

Technical Specification
for a typical
40'x 8'x 9'6" ISO Type
Steel Dry Cargo Container
“High Cube”

MODEL NO :
SPEC. NO : 403MAG_40HC
DATE OF ISSUE : Aug 26, 2003
OWNER : Magellan

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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 -40°C(-40°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) I.S.O./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.

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

3) The Customs Convention on the International Transport of Goods(T.I.R.).

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. (T.C.T.)

1.2.2 To satisfy the requirements of Rules of B.V, LR, GL, CCS or A.B.S..

2. Approval and Certificates

2.1 Classification Certificate

All the containers shall be certified for design type and individually inspected by 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 T.C.T Certificate

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

2.4 Customs Certificate (T.I.R.)

Customs' Approval and Certificate to be issued by Customs.

2.5 U.I.C. Registration

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

2.6 C.S.C. 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 thirty (30°) degrees to horizontal.

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 other 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 and Ratings

5.1 Dimension

	<u>External Dimensions</u>	<u>Internal Dimensions</u>
Length	12,192 (0, -10) mm	12,032 (0, -10) mm
Width	2,438 (0, -5) mm	2,352 (0, -5) mm
Height	2,896 (0, -5) mm	2,698 (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	.....	19mm
Front and Rear Diagonals	.....	10 mm.

5.2 Door Opening

Width	.....	2,340 (0,-5)	mm
Height	.....	2,585 (0,-5)	mm

5.3 Gooseneck Tunnel

Length	.....	3,315	mm
Width	1,029 (+3,0)	mm
Height	120 (0,-3)	mm

5.4 Inside Cubic Capacity

76.4 cu.m	2,700 cu.ft
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5.5 Rating

Maximum Gross Weight	30,480 kg	67,200 lbs
Maximum Payload	26,640 kg	58,730 lbs
Tare Weight (±2%)	.....	3,840 kg	8,470 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 cross members 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 and from the outside faces of the front end wall by 7.4 mm.

- 4) For the containers under the condition such as the load equal to 1.8R - T uniformly distributed over the floor, no part of the container base will deflect 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 and end walls, die-stamped corrugated steel roof, wooden flooring, 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.

6.1.1 Welding

- 1) The welding between the corner posts and the rails shall be continuous single welding.
- 2) The external welding between the corner posts and the front/side panels shall be continuous welding and the internal welding shall be as follows:
 - A. The continuous welding shall be 100 mm from the top and bottom.
 - B. The intermediate "tack welding" shall be 25 mm in every 200 mm and sealant shall be applied between the welding beads.
- 3) Weld penetration at connection points between side/front panels and frame of the container shall not be less than 75% at any point.
- 4) The crossmembers shall be continuous welded to the bottom side rails on both side.
- 5) 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 gooseneck tunnel, 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. : Two (2).
 Shape : Channel Section .
 Dimension : 162 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 with three 4.5 mm thick webs located beneath each board joint of the plywood, which are placed at certain center distance.

Shape : " C " section
 Small one : 122 x 45 x 40 x 4.0 mm , Qty. : 25
 Large one : 122 x 75 x 40 x 4.0 mm , Qty. : 3

6.3.3 Gooseneck Tunnel

The gooseneck tunnel consists of one piece pressed hat section tunnel plate, a number of pressed channel section tunnel bows, one welded box section rear bolster and tunnel outriggers. The gooseneck tunnel is designed according to ISO standard :

- a) Tunnel plate thickness : 4.0 mm Qty. : 1
- b) Tunnel bow thickness : 4.0 mm Qty. : 12
- c) Bolster thickness: 150x100x4.0 mm, Qty. : 1
- d) Outriggers - "C" section: 118x75x40x4.0 mm, Qty. : 1/each side
 118x45x40x4.0 mm, Qty. : 7/each side

6.3.4 Reinforcement

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

Dimension: 200 x 150 x 4.0 mm

6.4 Front End

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

6.4.1 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.

Thickness: 1.6 mm
 Corrugation dimension- Outer face : 110 mm , Depth : 45.6 mm
 Inner face : 104 mm , Slope : 18 mm

6.4.2 Front End Frame

The front end frame will be composed of one front sill, two corner posts, one front header and four corner castings.

6.4.2.1 Front Sill

The front sill consists of a "L" section steel pressed and a square tube front rail on top with flat strips as the wood supports.

"L" section plate	:	4.0mm thick.
Front rail	:	60 x 60 x 3.0 mm RHS.
Flat strips	:	4.0 mm thick.

6.4.2.2 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.

6.4.2.3 Front Header

The front header 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 RHS
Upper part	:	3.0 mm thick

6.5 Rear End

Rear end is composed of Rear End Frame which consists of one door sill, two corner posts, one rear header with header plate and four corner fittings, which are welded together as a sub-assembly, and Door Systems with locking devices.

6.5.1 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.

a) Door sill	:	4.5 mm thick	Slope : 1:10 approx.
b) Stiffener ribs	:	4.5 mm thick	Qty. : 4 Pcs.

6.5.2 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 12 mm
Outer part : 6.0 mm thick

6.5.3 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 : 4.0 mm thick , Qty. : 4

6.5.4 Door Systems

Doors will consist of two door leaves, each leaf with two locking devices, four hinges and pins, 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.

6.5.4.1 Door Leaves

Each leaf consists of door panel, steel door frame which consists of horizontal (upper & lower) and vertical (inner & outer) members. They are welded together to form the rectangular door leaf. 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
 - Inner face : 72 mm
 - Slope : 68 mm
 - Panel thickness : 2.0 mm
- 2) Door frame :
 - a) Vertical door member: 100x50x3.2 mm RHS (inner & outer)
 - b) Horizontal door member: 150x50x3.0 mm, channel section

6.5.4.2 Hinges and Pins

Four forged hinges, providing with bushed hole, are welded to each door leaf. Each door is installed by hinge pins, washers and bushings.

Washer	- Material : Stainless steel
	Location : Under the bottom of hinge
Bushing	- Self-lubricating synthetic
Pin	- Material : Stainless steel .

6.5.4.3 Locking Devices

Two locking bars are of steel tube with handles, anti-racking rings and cam ends, and fixed to each door leaf with bolts / nuts and six huck bolts at TIR locations, by top and bottom bearing brackets and two bar guide brackets. The bars are suspended in bearing brackets with bush of self-lubricating synthetic material. The locking device to be installed after painting.

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

Cam-keepers are welded to the door header and sill.

- a) Locking device type: HaiHang OR SAE JIN
- b) Locking bars treatment: Hot-Dipped galvanized (75 Microns)

6.5.4.4 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.

6.5.4.5 Seal Gaskets

The door seal gaskets (black colour) are of E.P.D.M rubber assembled by rivets, using strip retainers and adhesive sealant on the back.

Gasket's shape	: "J - C" Type
Retainer	: Stainless steel
Rivet	: Stainless steel

6.6 Side Wall Assembly

6.6.1 Top Side Rails

Each top side rail is used a square steel pipe.

Rail : 60 x 60 x 3.0 mm RHS

6.6.2 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.

- a) Inner panel : 1.6 mm Thk. , Qty. : 9 Pcs/Each side
- b) Outer panel : 2.0 mm Thk. , Qty. : 2 Pcs/Each side
- c) Trapezium :
 - Outer face : 72 mm , Slope : 68 mm
 - Inner face : 70 mm , Depth : 36 mm
 - Pitch : 278 mm ,

6.7 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 , 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. : 11 Pcs.

6.7.1 Roof reinforcement plate

Four 4.0 mm thick reinforcement plates shall be mounted around the four corner fittings.

6.8 Floor

6.8.1 The Floor Boards

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

- Plywood thickness : 28 mm
- Plywood moisture content : Less than 14 %
- Plywood ply number : MIn19 plies
- Plywood material : Apitong/Hardwood

6.8.2 Arrangement and Fixing

The plywood boards are longitudinally laid on the crossmember with a pre-blasted painted and free floating flat steel at the center, 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 Φ 16(head) , Electro zinc plated
Screws' Qty.	: 6 Pcs/end row, 4 Pcs/other, 3 Pcs/outrigger
Floor centre rail	: 50 x 4 mm, Primed and painted
"L" section	: 3.0 mm Thk.

6.9 Special Features

6.9.1 Customs Seal Provision

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

6.9.2 Lashing rings

- 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: 10, Total : 40
- 2) Lashing rods are welded on each rear & front corner post slot.
Lashing rods Qty. / Each front corner post: 3, Total: 6
Lashing rods Qty. / Each rear corner post: 3, Total: 6
- 3) Capabilities of pull load of every lashing point are as following:
 - a) Lashing rings on the side rails : 1,500 kg/each
 - b) Lashing rods on the corner posts : 1,000 kg/each
- 4) Treatment of lashing ring / bar : Electro zinc plated

6.9.3 Sill Cut-Outs

200 x 75 x 9 mm channel section steel recesses are provided in each end of rear and front sill adjacent to the bottom fitting to prevent damage due to any twistlocks misalignment.

6.9.4 Ventilators

One ventilator 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 silicone sealant is to be applied on the edges except the bottom side of the ventilator, after the completion of paint.

Quantity : 1 / each side panel
Material : ABS Labyrinth Type.

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 removal of all the rust, dirt, mill scale and all other foreign materials.
- 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) Hinges and cam-keepers will be electro zinc plated to 13 Microns.
- 5) 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	DFT (μ)
Exterior Surface	Epoxy zinc rich primer	30
	Epoxy primer (Brown)	40
	Acrylic top coat	50
		Total: 120
Interior Surface	Epoxy zinc rich primer	30
	Epoxy topcoat	40
		Total: 70
Under Structure	Epoxy zinc rich primer	30
	Waxy Bitumen	200
		Total: 230

* Epoxy zinc rich primer 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) Other marking: According to owner's requirements.
- 6) Material of marking : According to owner's requirements.

8.2 Consolidate Plate

8.2.1 The containers will bear marking plate 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. A 1mm thick EPDM rubber film is to be inserted between consolidated data plate and door panel.

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. (Approved by China Customs)
- 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) Date of manufacture (year-engraved, month-stamped)
- 6) Owner's serial number (stamped)
- 7) Owner's model number.

9. Testing and 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 ISO 1496/1 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 in every 100 of containers 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 kgs 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: 86,400kg/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 30 Deg. to horizontal. Time duration : 5 mins .
d. 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 .
e. Floor Strength	Truck Load:	Special truck is used.

	7,260 kg	Total contact area: 284 sq cm, Wheel width: 180 mm, Wheel center distance: 760 mm
f. Wall Strength (Front & Door)	Test Load: 0.4 P	Compressed air bag is used. Time duration : 5 mins.
g. Side Wall Strength	Test Load: 0.6 P	Compressed air bag is used. Time duration : 5 mins.
h. Roof Strength	Test Load: 300 kg	Applied area will be the weakest place of 600 x 300 mm longitudinal & transverse. Time duration : 5 mins .

i. Rigidity (Transverse)	Test Force: 15,240 kg (150 kn)	Hydraulic cylinder will be applied to front top end rail & door header through top corner fittings, each time pulling & pushing. Time duration : 5 mins .
j. Rigidity (Longitudinal)	Test Force: 7,620 kg (75 kn)	Hydraulic cylinder load will applied to side top rail through top corner fittings. Time duration : 5 mins .
k. One door off operation	Test load: Stacking:27,450 kg/post Racking:7,500kg	Hydraulic cylinder should be first to top of corner post, racking load should be applied, then additionally stacking load should be applied simultaneously.
l. Weather proofness	Nozzle: 12.5 mm (inside dia.) Pressure: 100 kpa (1 kg/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

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

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

10.2 When delivery

The owner shall inform Manufacturer all the documents needed two weeks before the date of delivery and Manufacturer will submit them to the owner .

12. Materials

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

Where used	Materials
<u>Front End Assembly</u>	
Front corner post	Corten A
Front sill	Corten A
Front panel	Corten A
Front header cap	Corten A
Front rail	Corten A
<u>Base Assembly</u>	
Bottom side rail	Corten A
Crossmember	Corten A
Gooseneck tunnel	Corten A
Outrigger	Corten A
Floor centre rail	Corten A
Floor support angle	Corten A
<u>Rear End Assembly</u>	
Rear corner post (outer)	Corten A
Rear corner post (inner)	SM50YA (or SS50)
Door sill	Corten A
Rear header cap	Corten A
Door header lower	Corten A
Door panel frame	Corten A
Door panel	Corten A
Door hinge	S25C, Elector Zinc Plated
Door hinge pin	Stainless steel
Locking device	HaiHang or SAE JIN
Locking cam, cam keeper	S20C
Locking rod	STKR41
Door gasket	E.P.D.M
Gasket retainer	Stainless steel
Washer	Stainless steel

Rivet	Stainless steel
Shim	E.P.D.M.
Corner fitting	SCW49
 <u>Side Wall Assembly</u>	
Side panel	Corten A
Top side rail	Corten A
Lashing bar, lashing ring	SS41, Electro zinc plated
Ventilator	A.B.S
 <u>Roof</u>	
Roof corner gusset	Corten A
Roof panel	Corten A
 <u>Floor</u>	
Floor board	Plywood (Apitong)
Floor screw	Electro zinc plated

Note :

Material	Yield point (Kg/sq.mm)	Tensile strength (Kg/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
SM50A	33	50