



**TECHNICAL SPECIFICATION**

FOR

20' X 8' X 8'6" ISO 1CC TYPE  
STEEL DRY CARGO CONTAINER

FOR

**ALL SPA-H**

WITH

CORRUGATED DOOR  
CORRUGATED ROOF  
1 PAIR OF FORKLIFT POCKET  
2 VENTILATORS  
BAMBOO FLOOR  
LOCK BOX

SPECIFICATION NO.: CTX 20 DVL  
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## SCOPE

This specification covers the design, construction, materials, testing, inspection and performance requirements for ISO, 1CC type steel dry cargo containers manufactured by anyone of the factories belong to Singamas Management Services Limited (hereinafter referred to as FACTORY).

The containers specified herein are manufactured under the quality control of FACTORY within the perimeters as such set forth by the Classification Societies.

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## **1. GENERAL**

### **1.1. Operational Environment**

The container is designed and manufactured for the carriage of general cargo by marine, road, and rail. It is designed to maintain its structural and weathertight integrity within a temperature range of -30 °C to 80 °C.

### **1.2. Regulations and Standards**

The container will conform to and satisfy the following regulations and standards.

#### 1.2.1 ISO/TC-104

All to meet series 1 freight containers set forth.

ISO 830 ----- Freight containers-Terminology.

ISO 668 ----- Series 1 freight containers-Classification, external dimensions and ratings.

ISO 6346 ----- Freight containers-Coding, identification and marking.

ISO 1161 ----- Series 1 freight containers-Corner fittings-specification.

ISO 1496-1 ----- Series 1 freight containers-Specification and testing-  
Part 1 : General cargo containers

#### 1.2.2 T.I.R. Requirements and Certifications

The container shall comply with the customs convention of containers, 1972 and all subsequent revisions to date and will be identified with appropriate approval plates and markings.

#### 1.2.3 Timber Component Treatment and Certification

All exposed timber components are treated with an Australian government approved insecticide and the container will be such identified with appropriate immunization plate.

#### 1.2.4 U.I.C. Registration

The container will be registered and comply with the International Union of Railways (UIC) code 592-1 OR and 592-2 OR.

#### 1.2.5 CSC Requirements

The container will comply with the rules set forth in the International Convention for Safe Containers and will be so identified with a plate.

#### 1.2.6 Classification Society

The container will be certified by classification society in design and individually during its production.

**1.3. Handling**

The container will be constructed to be handled under the following conditions without distortion or effect on its structural integrity:

- A. Lifting full by its top corner fittings by means of spreaders
- B. Lifting full by its bottom corner fittings by means of fitting at a sling angle of 45 degrees.
- C. Lifting full or empty by forklift at its forklift pocket.

**1.4. Transportation**

The container will be constructed to be suitable for transportation in normal operating conditions by modes of:

- A. Marine - on deck or in cell guided by vertical or diagonal lashings
- B. Rail - on flat or container car secured at its bottom corner fittings
- C. Road - on flat or chassis secured at its bottom corner fittings

**2. DIMENSIONS AND RATINGS**

**2.1 Dimension**

Title		20'
External (mm)	Length	6,058 (0, -6)
	Width	2,438 (0, -5)
	Height	2,591 (0, -5)
Internal (mm)	Length	5,898 (0, -6)
	Width	2,352 (0, -5)
	Height	2,393 (0, -5)
Door opening (mm)	Width	2,340 (0, -5)
	Height	2,280 (0, -5)

**2.2 Diagonal Difference**

Diagonal tolerance of front and rear frames should be less than 10 MM.  
 Diagonal tolerance of side and roof panels should be less than 13 MM.

**2.3 Internal Capacity**

33.2 CU.M. (1,173 CU.FT.)

**2.4 Ratings**

Title	KGS	LBS
Max. Gross Weight	30,480	67,200
Tare Weight	2,130	4,695
Max. Payload	28,350	62,505

## **2.5 Corner Protrusions**

- 2.5.1 The faces of the bottom corner fittings protrude from lower faces of all transverse members in the base of the container by 17 MM (+0.5, -6.0 MM).
- 2.5.2 The upper faces of top corner fittings protrude from upper faces of the highest point of the roof by 6 MM.
- 2.5.3 The outer side faces of corner fittings protrude from outside faces of corner posts by 3 MM.
- 2.5.4 Under 1.8 x max. gross weight no part of the base will protrude more than 6 MM below the bottom corner fittings.

## **3. MATERIAL AND CONSTRUCTION**

### **3.1. General**

The container is mainly constructed with steel frames, corrugated panels welded by CO<sub>2</sub> shielded Arc welding. All welds of the exterior including the base frames are continuous with full penetration. Bamboo floor is fixed to the cross members by self-tapping screws. All crevices will be sealed with elastic sealing compound.

### **3.2. Materials**

The main constructional materials are shown in Appendix A of the specification.

### **3.3. Corner Fittings**

All corner fittings used will comply with ISO/1161 standard.

### **3.4. Base Structure**

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

#### **3.4.1 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 50 x 30 x 4.5 mm

#### **3.4.2 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. There are 3 pcs of t4.0 stiffeners in each joint member.

Shape : "C" section  
Small one : 122 x 45 x 45 x 4.0 mm Qty. : 16 pcs.  
Large one : 122 x 75 x 45 x 4.0 mm Qty. : 2 pcs.

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Stiffener : 4.0 mm thick Qty. : 6 pcs.

### 3.4.3 Forklift Pocket

There will be a pair of forklift pocket in every container. Each forklift pocket consists of 2 pcs of cross members, one piece of top plate and 2 pcs of bottom end plates. Each forklift pocket is designed according to ISO standard :

Top plate : 3.2 mm thick	Qty. : one piece.
Bottom end plate : 6.0 mm thick	Qty. : 2 pcs.
Cross member : 122 x 45 x 45 x 4.0 mm	Qty. : (2) pcs.

### 3.4.4 Floor central rail

A 4.0 x 50 mm flat bar loosely placed on top of the crossmembers to support the floorboards at the center.

### 3.4.5 Floor retainer

A number of 25 x 25 x 2.3 mm thick angle steel will be placed on the side of the bottom side rails or the crossmembers to support the floorboards.

### 3.4.6 Base Gusset

Four corner gussets, these protection plates will be welded from side rail to corner fittings.  
Dimension : 200 x 146 x 4.0 mm

## **3.5 Front End**

The front end will be composed of front end frame and corrugated end wall, which are welded together as a sub-assembly.

### 3.5.1 Front End Frame

The front end frame will be composed of two corner posts, one top end rail (sub-assembly), one bottom end rail and four corner fittings.

#### 3.5.1.1 Front Corner Post

Each corner post is made of a 6.0 mm thick section steel pressing to ensure the suitable strength, light-weight and easy maintenance.

#### 3.5.1.2 Top End Rail (sub-assembly)

The front top end rail is constructed with steel square tube lower part and steel plate upper part. The upper part is extended inwards of the container certain distance with full width from front part of top corner fittings.

Lower rail : 60 x 60 x 3.0 mm  
Upper part : 3.0 mm thick

### 3.5.1.3 Bottom end rail

The bottom end rail is of 4.0 mm pressed steel and formed into open sections. The bottom end rail has 4 pcs inner vertical gussets. Two channel section steel recesses are provided adjacent to the bottom fitting to prevent damage due to any twistlock misalignment.

Gusset thickness : 4.0 mm  
 Channel section : 200 x 75 x 9.0 mm  
 Bottom end rail : 40 x 32 x 60 x 154 x 40 x 4.0 mm

### 3.5.2 Front End Wall

The front end wall is composed of steel sheet fully vertically corrugated into trapezium section, butt joint together to form one panel by means of automatic welding.

Front end wall thickness: 1.6mm  
 Corrugation dimension – Depth : 45.6 mm  
 Outerface : 110 mm  
 Interface : 104 mm  
 Slope : 18 mm  
 Pitch : 250 mm

## **3.6 The Rear Frame**

The rear frame consists out of one door header, one door sill, four corner fittings and two corner posts.

### 3.6.1 Rear 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 : 6.0mm thick

### 3.6.2 Door Header

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

Rear header : 4.0 mm thick  
 Header plate : 3.0 mm thick  
 Rib : 4.5 mm thick Qty. : 4 pcs.

### 3.6.3 Door Sill

The door sill is built of a special channel section steel pressing with internal ribs as stiffeners at the back of each cam keeper. 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.

Door sill : 4.5 mm thick, Slope : 10 mm  
Stiffener ribs : 4.5 mm thick Qty. : 4 pcs.  
Channel section : 200 x 75 x 9.0 mm

### **3.7 Side Wall Assembly**

The side walls will be continuously welded to each other and to the end rails and corner posts. Welding penetration side panels to rails should be min.75%.

#### 3.7.1 Top Side Rails

Each top side rail is used a square steel pipe. Rail : 60 x 60 x 3.0 mm

#### 3.7.2 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 welding.

Trapezium – Depth : 36 mm  
Outerface : 72 mm  
Interface : 70 mm  
Slope : 68 mm  
Pitch : 278 mm

- a) Inner panel : 1.6 mm thick Qty. : 3 pcs / each side.
- b) Outer panel : 2.0 mm thick Qty. : 2 pcs / each side.

### **3.8 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 welding.

Corrugation shape – Depth : 20 mm  
Outerface : 91 mm  
Interface : 91 mm  
Slope : 13.5 mm  
Pitch : 209 mm

Camber upwards : 5 mm  
Panel thickness : 1.6 mm  
Sheet Qty. : 5 pcs

#### 3.8.1 Roof Reinforcement Plate

Four reinforcement plates shall be mounted around the four corner fittings.  
Dimension : 300 x 270 x 4.0 mm

### **3.9 Door**

The door consists of two door leaves, each leaf with two locking devices, four hinges, seal gaskets and door holders.

#### 3.9.1 Door Leaf

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 leaf.

##### 3.9.1.1 Door panel : With 2 corrugations.

Panel thickness : 1.6 mm  
Depth : 45.6 mm  
Interface : 70 mm  
Slope : 32 mm

##### 3.9.1.2 Door frame : a) Vertical door member : 100 x 50 x 3.2 mm (inner & outer) b) Horizontal door member : Channel section, 150 x 50 x 3.2 mm.

##### 3.9.1.3 Each door is capable of swinging 270 degrees when fully opened and can be secured in that position by means of nylon ropes attached.

##### 3.9.1.4 The right door is so designed that the right door must be opened before the left in compliance with T.I.R. requirements.

#### 3.9.2 Door gasket

The door gasket is of extruded EPDM with a double lip to ensure water tightness. The upper and side gaskets are of 'J' type configuration. Bottom is of a 'C' type configuration. It is attached with sealant and secured with a stainless steel retainers by blind rivets.

#### 3.9.3 Hinges and Pins

Each door is suspended by four hinges with stainless steel pins, nylon bushings and brass washers placed at the hinge pin lugs of the rear corner posts.

#### 3.9.4 Locking Devices

Galvanized locking devices on a galvanized 34 MM dia. pipe are secured to the door with nuts and bolts and has nylon bushings on the brackets. The Locking devices will be installed after the container is painted.

**Type: Haihang “HH-E” with forged handle (no. 97HH—E—05—1) or Singamas Yixing SCI8568MN with forged handle (SCI8009) which is equivalent to Haihang “HH-E” tyep**

#### 3.9.5 Door Holder and Receptacle

A door holder per door, made of mixed nylon rope, is tired to the center-side locking rod and the receptacle (hook type) is welded to each bottom side rail to retain the door at the open position.

### 3.10 Floor

#### 3.10.1 The Floor Boards

The floor consists of bamboo floor. The floor used will be certified to meet the requirements of Australian Commonwealth Dept. of Health (Plant Quarantine Treatment Schedule) for Timber Components ( T.C.T. ). The floor dimension should according to the IICL dimension standard. The floor thickness is 28 mm.

#### 3.10.2 Arrangement and Fixing

The floor are longitudinally laid on the crossmember with a pre-blasted painted and free floating flat steel at the center and two angle steel along both side rails. The floor 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 2.0 mm to 2.5 mm.

Screws : M8 x 45 x ø16(Head) mm  
Screws' Qty. : 5 pcs / end row and joint , 4 pcs / other

### **3.11. Sealing**

1. Each perimeter of the floor;
2. All the overlapped joints of inside;
3. All the holes for bolts and nuts;
4. Three sides of CSC plate and ventilators;
5. Between door gasket and door panel at 305 mm above lower gasket;
6. All the places where may leak water will be sealed to give prevention against water entry.

Note: The application of interior sealant will be put on after water testing.

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

### **3.12 Special Features**

3.12.1 Shoring Slots: 60x40 MM slots are provided for on each of the rear corner posts so that a 2" thick batten can be secured to give protection against shifting cargo.

#### 3.12.2 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 : 5 pcs , total : 20 pcs.
- 2) Lashing bars are welded on each front & rear corner post slot.  
Lashing bars Qty. / each front & rear corner post : 2 pcs, total : 8 pcs.
- 3) Capabilities of pull load of every lashing point are as following:

Lashing rings on the side rails : 1,500 kg / each

3.12.3 Ventilators – Two (2) ventilators should be small type fabricated from A.B.S. resin by injection molding process. They will be secured to the second corrugation recess from right corner post of both side walls, by means of three (3) Aluminum Huck bolts.

3.12.4 Customs Seal Provision

Customs seal provision are made on each locking handle and retainer in accordance with TIR requirements.

## **4. SURFACE PROTECTION**

### **4.1. Surface Preparation**

All steel components, prior to forming, will be shot-blasted to a SA 2.5 standard surface by means of an automatic centrifugal shot surface cleaning machine. A weld-able primer compatible to the paint system will be applied immediately to a thickness of 10 micron to preserve the surface integrity during the assembly process. After the container is assembled it is shot-blasted again manually to clean all the welds and any other area that was contaminated during the assembly process. Slags and spatters are removed by means of grinding or needle hammers.

### **4.2 Paint**

*Supplier: Hempel – Hai Hong*

*Exterior: Color: RAL 5010 Gentian blue*

Apply one coat of epoxy zinc rich primer no. Hempadur Zinc 15360 to 20 mic. DFT.

Apply one coat of epoxy primer no. Hempadur Primer 1530C to 40 mic. DFT. (Grey)

Apply one coat of Acrylic topcoat no. Hempatex 56430 to 40 mic. DFT.

Total 100 mic. Minimum-DFT.

*Interior: Color: RAL 7035 Light grey*

Apply one coat of epoxy zinc rich primer no. Hempadur Zinc 15360 to 20 mic. DFT

Apply one coat of epoxy topcoat no. Hempadur Hi-Build 4520C to 40 mic. DFT.

Total 60 mic. Minimum-DFT.

### **4.3. Undercoating**

The whole underside will be coated with 20 mic. of epoxy zinc rich primer no. Hempadur Zinc 15360 and 150 mic. of Waxy or Bituminous undercoating.

Color: Black

Total 170 mic. Minimum-DFT.

## **5. MARKING**

### **5.1 Lettering**

The container will be marked in accordance with ISO requirements, owner's specifications, and other regulatory authorities.

### **5.2. Materials**

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The decals are of a self adhesive type and are warranted for seven (7) years against normal wear and tear. All data plates will be stainless steel and secured by steel blind rivets and sealed with sealant.

### **5.3 Plating and Stamping**

- 5.3.1 Owner's serial number will be stamped onto the top plane of the left corner casting and manufacturer's serial number will be stamped onto the top plane of the right corner casting.
- 5.3.2 Chemically etched stainless steel plates (Consolidated data plate i.e. TIR, CSC, TCT) will be permanently riveted with steel blind rivets and sealant will be applied around these plates.

## **6. TESTING AND INSPECTION**

### **6.1. Materials and Parts Inspection**

All materials and parts are inspected by the manufacturer's Quality Control department to ensure they are up to the specification called for in the design.

### **6.2. Production Line Quality Control**

All containers are manufactured under effective quality control procedures to meet the specified standards. All dimensions are checked and smooth operation of the doors are ensured after each container's completion. A light and watertight test is conducted on all containers.

Quality control personnel independent of the production dept. will be inspecting on all phases of the production as well as ad hoc inspections by the classification society's surveyor and buyer's representatives to assure the quality of the container.

## **7. WARRANTY**

### **7.1. Guarantee**

The guarantee period will commence the day after the certification is issued by the classification society.

### **7.2. Paint Guarantee**

The application of paint will be guaranteed against corrosion and paint failure for a period of three (3) years. The guarantee is for all faults affecting more than 10% of the painted surfaces and will assure partial or total re-painting of the containers. Normal wear/tear, or corrosion caused by acid, alkali or results of damages by abrasion, impact or accident are excluded.

Note: Corrosion is defined as rusting which exceeds RE3 (European scale of degree of rusting) on at least ten (10) percent of the total container surface coated with the concerned coating system.

### **7.3. Other Guarantee**

This container will be guaranteed against any defects or omissions in constructions, workmanship and materials for a period of thirty (30) months. In the event of defects, FACTORY will replace, correct or install to make the container satisfactory to this specification and its intended service at FACTORY's expense. Any damages caused by mis-handling, mis-securing, mis-loading, impact and any natures of accidents are excluded.

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**APPENDIX A**
**Material list for main steel parts**

YP = YIELD POINT (KG/MM<sup>2</sup>)

E = ELONGATION %

TS = TENSILE STRENGTH (KG/MM<sup>2</sup>)

FRONT PANEL	SPA-H OR EQUIVALENT
FRONT TOP RAIL	YP=35 TS=49 E=22
FRONT CORNER POST	
FRONT BOTTOM RAIL	
REAR CORNER POST-OUTER	
DOOR PANEL	
DOOR HEADER	
DOOR RAIL	
DOOR EDGE MEMBER	
DOOR SILL	
SIDE PANEL	
TOP SIDE RAIL	
BOTTOM SIDE RAIL	
ROOF PANEL	
CROSS MEMBER	
REINFORCEMENT PLATE	
FORK LIFT POCKET	
FLOOR SPACER	
DOOR SEAL RETAINER	SUS 304
CONE DAMAGE PROTECTOR	JIS: SS41 HOT ROLLED SHAPED STEEL YP=25 TS=41 E=21
REAR CORNER POST-INNER	JIS: SM50YA HOT-ROLLED HI-TENSILE SHAPED STEEL YP=37 TS=50 E=15
LOCKING BAR	JIS: STK41 YP=23 TS=41 E=23
CORNER FITTING	JIS: SCW49 MOD. WELDABLE CASTING YP=28 TS=49 E=20
DOOR HINGE	JIS: S25C FORGING STEEL YP=23 TS=44 E=20
DOOR LOCKING CAM AND KEEPER	JIS: S20C FORGING STEEL YP=23 TS=44 E=19

**APPENDIX B**

**TESTING ITEMS, LOADS AND CRITERIA**

NOTE: Figures in brackets of "residual deformation" column show the total residual deformation after completion of the series tests 1, 2A, 2B, 2C, 3, and 6

R: Gross Weight 30,480 KG  
 P: Payload 28,350 KG  
 T: Tare Weight 2,130 KG  
 \*Measured from the plane of bottom corner fittings.  
 \*\*Elastic Deformation  
 \*\*\*Dimensions within ISO tolerance

Test Load	Permissible Criteria		
	Deflection under Load	Residual Deformation	
1. Stacking			
848 KN (86,400 KG) per post	Corner Posts	** 4MM	2MM
	Bottom Side	4MM	
Offset: 25MM laterally	Rails		
38MM longitudinally	Cross Members	*6MM	3MM
(1.8R-T) loaded on floor			
2.A. Lifting from the four top corner fittings			
(2R), vertically	Bottom Side	4MM	
(2R-T), loaded on floor	Rails		
	Cross Members	*6MM	3MM
2.B. Lifting from the four bottom corner fittings			
(2R), lifting forces 45 angle	Bottom Side	4MM	
(2R-T), Loaded on floor	Rails		
	Cross Members	*6MM	3MM
2.C. Lifting from fork pockets			
(1.6R):	Bottom Side	*6MM	3MM
(1.6R-T):loaded on floor	Rails		
3. Restraint			
(2R), per rail, compression and tension longitudinally,	Bottom Side Rails		
(R-T) loaded on floor	Vertically		3MM
	Longitudinally		2MM

4.	Strength of End Walls			
	(0.4P) uniformly	Front End Panel Door Panel		8MM 5MM
5.	Strength of Side Walls			
	(0.6P) uniformly	Side Panel Top & Bottom Side Rails		10MM 4MM
6.	Floor Strength			
	7,260 KG, axle weight 3,630 KG per wheel	Cross Members		3MM
7.	Strength of the Roof			
	300 KG, distributed over an area of 300MM x 600MM	Roof Panel		5MM
8.A.	Rigidity (Transverse)			
	15,240 KG, horizontally, push and pull	End Frame (diagonal)	** 60MM	10MM
8.B.	Rigidity (Longitudinal)			
	7,620 KG, horizontally, push and pull	Side Frame (at Top Fittings)	** 25MM	7MM
9.	Weatherproofness			
	By Spray Rack System: Nozzle Pressure: Nozzle Diameter:	0.5 hour min. 1 KG / CM <sup>2</sup> 12.5 MM		
	Distance from Container Surface to Nozzle: Remove Speed:	1.5 M 100 MM/SEC.		