

TECHNICAL SPECIFICATION FOR

STEEL DRY CARGO CONTAINER

20' x 8' x 8'6" ISO TYPE
(WITH THREE BULKER ROOF HATCHES
& WOODEN FLOOR & TWO DOOR HATCHE
& FRONT HATCHE)

1. General

1.1 Scope

This specification will cover the design, construction, materials, testing and inspection performances of 20' x 8' x 8'6" ISO 1CC type steel dry cargo containers.

These containers specified herein will be manufactured at (hereinafter referred to under strict quality control by and be approved by the classification society or agency.

1.2 Operational environment

The container will be designed and constructed for carriage of general cargo by marine (on or below deck), road and rail throughout the world. All materials used in the construction will be to withstand extremes of temperature range from -30° C (-22° F) to $+80^{\circ}$ C ($+176^{\circ}$ F) without effect on the strength of the basic structure and watertightness.

1.3 Standards and Regulations

The container will satisfy the following requirements and regulations, unless otherwise mentioned in this specification.

1.3.1 ISO Container Standards (1CC type)

ISO 668	Series 1 freight containers - Classification external dimensions and ratings
	[Amd. 1993 (E)]
ISO 830	Terminology in relation to freight container (Amd. 1988)
ISO 1161	Series 1 freight containers - Corner fittings Specification (Amd. 1990)
ISO 1496-1	Series 1 freight containers - Specification and testing.
	part 1: General cargo containers for general purposes (Amd.2 - 1998)
ISO 6346	Freight containers - coding, identification and marking - 1995(E)

1.3.2 T.I.R. Certification

All the containers will be certified and comply with "The Customs Convention on the International Transport of Goods under the cover of T.I.R. Carnets." or "The Customs Convention on Containers."

1.3.3 C.S.C. Certification

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

1.3.4 T.C.T. Certification

All exposed wooden components used for container will be treated to comply with the requirements of "Cargo Containers - Quarantine Aspects and Procedures" of the Commonwealth Department of Health, Australia.

1.3.5 U.I.C. Registration

All the containers will be registered and comply with the "International Union of Railways."

1.3.6 Classification society

All the containers will be certified for design type and individually inspected by classification society.

1.4 Handling

The container will be constructed to be capable of being handled without any permanent deformation under the following conditions:

- a) Lifting, full or empty, at top corner fittings vertically by means of spreaders fitted with hooks, shackles or twistlocks.
- b) Lifting, full or empty, at bottom corner fittings using slings with terminal fittings at any angles between vertical and 45 degrees to the horizontal.
- c) Lifting, full or empty, at forklift pockets using forklift truck.

diagonal wire lashings.

1.5 <u>Transportation</u>

The container will be constructed to be suitable for transportation in the following modes:

- a) Marine: In the ship cell guides of vessels, Seven (7) high stacked (max gross weight 30,480kg).

 On the deck of vessels, four (4) high stacked and secured by vertical and
- b) Road : On flat bed or skeletal chassis, secured by twistlocks or equivalent at the bottom corner fittings.
- c) Rail : On flat cars or special container cars secured by twistlocks or equivalent at the bottom corner fittings.

2. <u>Dimensions and Ratings</u>

2.1 External Dimensions

Length	6,058	+ 0mm 19'10 1/2"	+0
		- 6mm	-1/4"
Width	2,438	+ 0mm 8'	+0
		- 5mm	-3/16"
Height	2,591	+ 0mm 8'6"	+0
-		- 5mm	-3/16"

- 1) No part of the container will protrude beyond the external dimensions mentioned above.
- 2) Maximum allowable differences between two diagonals on anyone of the following surfaces will be as follows:

Roof, bottom and side diagonals: 13mm 1/2" Front and rear diagonals: 10mm 3/8"

2.2 <u>Internal Dimensions</u>

2.3

Length	5,854	+ 0mm - 6mm	19' 2	15/32"	+0 -1/4"
Width	2,352	+ 0mm - 5mm	7' 8	19/32"	+0 -3/16"
Height	2,366	+ 0mm	7' 9	5/32"	+0
Rear door opening dimensions		- 5mm			-3/16"
Width	2,340	+ 0mm	7' 8	1/8"	+0
Height	2,280	- 5mm + 0mm	7' 5	3/4"	-3/16" +0

2.4 Front hatch opening dimensions

Width	2,200 + 0mm	7' 2	39/64" +0
	- 5mm		-3/16'
Height	600 + 0mm	1'11	5/8" +0
	- 5mm		-3/16

- 5mm

2.5 <u>Internal cubic capacity (Nominal)</u>

32.6 cu.m 1,150 cu.ft

2.6 Forklift pockets

	(OUTER)	(INNER FOR EMPTY)
Width	360 mm	360 mm
Height min.	115 mm	115 mm
Centre to centre	2,050 mm +/- 50 mm	860 mm +/- 50 mm

2.6 Ratings

Max. Gross Weight (R)	30,480 kgs	67,200 lbs
Tare Weight (design) (T)	2,500 kgs	5,510 lbs
Max. Payload (P)	27,980 kgs	61,690 lbs

Tare Weight Tolerance 2%

-3/16"

3. Materials

3.1 <u>General</u>

The following materials will be used in the construction of containers.

3.2 Part specification

: · · · · · · · · · · · · · · · · · · ·	<u>Parts</u>	Materials by JIS
1)	Roof panels Door panels Side panels Front panels Bottom side rails Cross members Upper & lower plates of forklift pockets Rear corner posts (outer) Door sill Door header (upper & lower) Door horizontal frames Door vertical frames Top side rails Front corner posts Front bottom end rail Front top end rail	Anti-Corrosive Steel: CORTEN A, SPA-H, B480 or equivalent Y.P.: 35 kg/sq. mm T.S.: 49 kg/sq. mm
2)	Rear corner posts (inner)	Rolled high tensile steel: SM490A or equivalent Y.P.: 33 kg/sq. mm T.S.: 50 kg/sq. mm
3)	Floor centre rail	Structural Steel: SS400 Y.P.: 25 kg/sq.mm T.S.: 41 kg/sq.mm
4)	Door locking bars	Structural steel round pipe: STK41 Y.P.: 24 kg/sq. mm T.S.: 41 kg/sq. mm
5)	Corner Fitting	Casted weldable steel: SCW480 Y.P. : 28 kg/sq. mm T.S. : 49 kg/sq. mm
6)	Locking gear cams and keepers	Forged weldable steel: S20C Y.P. : 23 kg/sq. mm T.S. : 44 kg/sq. mm
7)	Door hinge pins Door gasket retainer	Stainless steel: SUS304
8)	Door gasket	EPDM
9)	Floor board	Hardwood plywood, min.19-ply

4. Construction

4.1 General

- 4.1.1 The container will be constructed with steel frames, fully vertical-corrugated steel sides and front wall, horizontal-corrugated steel double doors at rear end, with hatch flat panels and die-stamped steel roof and corner fittings.
- 4.1.2 All welds of exterior including the base frames will be continuous welding using CO₂ gas, but inner part of each bottom side rail will be fastened by staggered stitch welding.
- 4.1.3 Interior welds when needed will be stitched with a minimum bead length of 15mm.
- 4.1.4 Gaps between adjacent components to be welded will not exceed 3mm or the half thickness of the parts being welded.
- 4.1.5 Chloroprene sealant is to be applied at periphery of floor surface and inside unwelded seams, butyl sealant is used to caulk at invisible seam of floor joint area and between door gasket and frame.
- 4.1.6 The wooden floor will be fixed to the base frames by zinc plated self-tapping screws.

4.2 Protrusion

- 4.2.1 The plane formed by the lower faces of the bottom side rails and all transverse members shall be positioned by 12.5mm +5/-1.5mm above the plane formed by the lower faces of the bottom corner fittings.
- 4.2.2 The top corner fittings are to protrude a minimum of 6mm above the highest point of the roof.
- 4.2.3 The outside faces of the corner fittings will protrude from the outside faces of the corner posts by minimum 4mm for side structure and 4mm for front end structure.
- 4.2.4 The outside faces of the corner fittings will protrude from side wall by nominal 7mm and from the outside face of the end wall by 7mm.
- 4.2.5 Under maximum payload, no part of the container will protrude below the plane formed by the lower faces of the bottom corner fittings at the time of maximum deflection.
- 4.2.6 Under 1.8 x maximum gross weight, no part of the container will protrude more than 6.0mm below the plane formed by the lower faces of the bottom corner fittings at the time of maximum deflection.

4.3 Corner fittings

The corner fittings will be designed in accordance with ISO 1161 (Amd.1990) and manufactured at the works approved by classification society.

4.4 Base frame structure

Base frame will be composed of two (2) bottom side rails, two sets of forklift pockets and totally nineteen (19) cross members.

4.4.1 Bottom side rail

Each bottom side rail is built of 52x30x155x28x4.5mm thick cold-formed double "Z" section steel made in one piece..

The lower flange of the bottom side rail is outward so as to facilitate easy removal of the cross members during repair and of less susceptible corrosion.

Reinforcement plates are to be made of 4.0mm thick, flat steel plates. The plates are welded to bottom corner fitting.

4.4.2 Forklift pockets

Each forklift pocket is built of 3.0mm thick full depth flat steel top plate and two 200 mm deep x 6.0 mm thick flat lower end plates between two channel section cross members.

The one set of forklift pockets is designed in accordance with ISO requirements.

Another set of forklift pockets is Nonstandard only for empty.

4.4.3 Cross member

The cross members are made of pressed channel section steel with a dimension of 122x45x4.0mm for the normal areas and 75x122x45x4.0mm for the floor butt joints. The cross members are placed fully to withstand floor strength and welded to each bottom side rail.

4.5 Flooring

The floor will consist of six pieces plywood boards, floor centre rail, and self-tapping screws.

4.5.1 Floor

The wooden floor to be constructed with 28mm thick min.19-ply marine grade plywood boards are laid longitudinally on the transverse members between the floor centre rail of 4.0mm thick flat bar and bottom side rails.

The floor boards are tightly secured to each transverse member by self-tapping screws, and all butt joint areas and peripheries of the floor boards are caulked with sealant.

Wood species

Marine grade plywood

2) Glue

Phenol-formaldehyde resin.

3) Treatment

a) Preservative:

Basileum or others.

b) In accordance with Australian Health Department Regulations. Average moisture content will be less than 14% before installation.

4.5.2 Self-tapping screw

Each floor board is fixed to the transverse members by zinc plated self-tapping screws that are 8.0mm dia. shank x 16mm dia. head x 45mm length, and fastened by four screws per cross member but six screws at joint areas. Screw heads are to be countersunk with about 2mm below the floor top surface.

4.5.3 The floor centre rail

The floor centre rail with t4.0 x 50mm flat bar will run the full length in center. It should be blasted and coated with zinc rich primer and installed on the finishing line after all blasting and painting has been completed. The floor center rail is a free floating and not welded to the base.

4.6 Rear frame structure

The rear frame will be composed of one door sill, two corner posts, one door header and four corner fittings, which will be welded together to make the door-way.

4.6.1 Door sill

The door sill to be made of a 4.5mm thick pressed open section steel is reinforced by four internal gussets of a 4.0mm thick at the back of each locking cam keeper location.

A 200 x 75mm section is cut out at each end of the door sill and reinforced by a 200 x 75mm channel steel as a protection against handling equipment damages.

4.6.2 Rear corner post

Each rear corner post of hollow section is fabricated with pressed, 6.0mm thick, steel outer part and 40x113x12mm hot-rolled channel section steel inner part, which are welded continuously together to ensure a maximum width of the door opening and to give a sufficient strength against stacking and racking forces.

Four (4) sets of hinge pin lugs are welded to each rear corner post.

4.6.3 Door header

The door header is constructed with a 4.0mm thick pressed "U" section steel lower part having four internal gussets at the back of each locking cam keeper location and a 4.0mm thick pressed steel upper part, which are formed into box section by continuous welding.

4.7 <u>Door</u>

- 4.7.1 Each container will have double wing doors at rear end frame, and each door will be capable of swinging approximately 270 degrees.
- 4.7.2 Each door is constructed with pressed 3.2mm thick channel section steel horizontal frames for the top and bottom, 100x50x3.2mm rectangular hollow section vertical frames for the post side and centre side of door respectively, 2.0mm thick horizontally corrugated steel door panel, which are continuously welded within frames.
 - At the bottom of each door will have one discharge hatch, It is composed of one discharge door, two (2) sets of hinges, one set of galvanized locking assemblies and a suit of the gasket of discharge door.
- 4.7.3 Two sets of galvanized locking assemblies which is the same model "HH-ET" or equivalent with steel handles are fitted to each door wing using high tensile GALV. steel bolts, among them six (6) TIR holts are huck holts according to TIR requirements. Locking bar retainers are fitted with nylon bushings at the top, bottom and intermediate bracket.

 Locking gears should be assembled after painting and not to be painted.
- 4.7.4 The left-hand door can not be opened without opening the right-hand door when the container is sealed in accordance with TIR requirements.
- 4.7.5 The door hold-back of nylon rope is provided to the centre locking bar on each door and a hook of steel bar is welded to each bottom side rail.
- 4.7.7 The door gasket made of an extruded triple lip type (J-C type vertical and upper are "J", lower

is "C") EPDM rubber is installed to the door peripheral frames with stainless steel gasket retainers and fastened by stainless steel rivets at a pitch of approximately 150mm. The door gasket must be caulked with butyl sealant before installation to the door frames.

4.8 Roof structure

The roof constructed with 2.0mm thick die-stamped steel sheets having about 5.0mmupward smooth camber, short die-stamped steel sheet and three Bulker Roof Hatches, and four corner protection plates.

4.8.1 Roof panel

The roof panel is made of 2.0mm thick flat steel panels and Bulker Roof Hatches, which are welded together to form one panel and continuously welded to the top side rails and top end rails. All overlapped joints of inside unwelded seams are caulked with chloroprene sealant.

4.8.2 Protection plate

Each corner of the roof in the vicinity of top corner fitting is reinforced by 3.0mm thick rectangular steel plate to prevent the damage caused by mishandling of lifting equipment.

4.9 Top side rail

Each top side rail is made of 60x60x3.0mm thick rectangular hollow section steel.

4.10 Side wall

The trapezium section side wall is constructed with 2.0mm thick fully vertically continuous corrugated steel panels. which are butt welded together to form one panel and continuously welded to the side rails and corner posts. All overlapped joints of inside are caulked with chloroprene sealant.

4.11 Front structure

Front end structure will be composed of one bottom end rail, two corner posts, one top end rail, one front discharge hatch, four corner fittings and an end wall, which are welded together.

4.11.1 Bottom end rail

The bottom end rail to be made of a 4.5mm thick pressed open section steel is reinforced by three internal gussets. A 200x75mm is cut out at each end of the bottom end rail and reinforced by a 200x75mm channel steel as a protection against handling equipment damages.

4.11.2 Front corner post

Each corner post is made of 6.0mm thick pressed open section steel in a single piece, and designed to give a sufficient strength against stacking and racking forces.

4.11.3 Top end rail

The top end rail is constructed with 4.0mm thick "Z" section steel

4.11.4 Front wall

The trapezium section front wall is constructed with 2.0mm thick vertically corrugated steel panels, butt welded together to form one panel, and continuously welded to front end rails and corner posts. All overlapped joints of inside are caulked with chloroprene sealant. At the bottom of front wall will have one discharge hatch, It is composed of one discharge door, one set of galvanized locking assemblies and a suit of the gasket of discharge door.

4.11.5 Front discharge hatch frame

The front discharge hatch frame will be composed of one 4.5 mm thick special welding box shaped header, two 4.0 mm thick special welding boxes shaped corner posts and the front sill, which are welded together as a sub-assembly.

4.11.6 Front discharge hatch

The front discharge hatch will be constructed with 2.0 mm thick vertically corrugated steel panel, 4.0 mm thick rectangular pips and locking assembly. the front discharge hatch frame will be installed by hinge pins to the front discharge hatch frame

4.12 Special feature

4.12.1 Customs seal provisions

Customs seal and padlock provisions are made on each locking handle retainer to cover the sealed area in accordance with TIR requirements.

4.12.2 Lashing fittings

- a. Lashing rings are welded to each top side rail & bottom side rail at corresponding recessed area of side wall. Lashing rings Qty. / top side rail : 5, Total : 20
- b. Lashing bars are welded on each rear corner post slot & on each front corner post.

Lashing bars Qty. / front corner post : 3 Total : 6 Lashing bars Qty. / rear corner post : 2, Total : 4

c. Capabilities of pull load of every lashing point are as following:

Lashing rings on the side rails: 1,500 kg/each
Lashing bars on the corner posts: 1,500 kg/each
d. Treatment of lashing ring / bar: Electro zinc plated

4.12.3 4.12.3 Ventilators

Two ventilators with EPDM seal gasket are supplied on each side wall at each end fixed by aluminum huck-bolts, the seal is to be applied on the edges except the bottom side of the ventilator, after the completion of paint. The sealant is Chloroprene sealant.

Ventilator material: ABS resin labyrinth type Ventilator Oty.: 1 / side wall, Total: 2.

5. Surface preservation

5.1 Surface preparation

- 1) All steel surfaces prior to forming or after will be fully abrasive shot blasted conforming to Swedish Standard SA2 1/2 to remove all rust, dirt, mill scale and all other foreign materials.
- 2) All door hardware will be hot-dipping zinc galvanized with approximately 75 microns thickness.
- 3) All fasteners such as bolts, and nuts, hinges, cam keepers, lashing fittings will be electrogalvanized with approximately 13 microns thickness.

5.2 Primer coating

5.2.1 Prior to assembly

All steel surfaces will be coated with 10 microns thick two-pack polyamide cured zinc rich epoxy primer immediately after shot blasting, and then dried up in drying room.

5.2.2 After assembly

- All weldments will be shot blasted to remove all welding fluxes, spatters, burnt primer coatings caused by welding heat, and other foreign materials.
 Then all blasted weldments will be coated with zinc rich epoxy primer.
- 2) Exterior of assembled container will be coated again 20 microns with zinc rich primer and again 40 microns epoxy primer prior to top coating.
- 3) Interior and base of assembled container will be coated again 20 microns with zinc rich primer.

5.3 Top coating

- 1) After drying of primer, exterior of container will be coated again with high build top paint and interior will be coated again with polyamide cured epoxy resin based high build coating.
- 2) The dry film thickness of top coating will be 50 microns for the exterior and 50 microns for the interior.

5.4 <u>Under coating</u>

After completion of flooring, all the understructures and floor will be coated with minimum 200 microns dry film thickness bituminous coating.

5.5 The total dry film will be (microns):

	EXT.	INT.	BASE
Zinc rich primer	30	30	30
Epoxy primer	40		
Epoxy high build coating		50	
Chlorinated rubber or Acrylic coating	50		
Bitumen			200
Total	120	80	230

6. Marking

6.1 Arrangement

The container will be marked in accordance with ISO, UIC, TCT, CSC and TIR requirements, owner's marking specifications and other required regulations.

6.2 <u>Materials</u>

1) Decal:

Self-adhesive, high tensile PVC film for seven (7) years guarantee

without peeling off, tenting or colour fading.

2) Certification plate:

18-8 type stainless steel plates to be chemically etched by acid and

treated by enamel.

6.3 Specifications

1) Identification plates such as consolidated data plate consisting of CSC and TIR will be riveted on the door permanently by stainless steel blind rivets. The entire periphery except underside will be caulked with sealant.

2) The owner's serial numbers and manufacturer's serial numbers will be stamped into the top plane of rear lower corner fitting.

7. Testing and Inspections

7.1 <u>Testing</u>

7.1.1 Prototype testing

The prototype container to be manufactured in accordance with this specification will be tested by manufacturer under the supervision of classification society.

	Test items & loads	Test methods
A)	Stacking	Hydraulic cylinder load will be applied to each
	Internal load: 1.8R-T	corner post through top corner fittings.
	Test load: 86,400kg/post	Offset: 25.4 mm lateral
	rest toad. 80,400kg/post	38.0 mm longitudinal
B)	Lifting (from top corner fittings)	Lifting vertically.
	Internal load: 2R-T	Time duration : 5 minutes
C)	Lifting (from bottom corner fittings)	Lifting 45 degree to the horizontal.
	Internal load: 2R-T	Time duration : 5 minutes
D)	Restraint (longitudinal)	Hydraulic cylinder load will be applied to the
	Internal load : R-T	bottom side rails.
	Test load: 2R	
E)	Floor strength	Use of a special truck.
	Test load: 7,260 kgs	Total contact area: 284 sq. cm
And the second s	(16,000 lbs)	Wheel width : 180 mm
the first of the control of the cont	(10,000 103)	Wheel centre : 760 mm
F)	Wall strength (front)	Compressed air bag will be used.
	Test load: 0.4(R-T)=0.4P	
G)	Wall strength (side)	Compressed air bag will be used on one side only.
	Test load: 0.6(R-T)=0.6P	
H)	Wall strength (door)	Same as front wall strength test.
	Test load: 0.4(R-T)=0.4P	Same as from wan strongth test.
I)	Roof strength (weakest part)	Applied area will be 600x300mm longitudinal and
	Test load: 300 kgs	transverse.
J)	Racking (transverse)	I Trades ville and in deal and will be applied to the booden
	Test load: 15,240 kgs	Hydraulic cylinder load will be applied to the header
	(150 kn)	rail through top corner fittings.
K)	Racking (longitudinal)	Hydraulic cylinder load will be applied to the top
	Test load: 7,620 kgs	side rail through top corner fitting on one side only.

20'X8'X8'6"

	(75 kn)	Two times for pulling and pushing.
L) Dimensions and weight		After completion of test, the dimensions and weight will be checked.
M)	Weatherproofness	Inside dia. of nozzle: 12.5mm
		Distance: 1.5 m
		Speed: 100 mm/sec.
		Pressure: 1 kg/sq. cm

Maximum Gross Weight Tare Weight Maximum Payload * Note: R

T P

