

Technical Specification for 20' x 8' x 8'6" Type Steel Hard Top Dry Container with Steel Floor



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Scope

This specification covers design, construction, materials, testing, inspection & prototype container. The container is built in accordance with the requirements of 20' x8' x 8'6" type open top steel dry freight containers by CIMC-NANTONG (including Nantong CIMC-Smooth Sail Container Co., Ltd. – NSSC & Nantong CIMC Special Transportation Equipment Manufacture Co., Ltd. – NCSE). This Specification is for the purposes of information only and should not be copied without permission of CIMC NANTONG.

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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 -30°C (-22°F) to 70°C (158°F) without effect on container's strength and water-tightness.

1.2 Standards, Regulations and Rules

1.2.1 Standards and Regulations

Containers shall comply with following in their latest editions :

1) ISO/TC-104

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

6346 - Coding, identification and marking for freight containers

1161 - Specification of corner fittings for series 1 freight containers

1496/1 - Specification and testing of series 1 freight containers.

Part 1 : General cargo containers for general purposes

830 - Freight containers-Terminology.

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

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

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

1.2.2 To satisfy the requirements of rules of BV, ABS, CCS, LR or GL Classification Society.

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 Customs Certificate (TIR)

Customs' Approval and Certificate to be issued by Customs.

2.4 UIC Registration

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

2.5 CSC Certificate

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

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3. Handling

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

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

4. Transportation

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

4.1 Marine :

- **In the ship cell guides** : Seven(7) high stacked (Max. gross weight 30,480 kg) (Stacking capacity 86,400kg/post)
- **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

External Dimensions	Internal Dimensions
Length 6,058 (0, -6) mm	5,898 (0, -6) mm
Width 2,438 (0, -5) mm	2,332 (0, -5) mm
Height 2,591 (0, -5) mm	(Side)2,311 (0, -5) mm (Center)2,391 (0, -5) mm

No part of the container will protrude beyond the external dimensions mentioned above.

Maximum allowable difference between two diagonals on any one of the following surface are as follow :

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

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5.2 Door Opening

Width 2,340 (0, -5) mm

Height 2,265.5 (0, -5) mm

5.3 Roof Opening

Width between top side rail.. 2,132(0, -5) mm

Length between end roof supporter..... 5,576 (0, -6) mm

5.4 Fork Pocket(2 sets)

5.4.1 Outer Fork Pocket for Loaded Containers

Width 360 mm

Height 115 mm

Center distance 2,080 mm

5.4.2 Inner Fork Pocket for Empty Containers

Width 305 mm

Height 102 mm

Center distance 900 mm

5.5 Inside Cubic Capacity

31.8cu.m 1,123 cu.ft

5.6 Rating

Maximum Gross Weight 30,480 kg 67,200 lbs

Tare Weight ($\pm 2\%$)..... 3,280 kg 7,230 lbs

Maximum Payload 27,200kg 59,970 lbs

5.6 Corner Protrusions

- 1) The upper faces of the top corner fittings will protrude above the highest level of the roof construction by 11 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 12.5 (+5, -1.5) mm above the lower faces of the bottom corner fittings except the corner plates.
- 3) The outside faces of the corner fittings will protrude from the outside faces of the corner posts by nominal 3~4 mm. The outside faces of the corner fittings will protrude from the outside faces of the sides and front wall by nominal 7~8 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.

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6. Construction

6.1 General

The container will be constructed with steel frames, fully vertically corrugated steel side and end walls, movable steel roof cover, 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. All exterior weldings including that on base structure will be continuous to give perfect watertightness, Interior welds will be intermittent with a minimum bead length of 25 mm for every 200 mm. All the welds, even spots, will have 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

Base frame will be composed of two bottom side rails, 19 ranks cross members and two (2) sets of fork pockets (total four pockets), one set of them only for empty container lifting, and checker steel flooring, 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 faces outwards so as to be easily repaired and hard to corrode.
Qty. : Two (2).

Shape : Channel section.

Dimension : 158 x 60 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 4.0 mm thick webs located beneath each board joint of the plywood, which are placed at certain center distance.

Shape : " C " section

Small one : 140 x 30 x 30 x 4.0 mm , Qty. : 19

6.3.3 Fork Pocket

Every pocket is constructed with both adjacent cross members, a top plate and two bottom end plates of 200mm deep. The 102mm height forklift pockets only for empty container lifting.

Top plate : 4.0 mm Thick

Bottom plate : 6.0 mm Thick

6.3.4 Reinforcement

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

Dimension: 200 x 149 x 4.0 mm

6.3.5 Floor

The floor will be constructed with five (5) pieces 6.0 mm thick checker steel plates which will be butt welded and continuously welded to front sill, door sill and bottom side rails inside, and stitch welded to crossmembers.

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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: 2.0 mm

Corrugation dimension- Outerface: 110 mm , Depth: 45.6 mm

Interface: 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 fittings.

6.4.2.1 Front Sill

The bottom end rail to be made of a 4.5 mm thick pressed open section steel is reinforced by three internal gussets.

There is cut out at each end of the bottom end rail and reinforced by 200x75x9.0 mm channel steel as protection against handling equipment damages.

6.4.2.2 Corner Post

Each corner post is made of a 6 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 150x315x4.0mm channel section and t4.0 mm thick steel plate upper part. One piece of 4.0mm cornice continuous welded to upper face of front top rail.

6.5 Rear End

Rear end is composed of rear end frame which consists of one door sill, two corner posts, one door header 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 to be made of a 4.5 mm thick pressed open section steel is reinforced by four internal gussets at the back of each locking cam keeper location.

There is cut out at each end of the door sill and reinforced by a 200x75x9.0 mm channel steel as a protection against handling equipment damages.

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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, welded together to form a hollow section to ensure width of the door opening and suitable strength against the stacking and racking force. Four (4) sets of hinge lugs are welded to each outer 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 "U" section steel pressing and flat plate welded together to form a square tube and an angle section roof supporter with internal stiffener ribs by welding,

Rear header : 4.5 mm thick.

Header plate : 4.0 mm thick.

Stiffener ribs : 4.0 mm thick., Qty.: 4

Roof supporter 8.0 mm thick.

6.5.4 Door Systems

The doors consist of two leaves. Each leaf consists of a door panel, continuously welded into a frame, a pair of locking rods with mounting brackets and handles, four hinge blades and pins, sealing gaskets with retainers, and "tie back" retaining lines. The doors will be attached to the rear frame by the hinge pins and will be capable of opening through an arc of about 270 degrees. Door panel and frame welding will be accomplished with mixed gas welding equipment only.

6.5.4.1 Door Leaves

Each door leaf consists of a panel and a door frame. The door frame consists of vertical (inner & outer) and horizontal (upper & lower) members. The door panel and door frame (including square tube end plate) are welded together with mixed gas welding equipment, and form the rectangular door leaves.

The doors are so arranged that the left leaf can't be opened without displacement of the right leaf.

a. Door Panel : With 5 corrugations

Depth : 40 mm Slope : 22 mm

Width : 106 mm Panel thickness : 2.0 mm

b. Door Frame

1) Horizontal door member : 150 x 50 x 3.0 mm, channel section.

2) Vertical door member : 100 x 50 x 3.2 mm RHS

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 : Stainless steel, under the bottom of hinge

Bushing :

Pin :

Self-lubricating synthetic

Stainless steel.

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6.5.4.3 Locking Devices

Two steel tube locking rods with handles, cam ends, and mounting brackets are attached to each door leaf. They are fastened to the door with standard bolts / nuts as well as six huck bolts for TIR security purposes. The bars are suspended in the mounting brackets with synthetic, self-lubricating bushings. An EPDM shim will be inserted between the mounting brackets and the door for abrasion protection, the shim will be a minimum of 3 mm larger in circumference than the brackets.

Cam keepers are welded to the door header and sill to receive the cams mounted on the lock rods.

a) Locking device type : Bloxwich type (BE2566MN)
Saejin type (SJ-13BF)

b) Locking rod treatment : Hot-Dipped galvanized to BS729 (75μ)

c) Cam keeper treatment : Electro zinc plated.

6.5.4.4 Door Holder and Receptacle

A door tie back, made of mixed nylon rope, is tied to the centerside locking rod & the receptacle (door hook) is welded to each bottom side rail to retain the door in the open position.

6.5.4.5 Seal Gaskets

The door seal gaskets (black colour) are of EPDM 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 made of a 150x150x4.5 mm rectangular tube

6.6.2 Side Walls

Each side wall will be composed of a number of sheets, fully vertically corrugated into trapezium section, butt welded together to form one panel by automatic welding. There is a recessed flat area with inside reinforcement plate for fitting locking devices.

Thickness: 2.0 mm

Corrugation dimension- Outerface: 110 mm , Depth: 45.6 mm

Interface: 96 mm , Slope: 18 mm

6.6.3 Locking Devices

Six locking bars are of steel tube with handles, upper cam ends, lower hub and pivot, and fixed to each outer side panel and top side rail with bolts and nuts. The bars are suspended in pipe welded to top side rail and bottom bearing brackets welded to side panel with supporter plate. The vertical retainers catch with customs seal holes are fixed to channel section support welded to side panel.

Six cam-keepers are welded to roof cover frame upper channel for locking.

Locking device treatment : Hot-Dipped galvanized.

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6.7 Roof

The roof will be removable and constructed with roof frame, Roof panel, moving side ring for horizontal and vertical stowage inside container and seal gasket

6.7.1 Roof frame

The roof frame will be constructed with square tube and hot-rolled channel welded together to form one rectangle frame.

Square tube : 75 x 75 x 4.0 mm

Channel : 80 x 43 x 5.0 mm

6.7.2 Roof Panel

The roof will be constructed by several die-stamp corrugated steel sheets with a 5 mm upward 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 : 218 mm

Inter face :91 mm, Slope : 13.5 mm

Outer face :100 mm,

Camber upwards : 5mm

Panel thickness : 2.0 mm

Sheets Qty. : 5 Pcs.

6.7.3 Lifting rings

Four (4) sets of lifting rings are seated in half circle sleeve welded to side channel section.

Lifting ring diameter : Φ 12 mm

Sleeve thickness : 4.5 mm

6.7.4 Seal gasket

The seal gasket is of EPDM and of rectangular section, is glued to the inside of hot-rolled channel for water-tightness.

6.8 Special Features

6.8.1 Customs Seal Provision

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

6.8.2 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: 5, Total: 20

2) Lashing bars are welded on each rear & front corner post slot.

Lashing bars Qty. / Each front corner post: 3, Total: 6

Lashing bars 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 bars on the corner posts: 1,000 kg/each

4) Treatment of lashing ring / bar: Electro zinc plated

6.8.3 Sill Cut-Outs

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

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7. Preservation

7.1 Surface Preparation of the Steelwork

1) All the steel surfaces 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

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/Neoprene (Cargo contact area)

b. Butyl (Hidden parts and other area)

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 Zinc rich epoxy primer 30

Epoxy primer 40

Acrylic topcoat (Color: RAL5010) 40

Total: 110

Interior Surface Zinc rich epoxy primer 30

(including steel floor) Epoxy topcoat (Color: RAL7035) 40(80 for Floor)

Total : 70 (110 for floor)

Under Structure Zinc rich epoxy primer 30

Bitumen 190

Total : 220

7.2.4 The paint suppliers are **Hempel-HaiHong, Chugoku, KCC, Kansai** or other approved.

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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 (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 and sealant.

Plate material : Stainless steel

Plate treatment : Chemically etched & enameled

Rivets material : Stainless steel

Plate thickness : 0.8 mm

8.2.2 Contents of the Plate :

- 1) Owner's plate (name and address).
- 2) CSC approval No.
- 3) Customs approval No.
- 4) Date of manufacture (year and month engraved or stamped)
- 5) Owner's serial number (stamped)
- 6) 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 kg after welding in the construction line.

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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 45 Deg. to horizontal.

Time duration : 5 mins.

d. Lifting from Fork

Pocket (outter)

Lifting from Fork

Pocket (inner)

Internal Load :

1.6R-T

Internal Load :

0.625R-T

Lifted by horizontal bars.

Bar length : 1828 mm,

Bar width : 200 mm,

Time duration : 5 mins.

Lifted by horizontal bars.

Bar length : 1828 mm,

Bar width : 200 mm,

Time duration : 5 mins.

e. 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.

f. Floor Strength Truck Load :

5,460 kg

Special truck is used.

Total contact area : 284 sq cm,

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Wheel width : 180 mm,
Wheel center distance : 760 mm

g. Wall Strength
(Front & Door)

Test Load :

0.4 P

Compressed air bag is used.

Time duration : 5 mins.

h. Side Wall

Strength

Test Load:

0.6 P

Compressed air bag is used.

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. Weather Nozzle : 12.5 mm (inside dia.) Distance : 1.5 m
proofness Pressure : 100 kpa (1 kg/sq.cm) 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

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

General arrangement Side wall assembly

Base assembly Front end assembly

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Rear end assembly Marking arrangement
Roof assembly

11. Guarantee

The guarantee period will commence at the day of delivery and the delivery is not later than three (3) months after the containers are accepted by the owner.

11.1 Paint Guarantee

The paint system applied to the container surface shall be guaranteed against corrosion and/or paint failure for a period of five (5) years.

The guarantee shall be applied to all the kinds of faults / failures affecting more than 10 % of the painted surface and partial or total repainting shall be assured for the container(s) at the manufacturer's expense. Normal wear/tear, 20' x 8' x 8'6" Steel Hard Top with Steel Floor

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or corrosion caused by acid, alkaline solution or result from damages by abrasion impact or accident are excluded. Corrosions is defined as the rusting exceeding RE3 (European scale of degree of corrosion).

11.2 Other Guarantee

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

12. Materials

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

Where used Materials

Front End Assembly

Front corner post Corten A

Front sill Corten A

Front panel Corten A

Front header Corten A

Roof cover supporter SS41

Base Assembly

Bottom side rail Corten A

Crossmember Corten A

Fork pocket plate(upper & lower) SS41

Rear End Assembly

Rear corner post (outer) Corten A

Rear corner post (inner) SM50YA (or SS50)

Door sill Corten A

Door header Corten A

Door panel frame Corten A

Door panel Corten A

Door hinge S20C, Electro zinc plated

Door hinge pin Stainless steel

Locking cam, cam keeper S20C

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Locking rod STK41
Door gasket EPDM
Gasket retainer Stainless steel
Washer Stainless steel
Rivet Stainless steel
Shim EPDM
Corner fitting SCW49
Door hinge S20C, Electro zinc plated
Side Wall Assembly
Side panel Corten A
Top side rail SS41

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Roof cover supporter SS41
Locking device SS41, HDG
Lashing ring SS41, Electro zinc plated
Roof Assembly
Roof panel Corten A
Roof frame (outer) SS41
Roof frame (inner) Corten A
Floor
Floor (checker steel) SS41

Note 1 :

For the strength & supplies concern, SM50A & China GB 16Mn are the best design option in the market. But when material thickness ≥ 8 mm, its surface texture may have a roughness value about 0.5 mm due to thick steel plate hot rolled manufacturing process.

Note 2 :

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

China GB 16Mn 35 52