

TECHNICAL SPECIFICATION

FOR A TYPICAL

STEEL DRY CARGO CONTAINER

20' x 8' x 8'6" ISO 1CC TYPE

“OPEN-TOP”

MODEL NO :
SPEC. NO : **204MAG_200T**
DATE OF ISSUE : **May 17, 2002**
OWNER : **MAGELLAN**

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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 open-top steel dry freight containers.

These containers specified herein will be manufactured under strict quality control by manufacturer 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 -40°C (-40°F) to +70°C (+158°F) without effect on the strength of the basic structure and water tightness of the containers.

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 1894 -- General purpose series 1 freight containers – Minimum internal dimensions (2nd edition - 1979)
- 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, **BV, ABS, LR, GL** or **CCS**.

* Note:	BV	:	Bureau Veritas (<i>France</i>)
	ABS	:	American Bureau of Shipping (<i>USA</i>)
	LR	:	Lloyd's Register of Shipping (<i>UK</i>)
	GL	:	Germanischer Lloyd (<i>Germany</i>)
	CCS	:	China Classification Society (<i>P.R.C</i>)

1.4 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:

- 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 appropriate terminal fittings at any angles between vertical and 45 degrees to the horizontal.
- c) Lifting, full or empty, at forklift pockets using forklift truck.

1.5 Transportation

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

2. Dimensions and Ratings

2.1 External Dimensions

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

Length	5,898	+ 0mm - 6mm	19' 4 13/64"	0 -1/4"
Width	2,352	+ 0mm - 5mm	7' 8 19/32"	0 -3/16"
Height	2,348	+ 0mm - 5mm	7' 8 7/16"	0 -3/16"
Roof opening length	5672	mm	18' 7 5/16"	
Swing header opening width	1940	mm	6' 4 3/8"	

2.3 Door opening dimensions

Width	2,340	+ 0mm - 5mm	7' 8 1/8"	0 -3/16"
Height	2,280	+ 0mm - 5mm	7' 5 49/64"	0 -3/16"

2.4 Internal cubic capacity (Nominal)

32.4 cu.m 1,144 cu.ft

2.5 Forklift pockets dimensions (Nominal)

Width	360 mm	1' 2 11/64"
Height min.	115mm	4 1/2"
Depth of bottom plate	200 mm	7 7/8"
Centre to centre	2,080 mm +20/- 80mm	6' 9 57/64" +25/32"/ -3 5/32"

2.6 Ratings

Max. Gross Weight (R)	30,480 kgs	67,200 lbs
Tare Weight (design) (T)	2,250 kgs	4,960 lbs
Max. Payload (P)	28,230 kgs	62,240 lbs
Tare Weight Tolerance	2%	

3. Materials

3.1 General

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

3.2 Part specification

	<u>Parts</u>	<u>Materials</u>
1)	Door panels Side panels Front panels Top side rails Cross members Bottom side rails Floor guide rail Fork pockets Door sill Door header Door horizontal frames Door vertical frames Rear corner posts (outer) Front top end rail Front bottom end rail Front corner posts	Anti-Corrosive Steel: CORTEN A, SPA-H, B480 or equivalent Y.P. : 35 kg/sq.mm T.S. : 49 kg/sq.mm
2)	Roof rows Floor center rail Protection channel Lashing fittings	Structural Steel SS400 Y.P. : 25 kg/sq.mm T.S. : 41 kg/sq.mm
3)	Rear corner posts (inner)	Rolled high tensile steel SM490A Y.P. : 33 kg/sq.mm T.S. : 50 kg/sq.mm
5)	Door Locking bars	Structural Steel round pipe. STK41 Y.P. : 25 kg/sq.mm T.S. : 41 kg/sq.mm
6)	Corner Fitting	Casted weldable steel. SCW480 Y.P. : 28 kg/sq.mm T.S. : 49 kg/sq.mm
7)	Locking gear cams and keepers	Forged weldable steel. S20C Y.P. : 23 kg/sq.mm T.S. : 44 kg/sq.mm
8)	Door hinge pins Door gasket retainer	Stainless steel. SUS304
9)	Door gasket	EPDM
10)	Floor board	Hardwood plywood, 19-ply
11)	Tarpaulin cover	P.V.C

* Note: Y.P. --- Yielding Point
T.S. --- Tensile Strength

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, wooden flooring, removable roof bows & tarpaulin cover and corner fittings.
- 4.1.2 One pair of fork pockets and a removable header will be provided.
- 4.1.3 All steelwork will be built up by means of automatic and semi-automatic CO₂ gas arc welding (MAG welding). All welds of exterior including the base frames will be continuous welding on both sides except welds of joints for flooring.
- 4.1.4 Interior welds will be intermittent with a minimum bead length of 15mm for every 300mm about.
- 4.1.5 Welds will be even bead and have full penetration without undercutting or porosity.
- 4.1.6 Gaps between adjacent components to be welded will not exceed 3mm or the half thickness of the parts being welded which is the smaller.
- 4.1.7 The internal bend radius of the pressed section of the steel will be less than 1.0 time the thickness of the material being pressed.
- 4.1.8 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.
- 4.1.9 The wooden floor will be fixed to the base frames by electro-zinc plated self-tapping screws.

4.2 Protrusion

- 4.2.1 The upper faces of the top corner fittings will protrude above the highest level of the roof bows except corner plates by 10mm.
- 4.2.2 For the containers under empty condition the lower faces of the cross member in their bases including their end transverse members shall be on a plane located at 17mm above the lower faces of the bottom corner fittings except the corner plates.
- 4.2.3 The outside faces of the corner fittings will protrude from the outside faces of the corner posts by minimum 3mm 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 8mm.
- 4.2.5 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 base of 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, a set of forklift pockets and totally eighteen (18) cross members.

4.4.1 Bottom side rail

Each bottom side rail is built of 48x158x30x4.5mm cold-formed channel section steel made in one piece. The floor guide rails of 3.0mm thick pressed angle section steel are provided to the bottom side rails by staggered stitch welding.

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 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 200mm deep x 6.0mm thick flat lower end plates between two channel section cross members.

One reinforcement, 4.5mm thick, angle section steel to be welded to fork pocket at the top of each end. The one set of forklift pockets is designed in accordance with ISO requirements.

4.4.3 Cross member

The cross members are made of pressed channel section steel with a dimension of 45x122x45x4.0mm for the normal areas and 75x122x45x4.5mm 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 19-ply hardwood plywood boards are laid longitudinally on the transverse members between the floor centre rail of 4.0mm thick flat bar and the 3.0mm thick pressed angle section steel floor guide rails stitched welded to the 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.

- 1) Wood species : Apitong or Keruing
- 2) Glue : Phenol-formaldehyde resin.
- 3) Treatment :
 - a) Preservative: BASILEUM SI-84 or others.
 - b) In accordance with Australian Health Department Regulations. Average moisture content will be 12% before installation.

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- 4) The top surface of floorboards will be coated with 80 microns transparent polyurethane (PU) varnish.

4.5.2 Self-tapping screw

Each floor board is fixed to the transverse members by electro-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 1.5mm to 2.5mm below the floor top surface.

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 4.5mm thick pressed open section steel is reinforced by four internal gussets of 4.0mm thick at the back of each locking cam keeper location.

The upper face of the door sill has 10mm slope for better drainage and highest part is the same level as the upper face of the wooden floor.

A 200x75mm section is cut out at each end of the door sill and reinforced by 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 6.0mm thick pressed 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 4.0mm thick pressed "U" section steel lower part having four internal gussets at the back of each locking cam keeper location and 4.5mm thick pressed steel upper part, which are formed into box section by continuous welding. The removable header is capable of swinging to either side through an arc greater than 90 degrees.

The removable header is supported by two hinges.

Steel hinge pin and provided with a suitable EPDM rubber gasket to prevent the leakage of the water into the container.

The hinge pins additional a small chain to prevent the pins drop down and even disappears when removable the headers away.

The staple rings for fastening the tarpaulin cover by customs cable are made of 6.0mm diameter.

4.7 Door

- 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 3.0mm thick pressed channel section steel horizontal frames for the top and bottom, 100x50x3.2mm thick rectangular hollow section vertical frames, 2.0mm thick horizontally corrugated steel door panel, which are continuously welded within frames.

- 4.7.3 Two sets of galvanized locking assemblies which is the "BE-2566 MN" type with steel handles are fitted to each door wing using high tensile zinc plated steel bolts, among them six(6) TIR bolts are huck bolts according to TIR requirements. Locking bar retainers are fitted with bushings of selflubricating synthetic material at the top, bottom and intermediate bracket. EPDM shims should be placed between door hardware and door panels in order to protect the paint in those areas. 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.
- 4.7.6 Each door is suspended by four hinges being provided with stainless steel pins, self-lubricating synthetic bushings and brass washers, which are placed at the hinge lugs of the rear corner posts.
- 4.7.7 The door gasket to be 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 which must be caulked with butyl sealant before installation of gasket, and fastened by stainless steel blind rivets at a pitch of 150mm.

4.8 Roof structure

The roof will be constructed with eight (8) roof bows and removable tarpaulin cover. The customs cable will be used to secure the tarpaulin cover.

4.8.1 Roof bows

The removable roof bows are made of 34mm diameter steel tube and will be hot-dipping zinc galvanized. Both end of each bow are suspended by the roof bow retainers which welded to each top side rail.

Each roof bow is cambered upwards with about 30mm to easily run-off the water.

4.8.2 Tarpaulin cover

Tarpaulin made of PVC: 550-600 gr/sqm, thickness about 0.6mm without any reinforcing.

4.8.3 Customs cable

The transparent PVC covered 8.0mm dia. steel rope with 3.5mm dia steel wire core is used to ensure the tarpaulin cover in accordance with TIR requirement.

The stainless steel end-pieces of steel rope are to be capable of accepting the self-locking strap.

4.9 Top side rail

- 4.9.1 Each top side rail will be made from an up part of a 100x50x3.2mm thick square hollow section steel and a down part of a 100x100x4.0mm thick square hollow section steel.

At the face recess side have a row of tarpaulin cover staple rings.

On the lower part of the left side top rail worked on a vertically square tube 25x25x2.5mm & the tube hole used for through the two tarpaulin rope ends downward into the three staple rings.

4.9.2 Corner drainage plate

The corner drainage is made of a 6.0mm thick plate connecting the door header and side top rail, welded together to form a drainage plate. Then it strengthens the frame rigidity and available to drain the water.

4.10 Side wall

The trapezium section side wall is constructed with 1.6mm thick fully vertically continuous-corrugated steel panels for the intermediate part and 2.0mm thick fully vertically continuous-corrugated steel panels for both end parts which are butt welded together to form one panel and continuously welded to the side rails and corner posts. All overlapped joints between corner posts and side panels and unwelded joints between top/bottom rails and side panels are caulked inside with sealant.

4.11 Front structure

Front end structure will be composed of one bottom end rail, two corner posts, one top end rail, 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 4.0mm 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 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 3.2mm and 4.0mm thick square hollow section steel two parts welded together to form a special closed section as same as top side rail.

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 between corner posts and front panels and unwelded joints between top/bottom rails and front panels are caulked inside with sealant.

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

Five (5) lashing rings are welded to each top and bottom side rail at recessed corrugations of side panels but not extruded any cargo space (total 20 rings). Each lashing point is designed to provide a "1,500 kgs pull load in any direction" without any permanent deformation of lashing ring and surrounding area.

Three (3) lashing rods are welded to each corner post at the position of 150mm higher from the floor and 200mm lower from the bottom surface of top corner fittings. Each lashing rod on the corner post is designed to provide a "1,000 kgs pull load in any direction" without any permanent deformation.

4.12.3 Shoring slot

A shoring slot, having a size of 60mm width x 40mm depth is provided on each rear corner post so that 2 1/4" thick battens can be arranged to be able to prevent doors from damage due to shifting cargo.

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. Locking bolts hot-dipping zinc galvanized approximately 30 microns thickness.
- 3) All fasteners such as self-tapping screws, hinges, cam keepers and lashing fittings will be electro-galvanized with approximately 13 microns thickness.

5.2 Primer coating

5.2.1 Prior to assembly

All steel surfaces will be coated with 10-15 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

- 1) 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 15-20 microns with zinc rich epoxy primer and again 45 microns epoxy primer prior to top coating.
- 3) Interior and base of assembled container will be respective coated 10-15 microns and 15-20 microns with zinc rich epoxy primer prior to top coating.

5.3 Top coating

- 1) After drying of primer, exterior of container will be coated again with high build chlorinated rubber 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 35 microns for the exterior and 50 microns for the interior.

5.4 Under coating

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	25	30
Epoxy primer	45		
Epoxy high build coating		50	
Acrylic top coating	45		
Bitumen			200
Total (Min.)	120	75	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 Materials

- 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, TIR and TCT will be riveted on the door permanently by stainless steel blind rivets. The entire periphery except the bottom side will be caulked with sealant.
- 2) The owner's serial numbers and manufacturer's serial numbers will be stamped into the inside of right corner post of the rear at eye level.

7. Testing and Inspections

7.1 Testing

7.1.1 Prototype testing

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

	<u>Test items & loads</u>	<u>Test methods</u>
A)	Stacking Internal load : 1.8R-T Test load : 86,400kg/post	Hydraulic cylinder load will be applied to each corner post through top corner fittings. Offset: 25.4 mm lateral 38.0 mm longitudinal
B)	Lifting (from top corner fittings) Internal load : 2R-T	Lifting vertically. Time duration : 5 minutes
C)	Lifting (from bottom corner fittings) Internal load : 2R-T	Lifting 45 deg. to the horizontal. Time duration : 5 minutes
D)	Lifting (for forklift pockets) Internal load : 1.6R-T	Lifting by horizontal bars. Bar length : 1,828mm Bar width : 200mm
E)	Restraint (longitudinal) Internal load : R-T Test load : 2R	Hydraulic cylinder load will be applied to the bottom side rails.
F)	Floor strength Test load : 7,260 kgs (16,000 lbs)	Use of a special truck. Total contact area: 284 sq.cm Wheel width : 180 mm Wheel centre : 760 mm
G)	Wall strength (front) Test load : 0.4(R-T)=0.4P	Compressed air bag will be used.
H)	Wall strength (side) Test load : 0.6(R-T)=0.6P	Compressed air bag will be used on one side only.
I)	Wall strength (door) Test load : 0.4(R-T)=0.4P	Same as front wall strength test.
J)	Racking (transverse) Test load : 15,240 kgs	Hydraulic cylinder load will be applied to the header rail through top corner fittings.
K)	Racking (longitudinal) Test load : 7,620 kgs	Hydraulic cylinder load will be applied to the top side rail through top corner fitting on one side only. Two times for pulling and pushing.

L)	Operation of door	After completion of test, the operation of doors, locks, hinges, etc. will be checked.
M)	Dimensions and weight	After completion of test, the dimensions and weight will be checked.
N)	Weatherproofs	Inside dia. of nozzle : 12.5mm Distance : 1.5 m Speed : 100 mm/sec. Pressure : 1 kg/sq.cm

* Note: **R** Maximum Gross Weight
T Tare Weight
P Maximum Payload