Rainbow Containers GmbH

T E C H N I C A L S P E C I F I C A T I O N

FOR

20' x 8' x 8'6" TYPE
STEEL DRY CARGO CONTAINER

- WITH DOUBLE DOORS ON BOTH ENDS -

FOR

Rainbow Containers GmbH - Hamburg

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C O N T E N T S

1. GENERAL

1.1 Operational Environment

The container will be designed and constructed for the transportation of general cargo on sea (above or under deck) and on land (road or rail) throughout the world, and will be suitable for the environmental conditions imposed by those modes of transport. All materials used in the construction will be able to withstand extreme temperature ranging from -30°C (-22°F) to 70°C (158°F) without effect on container's strength and watertightness.

1.2 Standards, Regulations and Rules

1.2.1 Standards and Regulations

Containers shall comply with following in their latest editions :

1) ISO/TC-104

668	-	Series 1 freight containers-Classification, external dimensions and ratings
6346	-	Coding, identification and marking for freight containers
1161	-	Specification of corner fittings for series 1 freight containers
1496/1	-	Specification and testing of series 1 freight containers. Part 1 : General cargo containers for general purposes
830	-	Freight containers-Terminology.
6359	-	Freight containers-Consolidated date plate

2) The International Union of Railway (UIC) code 592-2 OR.

3) The Customs Convention on the International Transport of Goods (TIR).

4) The International Convention for Safe Containers (CSC).

5) Transportation Cargo Containers and Unit Loads Quarantine Aspects and Procedures by Commonwealth of Australia Department of Health (TCT).

1.2.2 To satisfy the requirements of Rules of GL Classification.

2. APPROVAL & CERTIFICATES

2.1 Classification Certificate
All the containers shall be certified for design type and individually inspected by Germanischer Lloyd Classification Society.

2.2 Production Certificate
The Production Certificate of series containers to be issued by the Classification Society. The Society's seal shall be provided.

2.3 TCT Certificate
Certificate of timber treatment to the requirement of Australia Department of Health.

2.4 Customs Certificate (TIR)
Customs' Approval and Certificate to be issued by the Customs.

2.5 UIC Registration
All the containers will be registered & comply with the International Union of Railways.

2.6 CSC Certificate
All the containers will be certified and comply with the requirements of the International Convention for Safe Containers.

3. HANDLING

The container will be constructed to be capable of being handled without any permanent deformation which will render it unsuitable for use or any other abnormality during the following conditions :

1) Lifting, full or empty, at the top corner fittings vertically by means of spreaders fitted with hooks, shackles or twistlocks.
2) Lifting, full or empty, at the bottom corner fittings using slings with appropriate terminal fittings at slings angle of forty-five (45) degrees to horizontal.
3) Lifting, full or empty only, at two fork pocket by fork lift truck.

4. TRANSPORTATION

The container shall be constructed to be suitable for transportation for following modes without any permanent deformation which will render the container unsuitable to use or any abnormality.

4.1 Marine :

- In the ship cell guides : Seven (7) high stacked. (max gross weight 30,480 kg)
- On the deck : Four (4) high stacked and secured by suitable vertical and diagonal wire lashings.

4.2 Road - On flat bed or skeletal chassis :
Secured by twistlocks or the equivalent at the four bottom corner fittings.

4.3 Rail - On the flat cars or special container car :
Secured by twistlocks or the equivalent at the four bottom corner fittings.

5. DIMENSIONS & RATINGS

5.1 Dimension

	External Dimensions	Internal Dimensions
Length	6,058 (0, -6) mm	5,844(0, -6) mm
Width	2,438 (0, -5) mm	2,352 (0, -5) mm
Height	2,591 (0, -5) mm	2,393 (0, -5) mm

No part of the container will protrude out beyond the external dimensions mentioned above.
Maximum allowable difference between two diagonals on any one of the following surface are as follow :

Roof, Bottom and Side Diagonals	.....	13 mm
Front and Rear Diagonals	.....	10 mm

5.2 Door Opening

Width	2,340 (0, -5) mm
Height	2,280 (0, -5) mm

5.3 Fork Pocket

Width	360 mm
	115 mm
Center distance	2,080 mm

5.4 Inside Cubic Capacity

32.9 cu.m 1,160 cu.ft

5.5 Rating

Maximum Gross Weight	30,480 kg	67,200 lbs
Tare Weight	2,340 kg	5,160 lbs
Maximum Payload	28,140 kg	62,040 lbs

5.6 Corner Protrusions

1) The upper faces of the top corner fittings will protrude above the highest level of the roof construction except corner plate by 6 mm.
2) For the containers under empty condition the lower faces of the crossmembers in their bases including their end transverse members shall be on a plane located at least 17 mm above the lower faces of the bottom corner fittings.
3) The outer side faces of the corner fittings will protrude from the outside faces of the corner post by minimum 3 mm. The outer side faces of the corner fittings will protrude from the outside faces of the side walls by nominal 7 mm.
4) For the containers under the condition such as the load equal to 1.8R-T is uniformly distributed over the floor, no part of the container base will deflect by more than 6 mm below the lower faces of the bottom corner fittings.

6. CONSTRUCTION

6.1 General

The container will be constructed with steel frames, fully vertically corrugated steel side, die-stamped corrugated steel roof, wooden flooring, two corrugated double hinged doors and ISO corner fittings at eight corners. All steelworks will be built up by means of automatic and semi-automatic CO2 gas arc welding (MAG welding). All exterior welds including that on base structure will be continuous to give perfect water tightness. Interior welds will be intermittent with a minimum bead length of 25 mm for every 200 mm. All the welds, even spots, will have full penetration without undercutting or porosity.

6.2 Corner Fittings

Corner fittings will be designed in accordance with ISO / 1161 standard, and manufactured at the workshops approved by the classification society.

6.3 Base Frame

The base frame will be composed of two (2) bottom side rails, a number of crossmembers and a pair of fork pockets, which are welded together as a sub-assembly.

6.3.1 Bottom Side Rail

Each bottom side rail is built of a steel pressing made in one piece. The bottom flange face outwards so as to be easily repaired and hard to corrode.

Qty. :	2 pcs
Shape :	Channel section
Dimension :	158 x 48 x 30 x 4.5 mm

6.3.2 Crossmember

The crossmembers are composed of a number of small pressed channel section and some large one located beneath each board joint of the plywood, which are placed at certain center distance.

Shape	:	"C" section			
Dimension	:	122 x 45 x 35 x 4.0 mm,	Qty.	:	13 pcs.
		122 x 75 x 35 x 4.0 mm,	Qty.	:	2 pcs.

6.3.3 Fork Pocket

One pair of fork pockets will be provided in according with ISO requirements for loaded handling. Each fork pocket is constructed with two adjacent crossmembers, a top plate and two bottom end plates. A angle stiffener plate will be welded to each opening of fork pocket.

Top plate thickness	:	3.0 mm
Mouth plate thickness	:	6.0 mm; Depth : 200 mm.
Side rail ("C" section)	:	122 x 45 x 35 x 4.0 mm, Qty. : 4

6.3.4 Bottom Reinforcement Plate

Reinforcement plates will be welded at two end of bottom side rail.

Dimension : 200 x 149 x 4.0 mm

6.4 End Door

Each unit has two (2) End doors. Each End is composed of End Frame which consists of two corner posts, one end header with header plate, one door sill and four corner fittings, which are welded together as a sub-assembly, and Door Systems which are with locking devices.

6.4.1 Corner Post

Each corner post is constructed from an inner part of channel shaped hot-rolled section steel and an outer part of steel pressing, welded together to form a hollow section to ensure the door opening and suitable strength against the stacking and racking force. Four (4) sets of hinge pin lugs are welded to each outer part of the corner post.

Inner part : 113 x 40 x 10 mm, Outer part : 6.0 mm thick.

6.4.2 Door Header

The door header is constructed from a lower part of a "U" shaped steel pressing with internal stiffener ribs and an upper part of steel pressing rear header plate, they are welded together to form a box section to provide a high rigidity.

Door header	:	4.0	mm	thick		
Header plate	:	3.0	mm	thick		
Rib	:	4.0	mm	thick,	Qty.	: 4 pcs / each end

6.4.3 Door Sill

The door sill is built of a special channel section steel pressing with internal ribs as stiffeners. The upper face of the sill has a slope for better drainage and the highest part is on the same level to the upper face of the wooden floor. Two channel section steel recesses are provided adjacent to the bottom fitting to prevent damage due to any twistlock misalignment.

a) Door sill : 4.5 mm thick Slope : 1:10 approx.

b) Stiffener ribs : 4.0 mm thick Qty. : 4 pcs / each end

c) Channel section : 200 x 75 x 9 mm

6.4.4 Door Systems

Doors will consist of two door leaves, each leaf with four hinges and pins, two locking devices, seal gaskets and the door holders. The doors will be installed by hinge pins to the rear end frame and capable of swinging about 270 degrees.

6.4.4.1 Door Leaves

Each leaf consists of door panel, steel door frame which consists of vertical (inner & outer) and horizontal (upper & lower) members. They are welded together to form the rectangular door leave. The door are so arranged that the left leaf can not be opened without displacement of the right leaf.

1) Door panel : With 5 corrugations

Depth	:	36 mm
Interface	:	72 mm
Slope	:	68 mm
Panel thickness	:	2.0 mm

2) Door frame :

a) Vertical door member : 100 x 50 x 3.2 mm RHS (outer & inner)

b) Horizontal door member : Channel section, 150 x 50 x 3.0 mm.

6.4.4.2 Hinges and Pins

Each End have four forged hinges, providing with bushed hole, are welded to each door leaf. Each door is installed by hinge pins, washers (at the bottom of the hinge) and bushings.

Washer and Pin - Material : Stainless steel

Bushing - Self-lubricating synthetic

6.4.4.3 Locking Devices

Two locking bars are of steel tube with handles, anti-racking rings and cam ends, and fixed to the door leaf with huck-bolts, by top and bottom bearing brackets and one bar guide bracket. The bars are suspended in bearing brackets with bush of self-lubricating synthetic material.

The additional lock eye & the relevant lock box are provided access to the left locking bar of the right door for further safety.

Cam-keepers are welded to the door header and sill

a)Locking device type : BE 2566 MN or modified bolt-on type, made in China.

b)Locking device treatment : Hot-dipped galvanized (75 microns).

6.4.4.4 Seal Gaskets

The door seal gaskets (black color) are of EPDM rubber assembled by rivets at an about 145 mm pitch, using strip retainers and adhesive sealant on the back.

Gasket's shape : "J-C" type

Retainer and Rivet : Stainless steel

6.4.4.5 Door Holder and Receptacle

A door holder per door, made of mixed nylon rope, is tied to the center side locking rod & the receptacle (door hook) is welded to each bottom side rail to remain the door at the open position.

6.4.4.6 Shim

The EPDM shim will be placed over the holes on the door for fastener.

Thickness : 1 mm for the large bearing bracket, 4 mm for other.

6.5 Side Wall Assembly

6.5.1 Top Side Rails

Each top side rail is used a square steel pipe.

Rail : 60 x 60 x 3.0 mm RHS

6.5.2 Side Walls

Each side wall will be composed of a number of sheets for the intermediate (inner) parts and outer panels at each end of side wall, fully vertically corrugated into trapezium section, butt welded together to form one panel by automatic MAG welding.

a) Inner panel : 1.6 mm thick Qty. : 3 pcs / each side.

b) Outer panel : 2.0 mm thick Qty. : 2 pcs / each side.

c) Trapezium :

Outer face : 72 mm, Slope : 68 mm,

Inner face : 70 mm, Depth : 36 mm,

Pitch : 278 mm.

6.6 Roof

The roof will be constructed by several die-stamp corrugated steel sheets with a certain upwards camber at the center of each trough and corrugation, these sheets are butt jointed together to form one panel by automatic MAG welding.

Corrugation Shape - Depth : 20~25 mm, Pitch : 209 mm,

Inter face : 91 mm, Slope : 13.5 mm,

Outer face : 91 mm.

: Camber upwards : 5 mm

Panel thickness : 2.0 mm

Sheet Qty. : 5 pcs

6.6.1 Roof Reinforcement Plate

Four reinforcement plates shall be mounted around the four corner fittings.

The dimension : 310 x 300 x 3.0 mm

6.7 Floor

6.7.1 The Floor Boards

The floor consists of plywood. The plywood is treated with wood preservative according to the Commonwealth Department of Health, Australia.

Plywood thickness	:	28mm
Plywood moisture content	:	Less than 14%
Plywood ply number	:	19 piles
Plywood material	:	Apitong

6.7.2 Arrangement and Fixing

The plywood boards are longitudinally laid on the crossmember with a free floating flat bar joint at the center and two angle steel along both side rails. The plywood boards are tightly secured to each crossmember with countersunk self-tapping electro-zinc plated steel screws. These heads of the floor screws are countersunk below the level of the upper surface of the floor by 1.5 mm to 2.5 mm.

Screws	:	M8 x 45 x Φ16 (head), electro zinc plated.
Screws' qty.	:	6 pcs / end row, 4 pcs / other.
Flat bar	:	50 x 4 mm, painted with epoxy zinc topcoat.
"L" section	:	2.3 mm thick

6.8 Special Features

6.8.1 Customs Seal Provision

Customs seal provision are made on the left locking handle and retainer of the right door in accordance with TIR requirements by "Huck-bolt" rivets.

6.8.2 Lashing Rings and Lashing Bars

1) Lashing rings are welded to each bottom and top side rail at corresponding recessed area of side wall.
   Lashing ring qty. / each bottom or top side rail : 4 pcs, total : 16 pcs.
2) Lashing bars are welded on each end corner post slot.
   Lashing bars qty. / each corner post : 2 pcs, total : 8 pcs.
3) Capabilities of pull load of every lashing point are as following :
   a) Lashing rings on the side rails : 1,500 kgf / each
   b) Lashing bars on the corner posts : 1,000 kgf / each
4) Treatment of lashing ring / lashing bar : Electro zinc plated

6.8.3 Ventilators

One ventilator with EPDM seal gasket is supplied on each side wall at the right-hand end when facing the side from outside of container, fixed by three aluminum huck-bolts, the seal is to be applied on the edges except the bottom side of the ventilator, after the completion of paint.

Quantity : One / each side panel
Material : ABS labyrinth type (with same color as exterior color of container)

7. PRESERVATION

7.1 Surface Preparation of the Steelwork

1) All the steel surface prior to forming or after will be degreased and shot blasted to Swedish Standard SA 2.5 to obtain the surface roughness at 25 to 35 microns which can result in the remove of all the rust, dirt, mill scale and all other foreign materials, and then covered with Rich Zinc Primer at 10 to 15 microns within 20 minutes.
2) Locking rod assemblies, which are welded with gear cams, bars holder and handle hinges, are hot-dipping galvanized (Thickness : 75 microns).
3) All fasteners such as bolts / nuts, washers, self-tapping screws, which are not mentioned in this Spec. will be electro zinc plated to 13 microns.
4) Sealant for joints
   Each perimeter of the floor, all the overlapped joints of inside, all the holes for bolts and nuts and all the places where may leak water will be sealed to give prevention against water entry.

Sealant Materials :

a. Chloroprene (Cargo contact area)
b. Butyl (Hidden parts)

7.2 Coating

7.2.1 Prior to Assembly

All the steel surface will be coated with primer paint immediately after shot-blasting.

7.2.2 After Assembly

All the weld joints will be shot-blasted to remove all the welding fluxes, spatters, burnt primer coatings caused by welding heat, and other foreign materials, and followed with the secondary paint operation immediately.

7.2.3 All the surface of the assembled container will have coating system as follows :

Process	Paint Name :(Hempel)	DFT (μ)
Exterior Surface (Including Roof)	Epoxy zinc rich primer	30
	Epoxy resin primer	40
	Acrylic top coat, Color : RAL 5013	40
	Total : 110	
Interior Surface	Epoxy zinc rich primer	25
	Epoxy topcoat Color : RAL 7035	50
	Total : 75	
Under Structure	Epoxy zinc rich primer	30
	Tecty 121B, ACST 8508, Dinitrol 4941K	200
	Total : 230	

Zinc rich epoxy and epoxy topcoat are not applied to the wooden floor.

8. MARKINGS

8.1 Lettering

The markings will be designed decal and arranged according to buyer's requirement.
The markings consist of the following contents :

1) Owner’s emblems According to owner’s design.
2) Owner’s code, serial number and check digit (outside & inside)
3) Size and type code (outside)
4) Weight details (on door)
5) UIC marking
6) Other marking : According to owner’s requirements.
7) Material of marking : According to owner’s requirements.

8.2 Consolidate Plate

8.2.1 The containers will bear some of the marking plates in accordance with the requirements of the Classification Authorities and owner such as mentioned in section 2.2 in this specification. The plate will be permanently riveted to the specified position by rivets and sealant.

Plate material :	Stainless steel
Plate treatment :	Chemically etched & enameled
Rivets material :	Stainless steel
Plate thickness :	0.8 mm

8.2.2 Contents of the Plate :

1) Owner’s plate (name and address)
2) CSC approval No.
3) Customs approval No.
4) Australian wood treatment
   The engraved letters on this plate are as following :
   IM : Immunization
   XXXX : The name of preservative
   XXXX : The time of immunization
5) Inspection authority
6) Date of manufacture (year and month - engraved or stamped)
7) Owner’s serial number (stamped)
8) Owner’s model number

9. TESTING & INSPECTION

9.1 Proto-type Container

Proto-type container to be manufactured in accordance with this specification and shall be tested according to procedures described in the ISO1496/1 and the Classification Society's requirements. The containers will be fabricated & tested in advance of the mass production.

9.2 Container in Mass Production

9.2.1 Every container in mass production shall be manufactured under effective quality control procedures to meet the specified standards. One of every 150 of containers shall meet the requirements of owner or classification society, and shall be tested for following items :

a) Stacking test
b) Lifting from top corner fitting test
c) Lifting from bottom corner fitting test
d) Floor test.

After completion, all the containers shall be subject to dimension check, door operation check, light leakage test & production type weather-proofness test. The containers shall be inspected by the surveyor of Classification Society and identified by the appropriate society seal.

9.2.2 Each assembled corner post structure will have tension test with 15,240 kgf after welding in the construction line.

9.3 The proposed criteria table for general prototype testing :

Test No.	Test Load	Method
a. Stacking	Internal Load : 1.8R-T Testing Load : 86,400 kgf/post	Hydraulic cylinder load to corner post through top corner fittings. Time duration : 5 mins.
b. Lifting from Top Corner Fittings	Internal Load : 2R-T	Lifting vertically from top corner fittings. Time duration : 5 mins.
c. Lifting from Bottom Corner Fittings	Internal Load : 2R-T	Lifting from bottom corner fitting 45 degrees to horizontal. Time duration : 5 mins.
d. Wall Strength	Test Load : 0.4P	Compressed air bag is used. Time duration : 5 mins.
e. Side Wall Strength	Test Load : 0.6P	Compressed air bag is used. Time duration : 5 mins.
f. Lifting from Fork Pocket	Internal Load : 1.6R-T	Lifted by horizontal bars. Bar length 1,828 mm, bar width 200 mm. Time duration : 5 mins.
g. Restraint (Longitudinal)	Testing Load : 2R (R/side) Internal Load : R-T	Hydraulic cylinder load applied to bottom side rails in compression & then tension. Time duration : 5 mins.
h. Floor Strength	Truck Load : 7,260 kgf	Special truck is used. Total contact area : 284 sq.cm. Wheel width : 180 mm, Wheel center distance : 760 mm.
i. Roof Strength	Test Load : 300 kgf	Applied area will be the weakest place of 600 x 300 mm longitudinal & transverse. Time duration : 5 mins.
j. Rigidity (Transverse)	Test Force : 15,240 kgf	Hydraulic cylinder will be applied to front top end rail & door header through top corner fittings, each time

	(150 kn)	pulling & pushing. Time duration : 5 mins.	
k. Rigidity (Longitudinal)	Test Force : 7,620 kgf (75 kn)	Hydraulic cylinder load will applied to side top rail through top corner fittings. Time duration : 5 mins.	
l. Weather Proofness	Nozzle : 12.5 mm (inside dia.) Pressure : 100 kpa (1 kgf/sq.cm)	Distance : 1.5 m Speed : 100 mm/Sec.	

Note : R - Maximum gross weight T - Tare weight P - Maximum payload

9.4 Inspection

9.4.1 Materials and Component Parts Inspection

All the materials and components will be inspected by Quality Control Dept. to make sure that the most suitable and qualified components being used for the containers and to meet this specification.

9.4.2 Production Line Inspection

Every containers will be manufactured under effective Quality Control procedures, and every production line of the factory will be inspected and controlled by the Quality Control Dept. to meet this specification.

10. DOCUMENTS SUBMISSION

10.1 When Contracting

CIMC NANTONG shall submit the specification with following drawing (3 sets) :

General arrangement	Rear end assembly
Base assembly	Marking arrangement
Side wall assembly	

11. WARRANTY

11.1 Paint Guarantee

The paint system applied to the container surface shall be guaranteed against corrosion and / or paint failure for a period of five (5) years. The guarantee shall be applied to all the kinds of faults / failures affecting more than 10% of the painted surface and partial or total repainting shall be assured for the container(s) at the manufacturer's expense. Normal wear / tear, or corrosion caused by acid, alkaline solution or result from damages by abrasion impact or accident are excluded. Corrosion is defined as the rusting exceeding RE3 (European scale of degree of rusting).

11.2 Other Guarantee

All containers shall be guaranteed against any defects or omissions in construction, poor workmanship, or defective materials for a period of one (1) year. Any damages caused by mis-handling, mis-securing, mis-loading, impact and other natures of accident are excluded. The self-adhesive film decal shall be guaranteed seven (7) years.

12. MATERIALS

The main materials used in construction are as follows or approved equivalent :

Where used	Materials
Base Assembly :	
Bottom side rail	Corten A
Crossmember	Corten A
Fork pocket	Corten A
Floor centre rail	Corten A
End Assembly :	
End corner post (outer)	Corten A
End corner post (inner)	SS50 or SM50YA
End header cap	Corten A
Door header lower	Corten A
Door sill	Corten A
Door panel frame	Corten A
Door panel	Corten A
Door hinge	S25C
Door hinge pin	Stainless steel
Washer	Stainless steel
Locking device BE 2566 MN or modified bolt-on type, made in China.	
Locking cam	S20C
Locking cam keeper	S20C
Locking rod	STKR41
Door gasket	EPDM
Gasket retainer	Stainless steel
Rivet	Stainless steel
Shim	EPDM
Corner fitting	SCW49
Side Wall Assembly :	
Top side rail	Corten A
Side panel (inner)	Corten A
Side panel (outer)	Corten A
Lashing ring	SS41, electro zinc plated
Lashing bar	SS41, electro zinc plated
Ventilator	ABS
Roof Assembly :	
Roof panel	Corten A
Roof corner gusset	Corten A
Floor :	
Floor board	Plywood (Apitong)
Floor screw	Electro zinc plated

Note :

Material	Yield point (Kgf/sq.mm)	Tensile strength (Kgf/sq.mm)
SS41	25	41
JIS SCW49	28	49
SS50	29	50
S20C	25	42
S25C	28	46
SM50YA	37	50
Corten A	35	49