive to the container should be provided for closing off the air circulation openings when the container is not connected to a cold air supply.
 - (2) Closure devices should be capable of being sealed.

Fig. 8.13 Air Temperature Measurement Point (Inside and Outside)

Dimensions are in millimetres.



Inside air temperature measurement points

Chapter 9 SAFETY APPROVAL PLATE

9.1 Safety Approval Plate

9.1.1 Safety Approval Plate

1 Safety Approval Plates to be affixed to containers of the container system prescribed by Article 56-4, paragraph 3 of the Regulations for the Enforcement of the Ship's Safety Law in Japan are to be in accordance with [Fig.9.1](#).

2 The Safety Approval Plates to be affixed to containers under the authority of the Government of the Contracting Parties of **CSC** other than Japanese are to be in accordance with [Fig.9.3](#).

Fig. 9.1 Safety Approval Plate (Type-J)

CSC SAFETY APPROVAL			STAMPS
J-NK / / /			
DATE MANUFACTURED			
IDENTIFICATION No.			
MAXIMUM OPERATING GROSS MASS	kg	lbs	
ALLOWABLE STACKING LOAD			
FOR 1.8g	kg	lbs	
TRANSVERSE RACKING TEST FORCE		newtons	
ONE DOOR OFF:			
ALLOWABLE STACKING LOAD			
FOR 1.8g	kg	lbs	
TRANSVERSE RACKING TEST FORCE		newtons	
FIRST MAINTENANCE EXAMINATION DATE			

Remarks:

1. The Safety Approval Plate is to take a permanent, non-corrosive, fire-proof and rectangular form.
2. The Safety Approval Plate is to be sized to at least 100 mm in width and 200 mm length.
3. The words "CSC SAFETY APPROVAL" are to have at least a height of 8 mm, and all other words and numbers at least a height of 5 mm.
4. The mark of the Society as shown in [Fig.9.2](#) is to be stamped on the surface of the plate.
5. Containers subjected to the End wall Test or Side Wall Test by a load different from the specified in [Table 5.1](#) are to be indicated with the words "END WALL STRENGTH" and the test load of the End Wall Test or the words "SIDE WALL STRENGTH" and the test load of the End Wall Test between the descriptions of "TRANSVERSE RACKING TEST FORCE newtons" and "FIRST MAINTENANCE EXAMINATION DATE" respectively.
6. Beneath the Line of "FIRST MAINTENANCE EXAMINATION DATE", a suitable space is to be left for indicating the month and year when the subsequent maintenance and examination are to be carried out.
7. For Safety Approval Plates affixed to containers which do not have doors, the indication of "ONE DOOR OFF: ALLOWABLE STACKING LOAD FOR 1.8g kg lbs TRANSVERSE RACKING TEST FORCE newtons" may be omitted.

Fig. 9.2 Mark of the Society

Fig. 9.3 Safety Approval Plate (Type-F)

<i>CSC SAFETY APPROVAL</i>		
[1] - NK/ [2]		
<i>DATE MANUFACTURED</i>		
<i>IDENTIFICATION No.</i>		
<i>MAXIMUM OPERATING GROSS MASS</i>	<i>kg</i>	<i>lbs</i>
<i>ALLOWABLE STACKING LOAD</i>		
<i>FOR 1.8g</i>	<i>kg</i>	<i>lbs</i>
<i>TRANSVERSE RACKING TEST FORCE</i>		<i>newtons</i>
<i>ONE DOOR OFF:</i>		
<i>ALLOWABLE STACKING LOAD</i>		
<i>FOR 1.8g</i>	<i>kg</i>	<i>lbs</i>
<i>TRANSVERSE RACKING TEST FORCE</i>		<i>newtons</i>
<i>FIRST MAINTENANCE EXAMINATION DATE</i>		

Remarks:

1. The Safety Approval Plate is to take a permanent, non-corrosive, fire-proof and rectangular form.
2. The Safety Approval Plate is to be sized to at least 100 mm in width and 200mm in length.
3. The words “CSC SAFETY APPROVAL” are to have at least a height of 8 mm, and all other words and numbers at least a height of 5 mm.
4. At symbol [1] the distinguishing sign of the country of approval and at [2] the approval references and approval date (month and year) are to be shown respectively.
5. Containers subjected to the End Wall Test or Side Wall Test by a load different from the specified in **Table 5.1** are to be indicated with the words “END WALL STRENGTH” and the test load of the End Wall Test or the words “SIDE WALL STRENGTH” and the test load of the side Wall Test between the descriptions of “TRANSVERSE RACKING TEST FORCE newtons” and “FIRST MAINTENANCE EXAMINATION DATE” respectively.
6. Beneath the line of “FIRST MAINTENANCE EXAMINATION DATE”, a suitable space is to be left for indicating the month and year when the subsequent maintenance and examination are to be carried out.
7. For Safety Approval Plates affixed to containers which do not have doors, the indication of “ONE DOOR OFF: ALLOWABLE STACKING LOAD FOR 1.8g kg lbs TRANSVERSE RACKING TEST FORCE newtons” may be omitted.

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GUIDANCE FOR THE CONSTRUCTION AND CERTIFICATION OF FREIGHT CONTAINERS

Chapter 1 GENERAL

1.1 General

1.1.1 Application

The “**Rules for the Construction and Certification of Freight Containers**” (hereinafter, referred to as “the Rule”) are in compliance with the following;

- (1) *CSC*
- (2) *ISO/IS 668-1976* Freight containers-External dimensions and ratings
- (3) *ISO/IS 1161-1976* Series1 freight containers corner fittings-Specification
- (4) *ISO/IS 1496 /I-1976* Series1 freight containers-Specification and testing-Part I: General cargo containers
- (5) *ISO/IS 1496 /II-1977* Series1 freight containers-Specification and testing-Part II: Thermal containers
- (6) *ISO/IS 1496 /III-1974* Series1 freight containers-Specification and testing-Part III: Tank containers for liquids and gases
- (7) *ISO/IS 1894-1975* General purpose series1 freight containers-Minimum internal dimensions

1.1.2 Equivalency

“Containers with an effective Safety Approval Plate as considered appropriate by the Society” prescribed in **1.1.2-1 of the Rules** are those specified in Article 19-3 of the Regulations for the Enforcement of the Ship’s Safety Law in Japan.

1.1.5 Inspection

“Case the Society requires” prescribed in **1.1.5-4 of the Rules** is a case of new installation, renewal, removal or alteration of loading system of containers which do not satisfy any of the following conditions;

- (1) to carry the Safety Approval Plate
- (2) the due date for the maintenance is not over
- (3) not to have an exceeding waste, corrosion, crack, deformation and/or other abnormality.

1.1.10 Submission of Application

Applications are as of **CTYP-APP**, **CMNF-APP**, **CTEST-APP**, **RUTYP-APP**, **RUMNF-APP** and **RUTEST-APP**.

Chapter 2 DESIGN TYPE APPROVAL

2.1 General

2.1.1 General

In case part of the design type be altered according to requirement [2.1.2 in the Rules](#), revised plans, etc. are to be submitted to the Society and, in general, tests as specified in [Table 2.1](#) or [Table 2.2](#) are to be carried out on structural members of the altered design type.

Table 2.1 Test Items for Alteration of Design Type (general cargo container)

Table 2.1 Test Items for Alteration of Design Type (general cargo container)															
Structural Member	Test Item														
	1	2	3	4	5	6	7	8	9	10		11	12	13	14
										F	R				
END FRAME															
Upper Corner Fitting	○			○			○	○							
Lower Corner Fitting		○		○					○						
Corner Post				○			○	○							
Top End Rail							○								
Bottom End Rail							○								
FRONT END WALL															
End Post										○					
End Panel										○					
END DOOR															
Door Body											○				
Lock rod							○				○				
Door Hinge							○								
Door Cleat							○								
SIDE WALL															
Side Post												○			
Side Panel	○											○			
Top Side Rail	○							○				○			
Bottom Side Rail			○					○	○			○			
FLOOR															
Floor Bearers						○									
Floor Sheet						○									
Tunnel Recess						○									
Fork Pocket			○			○			○						
ROOF															
Roof Bows					○										
Roof Sheet					○										

Note:

Numbers of test items indicate as follows:

- 1: Top Lifting Test
- 2: Bottom Lifting Test
- 3: Fork Lifting Test

- 4: Stacking Test
- 5: Roof Test
- 6: Floor Test
- 7: Transverse Racking Test
- 8: Longitudinal Racking Test
- 9: Restraint Test
- 10: End Wall Test (F: Front, R: Rear)
- 11: Side Wall Test
- 12: Longitudinal Inertia Test
- 13: Lateral Inertia Test
- 14: Pressure Test

Table 2.2 Test Items for Alteration of Design Type (tank container)

Structural Member	Test Item														
	1	2	3	4	5	6	7	8	9	10		11	12	13	14
										F	R				
END FRAME															
Upper Corner Fitting	○			○			○	○							
Lower Corner Fitting		○		○					○						
Corner Post				○			○	○							
Top End Rail							○								
Bottom End Rail							○								
SIDE WALL															
Side Post		○													
Side Panel															
Top Side Rail	○							○					(2)		
Bottom Side Rail			○					○	(1)				(2)	(1)	
FLOOR															
Floor Bearers									(2)				(2)	(2)	
Floor Sheet															
Tunnel Recess													(2)		
Fork Pocket			○												
ROOF															
Roof Bows													(2)	(2)	
Roof Sheet															
OTHERS															
Dome													○		○
Cylinder	(2)								(2)				(2)	○	○
End Diagonal							○						(3)	(3)	
Side Diagonal	○	○						○							
Saddle	○												○	○	

Notes:

- Test items of No. 1-14 refers to the footnote in [Table 2.1](#).
- (1) applies only to a type of tank container that a tank is contained in rectangular frameworks and supported only by bottom rails, saddles, etc.
- (2) applies only to a type of tank container that a tank is supported by connecting frames to a surface of tank.
- (3) need not apply if a tank is apart from end diagonals.