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CLASSIFICATION NOTES: CERTIFICATION OF CONTAINERS

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Certification of Containers

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Section 1

Certification of Containers

1.1 Introduction

1.1.1 This document provides requirements for the certification of containers in accordance with International Convention for Safe Containers, 1972 (herein after referred to as CSC).

1.2 Scope

1.2.1 This Classification Note includes testing, inspection and approval of containers in accordance with the criteria established in the CSC .

1.2.2 This Classification Note excludes certification of containers specially designed for air transport and offshore containers.

1.3 Definitions

"Container" means an article of transport equipment for goods:

- (a) of a permanent character and accordingly strong enough to be suitable for repeated use
- (b) specially designed of internationally standardized size to facilitate the transport of goods, by one or more modes of transport, without intermediate reloading.
- (c) designed to be secured and/or readily handled and stored, having corner fittings for these purposes
- (d) of a size such that the area enclosed by the four outer bottom corners is either:
 - (i) at least 14 m² (150 sq. ft) or
 - (ii) at least 7 m² (75 sq. ft) if it is fitted with top corner fittings.

The term "container" includes neither vehicles or packaging; however, containers when carried on chassis are included.

"Corner fittings" means an arrangement of apertures and faces at the top and/or bottom of a container for the purposes of handling, stacking and/or securing.

"Administration" means the Government of a Contracting Party under whose authority containers are approved.

"Approval" means the decision that a design type or a container is safe within the terms of the present Convention. International Convention for Safe Containers.

"International transport" means transport between points of departure and destination situated in the territory of two countries to at least one of which the CSC Convention applies.

"Cargo" means any goods, wares, merchandise and articles of every kind whatsoever carried in the containers.

"Owner" means the owner as provided for under the national law of the Contracting Party or the lessee or bailee, if an agreement between the parties provides for the exercise of the owner's responsibility for maintenance and examination of the container by such lessee or bailee.

"Type or Type series container" means any container manufactured in accordance with the approved design type.

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

"Maximum operating gross weight" or "rating" or "R" means the maximum allowable combined weight of the container and its cargo.

"Tare weight" means the weight of the empty container including permanently affixed ancillary equipment.

"Maximum permissible payload" or "P" means the difference between maximum operating gross weight or rating and tare weight.

"Manufacturer" is an organization (firm) that: manufactures containers, materials or products; or performs part of operations (carries out part production) that determine the quality of the material or product; or carries out the final assembly of the product. The manufacturer is responsible for the container, material or product compliance with the applicable requirements and approved documentation.

1.4 Materials and components

1.4.1 The steel and corner fittings are to be manufactured at works approved by IRS. Consideration will be given to acceptance of works approval by any other IACS member Society.

Other components may be accepted based on the component manufacturer's certificates and on verification of effective controls having been applied by the Container manufacturer on the component manufacturer/s.

Section 2

Container Approval Procedures

2.1 General

2.1.1 Containers designed, manufactured, tested, and marked in compliance with the following requirements may be certified by IRS.

2.1.2 Certification consists of the following steps:

- design review
- inspection and testing of prototype
- production inspection and testing
- plating and marking
- issuance of certificates

2.1.3 An application for approval and certification is to be made to IRS by the owner/ manufacturer on the Service Request Form (SRF) available on website at www.irclass.org. The application is to include:

- short description of the container type(s) (size, function, special features, etc.)
- specification of standards and regulations complied with
- preferred type of approval scheme.
- place of manufacture (if applicable)
- if individual approval is sought: the number of containers to be manufactured.

2.1.4 Request towards approval can be under the following instances:

- New container approval either for type approval or for individual certification.
- Re-certification of container subsequent to modification of an approved design type / on repair / change of certification body.
- Periodical examination of each container

2.2 Approval schemes

2.2.1 Approval schemes include the following:

- Individual Container Approval (Case-by-Case) or against purchase order from owner with specific request
- Approval valid for batch or series production (The firm applying for type approval)

2.2.2 The manufacturer is to take sole responsibility for conformity of the product to the applicable requirements and provide information about all places of manufacture. If a type approved container design is manufactured at different places of manufacture, prototype testing will normally be carried out at each manufacturing plant.

2.3 Documentation

2.3.1 Documents to be submitted for approval:

- Plans showing arrangement, dimensions, maximum gross mass, payload, scantlings of strength members, sling angle, pad eyes and design details as well as materials to be used material standards are to be specified.
- Particulars of joining methods (welding, bolted or riveted connections). Welds to be indicated with welding symbols to a recognized standard.
- particulars of corrosion protection and painting (type, application, dry film thickness)
- plating and marking.
- Quality Assurance Plan
- Test protocol (including procedures for various NDT as per the reference standard)
- In addition, following documents are to be submitted for tank containers
 - technical conditions/specification, applicable standards, technical characteristics;
 - list of hazard categories of cargo or a list of goods (when this requirement is available in the rules on the transportation of goods, national or international normative documents), cargoes that may be carried in a tank container.
 - drawings of corner fittings (during manufacture of containers at the manufacturer's works); framework (corner posts, attachments of the tank to the framework, top and bottom side and end rails, walkways and ladders); tank or tanks; hatch and manhole covers; piping; cargo refrigerating and/or heating systems; CSC Plates; plate bearing the particulars of tank; general views of the container and its marking.
 - The specific design requirements of relevant regulations such as IMO IMDG Code are to be demonstrated in the submission.

2.3.2 Documents to be submitted for information

- Outline of manufacturing firm, e.g. organization and management structure.
- Registration certificate of the firm and legal permissions from the local authority for the intended scope of approval
- Experience of the firm in manufacturing, information related to manufacturing facility, product portfolio, product applications, production capacity
- General layout of production facility and availability of equipment to demonstrate available facilities are adequate for the intended production capacity.
- Product description and the manufacturing and testing standards including Non destructive testing (NDT) followed

- Personnel involved in production and QA/QC, documenting training and experience within the relevant area, and qualifications according to recognised national, international or industry standards, as relevant
- Quality Manual and/or documented procedures covering the requirements in 2.4.1 and all elements of ISO 9001 (latest version). In case manufacturer is certified to ISO 9001 (latest version), certificate copy is to be submitted for records.
- Occupational Health and Safety Manual and/or documented procedures covering requirements in 2.4.2 and all elements of ISO 45001 (latest version) In case manufacturer is certified to ISO 45001 (latest version), certificate copy is to be submitted for records.
- List of measuring and testing equipment and their latest calibration certificates
- List of lifting appliances and their latest test record
- Raw materials used and their list of suppliers
- List of outsourced items along with sub-contractors if any
- Material Safety Data Sheet (MSDS) and paint specification of the paint used / intended to be used
- Paint manufacturer's recommended procedures
- Design calculations including lifting set calculations.
- Other documentation as required for special purpose containers such as refrigeration and liquid cargo container etc.
- The applicant is to state the identification symbols which will be assigned by the manufacturer to the type of container as per specific approval.
- The application for type approval is also to be accompanied by a declaration from the manufacturer that they will:
 - (a) produce such containers of the design type concerned as may be required to be examined.
 - (b) Indicate any change in the design or specification and await its approval before affixing the Safety Approval Plate to the container.
 - (c) affix the Safety Approval Plate to each container in the design type series.
 - (d) keep a record of containers manufactured to the approved design type. This record is to at least contain the manufacture's identification numbers, dates of delivery and names and addresses of customers to whom the containers are delivered.

2.4 Document review and Design appraisal at Head Office (H.O.)

2.4.1 Quality System: The manufacturer is to have a documented system covering all elements of ISO 9001 (latest version) and the following:

- Manufacturing process
- Maintenance and calibration of measuring and testing equipment
- Procedures for maintenance and testing of lifting appliances.

- Procedure for procurement of raw materials such as steel plates, corner fittings etc. The corner fittings are to be procured from approved works
- Quality Control Measures exercised on subcontractors and raw material suppliers.
- Supervision and verification to ensure compliance with manufacturing and testing procedure - Training of workmen (Supervisor/ Staff/ work men/welders)
- Storage and preservation
- Record keeping such as material certificates, inspection reports and test data, calibration data, damage and claim records, etc.
- Identification & traceability
- Inspection & testing before, during and after manufacture
- Defect identification and rectification during product manufacturing
- Paint application process in accordance with paint manufacturer's recommendation and procedure for maintaining records
- Periodic review of work process procedures, complaints, corrective actions, and issuance, maintenance and control of documents

In case, the manufacturer is certified for latest version of ISO 9001, certificate validity is to be verified and it is to be confirmed that certificate scope covers the intended scope of approval requested from IRS.

2.4.2 Occupational Health and Safety Procedures: The manufacturer is to have a documented system covering all elements of ISO 45001 (latest version) and the following:

- Safe working practices especially related to welding, lifting, paint application etc
- Safety training to the workers
- Material handling throughout the works
- Disposal of scrap / waste material in accordance with local laws

In case, the manufacturer is certified for latest version of ISO 45001, certificate validity is to be verified and it is to be confirmed that certificate scope covers the intended scope of approval requested from IRS.

2.4.3 Design Appraisal: Design of the container will be reviewed by IRS, by reference to the applicable requirements of this Classification Note, Regulations and design codes/ Standards. This involves a review of:

- structure, including design details
- material specifications
- welding and other joining methods
- supporting structures for other permanent equipment.

Where safety hazards may arise in connection with items not covered directly by the existing requirements, overall safety standard is to be maintained.

2.4.4 Design review process is indicated in Annex- I.

2.5 Testing and inspection

2.5.1 Works Assessment

2.5.1.1 During the type approval of containers for mass production, in addition to the design review, an inspection of the manufacturer's works is to be carried out to assess the manufacturing and testing facilities and process control to ensure consistency in product quality.

2.5.1.2 This includes assessment of the manufacturing facilities, quality control operations, infrastructure for testing, availability of qualified/competent resources for the declared production capability etc. Registration certificate of the manufacturing firm and legal permissions from the local authority for the intended scope of approval are to be verified.

2.5.1.3 It is to be verified that the following are implemented in practice as stated in submitted quality manual/documentated procedures:

- Manufacturing process
- It is to be ensured that the measuring and testing equipment are calibrated and maintained in accordance with OEM's recommendations. The calibration may be carried out by the OEM or at an NABL accredited laboratory / Government approved facility.
- Procedures for maintenance and testing of lifting appliances. It is to be verified that the latest test records are valid as per OEM's recommendation.
- Procedure for procurement for raw materials such as steel plates, corner fittings etc. The corner fittings are to be procured from approved works.
- Quality Control Measures exercised on subcontractors and raw material suppliers.
- Supervision and verification to ensure compliance with manufacturing and testing procedure
- Training of workmen (Supervisor/ Staff/ work men/welders)
- Procedure for Storage and preservation
- Record keeping such as inspection reports and test data, calibration data, damage and claim records, etc.
- Procedure for identification & traceability
- Quality Control Inspection & testing before, during and after manufacture including NDT
- Defect identification and rectification during product manufacturing
- Periodic review of work process procedures, complaints, corrective actions, and issuance, maintenance and control of documents

2.5.1.4 It is to be verified that manufacturer implements the health and safety measures stated in the documented procedures. These procedures include:

- Adoption of safe working practices
- Use of personal protective gears and adherence to health, safety & environment related requirements
- Safety training to the workers
- Display of various safety instructions and good practices of material handling throughout the works
- Disposal of scrap / waste material as documented
- Measures taken to minimize the risk of fire/explosion and to ensure health and safety of personnel involved in welding, lifting, painting etc.

2.5.1.5 It is to be verified that the manufacturer has got facility for application of paints in controlled condition as per paint manufacturer's recommendation.

2.5.1.6 It is to be verified that marine grade paint is used and its MSDS and paint specification recommended by paint manufacturer are to be verified.

2.5.1.7 It is to be verified that procedure exists to maintain records which demonstrate that the painting is done in accordance with paint manufacturer's recommendation. Following is also to be verified

- a. Declaration from the paint manufacturer that the product is free from prohibited chemicals
- b. Material Safety Data Sheet (CAS No. and Chemical Composition)
- c. Recommended painting procedure including surface preparation, ambient atmospheric conditions (such as temperature, humidity) to be maintained while applying paint, application methodology drying duration etc
- d. Dry Film Thickness (DFT) and the No. of Years the coating can last as per manufacturer's recommendation

2.5.1.8 Manufacturer's procedure for marking on Container Safety Approval Plate is to be verified in accordance with Annex IV of this Classification Note.

2.5.2 Prototype testing

2.5.2.1 Prototype tests are to be carried out irrespective of whether a single container or a series of containers are planned to be built.

2.5.2.2 Certificates for raw material such as steel plates, corner fittings are to be verified. It is to be confirmed that steel and corner fittings are procured from approved

works. Consideration will be given to acceptance of works approval by any other IACS member Society.

2.5.2.3 Prior to conduct of prototype tests, visual examination of the container is to be carried out.

2.5.2.4 Following tests are to be performed on the prototype and witnessed by IRS Surveyors. The Test load, test procedures and acceptance criteria are to be in accordance with Annex II. (Also refer Annex VI, for guidance on testing.)

- a. Dimensional Check: Prior to the start of the following structural tests the empty container is to be measured in accordance with approved plan. The dimensional check is to be repeated upon completion of the structural tests.
- b Lifting Test
- c. Lifting from corner fittings
- d. Lifting from the bottom corner fittings
- e. Lifting by any other additional methods such as lifting from fork-lift pockets, lifting from grapples-arm position or any other method
- f. Stacking
- g. Concentrated Load Test – on Roof and on Floor
- h. Transverse racking
- i. Longitudinal restraint (static test)
- j. End-walls
- k Side walls
- l. One door off operation
- m. Cargo Securing Devices (where provided)
- n. Weather tightness

2.5.2.5 For tank containers, testing requirements of ISO 1496-3 are also to be complied with. It is to be verified that pressure relief devices where fitted are set to the correct pressure. In case of tanks containers subject to IMDG Code, relevant testing requirements of IMDG Code are to be complied with.

2.5.3 Examination during production

2.5.3.1 The certificates for raw material such as steel plates, corner fittings are to be verified. It is to be confirmed that steel and corner fittings are procured from approved works. Consideration will be given to acceptance of works approval by any other IACS member Society.

2.5.3.2 It is to be verified that the manufacturer has qualified welders for approved welding procedures and that they can manufacture the containers.

2.5.3.3 All weld procedure specifications (WPS), procedure qualification records (PQR), and welder's performance qualification records are to be in accordance with recognized standards and are to be reviewed to the satisfaction of the Surveyor.

2.5.3.4 It is to be verified that marine grade paint is used which meets the Purchase Order requirement and that painting is done in accordance with paint manufacturer's recommendations and records maintained

2.5.3.5 All nondestructive tests performed by the manufacturer are to be carried out by personnel qualified to conduct such inspections in accordance with recognized standards. Where nondestructive tests are performed, it is to be demonstrated that such testing is properly recorded by the manufacturer and found to be to the satisfaction of the Surveyor.

2.5.3.6 Certification will be based on surveillance of the manufacturer's quality assurance system and on the basis of agreed Quality Assurance Plan in manufacturing/survey.

2.5.3.7 The manufacturer is to ensure examination/testing as per mutually agreed test protocol is carried out for each container prior to its delivery.

2.5.3.8 The tests specified at 2.5.2.4 are to be performed during production and witnessed by IRS Surveyors. The test load, test procedures and acceptance criteria are to be in accordance with Annex II. Before commencement of tests, container is to be visually examined.

2.5.3.9 For tank containers, it is to be verified that pressure relief devices where fitted are set to the correct pressure.

2.5.3.10 Upon satisfactory completion of the production testing, Safety Approval Plate with details as described in Annex IV of this Classification Note is to be permanently affixed to the container at a readily visible place. The date (month and year) before which a new container is to undergo its first examination will be hard stamped on the Safety Approval Plate along with IRS logo by the Surveyor.

2.6 Issuance of certificate

2.6.1 On completion of the design review, works assessment, testing, as per protocol and satisfactory review of the test reports based on the surveyor's recommendation, a Type Approval Certificate can be issued to the manufacturer for the specific design type. The validity of the type approval certificate would be for 5 years from the date of issuance of Certificate for the specific design of the container.

2.6.2 Along with the type approval certificate conforming to the type design requirement, each container will be issued with a container approval certificate on satisfactory completion of tests.

2.6.3 Validity and due date for first examination (month and year), which is not to be more than 5 years from date of issuance of the Type Approval Certificate, will be mentioned in the Certificate.

2.7 Re-certification of pre-certified containers on modification of an approved design type/repair or change of certification

2.7.1 Re-certification of container is required after modification of an approved design type / on repair / change of certification body. Containers that have been certified by other certifying bodies due to repair and modification will not automatically be accepted as complying with the requirements & IRS reserves the right to review design, inspect and test any container before issuing the certificates.

2.7.2 All relevant documentation is to be submitted for review and approval. If the documentation is incomplete, additional requirements may be specified by IRS. This may include calculations, sampling to determine material properties and re-welding of important welds.

2.7.3 Each container is to be thoroughly inspected, including the use of NDT to the extent required by the surveyor. The lifting equipment would be tested as per the specified requirements. If the container is found not complying fully with the requirements of this Classification Note, IRS may specify required modifications, de-rating or other limitations.

2.7.4 Upon completion of satisfactory tests for recertification, container approval certificate will be issued. The due date (month and year) before which the recertified container is to undergo its next examination (not exceeding 30 months) will be hard stamped on the Safety Approval Plate along with IRS logo by the Surveyor and; is to be filled in the container approval certificate

2.8 Renewal of Type Approval Certificate

2.8.1 Renewal of type approval certificate would be carried out based on satisfactory facility assessment, review of record pertaining to quality assurance system and sample inspection of containers prior to the date of expiry of the certificate.

2.8.2 The detailed scope of renewal of the type approval certificate is as follows:

- a. Review of type approval documentation if any change affected.
- b. Verification of satisfactory implementation of QC procedures.
- c. Assessment of the system to ensure consistent quality of the type approved products.
- d. In service product performance from the user and review of customer complaints, if any
- e. Witnessing of additional tests due to new requirements/amendments (if any) incorporated in the reference standard(s) or convention.
- f. Review of validity of quality management certificate as applicable
- g. Review of possible changes in design, materials and performance.
- h. Review changes in the organization structure.
- i. Review changes in the machinery and equipment
- j. Review status of calibration certificates for the measuring & testing equipment.
- k. Ensure traceability between manufacturer's product marking and type approval certificate.

2.8.3 The validity of such renewal of type approval certificate will be for a period of 5 years.

2.9 Periodical examination of each container

2.9.1 The owner is to ensure examination of the container is undertaken at an interval

- not exceeding 5 years from date of manufacture for the first examination
- not exceeding 30 months for each subsequent re-examination

2.9.2 Examination is to include a detailed visual inspection for defects or other safety-related deficiencies or damage which will render the container unsafe and include examination of all structurally significant components of the container, particularly the corner fittings.

2.9.3 A visual examination of the exterior of the container will normally be sufficient. However, an examination of the interior is also to be performed if reasonably practicable (e.g., if the container is empty at the time). Furthermore, the top and underside of the

container, including the underside of the lower corner fittings, are to be examined. This may be done either with the container supported on a skeletal chassis or, if the Surveyor considers it necessary, after the container has been lifted on to other supports.

2.9.4. It is to be examined that the condition of the paint coating is satisfactory.

2.9.5 The structurally sensitive components of a container that are to be examined for serious deficiencies are detailed in Annex III of this Classification Note.

2.9.6 The Surveyor may seek non-destructive testing during periodical examinations to validate the load test findings. The findings of the NDT are to be noted and if found beyond acceptable criteria, necessary actions taken to make correction are to be recorded prior to issuing the container approval certificate.

2.9.7 For tank containers, pressure relief valves, where fitted, are to be removed and tested to the set pressure marked on the valve. Rupture discs, or fusible plugs, where fitted, are to be removed and inspected for corrosion, cracking, or any other abnormality.

2.9.8 Upon satisfactory completion of the examination, the date (month and year) before which the container is to be re-examined (not more than 30 months) will be hard stamped on the Safety Approval Plate along with IRS logo by the Surveyor.

2.9.9 Upon satisfactory completion of periodic examination, each container is to be issued with a container approval certificate. Validity and due date for next examination, which is not to be more than 30 months from the date of examination done now, is to be mentioned in the certificate.

2.10 Records of examinations

2.10.1 The owner is to ensure that a system is maintained where examination records are kept, which are to include the following:

- 1) the owner's unique serial number of the container;
- 2) the date on which the examination was carried out;
- 3) identification of the competent person who carried out the examination;
- 4) the name and location of the organization where the examination was carried out;
- 5) the results of the examination;

2.10.2 The records are to be auditable and made available within a reasonable time on its request. There is no requirement to keep the records of routine operating inspections

ANNEX I

Procedure for Design Review

1 General Requirements

1.1 Construction is to be structurally sound and when appropriate, weather-tight. All fittings and appurtenances are to be within the maximum outside dimensions of the container. The main frame, corner structures, sides, and ends are to have sufficient structural strength to remain serviceable and withstand, without significant permanent deformation, the static and dynamic loads imposed by lifting the container by top or bottom corner fittings, the stacking loads, and the impact and racking loads encountered in normal service. The floor structure is to be strong enough to support the payload under dynamic loading conditions encountered in normal service and concentrated fork-lift truck axle loads. The specific design loading requirements are to be not less than those given in paragraph 7 of this annex.

1.2 The manufacturer is responsible for designing the container with sufficient strength to withstand the design loads, and is to include factors of safety allowing for fatigue, normal wear and tear, manufacturing fabrication techniques, and material properties.

2 Materials

2.1 Structural materials are to conform to an established specification or recognized national standard, unless specifically approved. The chemical composition, mechanical properties, heat treatment and weldability are to be suitable for the purpose.

2.2 Materials used for construction of containers are to be furnished with material test certificates and subject to test as may be required.

3 Service Conditions

3.1 General

3.1.1 Containers used in multimodal transport are to be serviceable under normal operation in weather conditions ranging from tropical to arctic zones. Each transport mode has its own operating load requirements which can be expressed as accelerations in the vertical, transverse or longitudinal direction.

3.1.2 It is assumed that the combined effect of a vessel's motions and gravity results in an equivalent 1.8 times gravity for vertical acceleration, an equivalent 0.6 times gravity for transverse acceleration, and an equivalent 0.4 times gravity for longitudinal acceleration, acting individually.

4 Dimensions

4.1 The internal, external dimensions, tolerances, door openings, ratings, locations of corner fittings are to be in accordance with ISO 668: 2020 - Series 1 freight containers — Classification, dimensions and ratings

5 Design Features

5.1 Corner Design

5.1.1 The corner and intermediate fittings are to be in accordance with ISO 1161:2016 Series 1 freight containers—Corner and Intermediate Fittings—Specifications.

5.2 Roof Clearance

5.2.1 The top corner fittings are to protrude a minimum of 6 mm ($\frac{1}{4}$ in.) above the highest point of the roof or upper structure. The transverse and longitudinal areas adjacent to the top corner fittings may be designed with reinforcements or “doubler plates” to protect the roof from being punctured during top lifting operations. Such reinforcements may extend the full width of the container and not more than 750 mm ($29\frac{1}{4}$ in.) from each end and may not protrude above the top surface of the corner fitting.

5.3 Load Transfer Area

5.3.1 The base structure of a container is to be provided with a load transfer area in accordance with Annex B of ISO 668:2020

6 Optional Design Features

6.1 Fork-Lift Pockets

6.1.1 Fork-lift pockets may be provided for handling containers in the loaded or unloaded condition. The fork-lift pockets are to meet the dimensional requirements specified in Annex C of ISO 1496:2013 and pass completely through the base structure of the container so that lifting devices may be inserted from either side. Fork-lift pockets are to be provided with a base strap or equivalent at each end.

6.2 Lifting Areas

6.2.1 Lifting areas may be provided for handling containers in the loaded or unloaded condition by means of grapples or similar devices. The lifting areas are to meet the location requirements specified in Figure 1

6.3 Gooseneck Tunnels

6.3.1 Gooseneck Tunnels may be provided in containers to accommodate chassis goosenecks. The tunnels are to meet the dimensional requirements specified in Annex C of ISO 668:2020.

6.4 Cargo Securing Devices

6.4.1 Cargo securing devices may be provided in containers for securing cargo and are to meet the requirements of Annex C of ISO 1496:2013.

7 Design Loading Specifications

7.1.1 The design load is to take into account the load described in Annex II of this guideline and the dynamic loads likely to be encountered in container operation. Factors such as characteristics of load application, load repetition, load reversal and container life are to be considered in the design of the container. Due regard is to be given to local stresses resulting from attachment devices used for handling and securing a container.

8 Coating and corrosion protection

8.1.1 Containers are to be suitable for the environment by means of construction, use of suitable material and/or corrosion and paint protection. The verification of paint is to be carried out as per 2.5.1.7.

9 Tank Containers

9.1 Tank containers

9.1.1 Tank containers for liquids are to be designed and tested according to relevant parts of ISO 1496/3 and procedures described in Annex-II to this Classification Note.

Note: Only containers with tanks that are intended for transport of cargo are considered to be tank containers. Other types of tanks, e.g. processing plants, storage tanks etc. that are empty during transport, are considered to be service equipment, and are not normally covered by approval and certification to this guideline.

9.2 Tank containers for dangerous goods

9.2.1 Tank containers for dangerous goods are to fulfil the requirements of the IMDG Code Chapter 6.7, and are to be designed according to a recognised code for pressure vessels. A tank and its supports are to be able to withstand lifting and impact loads in addition to dynamic forces as specified in the IMDG code. Also due account is to be taken of fluid surge arising from partly filled tanks.

9.2.2 Tank containers for dangerous goods are to comply with the following requirements for fork lift pockets on tank containers in the IMDG Code:

“Forklift pockets shall be capable of being closed off. The means of closing forklift pockets shall be a permanent part of the framework or permanently attached to the framework. Single-compartment portable tanks with a length less than 3.65 m need not have closed off forklift pockets provided that:

- .1 the shell and all the fittings are well protected from being hit by the forklift blades; and*
- .2 the distance between the centers of the forklift pockets is at least half of the maximum length of the portable tank.”*

Note:

The IMDG Code (Ch.4.2) does not allow portable tanks with dangerous cargo to be lifted with fork lift truck unless they are less than 3.65 m long and comply with the quoted subparagraphs.1 and .2 above.

Impact protection on tank containers for dangerous cargoes

On tank containers for dangerous cargoes, all parts of the tank and fittings are to be suitably protected from impact damage. Additionally following applies:

Top

The top of the tank and fittings are to be protected by beams, plates or grating. No part of the tank or fittings are to extend above a level 100 mm below the top of the framework (i.e. the top of the side or end rails).

It is not to be possible for any part of the lifting set to foul on fittings, manhole cleats or other protrusions on the tank.

Sides

Protective beams are to be placed at or near the location where the tank shell is nearest to the outer plane of the sides. Beams are to be spaced sufficiently close to give the necessary protection.

At maximum calculated elastic deflection of any side member, the residual clearance between this member and any part of the tank shell or fittings are to be at least 10 mm.

Bottom

No part of the underside of the tank shell (including sumps) and bottom valves or other fittings, are to extend below a level 150 mm above the bottom of the framework (the underside of the side or end rails). Any such part extending below 300 mm above the bottom of the framework, is to be protected by beams or plating.

ANNEX – II

Test loads and Test Procedures

Where appropriate to the design of the container, the following test loads and the test procedures are to be applied to all kinds of containers under test:

1 Lifting

The container, having the prescribed internal loading, is to be lifted in such a way that no significant acceleration forces are applied. After lifting, the container is to be suspended or supported for five minutes and then lowered to the ground.

(A) Lifting from corner fittings

Test loadings and applied forces	Test procedures
<p>Internal load: A uniformly distributed load such that the sum of the mass of container and test load is equal to 2R. In the case of a tank container, when the test load of the internal load plus the tare is less than 2R, a supplementary load, distributed over the length of the tank, is to be added to the container.</p> <p>Externally applied forces: Such as to lift the sum of a mass of 2R in the manner prescribed (under the heading TEST PROCEDURES).</p>	<p>(i) Lifting from top corner fittings: Containers greater than 3000mm(10ft)(nominal) in length are to have lifting forces applied vertically at all four top corner fittings. Containers of 3000mm(10ft)(nominal) in length or less are to have lifting forces applied at all four top corner fittings, in such a way that the angle between each lifting device and the vertical is 30°</p> <p>(ii) Lifting from bottom corner fittings: Containers are to have lifting forces applied in such a manner that the lifting devices bear on the bottom corner fitting only. The lifting forces are to be applied at angles to the horizontal of:</p> <p>30° for containers of length 12000mm (40ft)(nominal) or greater,</p> <p>37° for containers of length 9000mm(30ft) (nominal) and up to but not including 12000mm(40ft)(nominal),</p>

	<p>45° for containers of length 6000mm(20ft) (nominal) and up to but not including 9000mm(30ft)(nominal),</p> <p>60° for containers of length less than 6000mm(20ft)(nominal).</p>
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(B) Lifting by any other additional methods

Test load and applied forces	Test procedures
<p>Internal load: A uniformly distributed load such that the sum of the mass of container and test load is equal to 1.25R.</p> <p>Externally applied forces: Such as to lift the sum of a mass of 1.25R in the manner prescribed (under the heading TEST PROCEDURES).</p>	<p>(i) Lifting from fork-lift pockets: The container is to be placed on bars which are in the same horizontal plane, one bar being centred within each fork-lift pocket which is used for lifting the loaded container. The bars are to be of the same width as the forks intended to be used in the handling, and are to project into the fork pocket 75% of the length of the fork pocket.</p>
<p>Internal load: A uniformly distributed load such that the sum of the mass of container and test load is equal to 1.25R. In the case of a tank container, when the test load of the internal load plus the tare is less than 1.25R, a supplementary load, distributed over the length of the tank, is to be added to the container.</p> <p>Externally applied forces: Such as to lift the sum of a mass of 1.25R in the manner prescribed (under the heading TEST PROCEDURES).</p>	<p>(ii) Lifting from grapple-arm position: The container is to be placed on pads in the same horizontal plane, one under each grapple-arm position. These pads are to be of the same sizes as the lifting area of the grapple arms intended to be used.</p> <p>(iii) Other methods: Where containers are designed to be lifted in the loaded condition by any method not mentioned in (A) or (B)(i) and (ii) they are also to be tested with the internal load and externally applied forces representative of the acceleration conditions appropriate to that method.</p>

2 Stacking

2.1 For conditions of international transport where the maximum vertical acceleration varies significantly from 1.8 g and when the container is reliably and effectively limited to such conditions of transport, the stacking load may be varied by the appropriate ratio of acceleration.

2.2 On successful completion of this test, the container may be rated for the allowable superimposed static stacking load, which is to be indicated on the Safety Approval Plate against the heading ALLOWABLE STACKING LOAD FOR 1.8 g (kg and lbs).

Test load and applied forces	Test procedures
<p>Internal load: A uniformly distributed load such that the combined weight of container and test load is equal to 1.8"R". Tank-containers may be tested in the tare condition.</p> <p>Externally applied forces: Such as to subject each of the four top corner fittings to a vertical downward force equal to 0.25 x 1.8 x the gravitational force of the allowable superimposed static stacking load.</p>	<p>The container, having the prescribed internal loading, is to be placed on four level pads which are in turn supported on a rigid horizontal surface, one under each bottom corner fitting or equivalent corner structure. The pads are to be centralized under the fittings and are to be of approximately the same plan dimensions as the fittings.</p> <p>Each externally applied force is to be applied to each of the corner fittings through a corresponding test corner fitting or through a pad of the same plan dimensions. The test corner fitting or pad is to be offset with respect to the top corner fitting of the container by 25 mm (1 in) laterally and 38 mm (1 1/2 in) longitudinally</p>

3 Concentrated loads

Test load and applied forces	Test procedures
(a) On roof	
<p>Internal load: None.</p> <p>Externally applied forces: A concentrated gravitational force of 300 kg (660 lbs) uniformly distributed over an area of 600 mm x 300 mm (24 in x 12 in).</p>	<p>The externally applied forces are to be applied vertically downwards to the outer surface of the weakest area of the roof of the container.</p>
(b) On floor	
<p>Internal load: Two concentrated loads each of 2,730 kg (6,000 lbs) and each added to the container floor within a contact area of 142 cm² (22 sq in).</p>	<p>The test is to be carried out with the container resting on four level supports under its four bottom corners in such a manner that the base structure of the container is free to deflect.</p>
<p>Externally applied forces: None.</p>	<p>A testing device loaded to a mass of 5,460 kg (12,000 lbs), that is, 2,730 kg (6,000 lbs) on each of two surfaces, having, when loaded, a total contact area of 284 cm² (44 sq in), that is, 142 cm² (22 sq in) on each surface, the surface width being 180 mm (7 in) spaced 760 mm (30 in) apart, centre to centre, is to be maneuvered over the entire floor area of the container.</p>

4 Transverse racking

Test load and applied forces	Test procedures
<p>Internal load: None.</p> <p>Externally applied forces: Such as to rack the end structures of the container sideways. The forces are to be equal to those for which the container was designed.</p>	<p>The container in tare condition is to be placed on four level supports, one under each bottom corner, and is to be restrained against lateral and vertical movement by means of anchor devices so arranged that the lateral restraint is provided only at the bottom corners diagonally opposite to those at which the forces are applied.</p> <p>The externally applied forces are to be applied either separately or simultaneously to each of the top corner fittings on one side of the container in lines parallel both to the base and to the planes of the ends of the container. The forces are to be applied first towards and then away from the top corner fittings. In the case of containers in which each end is symmetrical about its own vertical centreline, one side only need be tested, but both sides of containers with asymmetric ends are to be tested.</p>

5 Longitudinal restraint (static test)

When designing and constructing containers, it is to be borne in mind that containers, when carried by inland modes of transport, may sustain accelerations of 2" g" applied horizontally in a longitudinal direction.

Test load and applied forces	Test procedures
<p>Internal load: A uniformly distributed load, such that the sum of the mass of a container and test load is equal to the maximum operating gross mass or rating R. In the case of a tank container, when the mass of the internal load plus the tare is less than the maximum gross mass or rating, R, a supplementary load is to be added to the container.</p> <p>Externally applied forces: Such as to subject each side of the container to longitudinal compressive and tensile forces of magnitude Rg, that is, a combined force of 2Rg on the base of the container as a whole.</p>	<p>The container, having the prescribed internal loading, is to be restrained longitudinally by securing the two bottom corner fittings or equivalent corner structures at one end to suitable anchor points.</p> <p>The externally applied forces are to be applied first towards and then away from the anchor points. Each side of the container is to be tested.</p>

6 End-walls

The end-walls are to be capable of withstanding a force of not less than 0.4 times the force equal to gravitational force by maximum permissible payload. If, however, the end-walls are designed to withstand a force of less or greater than 0.4 times the gravitational force by maximum permissible payload, such a strength factor is to be indicated on the Safety Approval Plate.

Test load and applied forces	Test procedures
<p>Internal load: Such as to subject the inside of an end-wall to a uniformly distributed force of 0.4Pg or such other force for which the container may be designed.</p> <p>Externally applied forces: None.</p>	<p>The prescribed internal loading is to be applied as follows: Both ends of a container are to be tested except that where the ends are identical only one end need be tested. The end-walls of containers which do not have open sides or side doors may be tested separately or simultaneously. The end-walls of containers which do have open sides or side doors are to be tested separately. When the ends are tested separately the reactions to the forces applied to the end-wall are to be confined to the base structure of the container.</p>

7 Side-walls

The side-walls are to be capable of withstanding a force of not less than 0.6 times the force equal to the gravitational force by maximum permissible payload. If, however, the side-walls are designed to withstand a force of less or greater than 0.6 times the gravitational force by maximum permissible payload, such a strength factor is to be indicated on the Safety Approval Plate.

Test load and applied forces	Test procedures
<p>Internal load: Such as to subject the inside of a side-wall to a uniformly distributed force of 0.6Pg or such other force for which the container may be designed.</p> <p>Externally applied forces: None.</p>	<p>The prescribed internal loading is to be applied as follows: Both sides of a container are to be tested except that where the sides are identical only one side need be tested. Side-walls are to be tested separately and the reactions to the internal loading are to be confined to the corner fittings or equivalent corner structures. Open-top containers are to be tested in the condition in which they are designed to be operated, for example, with removable top members in position.</p>

8 One door off operation

a. Containers with one door removed have a significant reduction in their ability to withstand racking forces and, potentially, a reduction in stacking strength. The removal of a door on a container in operation is considered a modification of the container. Containers are to be approved for one door off operation. Such approval is to be based on test results as indicated below.

b. On successful completion of the stacking test the container may be rated for the allowable superimposed stacking load, which is to be indicated on the Safety Approval Plate immediately below line 5: ALLOWABLE STACKING LOAD FOR 1.8 g (kg and lbs) ONE DOOR OFF.

c. On successful completion of the racking test the transverse racking test force is to be indicated on the Safety Approval Plate immediately below line 6: TRANSVERSE RACKING TEST FORCE ONE DOOR OFF (newtons).

Test load and applied forces	Test procedures
Stacking	
<p>Internal load: A uniformly distributed load such that the sum of the mass of container and test load is equal to 1.8R.</p> <p>Externally applied forces: Such as to subject each of the four top corner fittings to a vertical downward force equal to 0.25 x 1.8 x the gravitational force of the allowable superimposed static stacking load.</p>	<p>The test procedures are to be as specified under 2</p> <p>STACKING</p>
Transverse racking	
<p>Internal load: None.</p> <p>Externally applied forces: Such as to rack the end structures of the container sideways. The forces are to be equal to those for which the container was designed.</p>	<p>The test procedures are to be as specified under 4</p> <p>TRANSVERSE RACKING</p>

9 Cargo Securing Devices (where provided)

Cargo securing devices are to be proof tested with a tensile force equal to 1.5 times the reference load using a shackle or hook having a maximum diameter of 10 mm. The reference load for an anchor point securing device installed in the floor or base structure is not to be less than 10 kN (2200 lbf).

The reference load for a lashing point securing device installed on the interior sides or at ceiling level is 5 kN (1100 lbf). The force is to be applied as indicated below and held for five (5) minutes and released. Each type of cargo securing device is to be tested.

- Location: Direction of forces:
- Floor Perpendicularly to the axis of the container structural members 45° to the horizontal plane.
- Interior sides 45° upwards and downwards
- Ceiling level 45° downwards

10 Weather tightness Test

The container is to be tested for weather tightness by applying a stream of water over all exterior surfaces. An example of acceptable parameters controlling the test include: 1 kgf/cm² (15 psi) pressure in conjunction with the use of a 12.5 mm inside diameter nozzle held at a distance of 1.5 m (5 ft) from the part under test with a rate of movement over the exterior of approximately 100 mm (4 in.) per second. Upon completion of this test, the container is considered to be satisfactory if the interior is free from the penetration of water.

ANNEX-III

Structurally sensitive components and serious structural deficiencies

The structurally sensitive components of a container that are to be examined for serious deficiencies are:

- .1 top rail;
- .2 bottom rail;
- .3 header;
- .4 sill;
- .5 corner posts;
- .6 corner and intermediate fittings;
- .7 understructure; and
- .8 locking rods.

(Refer **Figure 1** and **2** at the end of the annex for guidance)

The following criteria are to be used to make immediate out-of-service determinations by Surveyor.

Structurally sensitive component	Serious structural deficiency
Top rail	Local deformation to the rail in excess of 60 mm or separation or cracks or tears in the rail material in excess of 45 mm in length. Note: On some designs of tank containers the top rail is not a structurally significant component.
Bottom rail	Local deformation perpendicular to the rail in excess of 100 mm or separation or cracks or tears in the rail's material in excess of 75 mm in length.
Header	Local deformation to the header in excess of 80 mm or cracks or tears in excess of 80 mm in length.
Sill	Local deformation to the sill in excess of 100 mm or cracks or tears in excess of 100 mm in length.
Corner posts	Local deformation to the post exceeding 50 mm or tears or cracks in excess of 50 mm in length.

Corner and intermediate fittings (Castings)	Missing corner fittings, any through cracks or tears in the fitting, any deformation of the fitting that precludes full engagement of securing or lifting fittings, any deformation of the fitting beyond 5 mm from its original plane, any aperture width greater than 66.0 mm, any aperture length greater than 127.0 mm, any reduction in thickness of the plate containing the top aperture that makes it less than 23.0 mm thick or any weld separation of adjoining components in excess of 50 mm in length.
Understructure	Two or more adjacent cross members missing or detached from the bottom rails. 20% or more of the total number of cross members missing or detached. Note: If onward transportation is permitted, it is essential that detached cross members are precluded from falling free.
Locking rods	One or more inner locking rods are non-functional. Note: Some containers are designed and approved (and so recorded on the Safety Approval Plate) to operate with one door open or removed

Structurally sensitive components and definition of serious structural deficiencies

The following components are structurally sensitive and are to be examined for deficiencies in accordance with following table

(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Structurally sensitive component	Serious deficiency requiring immediate out-of-service determination	Deficiency requiring advice to owner and restrictions for transport	Restrictions to be applied in case of deficiencies according to column (iii)			
			Empty container		Loaded container	
			Sea transport	Other modes	Sea transport	Other modes
Top rail	Local deformation to the rail in excess of 60 mm or separation or cracks or tears in the rail material in excess of 45 mm in length (see Note 1)	Local deformation to the rail in excess of 40 mm or separation or cracks or tears in the rail material in excess of 10 mm in length (see Note 1)	No restriction	No restriction	Bottom lifting not allowed. Top lifting allowed only by use of spreaders without chains	Bottom lifting not allowed. Top lifting allowed only by use of spreaders without chains
Note 1: On some designs of tank containers the top rail is not a structurally significant component.						
Bottom rail	Local deformation perpendicular to the rail in excess of 100 mm or separation cracks or tears in the rail's material in excess of 75 mm in length (see Note 2)	Local deformation perpendicular to the rail in excess of 60 mm or separation cracks or tears in the rail's material in excess of 25 mm in length in the upper flange; or b) of web in any length(see Note2)	No restriction	No restriction	Lifting at (any) corner fitting not allowed	Lifting at (any) corner fitting not allowed

Note 2: The rails material does not include the rail's bottom flange.						
Header	Local deformation to the header in excess of 80 mm or cracks or tears in excess of 80 mm in length	Local deformation to the header in excess of 50 mm or cracks or tears in excess of 10 mm in length	Container is not to be overstowed	No restriction	Container is not to be overstowed	No restriction
Sill	Local deformation to the sill in excess of 100 mm or cracks or tears in excess of 100 mm in length.	Local deformation to the sill in excess of 60 mm or cracks or tears in excess of 10 mm in length.	Container is not to be overstowed	No restriction	Container is not to be overstowed	No restriction
Corner posts	Local deformation to the post in excess of 50 mm or cracks or tears in excess of 50 mm in length.	Local deformation to the post in excess of 30 mm or cracks or tears of any length.	Container is not to be overstowed	No restriction	Container is not to be overstowed	No restriction
Corner and intermediate fittings	Missing corner fittings, any through cracks or tears in the fitting, any deformation of the fitting that precludes full	Weld separation of adjoining components of 50 mm or less	Container is not to be lifted on board a ship if the damaged fittings prevent safe lifting or securing	Container is to be lifted and handled with special care	Container is not to be loaded on board a ship.	Container is to be lifted and handled with special care.

Corner and intermediate fittings (<i>cont</i>)	engagement of the securing or lifting fittings (see Note 3) or any weld separation of adjoining components in excess of 50 mm in length					
		Any reduction in the thickness of the plate containing the top aperture that makes it less than 25 mm thick.	Container is to be lifted and handled with special care. Container is not to be overstowed when twistlocks have to be used	Container is to be lifted and handled with special care.	Container is not to be lifted by the top corner fittings.	Container is to be lifted and handled with special care.
		Any reduction in the thickness of the plate containing the top aperture that makes it less than 26 mm thick.	Container is not to be overstowed when fully automatic twistlocks are to be used.	Container is to be lifted and handled with special care.	Container is not to be used with fully automatic twistlocks.	Container is to be lifted and handled with special care.
<p>Note 3: The full engagement of securing or lifting fittings is precluded if there is any deformation of the fitting beyond 5 mm from its original plane, any aperture width greater than 66 mm, any aperture length greater than 127 mm or any reduction in thickness of the plate containing the top aperture that makes it less than 23 mm thick.</p>						

Understructure	Two or more adjacent cross members missing or detached from the bottom rails.	One or two cross members missing or detached (see Note 4)	No restrictions	No restrictions	No restrictions	No restrictions
	20% or more of the total number of cross members missing or detached. (see Note 4)	More than two cross members missing or detached (see Note 4 and 5)	No restrictions	No restrictions	Maximum payload shall be restricted to 0.5 *P	Maximum payload shall be restricted to 0.5 *P
<p>Note 4: If onward transport is permitted, it is essential that detached cross members are precluded from falling free.</p> <p>Note 5: Careful cargo discharge is required as forklift capability of the understructure might be limited.</p>						

<p>Locking rods</p>	<p>One or more inner locking rods are non-functional (see Note 6)</p>	<p>One or more outer locking rods are non-functional (see Note 6)</p>	<p>Container is not to be overstowed.</p>	<p>No restriction</p>	<p>Container is not to be overstowed. Cargo is to be secured against the container frame and the door is not to be used to absorb acceleration forces – otherwise maximum payload shall be restricted to 0.5 P</p>	<p>Cargo is to be secured against the container frame and the door is not to be used to absorb acceleration forces- otherwise maximum payload si to be restricted to 0.5 P</p>
<p>Note 6 : Some containers are designed and approved (and so recorded on the CSC Plate) to operate with one door open or removed.</p>						

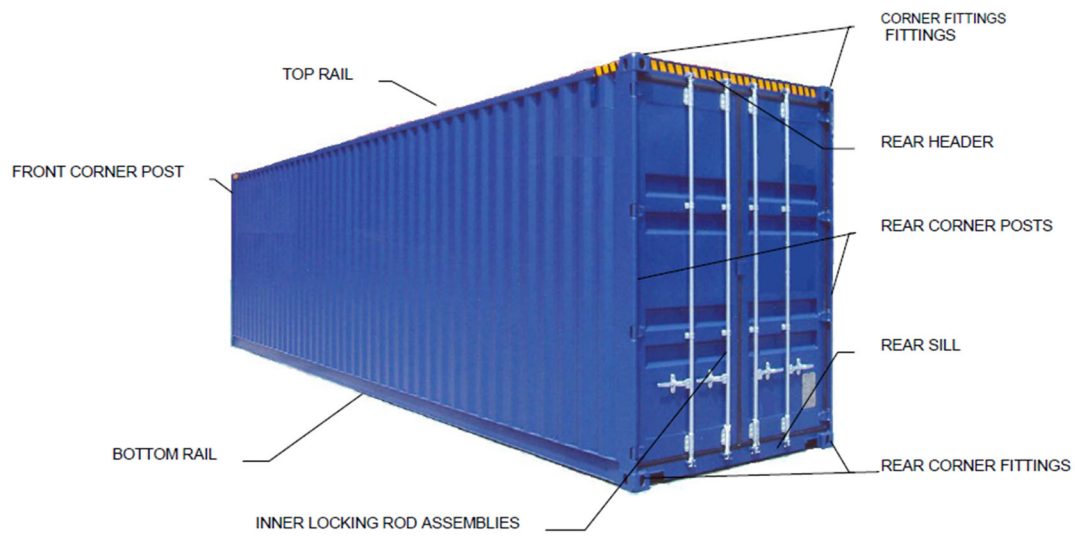


Figure 1

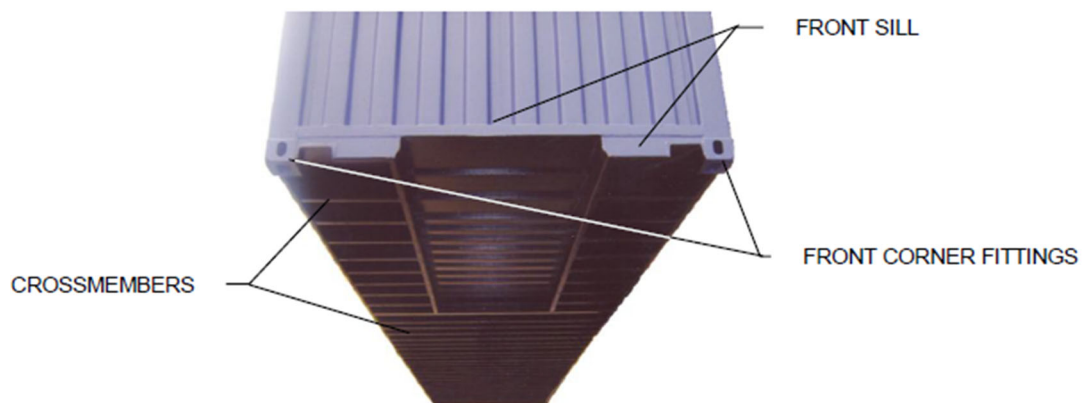


Figure 2

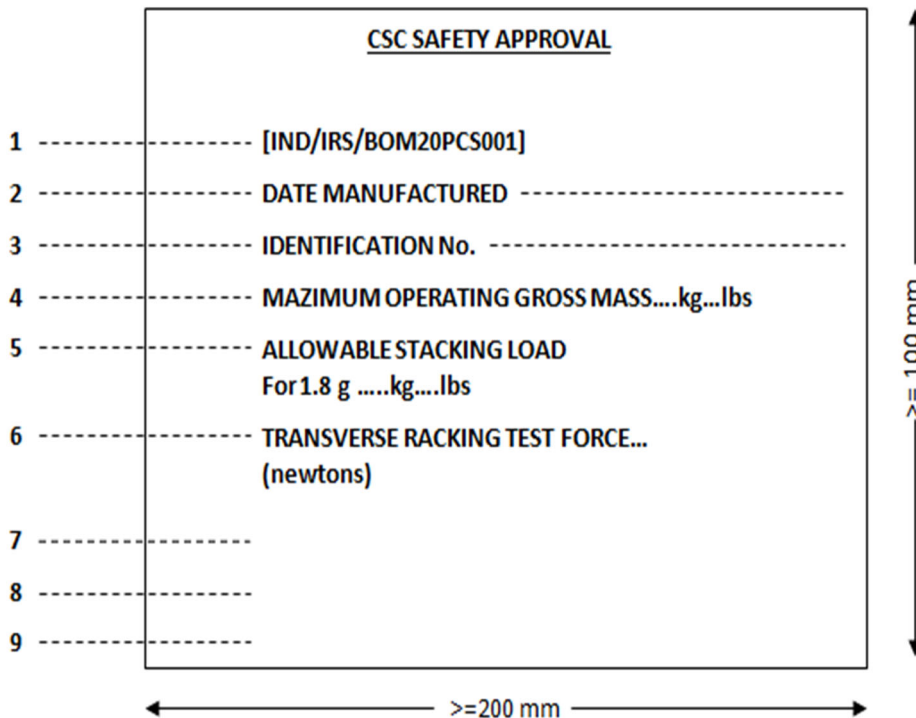
Annex IV

Container Markings

1.1 Safety Approval Plate

1.1.1 A Safety Approval Plate conforming to the specifications is to 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.

The Safety Approval Plate, conforming to the model reproduced below, is to take the form of a permanent, non-corrosive, fireproof rectangular plate measuring not less than 200 mm x 100 mm. The words **CSC SAFETY APPROVAL**, of a minimum letter height of 8 mm, and all other words and numbers of a minimum height of 5 mm are to be stamped into, embossed on or indicated on the surface of the plate in any other permanent and legible way.



1.1.2 The plate is to contain the following information in English

"CSC SAFETY APPROVAL"

- Country of approval (e.g. IND. The country of approval should be indicated by means of the distinguishing sign used to indicate country of registration of motor vehicles in international road traffic.) and approval reference
- Date (month and year) of manufacture
- Manufacturer's identification number of the container or, in the
 - Maximum operating gross mass (kg and lbs)
- Allowable stacking load for 1.8 g (kg and lbs)
- Transverse racking test force (newtons);
- End-wall strength to be indicated on plate only if end-walls are designed to withstand a force of less or greater than 0.4 times the gravitational force by maximum permissible payload, i.e. 0.4Pg.
- Side-wall strength to be indicated on plate only if the side-walls are designed to withstand a force of less or greater than 0.6 times the gravitational force by maximum permissible payload, i.e. 0.6Pg.
- 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.
- One door off stacking strength to be indicated on plate only if the container is approved for one door off operation. The marking is to show: ALLOWABLE STACKING LOAD ONE DOOR OFF FOR 1.8 g (... kg ... lbs). This marking is to be displayed immediately near the stacking test value (see line 5).
- One door off racking strength to be indicated on plate only if the container is approved for one door off operation. The marking is to show: TRANSVERSE RACKING TEST FORCE (... newtons). This marking is to be displayed immediately near the racking test value (see line 6).

1.1.3 Where it is considered that a new container satisfies the requirements of the Convention in respect of safety and if, for such container, the end-wall and/or side-wall strength values (factors) are designed to be greater or less than those stipulated in annex II, such values are to be indicated on the Safety Approval Plate. Where the stacking or racking values are less than 192,000 kg or 150 kN, respectively, the container is to be considered as having limited stacking or racking capacity and are to be conspicuously marked, as required under the relevant standard (ISO 6346 - Freight containers - Coding, identification and marking) .

1.1.4 The presence of the Safety Approval Plate does not remove the necessity of displaying labels or other information as may be required by other regulations which may be in force. A container may retain the Safety Approval Plate as permitted by the Convention prior to that date as long as no structural modifications occur to that container.

Annex V

Guidance on Materials for Containers (Other than Tank Containers)

1 The steel and corner fittings are to be manufactured at works approved by IRS. However, consideration may be given to waiver of approval of steel manufacturers having good experience in producing the steel of the specified standards.

2 Material that is used for container manufacturing is normally called CORTEN steel which has high corrosion resistance and high strength properties. The grade CORTEN-A steel is used for the body of containers. Corten steel is a high strength weathering steel. The word “CorTen” is the trademark name given to a weathering steel alloy material originally produced by United States Steel.

3 Corten steel alloy falls into the category of those steels that were developed to reduce or eliminate the use of coats, primers or paints on the material to make it rustproof. When exposed to the environment, corten steel forms an outer rust layer that protects this steel from corrosion. This is the reason why corten steel is also called weathering steel. The expected corrosion of this steel is very low, in the range of 0.1 -0.2 mm in 10 years.

4 Containers walls are made usually from 14 gauge (2.03 mm) corrugated sheet steel panels that are welded to the main structure. The top and bottom side rails and end frames are normally of 7 gauge (4.5 mm) tubular steel.

5 The commonly used standards for this steel are either

- a) JIS G-3125 SPA H or
- b) ASTM A588 Grade A or
- c) EN 10025-4: 2004 grade S355J0WP

The Chemical Composition and Mechanical properties of the above standards are given in the following:

Chemical composition of JIS G 3125 SPA-H steel plate								
Grade	C ≤	Si	Mn ≤	P	S ≤	Cu	Cr	Ni ≤
SPA-H	0.12	0.20~0.75	0.60	0.070~0.150	0.035	0.25~0.55	0.30~1.25	0.65

Mechanical Properties of JIS G 3125 SPA-H steel plate				
Grade	Plate Thickness	Yield strength	Tensile strength	Elongation
SPA-H	≤ 6.0mm	≥ 355 MPa	≥ 490 MPa	≥ 22
	> 6.0mm	≥ 355 MPa	≥ 490 MPa	≥ 15

ASTM A588 Grade A: Chemical Composition									
Grade	C	Mn	Cr	Si	N	S	Cu	P	Ni
ASTM A-588 Gr A	0.19 Max	0.80-1.25	0.40-0.65	0.30-0.65	0.010	0.040 max	0.25-0.40	0.05 max	0.40

Mechanical Properties of ASTM A 588 Grade A			
Grade	Plate Thickness	Yield strength	Tensile strength
ASTM A-588 Gr A	0-100 mm	≥ 345 MPa	≥ 485 MPa

Chemical composition of EN 10025-5:2004 Grade S355J0WP									
Grade	C ≤	Si	Mn ≤	P	S ≤	Al	Cu	Cr	Ni ≤
S355J0 WP	0.12	0.25-0.75	0.20-0.5	0.070-0.150	0.030	0.015-0.06	0.25-0.55	0.50-1.25	0.65

Mechanical Properties of EN 10025-5: 2004 Grade S355J0WP				
Grade	Plate Thickness	Yield strength	Tensile strength	Elongation
S355J0 WP	2-16 mm	≥ 355 MPa	≥ 470 MPa	≥ 20

Annex VI

Guidance on Testing

1. Prototype and Production Tests are to be carried out as described in 2.5.2, 2.5.3 and Annex II.

2. **Acceptance Criteria:** Upon application of the prescribed test load or force the container is not to exhibit significant permanent deformation or weakening of the structure, nor is the container, after removal of any load or force, to be dimensionally altered so as to render it unsuitable for use, or affect its handling, securing or interchangeability.

3. **Prototype tests:** The prescribed tests, in 2.5.2 are required to be performed on a prototype. The tests are to be witnessed by a Surveyor.

The tests need not all be performed on the same container, nor in the sequence listed. However, the tests are not to be performed on more than two representative containers; the dimensional check is to be done first; and the weather tightness test is to be performed on the same container that has undergone the racking tests. The dimensional check is to be repeated upon completion of all structural tests. The test loads/forces are to be applied in a manner that will allow free deflection of the container under test.

When the result of any test is not satisfactory, the test is to be repeated on a minimum of two additional containers to demonstrate satisfactorily the adequacy of the design.

4 **Production tests:** The dimensional checks and weather tightness tests in 2.5.3 are to be performed on each production unit.

If the manufacturing operation has sufficient jigs and fixtures to control dimensions, and the quality control procedures assure their accuracy, the frequency of performing dimensional check may be modified.

As a guide, the frequency of dimensional checks may be gradually reduced from check on every container to one in 20 containers provided the checks are satisfactory at every stage and record is verified that manufacturer has carried out the dimensional checks on the containers.

Where the checks on any container is not found satisfactory when the frequency is reduced, the frequency is to be increased to checks on each container and after stabilization the same process of reduction in frequency to one in 20 containers may be applied.

Other tests prescribed in 2.5.3 may be performed on one container from each lot of twenty (20) containers or fraction thereof provided record is verified that manufacturer has carried out these tests on the containers satisfactorily . Where the tests are not satisfactory on any container, the tests are to be repeated on minimum two additional

containers which should be satisfactory. If any of the test is not satisfactory on the additional containers tests are to be undertaken for all containers in the lot.

The Surveyor is to witness representative production tests during periodic visits to the plant of the manufacturer. Records of production tests are to be made available to the Surveyor during the periodic visits.

5. Acceptance Criteria for specific tests

5.1 Transverse racking:

The diagonals of the end frame to be tested are to be measured before the application of force and under full test load. With the container under full test load the sum of the changes in the length of the two diagonals is not to exceed 60 mm.

5.2 Longitudinal Restraint:

The deflection of the top of the container with respect to the bottom of the container with container under full test load is not to exceed 25 mm

End of Classification Note