

STAR*COOL

TECHNICAL SPECIFICATIONS FOR

40' X 8' X 9'6" REFRIGERATED CONTAINER WITH INTEGRATED
STAR COOL MACHINE
MODEL NO.: MQRS-40HS-062A
SuPoTec® FOAMING SYSTEM

- SIDE, DOOR LINING: HGSS
- SIDE, BASE, ROOF, DOOR PANEL: MGSS
- ROOF LINING: PRE-PAINTED ALUMINUM
- END FRAMES AND RAILS: CORTEN
- SCUFF LINER: ALUMINUM EXTRUSION
- COOLING MACHINE: STARCOOL SCI-40, INTEGRATED TYPE

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Drawing Reference

<u>NO</u>	<u>TITLE</u>	<u>DRAWING NO.</u>
1	General Arrangement	MQRS-40HS-1561A-GA
2	Base Assembly	MQRS-40BA-13AG
3	Floor Assembly	MQRS-40BF-08AE
4	Integrated Front Frame Assembly	MQRS-40FF-02AD
5	Rear Frame Assembly	MQRS-40RF-02AB
6	Rear Door Assembly	MQRS-40DP-01AA
7	Door Lining Installation	MQRS-40DL-01AB
8	Side Wall Assembly	MQRS-40SP-02AB
9	Side Lining Installation	MQRS-40SL-02AA
10	Roof Assembly	MQRS-40RA-02AA
11	Rear Jamb Installation	MQRS-40RJ-04AA
12	Integrated Front Foam Assembly	MQRS-40IF-01AD
13	Front Lining Installation	MQRS-40FL-02AC
14	Baffle Plate Installation	MQRS-40BP-23AA
15	Refrigeration System	MQRS-40RU-06AA
16	Marking Arrangement	MQRS-40HS-1561A-MA
17	Metallizing Application	MQRS-40MT-02AA

I CONTENTS FOR CONTAINER

1. GENERAL

1.1 Operational environment

The container is designed and manufactured for the transport of frozen, chilled and general cargo in marine, on highway and railway throughout the world. It must remain serviceable under the operating conditions encountered during each of the above mode of transport, as well as during climatic condition at temperatures of minus 40 deg.C to plus 80 deg.C without any effect on the containers strength and water-tightness.

1.2 Standards and regulations

- 1) I.S.O. (TC 104 1496/2 -1996)
- 2) T.I.R. approved by G.L.
- 3) Classification Society : G.L.
- 4) C.S.C. approved by classification society.
- 5) T.C.T. : No exposed timber components to be used.
- 6) A.T.P. (Containers to be designed and tested by ATP regulations).
- 7) Meet USDA cold treatment registration.
- 8) U.I.C. approved by classification society.
- 9) Meet ATO-DLO (Springer institute) certification.
- 10) I.S.O. 1161 and ABS Section 14 corner casting regulation. The mechanical properties is based on testing of separately cast test bars from the same cast and heat treatment lot as the castings they represent.

1.3 Handling

- 1) Lifting, loaded or empty, at the top corner fittings vertically by means of spreaders fitted with hooks, shackles or twist-locks.
- 2) Lifting, loaded or empty, at the bottom corner fittings using slings with terminal fittings at any angle between vertical and 30 degrees to the horizontal.

1.4 Transportation

- 1) Marine: Eight (8) high stacked (on a level 32,500 kgs ratings)in the ship cell guide and Four(4) high stacked on the deck.
- 2) Road: On flat bed or skeletal chassis, secured by twist-locks or combination of twist-locks and front penetration pins to lock the two (2) bottom corner fittings.
- 3) Rail – road:
 - COFC (Container-on-flatcar) : secured by twist-locks or equivalent.
 - Double stacking on the train.
 - TOFC (Trailer-on-flatcar) : secured to semi-trailer chassis.

2. TESTING AND INSPECTION

2.1 Proto-type container

A proto-type container manufactured in accordance with this specification will be tested according to the procedures described in the ISO 1496/2 and the Classification Society's Rules. Upon completion of the test, the container will be certified by the society with a test report showing the deflection and/or variations with in the criteria of the permissible values specified in society's Rules.

1) Stacking	102,375 kgs/post	(225,690 lbs)
- Internal load	1.8 R-T	
2) Top lifting	2 R -T	
3) Bottom lifting	2 R -T	
4) Restraint	R / rail.	
5) End wall strength	0.4 P	
6) Side wall strength	0.6 P	
7) Roof strength	300 kgs	(660 lbs)
8) Floor strength	7,260 kgs	(16,000 lbs)
9) Racking-	Transverse 15,240 kgs	(33,600 lbs)
	Longitudinal 7,620 kgs	(16,800 lbs)
10) Air tightness	25.4 mm(1") Aq. Internal pressure	
11) Thermal test		
12) Cooling performance test		

Where R: Max. Gross Weight
 P: Max. Payload
 T: Tare Weight

2.2 Production Line Container

Every container is manufactured under the effective quality control procedures to meet the specified standards.

After completion, all containers are subject to visual check, door operation check, etc.

2.3 Batch test

Minimum one (1) container per every production batch shall be tested for structure, Heat leakage.

- 1) Air leakage test
Frequency: Every one (1) unit per 10 containers.
- 2) Structure test
Item: Stacking
 Top lifting
 Floor strength
 Transverse racking
Frequency: Every one (1) unit per 200 containers.
- 3) Thermal test
Frequency: Every one (1) unit per 200 containers

3. DIMENSIONS AND RATINGS

- The dimensions and tolerances apply when measured at the temperature of 20 deg.C (68 deg.F) according to ISO 668-1995(E).

3.1 External Dimensions

	mm		ft - in	
Length(overall)	12,192	+0, -10	40 - 0	+0, -3/8
Width (overall)	2,438	+0, -5	8 - 0	+0, -3/16
Height(overall)	2,896	+0, -5	9 - 6	+0, -3/16

3.2 Internal Dimensions (nominal)

	mm		ft - in	
Length	11,588	+0, -10	38 - 0 3/16	+0, -3/8
Width	2,290	+0, -10	7 - 6 3/16	+0, -3/8
Height	2,545	+0, -10	8 - 4 3/16	+0, -3/8

3.3 Door Opening Dimension (nominal)

	mm		ft - in	
Width	2,290	+0, -5	7 - 6 3/16	+0, -3/16
Height	2,557	+0, -5	8 - 4 11/16	+0, -3/16

3.4 Inside cubic capacity (nominal)

	cu.m	cu.ft
For roof lining	67.5	2,384

3.5 Ratings

	kgs	lbs
Tested max. gross weight	34,000	74,960
Payload	29,580	65,220
Tare weight	4,420	9,740
(Including integrated refrigeration system) (Tolerance +2%,-2%)		

3.6 Air Leakage Rate

Maximum Air Leakage Rate (Q): 2.5 cu.m./hr. (at 25.4 mm Aq.)

3.7 Total Heat Transmission Rate

Estimated Heat Leakage Rate (U10): 42 W/K (36 kcal/hr. deg. C max.).

4. MATERIALS

4.1 Steel

Description	Material	Yield point kg/sq.mm (min.)	Tensile strength kg/sq.mm (min.)
1) Corrosion resistant high tensile steel	SPA-H	35	49
2) High tensile rolled steel	SS490	29	50
3) Mild carbon steel	SS400	25	41
4) Stainless steel (H.G.S.S.)	SUS304	21	52
	SUS436	25	46
	NTK D-7	27	61
5) Muffler grade stainless steel (M.G.S.S.)	SUS410, SUH409	25	41

4.2 Aluminum

1) Extrusion	6082-T6	26	29
	6061-T6	25	27
	6063-T5	11	15
2) Roof lining	5052-H42	16	22
	5052-H46		
3) Sheet	5052-H34	18	24

4.3 Sealant

- 1) Polyurethane or MS-polymer sealing compound. Sealant for the interior of container must be approved by FDA.
- 2) Butyl sealing compound (Unexposed)
- 3) Silicon sealing compound (Some exterior area)

4.4 Foam tape

- 1) 1.6 mm (0.063") thick, P.V.C. (Polyvinyl chloride) foam tape, one side adhesive, aluminum grey colored.
- 2) 3.0 mm(0.118") thick, E.P.D.M.(Ethylene-Propylene Diene Monomer) anti-electrolysis foam gasket, black colored.

4.5 Insulation

- 1) Material : Environmental friendly 0-Ozone Depeleting Potential and low Global Warming Potential, SuPoTec® (Modified Cyclo-pentane) blown rigid polyurethane foam
- 2) Nominal thickness and density:

	<u>thickness</u>	<u>overall density</u>	<u>core density</u>
Base	95 mm	50 kg/cu.m	40 - 47 kg/cu.m
Side	65 mm	45 kg/cu.m	35 - 42 kg/cu.m
Roof	90 mm	45 kg/cu.m	35 - 42 kg/cu.m
Door	78 mm	55 kg/cu.m	45 - 52 kg/cu.m
Front wall	67-85 mm	50 kg/cu.m	40 - 47 kg/cu.m

- 3) Surface preparation for PUR. Foam contact area:
 - Following unpainted bare metal surfaces of PUR foam contacting areas to be coated with foam adhesive or primer, but inaccessible area by automatic spraying system such as the area behind omega reinforcement flange will be excluded.
 - Side panel and lining
 - Aluminum T-floor
 - Base panel assembly
 - Door panel and lining
 - Roof panel
 - Front panel
 - Frames

5. CONSTRUCTION

5.1 Refrigeration system

-Model: Integrated refrigeration system with Star Cool SCI-40

5.2 Base structure

-Sub-floor: M.G.S.S., 0.8 mm thick main, 7 mm deep corrugation, M.G.S.S., 1.2 mm thick front end and SPA-H, 3.2 mm rear end welded to the bottom side rail on one side of sub-floor.

-Gooseneck tunnel: SPA-H, 4.0 mm, one (1) piece pressed hat section.

-Cross member: SPA-H, 4.0 mm, seven (7) pieces pressed trapezium section.

5.3 Flooring

-Floor stringer: P.E. located between cross member and aluminum floor board.

-Floor board: Aluminum 6082-T6, 63.5 mm high, extruded round header section. Butt welding by automatic MIG welding machine.

5.4 Front frame structure

-Front corner post: SPA-H, 6.0 mm (0.236") outer and 2.0 mm (0.079") inner. Two (2) elements fabricated integral section.

-Front top rail: SPA-H, 4.0 mm (0.157") one(1) piece top rail with 4.5 mm (0.177") doubler plates

-Front bottom rail: SPA-H, 3.2 mm (0.126") thick outer and gusset constructed special section.
Two (2) triangle gussets are welded to both ends of the front bottom rail and corner castings to reinforced strength.

-Front top plate: MGSS, 2.0 mm (0.079") thick outer with four corrugations and "C" section reinforcement.

-Front unit plate, lower: MGSS, 1.6 mm (0.063") thick outer with five corrugations

5.5 Rear frame structure

-Rear corner post: SPA-H, 6.0 mm (0.236") thick outer, inner "A", and 8.0 mm (0.315") inner "B" with 8.0 mm (0.315") stiffeners.

-Rear header: SPA-H, 4.0 mm (0.157") outer and 3.2 mm inner with 4.5 mm (0.177") doubler plates, constructed special section with four (4) gusset behind the cam keeper.

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- Rear sill: SPA-H., 6.0 mm (0.236") outer and SPA-H, 4.0 mm (0.157") inner welded to SS400 DIA. 25 reinforcement.
 - Rear jamb post: Rigid P.V.C. extruded special section.

5.6 Door assembly

- Door panel: M.G.S.S., 1.6 mm (0.063") thick outer facing with SPA-H reinforced member and E.P.D.M. rubber (4) edges door gasket fastened. Attached two chain holder to the inner locking rods on the door. Each door to be capable of opening through 270 degrees.
- Door locking gear: SAEJIN model SJ-88M/2M type or equivalent. 34 mm (1.339") outer locking bar diameter.
- Hinge assembly: Hinge blade - SS400, 8 mm thick, hot dip galvanized.
Hinge pin and washer - 12.7 mm dia. SUS304
Hinge washer – SUS304
Hinge bush – BRONZE
- Door frame: High impact rigid plastic, extrusion.
- Door inner gasket: E.P.D.M., extruded double lip section gasket and vulcanized corners to make an one (1) piece.
- Door fastener: Door hardware including door hinges assembly to be fastened with galvanized carbon steel bolts and nuts.
- Door lining: H.G.S.S. (NTK D-7), 0.7 mm (0.028") thick, 12 mm high standing ribs corrugation panel.

5.7 Side assembly

- Top side rail: SPA-H, 4.0 mm thick, one (1) piece roll formed slope open section.
- Bottom side rail: SPA-H, 4.0 mm thick lower and 3.0 mm upper.
Both end constructed SS400, 10 mm thick side protector to be welded to corner casting.

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- Side panel: M.G.S.S., 0.8 mm thick main & 1.2 mm thick end corrugated type. Each sheet inverted ribs to be automatically butt-welded together into one panel and continuously welded to the exterior of peripheral frame.
 - Side post: SPA-H, 1.6 mm thick, spot welded to side panel.
 - Side lining: H.G.S.S. (NTK D-7), 0.7 mm (0.028") thick, 7 mm deep inverted small corrugation panel. Automatically butt-welded together to form one (1) piece.
 - Scuff liner: Aluminum 6061-T6, 2.7 mm (0.106") thick, 410 mm high, full length one piece Alum. extrusion to be installed at bottom of each side lining panel.

5.8 Roof assembly

- Roof panel: M.G.S.S., 0.8 mm thick main and 1.0 mm thick end. Each sheet with 4 mm high standing corrugation to be automatically butt-welded together into one panel and continuously welded to the exterior of peripheral frame.
- Roof lining: Aluminum, 0.8 mm (0.031") thick one (1) piece pre-painted white panel with small beads.

5.9 Additional attachment

- 1) Floor drain:
Four (4) kazoo drain to be provided at the front and rear gutter.
- 2) Generator mounting device:
Clip on type generating set at both front corner posts and front top rail to be equipped with connection points to accommodate the clip-on generating set.
- 3) Lashing bar:
Six (6) lashing bars to be installed between the outer two (2) floor tees on each side. (safe working load of 1,000 kgs)

5.10 Marking

All containers are to be marked in accordance with the latest CSC and TIR requirements as well as ISO, as modified by customer, specified marks.

- 1) Decal:
 - Owner's code and serial number
 - Size and type code
 - Capacity marking
 - Certifying agency emblem
 - Others

- 2) Plates: Data plate (C.S.C./T.I.R. and T.C.T., etc.).

- 3) Permanent identification
Stamped 9.5 mm (3/8") high digits the owner's serial number on the top face of the left hand rear lower corner fitting.

6. PRESERVATION

6.1 Surface preparation of steel parts

- 1) Hot dip galvanized to 65 microns.
 - Door locking rod assembly with brackets.
 - Door T.I.R. slam plate.
 - Hinge blades.

- 2) Zinc plated to a minimum 13 microns
 - Tapping screw and steel fasteners.

- 3) Surface preparation prior to painting shall be accordance with the section 6.3 of this specification for surface preparation procedure.

6.2 Painting

Total DFT meets 90/10 rule.

- 1) Coverage for DFT should be minimum 90% of the total painted surface with specified DFT mentioned below.
- 2) The rest of Maximum 10% of the painted surface should not have a DFT below 90% of the specified DFT.

6.2.1 Steel frames

<u>Description</u>	<u>D.F.T. (microns)</u>
Outside surface	
Hot Zinc spray	40-60
Zinc phosphate epoxy primer	40
Acrylic top coat	50
Total (Excluding hot spray Zinc galvanizing)	90

6.2.2 M.G.S.S. material parts

Outside surface	
Zinc phosphate epoxy primer	40
Acrylic top coat	50
Total	90

6.2.3 M.G.S.S. panels (Only door panels)

Outside surface	
Zinc phosphate epoxy primer	40
Urethane top coat	50
Total	90

6.2.4 Top coat color : RAL 9003 white

6.2.5 Paint supplier : KCC or Hempel (Except shop primer)

6.3 Surface preparation procedure

6.3.1 Prior to assembly

6.3.1.1 Shot blasting (SPA-H parts)

A. Shot blasting

- 1) Abrasive material: Grit, ball, cut wire or their mixture shall be used as abrasive material for blasting. Mixture shall be suitably adjusted to achieve the required quality standard.
- 2) Blasting condition
 - Surface preparation grade: ISO 8501-1, 2007 Sa2.0
 - Density: Avg. 70% (For both side of sheets and outside of profiles)

B. Shop primer coating

Around 10 microns.

6.3.2 After assembly

6.3.2.1 End frame station

A. Shot blasting

Prior to hot spray Zinc metalizing, SPA-H parts will be shot blasted

Blasting condition

- Surface preparation grade: ISO 8501-1, 2007 Sa2.5
- Density: Avg. 95%
- Roughness: 40 – 60u (No greater than 80 microns)

B. Hot spray Zinc metalizing

- 1) Application standard : BS EN 22063 Metallic and other inorganic coating
Thermal spraying-Zinc, aluminum and their alloys.

- 2) 40-60 microns to exposed area

C. Primer coating

40 microns to exposed surface

6.3.2.2 Base frame station

A. Shot blasting

Prior to hot spray Zinc metalizing, SPA-H parts will be shot blasted

Blasting condition

- Surface preparation grade: ISO 8501-1, 2007 Sa2.5
- Density: Avg. 95%
- Roughness: 40 – 60u (No greater than 80 microns)

B. Hot spray Zinc metalizing

- 1) Application standard: BS EN 22063 Metallic and other inorganic coating
Thermal spraying-Zinc, aluminum and their alloys.

- 2) 40-60 microns to exposed Corten parts and welding seam line on the frame to panel area.

6.3.2.3 Main frame station

6.3.2.3.1 SPA-H parts:

A. Shot blasting

Prior to hot spray Zinc metalizing, exhibit SPA-H parts will be shot blasted

Blasting condition:

- Surface preparation grade: ISO 8501-1, 2007 Sa2.5
- Density: Avg. 95%
- Roughness: 40 – 60u (No greater than 80 microns)

B. Hot Zinc spray

- 1) Application standard: BS EN 22063 Metallic and other inorganic coating
Thermal spraying-Zinc, aluminum and their alloys.

- 2) 40-60 microns to no metallized exposed Corten parts and welding seam line on the frame to panel area.

C. Primer coating

- 1) 30 microns zinc rich primer to no zinc metalizing area
- 2) 40 microns zinc phosphate epoxy primer to top and bottom side rail, cross member, tunnel bolster, and gooseneck tunnel.

D. Top coating

50 microns to end frame, top and bottom side rail, cross member, tunnel bolster, and gooseneck tunnel.

6.3.2.3.2 MGSS/HGSS parts:

A. Shot blasting

All exhibit MGSS/HGSS parts will be sweep blasted.

Blasting condition

- Surface preparation grade: Uniformly affected
- Density: 30-40 %
- Roughness profile: 25 – 40u

B. Primer coating

40 microns to door, side, base and roof panel outside, panel welding seam line.

C. Top coating

50 microns to door, side, base and roof panel outside, panel welding seam line.

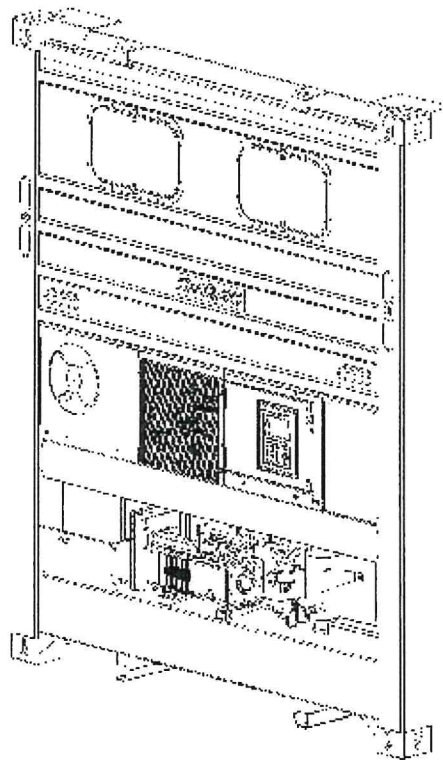
6.3.3 Final painting touch-up

Touch-up coating for damaged parts or low DFT area (minor repair).

All the unnecessary touch-up coating shall be avoided.

INTEGRATED REFRIGERATION SYSTEM

SCI-40



Printed: 2012-06-19
Version: 810935A010

Model version

This specification covers

*STAR*COOL*

Model	SCI-40
Version	3.5
Release Date	2011-10-10
Part number	810300A
Software release:	0349 or higher

Features

General description

The *STAR*COOL* model SCI-40 is an electric powered integrated cooling and heating system operating on refrigerant R134a.

The system is designed to maintain cargo temperatures in a range from -30°C (-22°F) to $+30^{\circ}\text{C}$ (86°F).

The system is designed to operate in ambient temperatures from -30°C to $+50^{\circ}\text{C}$

The refrigeration system is integrated into the front frame of a reefer container.

The rear bulkhead is made of pre-coated Fibre Reinforced Plastic.

The refrigeration system is designed to operate satisfactorily under sea going and environmental conditions as specified below:

- Salt –laden air, sea spray and high humidity.
- Rolling: amplitude of 30° on each side, period of 13 seconds.
- Pitching: amplitude of 6° on each side, period of 8 seconds.
- Permanent list: 15° on each side.
- Shock: 2g horizontal and 5g vertical.
- Vibrations: of the types encountered on ships, trucks and rail.

The system consists of the following modules, please see exploded view.

- Condenser / compressor module.
- Evaporator module.
- Evaporator fan module.

The cooling system is equipped with a two – stage compressor, electrically driven through a frequency converter.

The cooling system is also equipped with an economizer, which performs the task of sub-cooling the liquid from the receiver to the evaporator, thereby increasing the cooling capacity of the cooling system.

The evaporators are controlled by electronically expansion valves.

The equipment is designed to operate on a nominal 410 V AC / 450 V AC, 3 phase, 50/60 Hz, primary power source, according to ISO 1496-2.

An integrated dual wound transformer supplies control circuit voltage.

An automatic system, power supply sensing and correction, is provided to ensure the correct direction of rotation for the fan motors. This is done regardless of the incoming phase sequence from the primary power supply, provided that all fan motors are wired correctly.

A receiver is mounted in series with the air-cooled condenser.

The system is controlled by an electronic controller manufactured by Lodam

Electronics, controlling on the supply temperature probe in chilled mode (temperature setting above or equal to -5°C (23°F)) and on the return temperature in the frozen mode (temperature setting below -5°C (23°F)).

Controller accuracy is $\pm 0.25^{\circ}\text{C}$ ($\pm 0.45^{\circ}\text{F}$).

In frozen mode heating is disabled.

System can operate the evaporator fans in 2 speeds (high- and low speed). This is chosen from the controller display, under operation menu. At setpoint temperature above or equal to 0°C ($+32^{\circ}\text{F}$) and closed fresh air ventilation, the controller is default set to low speed on the evaporator fans.

The air from the system is delivered to the bottom of the container, with return air through the top of the evaporator coil section (bottom air delivery).

The system is equipped with a de-humidification function controlled by the electronic controller of the system. The humidity setpoint can be set in the range from 50 – 95 % RH. The system can control to the lowest level. The de-humidification function is active as long as the temperature control is in setpoint range. The system is equipped with heating elements, mounted under the evaporator coil, for the dehumidification.

The dehumidification system is also active in economy mode.

The system is equipped with a dual system for defrosting. There is installed a hot gas valve, in the refrigeration system, for hot gas defrosting of the evaporator coil. Furthermore the heating elements, mounted under the evaporator coil, are energized during defrost.

This dual system for defrosting ensures fast defrost sequence and thereby only a very small input of heat to the container. This results in very small temperature variations for the transported cargo, after a defrost sequence.

The dual system for defrost also ensures an even distribution of heat to the evaporator coil. The result of this is that there is no building up of ice in corners or other places of the evaporator coil.

The two defrost systems, hot gas and heating elements, are independent. This ensures a defrost sequence to be carried out, even with one system failing.

The defrost method is On-demand defrosting.

The system is equipped with a data logger, incorporated in the controller.

The logging interval is in pre-defined intervals, 15, 30, 60 or 120 minutes.

The logging of the USDA – sensors (3 pieces) and Cargo - sensor is done with an interval of one hour according to USDA requirements. With a logging interval of one hour, there is storage capacity for 2 years of temperature loggings.

Data - logger accuracy is $\pm 0.25^{\circ}\text{C}$ ($\pm 0.45^{\circ}\text{F}$).

The data – log can be retrieved with a PC – system StarView and Psion Logmans, via

high-speed serial communication port.

The controller has a battery back – up system for the data - logger, which after power off of the system continues logging in battery mode 120 times and then stops.

The following table show retrievable with Starview and Psion Logman software:

File Download Info			
F1	Signature	Header	
F2	Container ID		
F3	Controller ID		
F4	Controller Software		
F5	Retriever Software		
F6	Extraction date		
F7	Comment		
Data log			
D1	DT	Date	Stamp
D2		Time	
D3		Log Type [Event, Data, Log]	
D4		Event ID	Events + Alarms
D5		Param. 1	
D6		Param. 2	
D7		Param. 3	
D8		Param. 4	
D9		Param. 5	
D10	Tsup	Supply Air Temperature [°C]	Short Log
D11	Tret	Return Air Temperature [°C]	
D12	Tusda1	USDA 1 Temperature [°C]	
D13	Tusda2	USDA 2 Temperature [°C]	
D14	Tusda3	USDA 3 Temperature [°C]	
D15	Tcargo	Cargo Temperature [°C]	
D16	Tset	Temperature Setpoint [°C]	
D17	Humidity	Relative Humidity [%]	
D18	AirEx	Air Exchange [m3/h]	
D19	Psuc	Suction Pressure [Bar]	Extended Log Type 1
D20	Pdis	Discharge Pressure [Bar]	
D21	Fnet	Net frequency [Hz]	
D22	Unet	Voltage Phase 1-2 [V]	
D23	I1	Current, Ph. 1 [A]	
D24	I2	Current, Ph. 2 [A]	
D25	I3	Current, Ph. 3 [A]	
D26	Ifc	Frequency converter current [A]	
D27	Fcpr	Compressor Frequency [Hz]	
D28	Heater	Heating element [%]	
D29	Mevap	Evaporator motor status	
D30	Mcond	Condenser motor status	
D31	Tfc	Frequency module Temperature [°C]	
D32	Tamb	Ambient Temperature [°C]	
D33		Extended Log Type 2	
D34			
D35			
D36			
D37			
D38			
D39			
D40			
D41			
D42			
D43			

Header can be retrieved by Refcon, Logman, StarView and can be viewed in Refcon, LogView and StarView.

Events + Alarms and Short Log can be retrieved by Refcon, Logman, StarView and can be viewed by Refcon, LogView and StarView.

Extended Log Type 1 can be retrieved by StarView and Logman and shown in LogView and StarView.

Extended Log Type 2 can only be retrieved and viewed in StarView.

StarView is the unique program designed for communication with a Star Cool cooling system, through a serial connection to a PC.

Pre Trip Inspection

Pre Trip Inspection is a standard test used to ensure that the reefer machine is without failure and can be released for next trip.

Under PTI test, in the menu, it is possible to select between a normal PTI test and a Short PTI test, according to below table.

Normal PTI test
1. Function Test
2. Run test at +5°C
3. Run test at 0°C
4. Hold test at 0°C
5. Run test at -18°C
6. Defrosting test

Short PTI test
1. Function Test
2. Run test at +5°C
3. Run test at 0°C
4. Hold test at 0°C
5. Defrosting test

Programs

The system is equipped with the following programs:

Cold Treatment

Cold treatment is a non chemical treatment of cargo that eliminates the risk of fruit flies when importing or exporting fruit. Cold treatment is selected in the user interface in the operation menu in the menu programs. The duration of a cold treatment and the temperature vary depending on the type of fruit. These parameters are set in the CT menu based on National Authority outlines that can be different from country to country. The treatment temperature is per default set to 0°C.

During a cold treatment a "CT", is displayed next to the setpoint temperature in the controller interface. Humidity control and economy airflow mode cannot be activated during cold treatment.

Upon completion of a cold treatment program the commodity is slowly heated up to the desired setpoint temperature to ensure the quality of the commodity. The temperature increases 0.1°C per hour until setpoint is reached.

The program can be stopped by the operator at all times and is permanently interrupted by deactivation of cold treatment or initiation Pre Trip Inspection (PTI). For further details and how to select parameters please view appendix 1.

Multiple Temperature Setpoints

The Multiple Temperature Setpoints (MTS) program enables the system to change the setpoint temperatures of a shipment automatically up to six times during transport, e.g. for the ripening of bananas. The MTS program is activated in the user interface in the operation menu in the menu programs. The duration, the setpoint temperatures and the humidity setpoint are selected. Once the MTS program is active the setpoint temperature cannot be changed manually.

During the program "MTS" is displayed next to the setpoint temperature in the controller interface. The actual temperature is at all times displayed in the user interface.

Upon completion of the MTS program the system continues to maintain the latest setpoint temperature. The program can be stopped by the operator at all times and is permanently interrupted by an initiation of cold treatment or Pre Trip Inspection (PTI).

For further details and how to select parameters please view appendix 2.

Design standards

Refrigeration system complies with CE – marking according to Machinery Directive (98/37).

Refrigeration system is tested according to ARI, capacity – test method.

Refrigeration system complies with international Customs Regulations for container (TIR).

Refrigeration system complies with relevant ISO – standards.

Refrigeration system complies with Australian and New Zealand Health regulations.

Refrigeration system complies with ATO requirement for airflow.

Refrigeration system complies with USDA cold treatment and med fly quarantine requirements.

Refrigeration system complies with relevant ATP - standards.

Air performance according to AMCA.

Taint test according to BS 3755.

Refrigeration system data

Refrigerant charge, R 134a 4.5 kg

Evaporator airflow 4650 m³/h@ 190 Pa, high speed, 60 Hz.
2400 m³/h@ 63 Pa, low speed, 60 Hz.

Condenser airflow 4500 m³/h, 60 Hz.

Net R134a refrigeration cooling capacity

@ +37.8°C (+100°F) ambient, Power supply: 460 V / 60 Hz.

Air to evaporator	Cooling capacity	Power requirement	Cosine Phi
-28.9°C (-20°F)	4000 Watt (3440 kCal/h)	5710 Watt (4911 kCal/h)	0.96
-17.8°C (0°F)	6500 Watt (5590 kCal/h)	7040 Watt (6054 kCal/h)	0.96
+1.7°C (+35°F)	11500 Watt (9890 kCal/h)	12300 Watt (10578 kCal/h)	0.96

Reefer container with a heat leakage of max 40 W/K (U₂₀)

Max. Heating effect

6350 Watt (5460 kCal/h) @ 460V / 60 Hz, incl. Fan motor heat.

Unit air leakage

Less than 0.25 m³/h at 500 Pa.

General specification

Noise level

< 75 db (A) in 250 Hz band. Measured 1.5 m in front of container and 1.2 m above the ground, with the system operating at 50 Hz.

Compressor – motor assembly

Make	Bitzer
Type	Semi – hermetic two-stage reciprocating.
Number of cylinders	2 Low stages cylinders. 2 High stage cylinders.
Speed	Variable in interval from 20 Hz – 110 Hz controlled by the frequency converter.
Model	S4BCF – 5.2Y
Nominal power	5.5 kW
Compressor oil type	Reniso Triton SEZ 55 or equivalent
Compressor housing	Seawater resistant aluminium, unpainted.
Displacement	42 m ³ /h @ 110 Hz
Weight	58 Kg

Frequency converter

Make	Danfoss
Type	FCM 375
Frequency range	20 – 110 Hz
Converter housing	Seawater resistant aluminium, unpainted.
Tightness	IP 55

High Pressure cut – out switch

Cut –out	22.4 Bar ± 0.7 Bar
Cut – in	15.9 Bar ± 1.2 Bar

Fusible plug

Blow temperature	100°C (212°F)
------------------	---------------

Economizer

Make	DANFOSS
Type	Brazed plate heat exchanger
Material	Stainless steel, AISI 316 L

Evaporator coil

Make	Luvata / DunAn
Tube material	Copper, grooved, EN 12735 – 2
Fin Material	Aluminium, Hydrophilic treated
Fin spacing	3.4 mm
Attitude	45° from horizontal
Number of rows	6, dual piping (split 2/4) ø7 mm/ ø10 mm.
Number of circuits	16
Face area	0.725 m ²
Surface area	64.5 m ²
Condenser coil	
Make	Luvata / DunAn
Tube material	Copper, grooved, EN 12735 – 2
Fin/bracket Material	Aluminum EN AW 8000/5000
Fin spacing	2.0 mm
Number of rows	4, ø7 mm tubes
Face area	0.36 m ²
Surface area	32 m ²
Coating, tube/fin	Cataphoresis treatment, with additional acrylic resin
Evaporator fan	
Hub material	Polyamide, glass reinforced
Type	Axial
Number of fans	2
Number of blades	7
Pitch	25°
Diameter	ø315 mm
Blade material	Polyamide, glass reinforced
Drive	Direct on motor shaft
Condenser fan	
Hub material	Polypropylene, glass fibre reinforced
Type	Axial
Number of fans	1
Number of blades	4
Pitch	30°
Diameter	ø440 mm
Blade material	Polypropylene, glass fibre reinforced
Drive	Direct on motor shaft
Receiver	
Electro polished stainless steel.	
Volume	6.2 Litre

Defrosting

Defrost initiation	Automatic or manual initiation from the keypad
Trip defrosting interval	Defrost On Demand function is implemented in the controller software This function is monitoring the temperatures over the evaporator coil and based on differences in these temperatures initiates a defrost sequence

Defrosting method

Hot gas, combined with electrical heaters

Fresh air exchange

Fresh air exchange	Adjustable 0 - 220 m ³ /h (0-129 CFM) @ 60 Hz Adjustable 0 - 183 m ³ /h (0-107 CFM) @ 50 Hz Maximum meets ATO requirements While setting fresh air exchange rate, the controller display will show only the exchange rate
--------------------	--

Refrigeration controls

Expansion valves	2 pieces, electronically controlled from controller
Filter Drier	Danfoss DML 164 with O – ring or equivalent
Hot – gas valve	Solenoid valve
Moisture indicator	Incorporated in receiver sight glass
Material:	Brass acc. to EN 12164 / CW602N
Piping	Solid copper tubes according to EN 12735 – 1
Pipe coating Primer:	Epoxy resin zf – a120
Topcoat:	Polyurethane resin Hipon – 50

Electrical data

Input power	3 x 410 ± 50 V at 50 Hz ± 2.5 Hz 3 x 450 ± 50 V at 60 Hz ± 2.5 Hz
Control circuit voltage	12 V DC Nominal 16 V DC – 40 V DC
Controller/recorder	SCC6.1
Type	
Control accuracy	
T _{RET} , T _{SUP1} , T _{SUP2}	±0.25°C, range -30°C to +30°C
T _{USDA1} , T _{USDA2} , T _{USDA3} , T _{CARGO}	±0.25°C, range -30°C to +30°C

Circuit Breaker

Main power ampere 16 Amp

Contactors

Nominal: 9 Amp @ 40°C & 400 volt
 Max: 7 Amp @ 70°C & 520 volt
 Start current: 6 x nominal

Fuses

Control circuit 0.4 A tube fuse

Power plug

Type CEE 17, 4 pole, with earth, 32 Amp
 400/460 V / 50/60 Hz

Power Cable

Type 4 x 2.5 mm², 450 / 750 V, PU – sheath
 Length 18 m
 Colour Yellow
 Temperature Range -37°C to +90°C

USDA socket requirements

Location Rear left side
 Number 3 pieces + 1 cargo sensor
 Type Deutsch HD 10, female socket. Tin Plated

Evaporator fan motor

Make Grundfos/Zhongda/ABB
 Type Enclosed, non – vented
 Frame size 071B14
 Shaft material Stainless steel, X20CrNi172
 No. of motors 2
 Voltage 3 – phases, 350 / 500 V_{AC}, 50/60 Hz.
 Nominal power 0.45/0.07 kW @ 460V/60 Hz
 Protection, electrical Thermistors
 Speed Dual – speed
 High: 3460 / 2850 rpm (60/50 Hz).
 Low: 1760 / 1425 rpm (60/50 Hz)
 Rotation Counter – clockwise, when viewed from shaft end
 Bearings Permanently lubricated, sealed
 Bearing size Drive end Non - drive end
 6304 2Z C3 6201 2Z C3
 Bearing lubricant Klüberquiet BQH 72 – 102 or equivalent
 Temperature range: -40°C - +140°C

Condenser fan motor

Make	Grundfos /ABB /Zhongda
Type	Enclosed, non – vented
Frame size	071B3
Shaft material	Stainless steel, X20CrNi172
No. of motors	1
Voltage	3 – phases, 350 / 500 V _{AC} , 50/60 Hz
Nominal power	0.37/0.06 kW @ 460V/60 Hz
Protection, electrical	Thermistors
Speed	Dual – speed High: 1740 / 1460 rpm (60/50 Hz) Low: 870 / 730 rpm (60/50 Hz)
Rotation	Counter – clockwise, when viewed from shaft end
Bearings	Permanently lubricated, sealed
Bearing size	Drive end Non - drive end 6204 2Z C3 6201 2Z C3
Bearing lubricant	Klüberquiet BQH 72 – 102 or equivalent Temperature range: -40°C - +140°C

Evaporator coil heaters

Type	ø8.5 mm in stainless steel AISI 304
Number	6
Rating	750 W each @ 400V

Temperature sensors, including USDA

Type	NTC, 10 kOhm @ 25°C, type 10k3A1
Operating temp.	-40°C to +100°C
Accuracy	±0.13°C, range -30°C to +70°C

Pressure transmitters

Make	Saginomiya (NSK)
Type	Ratio metric pressure transmitter, with sealed gauge measuring principle ¼" in. female flare connection with deflator

Miscellaneous

Humidity sensor (10 - 100% RH)

Tin-plated cables.

2 pieces of removable evaporator hatches.

Integrated vacuum valve to prevent structural damage on the container.

Auto PTI, with function test and fault diagnostics.

SuPoTec¹ insulation foam, average thickness 65 mm.

Bolt, screws and nuts in stainless steel.

Closed cell neoprene gaskets.

Cover plates are painted with polyester powder, colour Ral 9003.

Fresh air exchange is measured and logged in m³/h, definition 5 m³/h.






¹ SuPoTec insulation is an abbreviation for Sustainable Polyurethane Technology with modified cyclopentane. SuPoTec is a zero ODP and low GWP blowing agent.

User interface





Keyboard layout and function

The keyboard consists of 14 keys divided into 4 groups.








Cursor keys

-  Enter key: Used for choosing a menu item or for acceptance of a set value. The key has to be pressed and hold for 3 seconds for a change to be accepted.
-  Cancel: Used for cancelling a menu choice or a setting.
-  Arrow up: Used for browsing in menus and setting parameters.
-  Arrow down: Used for browsing in menus and setting parameters.
-  Left/Right arrow: Used for movements of the cursor or select picture.


Menu keys

-  Information menu: Chooses menu, shows temperatures, pressures, currents etc.
-  Operations menu: Chooses menu, setting of various operation parameters.
-  Alarm menu: Chooses menu, shows alarms if any.
-  Service menu: Chooses menu, setting and showing off various service parameters.

Function keys

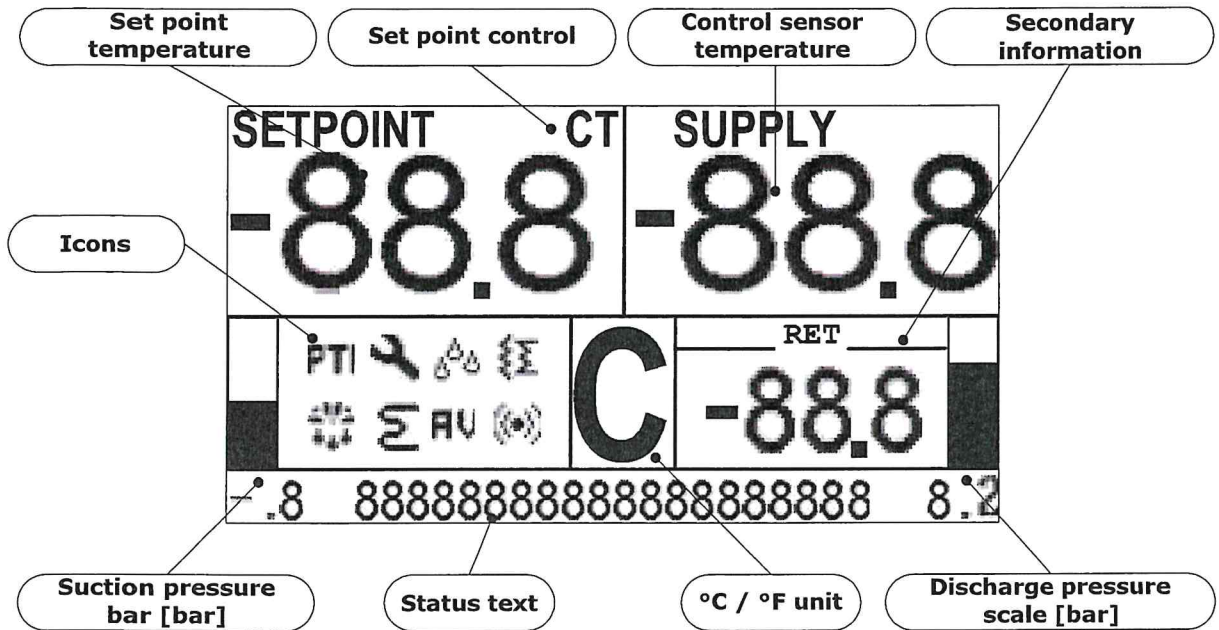
-  Defrost function key: Starts/stops defrosting. The key has to be pressed and hold for 3 seconds to accept the change.
-  Water cooling function key: Activating/deactivating of water cooled condenser. The key has to be pressed and hold for 3 seconds to accept the change. High pressure is constantly monitored to determine if the water connection is working correctly. If a failure in water supply occurs, the condenser fan is switched on to ensure continuous running of refrigeration system.
-  °C/°F functions key: Changes temperature showing on the display from °C and °F.
- The display will default show °C, by pressing  °F is shown. When  is released °C will be displayed.
- Likewise pressure display will change between bar and PSI.
- Fresh air exchange rate is always displayed in m³/h, regardless of °C or °F.
-  PTI function key: Starts/interrupts Normal PTI, Short PTI and Function test.
-  T function key: Shortcut to graphical view.

Wake-up key

-  Wake-up function key: Turns on/off the control in battery mode when no external supply is present.

Display layout

The below figure illustrates the layout of the display.



The display is divided into various areas, each with its individual information.

Display areas





Setpoint temperature area: Displays the setpoint temperature.

Setpoint control area: CT is displayed if the cold treatment program is activated. MTS is displayed if the Multiple Temperature Setpoints program is activated.

Control sensor temperature area: Displays supply or return and the corresponding temperature depending on temperature mode.

Suction pressure and bar graph area: Displays the suction pressure of the compressor.

Icons area: Displays icons for current operation mode.

-  Service icon: The control is in service mode.
-  Frost icon: The control is in frost mode.
-  Cooling icon: The control is in cooling mode.
-  Defrost icon: Defrosting is in operation.

- ☁ Dehumidification icon: Moisture regulation is active.
- Σ Heating element icon: Heating element is on.
- PTI PTI icon: PTI test is in operation.
- Σ Water cooled condenser icon: Water cooling is active.
- ☎ Alarm icon: Messages in the alarm list.
- AV Automatic Ventilation is active.

°C/°F unit icon: Displays °C or °F.

Secondary information icon: Displays the header and value of selected parameter.

Discharge pressure and bar graph area: Displays the discharge pressure of the compressor.

Status text area: Displays information on current operation mode.

Light diodes

The control has two light diodes:

A green diode, which indicates "In-Range": It flashes when the temperature is in range and lights constantly when the temperature has been in range for minimum 30 minutes (In Range); in chill mode and frozen mode $\pm 1.5^{\circ}\text{C}$.

If the temperature has been out of range for two hours the diode is turned off.

A red diode, which indicates Alarm in the following ways:

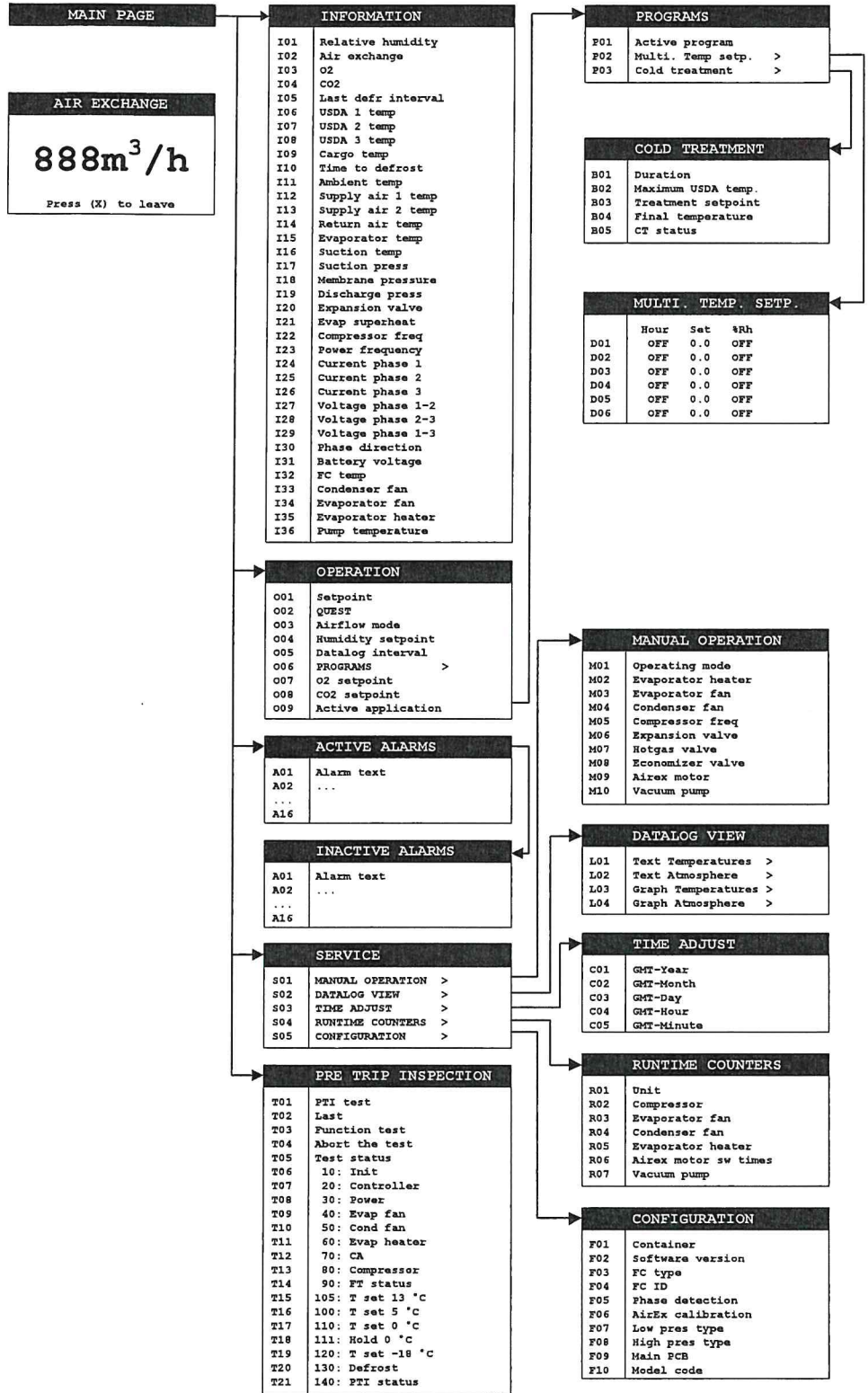
- a. It will be turned off with no alarms in the alarm list.
- b. It will be turned off if only warning. Symbol ☎ will be turned on.
- c. It will flash (2% on, 98%, off 3 second period) with alarms (non fatal).
- d. It will flash (80% on, 20 % off, 1 second period) with fatal, active alarms in the alarm list.

When the alarms are inactive the light will be off.

During power up both light diodes lights shortly to verify that they still operate.

The light diodes will only be able to light when the system is supplied with mains voltage.

Operation Menu structure




General operation



The following is general for operating menus and editing parameters.




By pressing a menu key the menu is chosen and the display will light the similar symbol.


The bottom part of the display shows parameter number, parameter value and a short auxiliary text in English.


After 30 sec. of no operation the display returns to the main menu. By pressing  the display returns to the previous level in the menu structure.


If one of the other menu keys is pressed the menu will change.




By means of the  and  keys the individual parameters may be browsed.

To change a parameter press  and the parameter is shown in inverse writing. The  and  keys may change the value of the parameters.

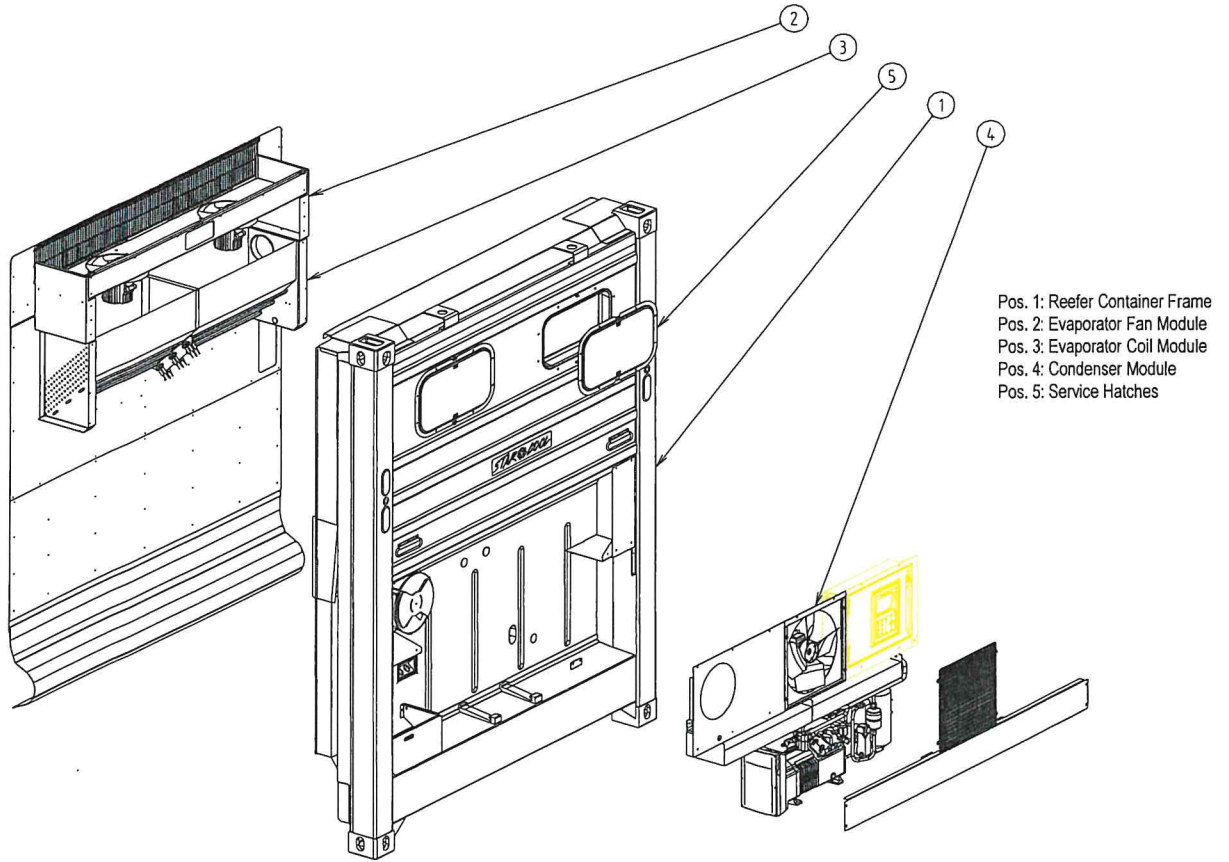
When the chosen value has been set, press , and the value is accepted and the parameter is shown in normal writing again.

The setpoint temperature is changed in the operation menu in the menu setpoint. To change the temperature setpoint the  key has to be pressed and hold for 3 seconds before the new setpoint is entered and accepted.

As long as the parameter value is shown in inverse writing, the setting may be regretted by pressing , and the old parameter value is shown again.

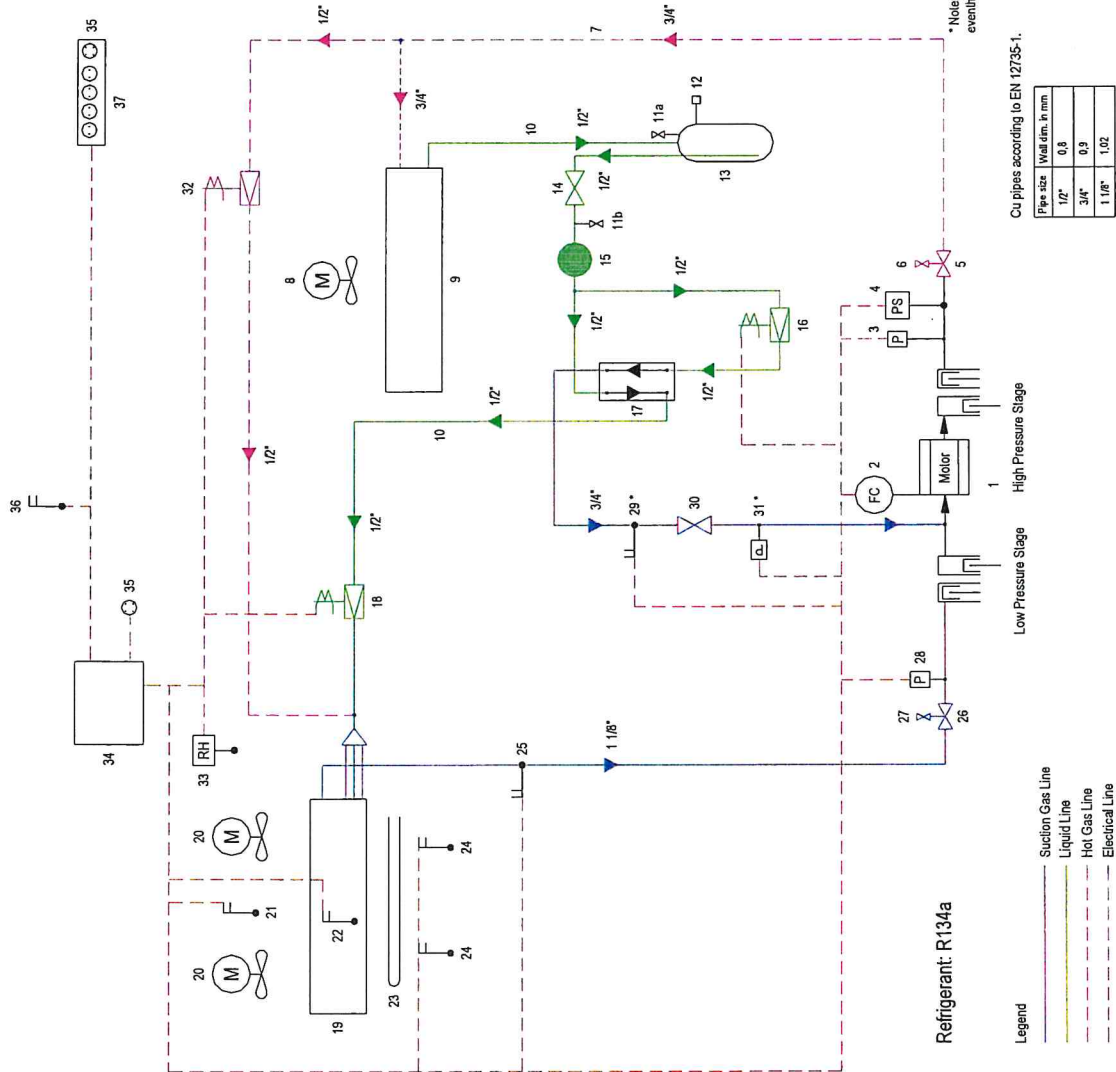
If the keys ,  or  are not pressed for 5 seconds, the setting will be cancelled, and the old parameter value shown again.

Exploded view



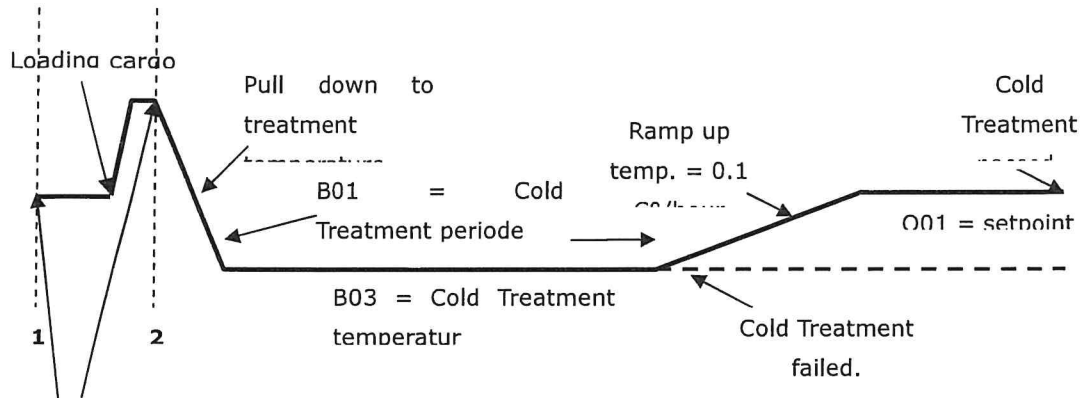
P - I diagram

- 1 Compressor
- 2 Frequency Converter
- 3 Discharge Pressure Transmitter (P_{dis})
- 4 High Pressure Switch
- 5 Discharge Service Valve
- 6 Evacuation Point
- 7 Discharge Line
- 8 Condenser Fan
- 9 Air Cooled Condenser
- 10 Liquid Line
- 11a Air Release Valve (old model)
- 11b Liquid Charging Valve (new model)
- 12 Fusible Plug
- 13 Receiver
- 14 Service Valve
- 15 Drying Filler
- 16 Electronical Expansion Valve, Economizer (V_{eco})
- 17 Economizer
- 18 Electronical Expansion Valve, Evaporator (V_{evp})
- 19 Evaporator
- 20 Evaporator Fan
- 21 Return Air Sensor (T_{ret})
- 22 Evaporator Temperature Sensor (T_{evp})
- 23 Heating Elements
- 24 Supply Air Sensors (T_{sup 1} + T_{sup 2})
- 25 Suction Temperature Sensor (T_{suc})
- 26 Suction Service Valve
- 27 Evacuation Point
- 28 Suction Pressure Transmitter (P_{suc})
- 29 Economizer Suction Temperature Sensor (T_{eco}) *
- 30 Economizer Suction Service Valve
- 31 Intermediate Pressure Transmitter (P_{ipa}) *
- 32 Hot Gas Valve (V_{hg})
- 33 Humidity Sensor (RH)
- 34 Controller
- 35 Communication Slot
- 36 Ambient Temperature Sensor (T_{amb})
- 37 Plug for Cargo Temperature Sensor



Appendix 1: Cold Treatment program, CT

Below is an illustration of a CT sequence



Start cold treatment at 1 or 2

CT can only be started when all Tusda sensors are in function.

If one or more Tusda sensors fail during the CT period the treatment temperature is kept as setpoint for the entire trip. When CT is completed without any sensor failure **"CT pass"** is written in the display. If a CT is completed with 1 or 2 sensor failures **"CT done"** is written in the display. If a CT is completed with 3 sensor failures, **"CT fail"**, is written in the display.

The CT-status will be displayed until:

- Program status set to none
- Initiated PTI
- Power off for more than 48 hours

Termination of an active CT can only be done by manually setting active program (P01) to none or if the system has been powered off for more than 48 hours.

The data log interval during CT is default set to 60 min. and cannot be changed.

The CT program is located in the operation menu under programs. The CT program is selected and the following parameters are displayed:

B01: Duration of the treatment

The duration of the CT is set in days. The value to be selected is between 1-99 days. The number of days depends on the cargo and the treatment temperature. The

treatment time is counted from when all 3 USDA sensors are valid and all showing a temperature below the maximum USDA temperature setting. If one or more USDA sensors are out of range and returns to in range again the timer for the CT will reset. A "CT pass" in the display shows that all USDA sensors have been below the maximum allowed temperature in the duration time in one period.

B02: Maximum allowed temperature for the USDA sensors

The maximum allowed temperature of the USDA sensors should be set. The value is between -10.0°C to +30.0°C.

B03: Treatment setpoint

The set-point temperature during the CT should be selected. The value range is -10.0°C to +30.0°C. The setpoint must be chosen so that all USDA sensors show a temperature below the maximum USDA temperature during treatment.

During CT it is possible to increase set point to maximum allowable temperature but only decrease 2.5°C below current set point.

B04: Final temperature

The final setpoint temperature should be selected. At the end of a treatment period the cargo might need to be warmed up to a higher temperature. The value range is between -10.0°C to +30.0°C. The treatment temperature is increased with 0.1°C per hour until the final temperature setpoint is reached. When the final temperature is reached the CT is finished. It automatically stops and the "CT" sign in the display disappears.

B05: Status of the CT program

The status of the CT can be viewed at all times. The message displayed is either: Not active, Active, Aborted, Pass, Done, Fail. The CT program stops automatically if the system has been powered off for more than 48 hours.

USDA

The bottom line in the CT menu shows the temperatures of USDA sensors 1 – 3 and the cargo sensor. The value displayed is the actual temperature measured of the sensor.

-70°C indicates that the sensor is not mounted!

Check alarm list for USDA alarms.

The CT program stops automatically, if the system has been powered off for more than 48 hours or PTI has been initiated.

Appendix 2: Multiple Temperature Setpoints program

The Multiple Temperature Setpoints program is located in the operation menu under programs. During an MTS program it is possible to have up to 6 setpoint temperatures. The following parameters should be entered for the number of setpoints that are chosen for the program:

Hours: Defines how many hours the temperature setpoint is used. When setpoint from "Set" is in-range the time starts. Setting Hours to Off clears all settings in this step and in the succeeding steps.

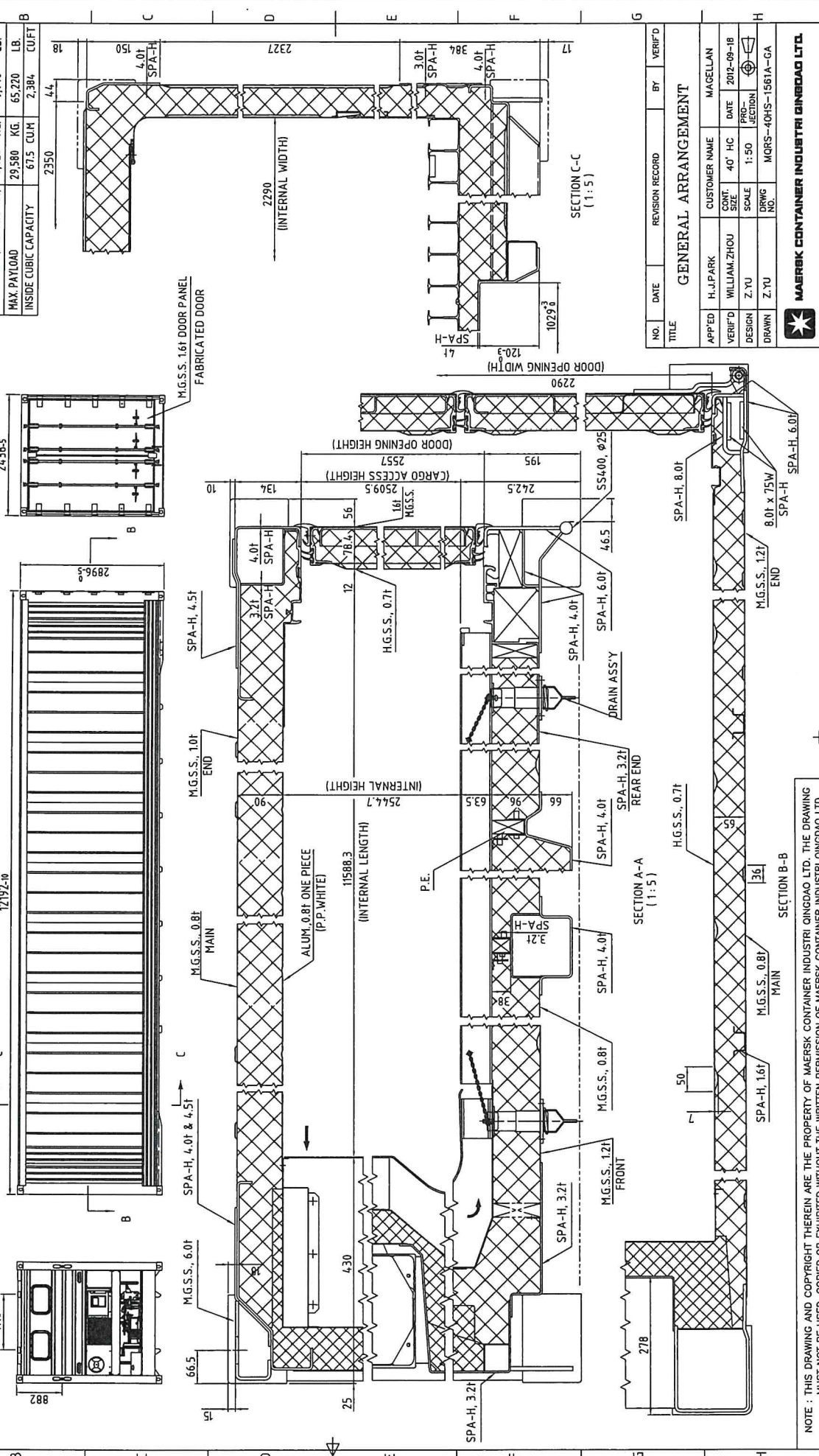
Set: The setpoint temperature to use for this step. The value range is from 1 to 999 hours. This setpoint will be used as the main setpoint even if the program is aborted.

%RH: Dehumidification - humidity setpoint. Values are: Off or 50% – 95%. Off means the controller maintains as high a humidity as possible, all other values means the controller will use the humidity setpoint to maintain de-humidification. Dehumidification is active immediately when the step starts including during temperature ramps.

Temperature changes are carried out with maximum cooling/heating capacity available - like the normal operation of the reefer machine.

The MTS program stops automatically if the system has been powered off for more than 48 hours.

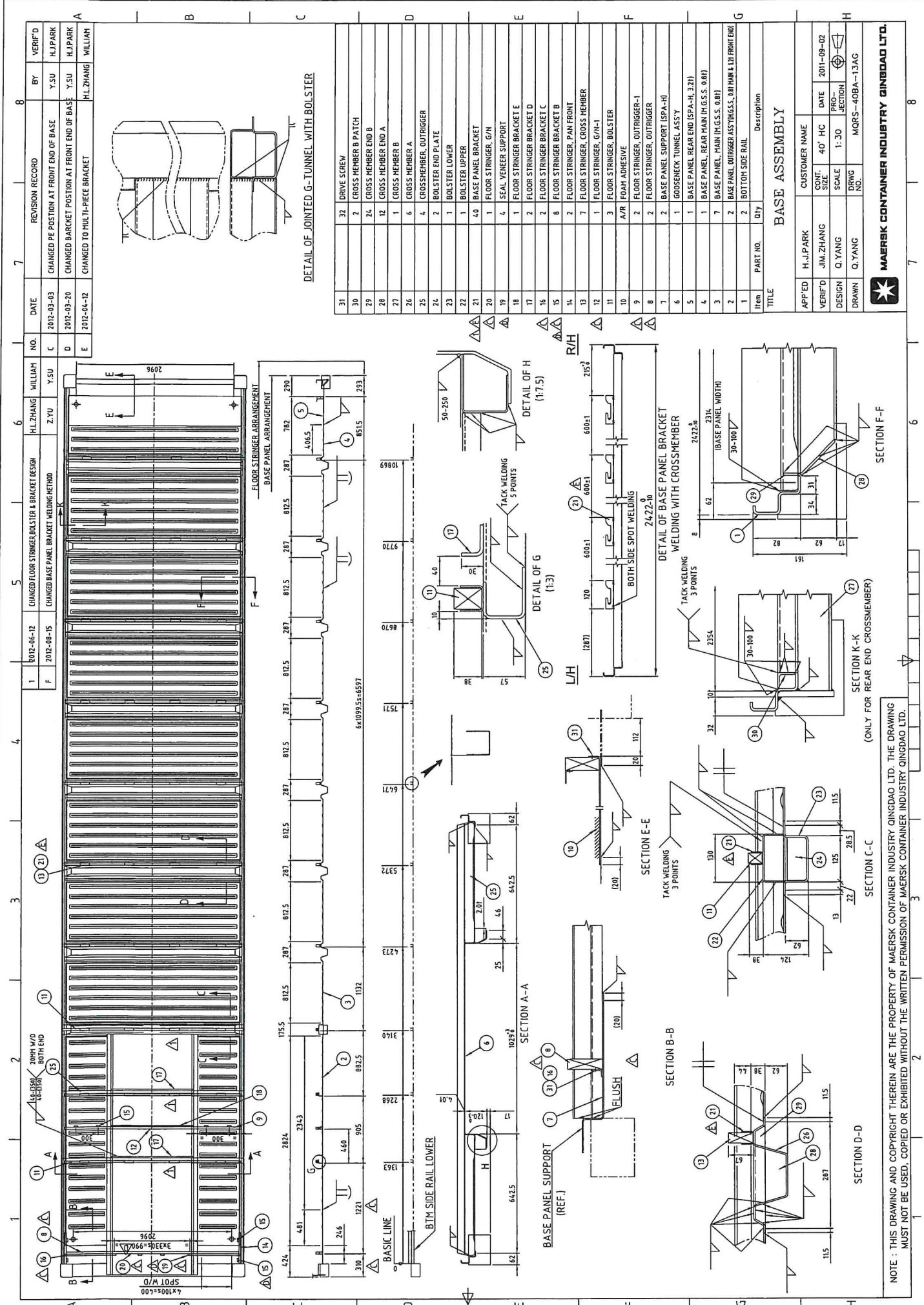
	LENGTH	WIDTH	HEIGHT	LENGTH	WIDTH	HEIGHT	LENGTH	WIDTH	HEIGHT	MAX. GROSS WEIGHT	TARE WEIGHT (INCLUDING UNIT)	MAX. PAYLOAD	INSIDE CUBIC CAPACITY
EXTERNAL	12,192 ^{+0.3} MM	4,000 ⁻⁰ MM	8'-0"	11,588 ^{+0.3} MM	3,716 ^{+0.3} MM	7'-6 3/16"	11,588 ^{+0.3} MM	3,716 ^{+0.3} MM	7'-6 3/16"	34,000 KG.	74,960 LB.	29,580 KG.	65,220 LB.
	2,438 ^{+0.3} MM	8'-0"	9'-6"	2,896 ^{+0.3} MM	9'-6"	10'-0"	2,290 ^{+0.3} MM	7'-6 3/16"	8'-4 3/16"	4,420 KG.	9,740 LB.	67.5 CU.M.	2,384 CU.FT.
	2,896 ^{+0.3} MM	8'-0"	10'-0"	2,290 ^{+0.3} MM	7'-6 3/16"	8'-4 3/16"	2,545 ^{+0.3} MM	7'-6 3/16"	8'-4 11/16"				
INTERNAL	11,588 ^{+0.3} MM	3,716 ^{+0.3} MM	7'-6 3/16"	11,588 ^{+0.3} MM	3,716 ^{+0.3} MM	7'-6 3/16"	11,588 ^{+0.3} MM	3,716 ^{+0.3} MM	7'-6 3/16"				
	2,290 ^{+0.3} MM	7'-6 3/16"	8'-4 3/16"	2,290 ^{+0.3} MM	7'-6 3/16"	8'-4 3/16"	2,290 ^{+0.3} MM	7'-6 3/16"	8'-4 11/16"				
	2,545 ^{+0.3} MM	7'-6 3/16"	8'-4 11/16"	2,290 ^{+0.3} MM	7'-6 3/16"	8'-4 11/16"	2,545 ^{+0.3} MM	7'-6 3/16"	8'-4 11/16"				
DOOR OPENING													
MAX. GROSS WEIGHT										34,000 KG.	74,960 LB.		
TARE WEIGHT (INCLUDING UNIT)										4,420 KG.	9,740 LB.		
MAX. PAYLOAD										29,580 KG.	65,220 LB.		
INSIDE CUBIC CAPACITY										67.5 CU.M.	2,384 CU.FT.		



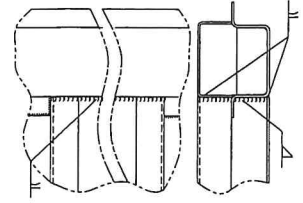
NO.	DATE	REVISION RECORD	BY	VERIFIED
TITLE				
GENERAL ARRANGEMENT				
APPROVED	H.J.PARK	CUSTOMER NAME	MAGELLAN	
VERIFIED	WILLIAM.ZHOU	CONT. SIZE	40'	HC
DESIGN	Z.YU	SCALE	1:50	PROJECTION
DRAWN	Z.YU	DRWG. NO.	MORS-40HS-1561A-GA	

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NO.	DATE	REVISION RECORD	BY	VERIF'D
1	2012-06-12	CHANGED FLOOR STRINGER, BOLSTER & BRACKET DESIGN	WILLIAM	H.J.PARK
F	2012-08-15	CHANGED BASE PANEL BRACKET WELDING METHOD	Z.YU	Y.SU
D	2012-03-20	CHANGED POSITION AT FRONT END OF BASE	Y.SU	H.J.PARK
E	2012-04-12	CHANGED TO MULTI-PIECE BRACKET	HL.ZHANG	WILLIAM



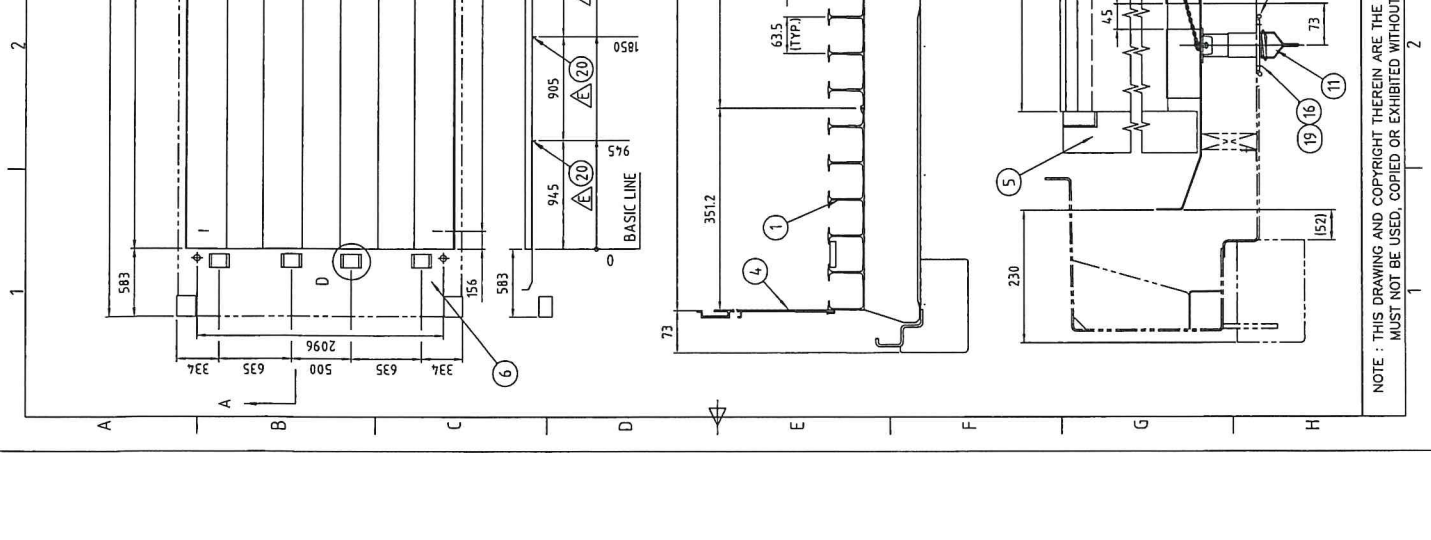
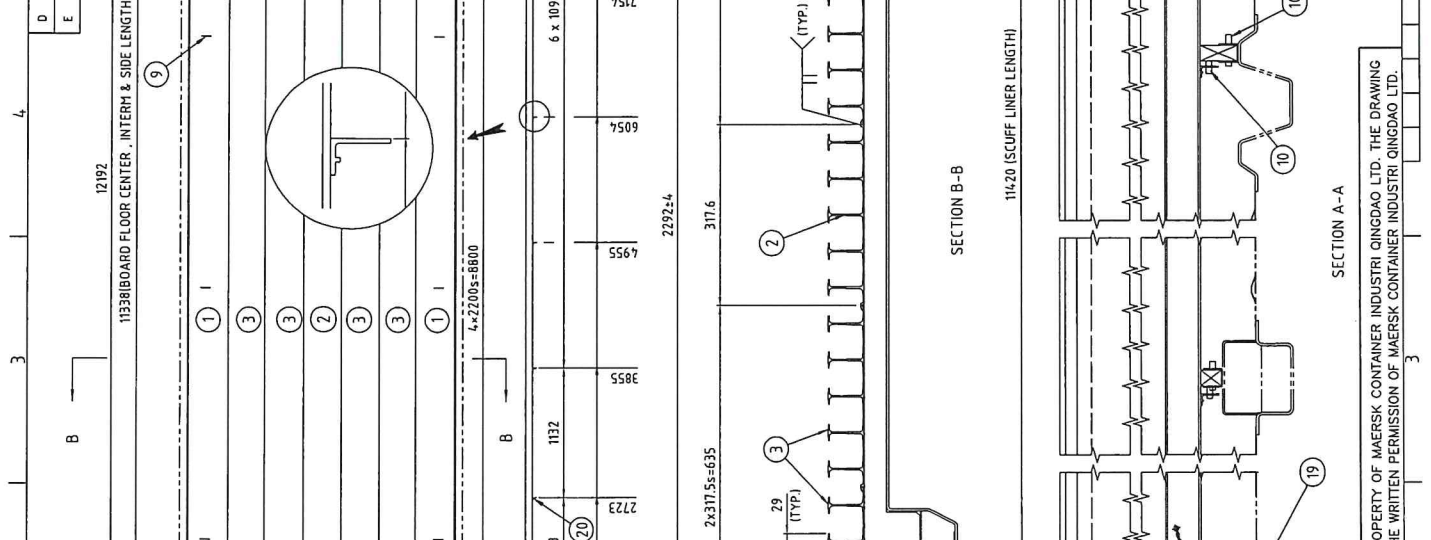
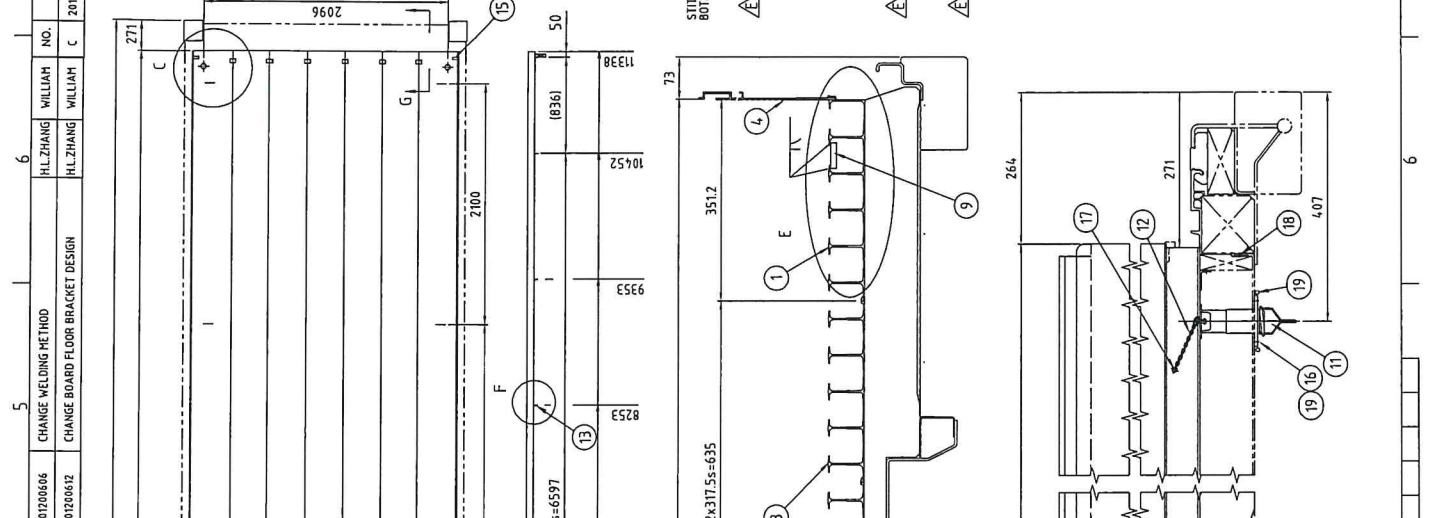
31	DRIVE SCREW
32	GROSS MEMBER B PATCH
29	GROSS MEMBER END B
28	GROSS MEMBER END A
27	GROSS MEMBER B
26	GROSS MEMBER A
25	CROSSMEMBER, OUTRIGGER
24	BOLSTER END PLATE
23	BOLSTER LOWER
22	BOLSTER UPPER
21	BASE PANEL BRACKET
20	FLOOR STRINGER, G/N
19	SEAL VENEER SUPPORT
18	FLOOR STRINGER BRACKET E
17	FLOOR STRINGER BRACKET D
16	FLOOR STRINGER BRACKET C
15	FLOOR STRINGER BRACKET B
14	FLOOR STRINGER, PAN FRONT
13	FLOOR STRINGER, CROSS MEMBER
12	FLOOR STRINGER, G/N-1
11	FLOOR STRINGER, BOLSTER
10	FOAM ADHESIVE
9	FLOOR STRINGER, OUTRIGGER-1
8	FLOOR STRINGER, OUTRIGGER
7	BASE PANEL SUPPORT (SPA-H)
6	GOOSENECK TUNNEL ASSY
5	BASE PANEL REAR END (SPA-H, 3/2)
4	BASE PANEL REAR MAIN (H.G.S.S. 0.8)
3	BASE PANEL MAIN (H.G.S.S. 0.8)
2	BASE PANEL OUTRIGGER ASSISTINGS, MAIN MAIN & 1/2 FRONT END
1	BOTTOM SIDE RAIL

BASE ASSEMBLY			
APPROVED	H.J.PARK	CUSTOMER NAME	
VERIF'D	JIM.ZHANG	CONT. SIZE	40' HC
DESIGN	Q.YANG	SCALE	1:30
DRAWN	Q.YANG	DRWG. NO.	MORS-40BA-13AG
		DATE	2011-09-02
		PROJ. SECTION	

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MAERSK CONTAINER INDUSTRY QINGDAO LTD.

REVISION RECORD			DATE	BY	VERIF'D
1	20120606	CHANGE WELDING METHOD	20120420	Y.SU	H.J.PARK
2	20120612	CHANGE BOARD FLOOR BRACKET DESIGN			
3					
4					
5					
6					
7					

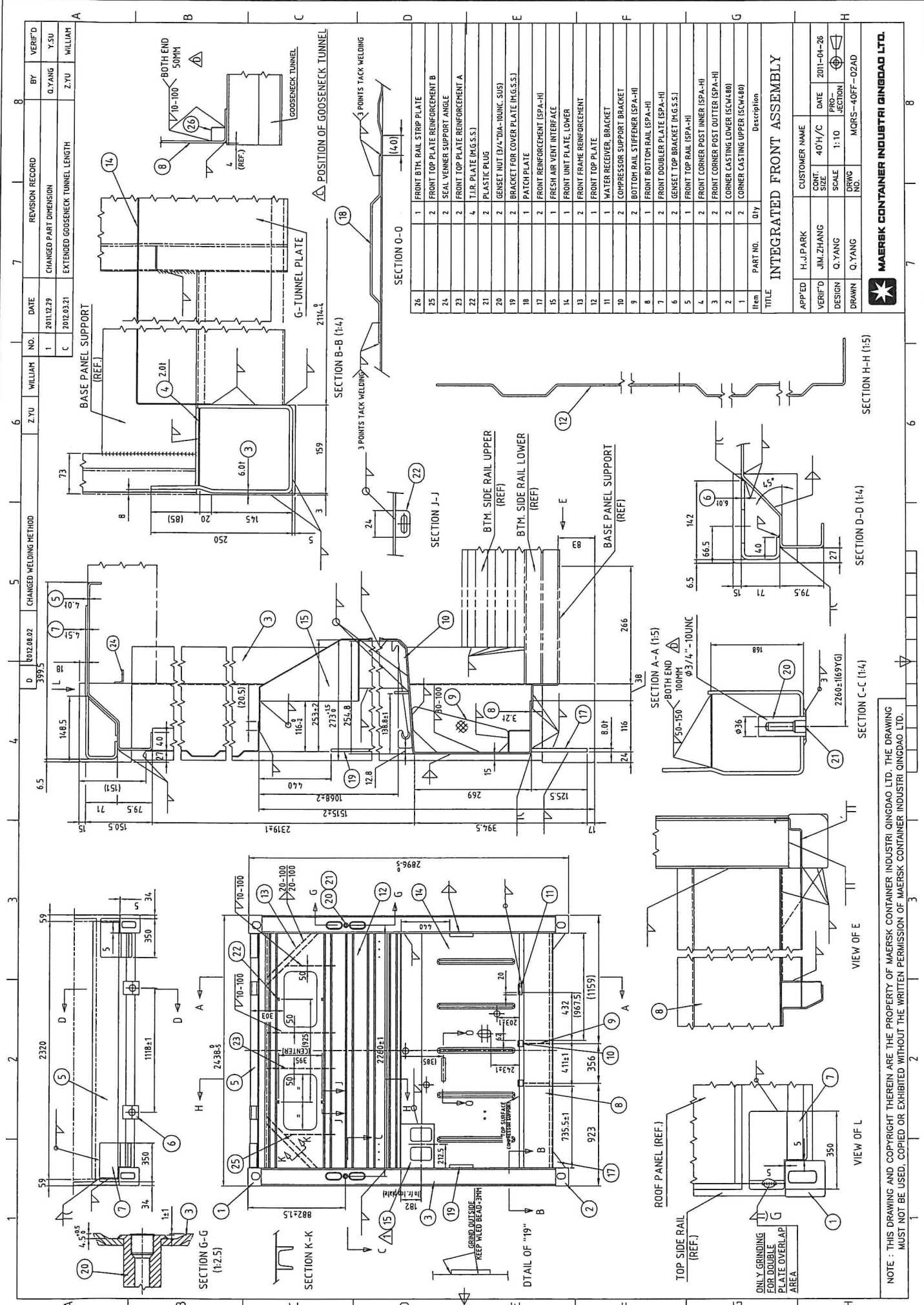


Item	Part No.	Qty	Description
20		3	BOARD FLOOR BRACKET D
19	AFR	MS or URETHANE SEALANT, WHITE	
18		16	DRIVE SCREW
17		16	DRIVE RIVET (1/8" DIA, 5/161-8627)
16		2	BOARD FLOOR BRACKET C
15		2	BOARD FLOOR BRACKET B
14		7	BOARD FLOOR BRACKET A
13		4	DRAIN PLUG WITH CHAIN
12		4	DRAIN ASS'Y
11		80	ROUND BAR
10		12	LASHING BAR
9		1	FLOOR STRINGER, REAR END
8		4	BAFFLE SUPPORT CHANNEL
7		1	PAN FRONT ASS'Y
6		2	SCUFF LINER, FRONT END
5		2	SCUFF LINER
4		4	BOARD FLOOR, INTERMEDIATE
3		1	BOARD FLOOR, CENTER
2		2	BOARD FLOOR, SIDE
1		2	BOARD FLOOR, SIDE

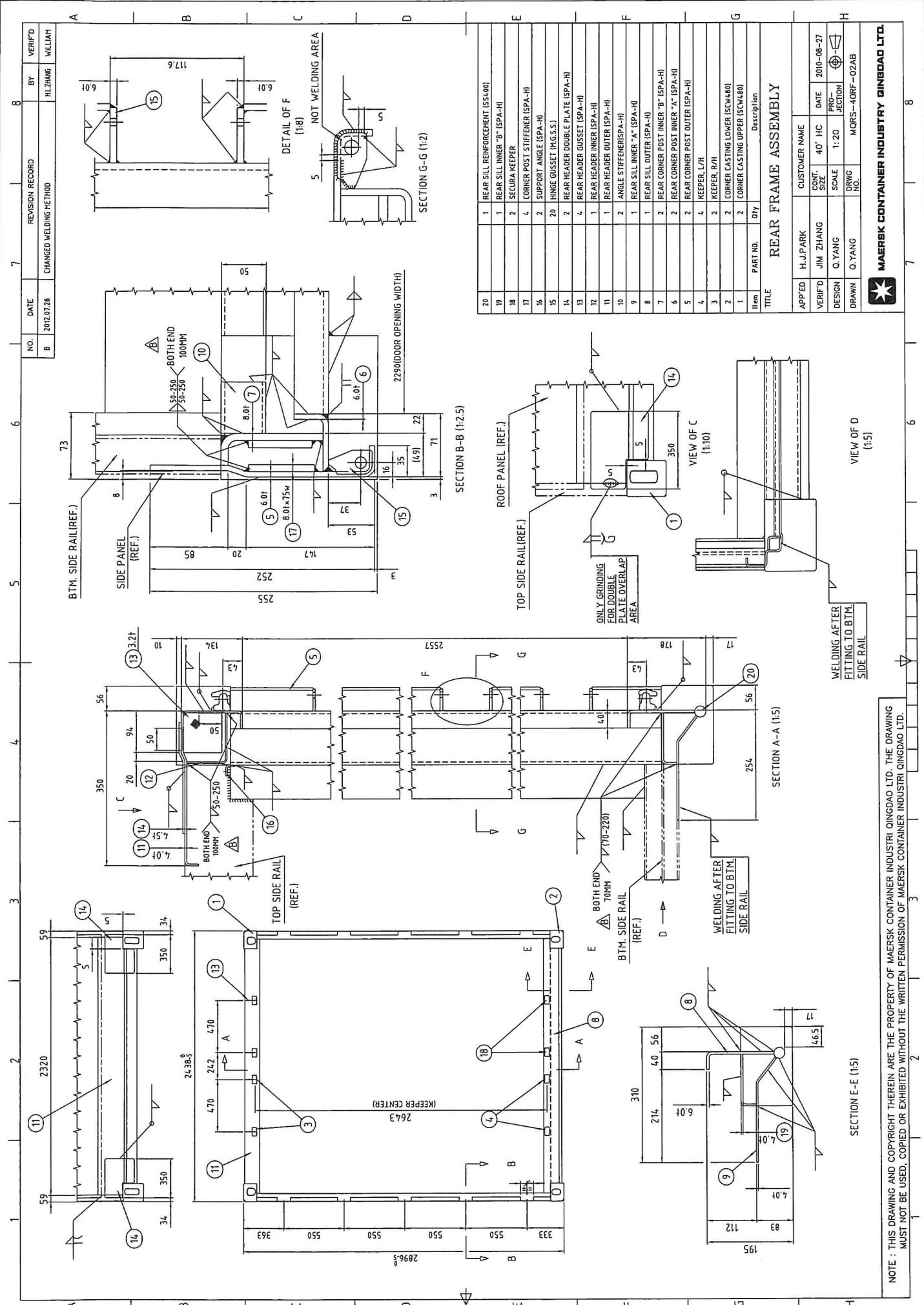
FLOOR ASSEMBLY			
APPROVED	CUSTOMER NAME	CONV. SIZE	DATE
H.J.PARK	JIM ZHANG	40' HC	2011-09-02
DESIGN	SCALE	PRO. SECTION	NO.
Q.YANG	1:30		
DRAWN	DRWG NO.	MORS-40BF-08AE	
Q.YANG			



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ITEM	DESCRIPTION	QTY
20	1 REAR SILL REINFORCEMENT (SS400)	
19	1 REAR SILL INNER "B" (SPA-H)	
18	2 SECURA KEEPER	
17	4 CORNER POST STIFFENER (SPA-H)	
16	2 SUPPORT ANGLE (SPA-H)	
15	20 HINGE GUSSET (M.G.S.S.)	
14	2 REAR HEADER DOUBLE PLATE (SPA-H)	
13	4 REAR HEADER GUSSET (SPA-H)	
12	1 REAR HEADER INNER (SPA-H)	
11	1 REAR HEADER OUTER (SPA-H)	
10	2 ANGLE STIFFENER (SPA-H)	
9	1 REAR SILL INNER "A" (SPA-H)	
8	1 REAR SILL OUTER (SPA-H)	
7	2 REAR CORNER POST INNER "B" (SPA-H)	
6	2 REAR CORNER POST OUTER (SPA-H)	
5	4 KEEPER, L/H	
4	2 KEEPER, R/H	
3	2 CORNER CASTING LOWER (SCW480)	
2	2 CORNER CASTING UPPER (SCW480)	
1	2	

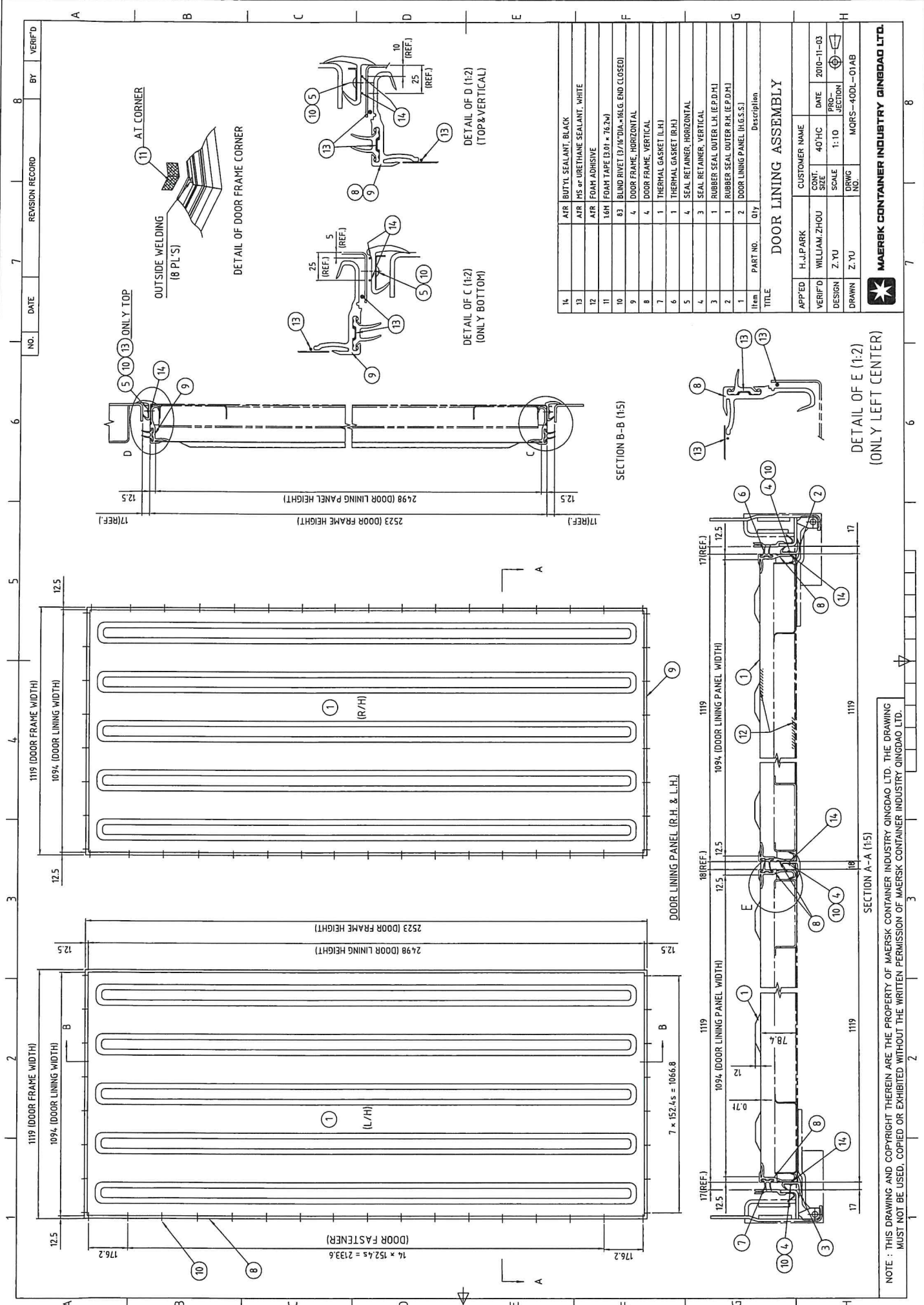
REAR FRAME ASSEMBLY

APPROVED	H.J.PARK	CUSTOMER NAME
VERIFIED	JIM ZHANG	CON'T. SIZE 40' HC
DESIGN	Q.YANG	DATE 2010-08-27
SCALE	1:20	PRO-JECTION
DRAWN	Q.YANG	DRWG NO. MORS-40RF-02AB

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MAERSK CONTAINER INDUSTRY QINGDAO LTD.



Item	Part No.	Qty	Description
14	APR	BUTYL SEALANT, BLACK	
13	APR	HS or URETHANE SEALANT, WHITE	
12	APR	FOAM ADHESIVE	
11	1.6H	FOAM TAPE (3.01 x 76.2W)	
10	83	BLIND RIVET (3/16" DIA x HLG. END CLOSED)	
9	4	DOOR FRAME, HORIZONTAL	
8	4	DOOR FRAME, VERTICAL	
7	1	THERMAL GASKET (L.H.)	
6	1	THERMAL GASKET (R.H.)	
5	4	SEAL RETAINER, HORIZONTAL	
4	3	SEAL RETAINER, VERTICAL	
3	1	RUBBER SEAL OUTER L.H. (E.P.D.H.)	
2	1	RUBBER SEAL OUTER R.H. (E.P.D.H.)	
1	2	DOOR LINING PANEL (H.G.S.S.)	

DOOR LINING ASSEMBLY			
APPROVED	H.I.PARK	CUSTOMER NAME	
VERIFIED	WILLIAM.ZHOU	CONT. SIZE	40'HC
DESIGN	Z.YU	SCALE	1:10
DRAWN	Z.YU	DRWG NO.	MORS-40DL-01AB
		DATE	2010-11-03
		PRO-SECTION	

DETAIL OF E (1:2)
(ONLY LEFT CENTER)

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SECTION A-A (1:5)

SECTION B-B (1:5)

DETAIL OF D (1:2)
(TOP & VERTICAL)

DETAIL OF C (1:2)
(ONLY BOTTOM)

DETAIL OF DOOR FRAME CORNER

OUTSIDE WELDING
(8 PL'S)

AT CORNER

1119 (DOOR FRAME WIDTH)

1094 (DOOR LINING WIDTH)

2523 (DOOR FRAME HEIGHT)

2498 (DOOR LINING HEIGHT)

1119 (DOOR FRAME WIDTH)

1094 (DOOR LINING WIDTH)

176.2 (DOOR FASTENER)

16 x 152.4s = 2133.6

176.2

176.2

176.2

176.2

176.2

176.2

176.2

176.2

176.2

176.2

176.2

176.2

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176.2

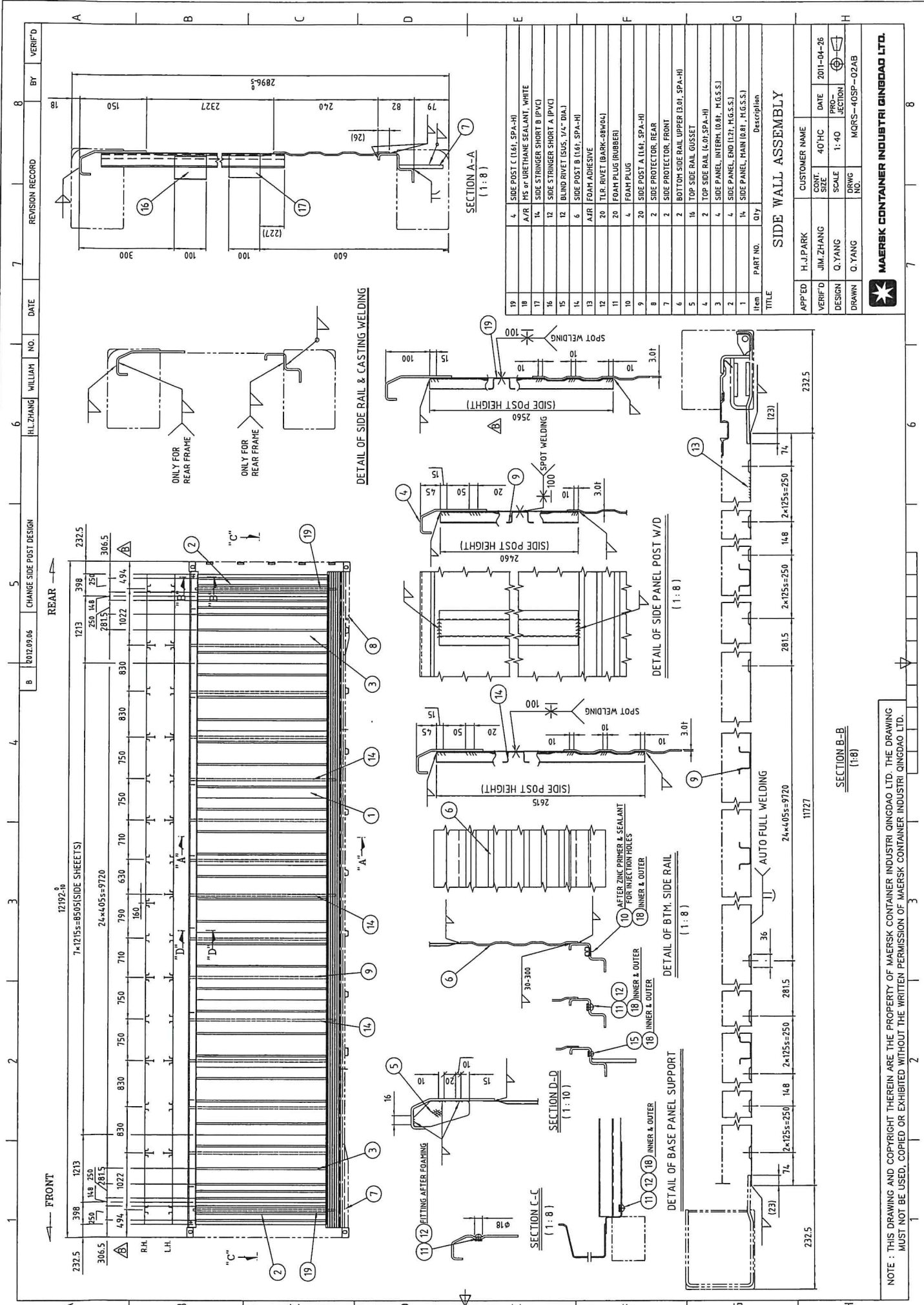
176.2

176.2

176.2

176.2

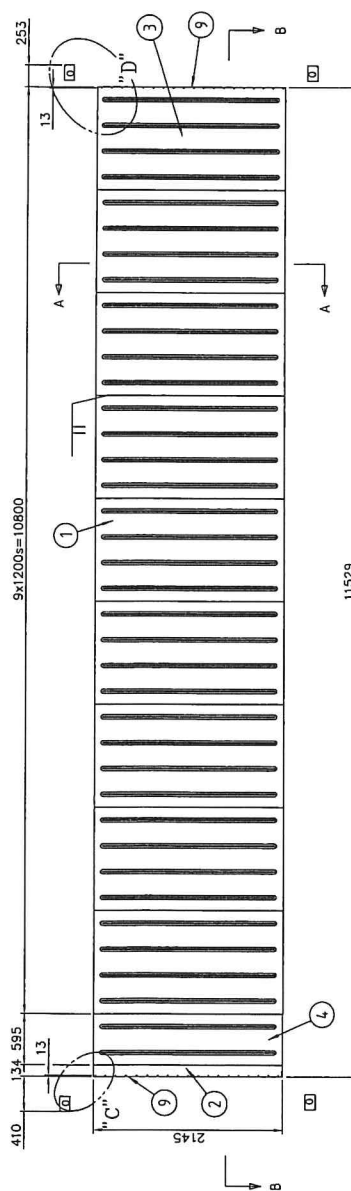
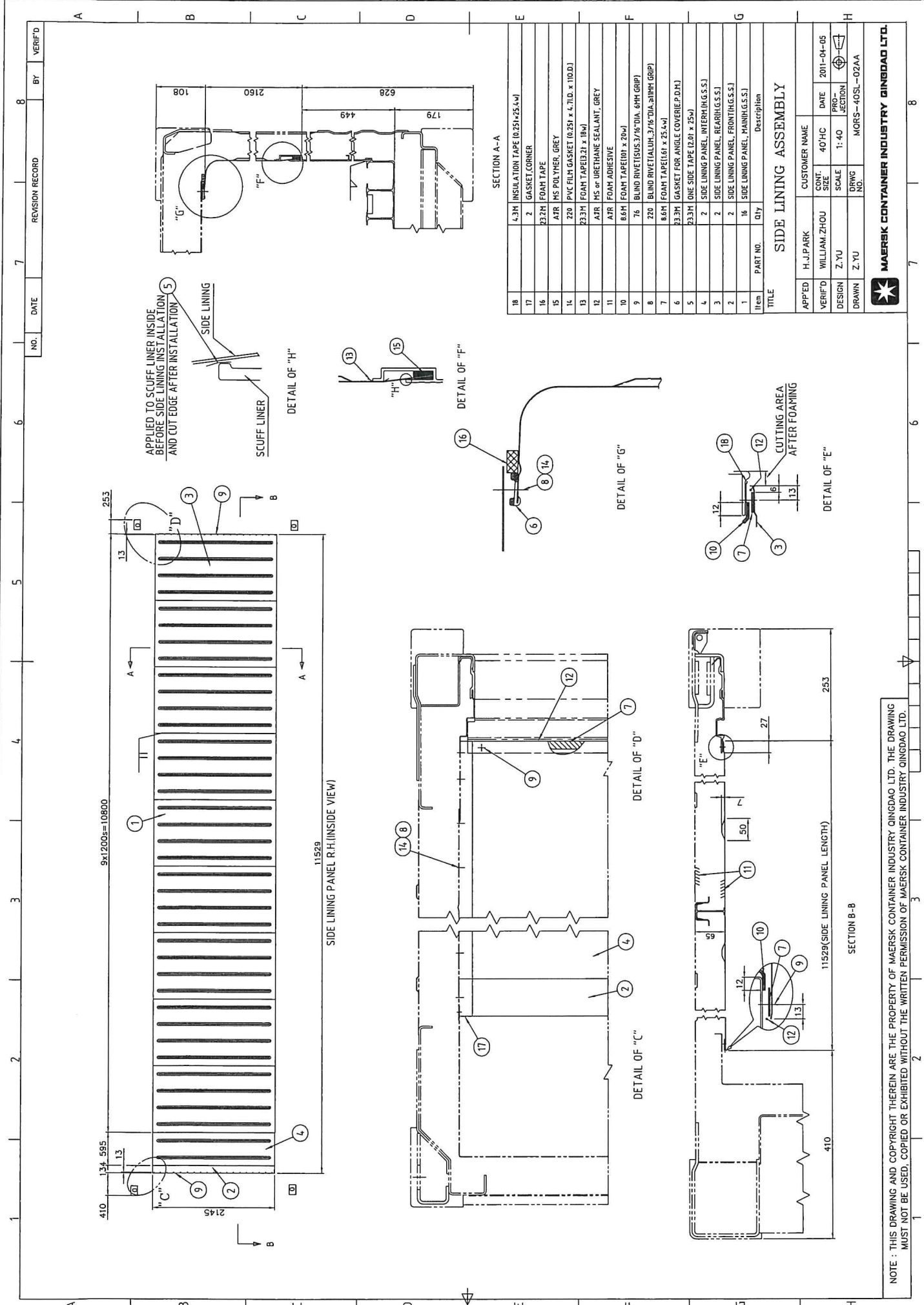
176.2



Item	Part No.	Qty	Description
18			4 SIDE POST C (1.6t, SPA-H)
17			A/R MS or URETHANE SEALANT, WHITE
16			14 SIDE STRINGER SHORT B (PVC)
15			12 SIDE STRINGER SHORT A (PVC)
14			12 BLIND RIVET (SUS. 1/4" DIA.)
13			6 SIDE POST B (1.6t, SPA-H)
12			A/R FOAM ADHESIVE
11			20 TLR. RIVET (BARK-BW04)
10			4 FOAM PLUG (RUBBER)
9			20 FOAM PLUG
8			2 SIDE POST A (1.6t, SPA-H)
7			2 SIDE PROTECTOR, FRONT
6			2 BOTTOM SIDE RAIL UPPER (3.0t, SPA-H)
5			16 TOP SIDE RAIL GUSSET
4			2 TOP SIDE RAIL (1.0t, SPA-H)
3			4 SIDE PANEL, INTERM. (0.8t, M.G.S.S.)
2			4 SIDE PANEL, END (1.2t, M.G.S.S.)
1			14 SIDE PANEL, MAIN (0.8t, M.G.S.S.)

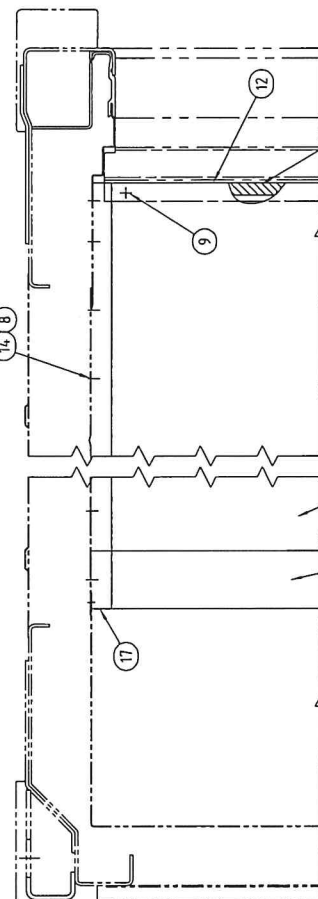
TITLE		SIDE WALL ASSEMBLY	
APPROVED	H. J. PARK	CUSTOMER NAME	
VERIFIED	JIM ZHANG	CONT. SIZE	40' HC
DESIGN	Q. YANG	SCALE	1:40
DRAWN	Q. YANG	DRWG NO.	MORS-40SP-02AB
		DATE	2011-04-26
		REV. SECTION	

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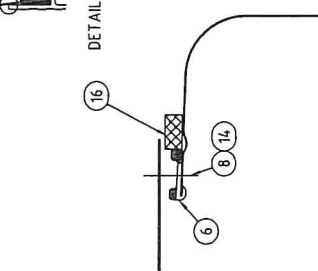


SIDE LINING PANEL R.H. (INSIDE VIEW)

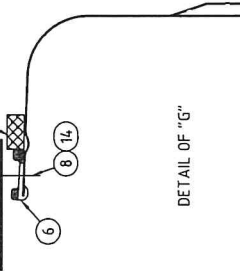
11529



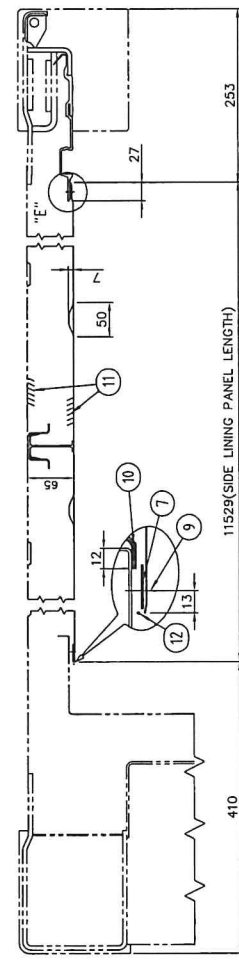
DETAIL OF "C"



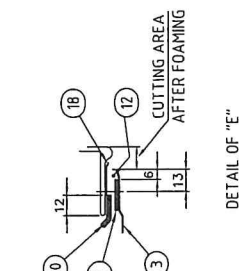
DETAIL OF "D"



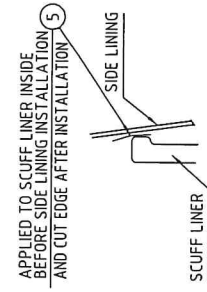
DETAIL OF "E"



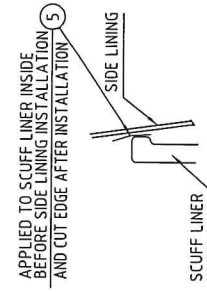
DETAIL OF "F"



DETAIL OF "G"



DETAIL OF "H"

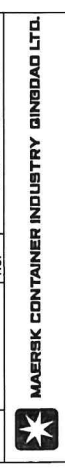


SECTION A-A

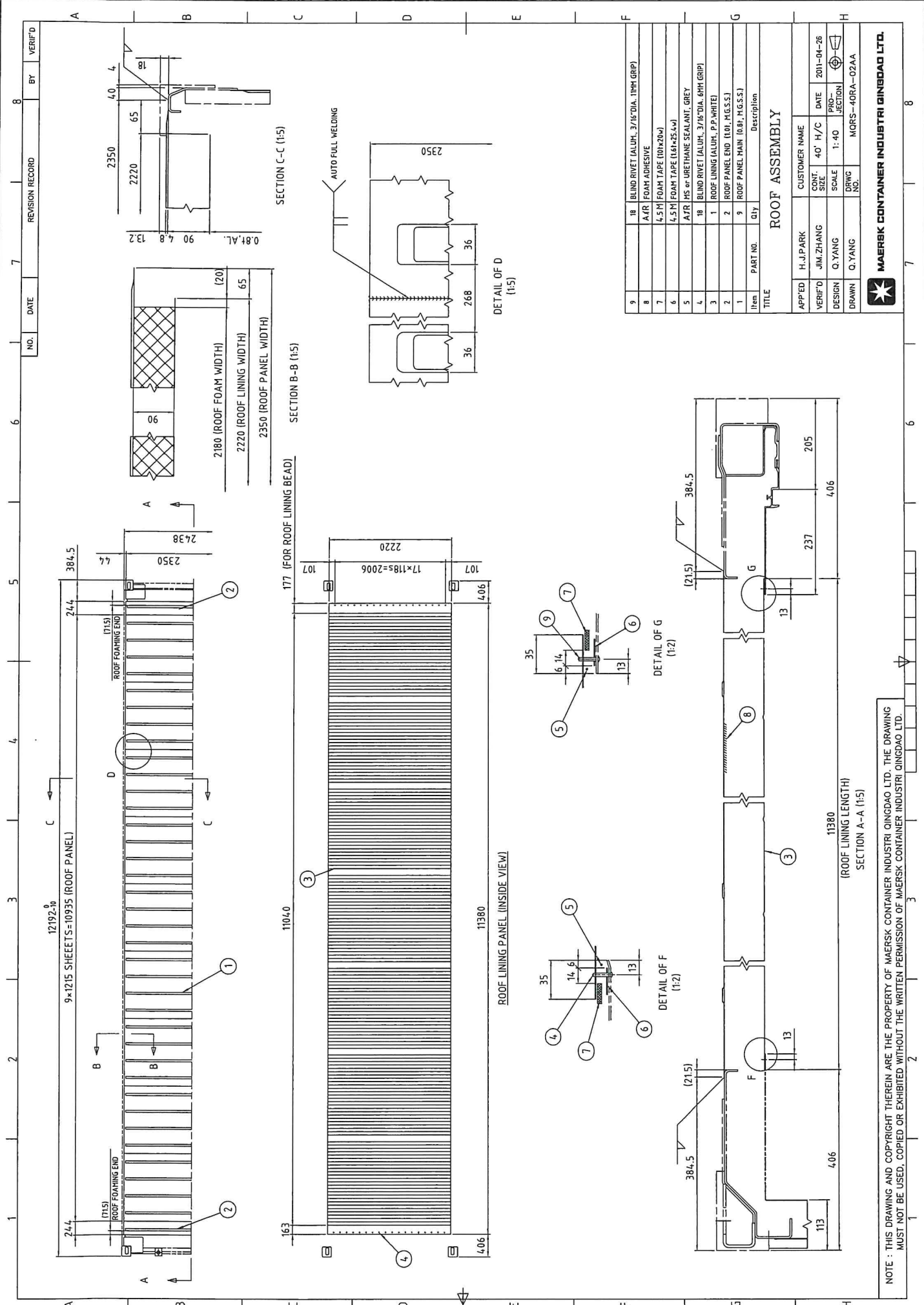
Item	Part No.	Qty	Description
18	4.3H	1	INSULATION TAPE (0.251 x 25.4w)
17	2	1	GASKET CORNER
16	232H	1	FOAM TAPE
15	4R	1	MS POLYMER, GREY
14	220	1	PVC FILM GASKET (0.251 x 4.710. x 110.D.)
13	233H	1	FOAM TAPE(21 x 18w)
12	4R	1	MS or URETHANE SEALANT, GREY
11	4R	1	FOAM ADHESIVE
10	8.6H	1	FOAM TAPE(101 x 20w)
9	76	1	BLIND RIVET(SUS.3/16" DIA. 6MM GRIP)
8	220	1	BLIND RIVET(ALUM.3/16" DIA. 6MM GRIP)
7	8.6H	1	FOAM TAPE(161 x 23.4w)
6	233H	1	GASKET FOR ANGLE COVERIE.P.D11
5	233H	1	ONE SIDE TAPE (2.01 x 25w)
4	2	1	SIDE LINING PANEL, INTERM.(H.G.S.S.)
3	2	1	SIDE LINING PANEL, REAR(H.G.S.S.)
2	2	1	SIDE LINING PANEL, FRONT(H.G.S.S.)
1	16	1	SIDE LINING PANEL, MAIN(H.G.S.S.)

SIDE LINING ASSEMBLY

APPROVED		H-J.PARK		CUSTOMER NAME	
VERIFIED	WILLIAM.ZHOU	CONT. SIZE	40HC	DATE	2011-04-05
DESIGN	Z.YU	SCALE	1:40	PROJECTION	1st ANGLE
DRAWN	Z.YU	DWG. NO.	MORS-40SL-02AA		



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NO.	DATE	REVISION RECORD	BY	VERIFD

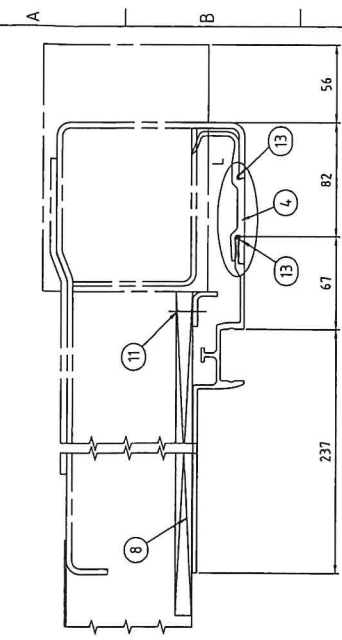
Item	Part No.	Qty	Description
9	18		BLIND RIVET (ALUM., 3/16" DIA., 1MM GRIP)
8	A/P/		FOAM ADHESIVE
7	4.5 M		FOAM TAPE (101x20x)
6	4.5 M		FOAM TAPE (161x25.4x)
5	A/P/		MS or URETHANE SEALANT, GREY
4	18		BLIND RIVET (ALUM., 3/16" DIA., 6MM GRIP)
3	1		ROOF Lining (ALUM., P.P. WHITE)
2	2		ROOF PANEL END (101, M.G.S.S.)
1	9		ROOF PANEL MAIN (101, M.G.S.S.)

TITLE			
ROOF ASSEMBLY			
APPRD	H. J. PARK	CUSTOMER NAME	
VERIFD	JIM ZHANG	CONT. SIZE	40' H/C
DESIGN	Q. YANG	SCALE	1:40
DRAWN	Q. YANG	DRWG. NO.	MORS-40RA-02AA
		DATE	2011-04-26
		PRO. SECTION	

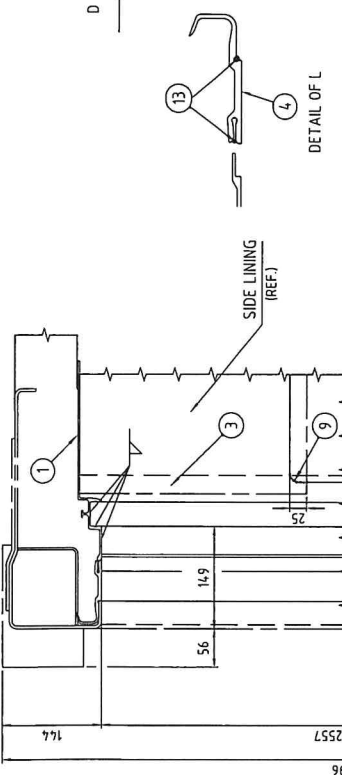
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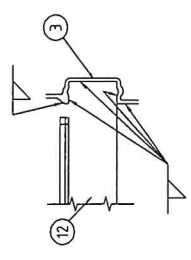
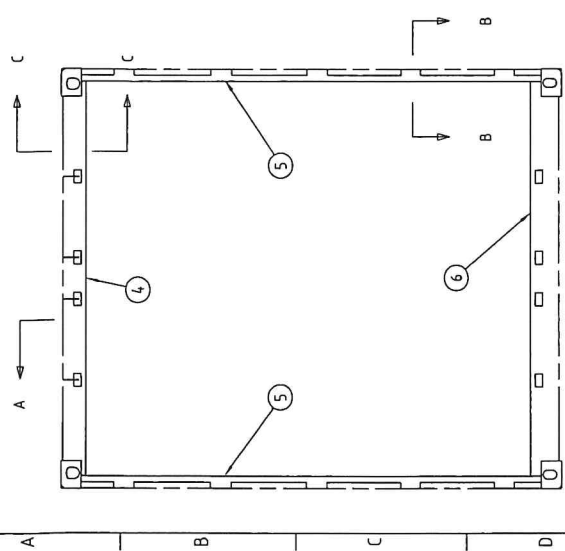
MAERSK CONTAINER INDUSTRI QINGDAO LTD.



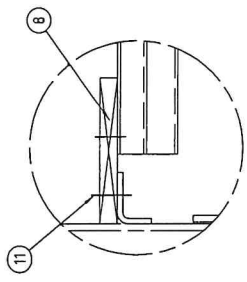
SECTION C-C (1:2.5)



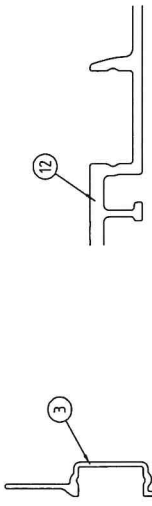
SECTION A-A (1:5)



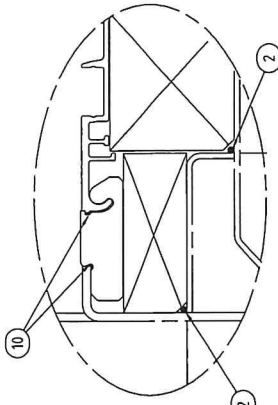
DETAIL OF J



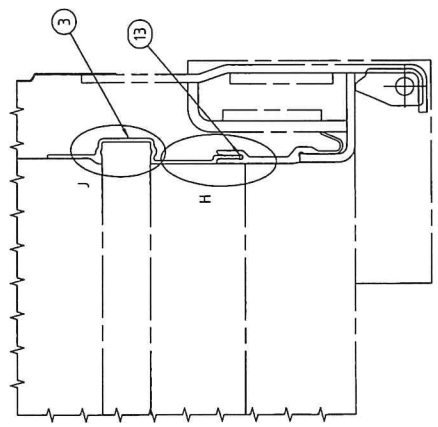
VIEW OF D (1:2)



DETAIL OF G



DETAIL OF E (1:10)



DETAIL OF H (TYP.)

(REAR JAMB SILL & BLOCK LENGTH)

Item	Part No.	Qty	Description
15	1		T-BOARD PROTECTOR (ALUM)
14	1		REAR SILL FILLER "B"
13	A/R		MS or URETHANE SEALANT, WHITE
12	1		REAR SILL GUTTER (ALUM)
11	6		DRIVE SCREW
10	A/R		TEROSTAT 937 SEALANT OR EQUIVALENT, WHITE
9	A/R		MS POLYMER, GREY
8	2		ROOF SEAL VENEER
7	1		JAMB SILL FILLER "A"
6	2		REAR JAMB BLOCK (P.V.C.)
5	1		REAR JAMB POST (P.V.C.)
4	1		REAR JAMB HEADER (P.V.C.)
3	2		LINING SUPPORT (ALUM)
2	A/R		BUTYL SEALANT, GREY
1	1		REAR TOP ANGLE (ALUM)

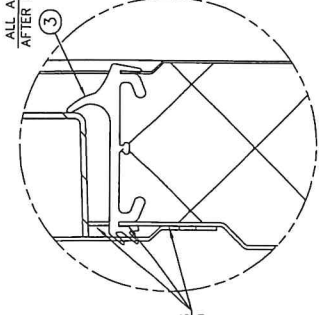
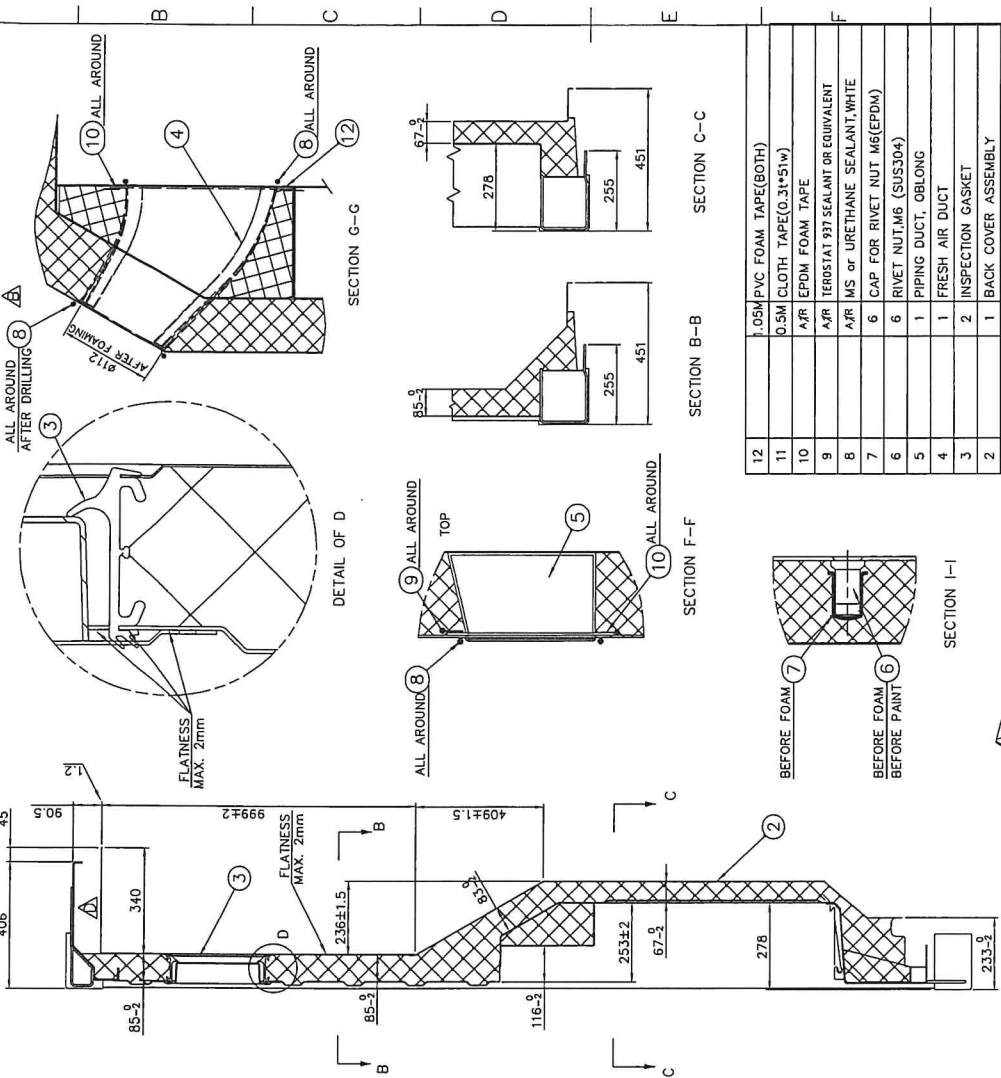
TITLE
REAR JAMB ASSEMBLY
(WITHOUT CA SYSTEM)

APPR'D	H.J.PARK	CUSTOMER NAME	DATE
VERIF'D	JIM ZHANG	40/HC	2011-04-26
DESIGN	Q. YANG	SCALE	1:2
DRAWN	Q. YANG	DRWG NO.	MORS-40RJ-04AA

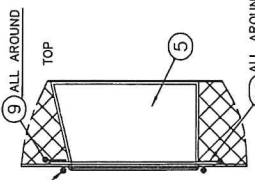


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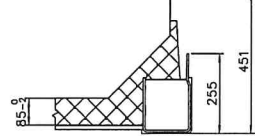
NO.	DATE	REVISION RECORD	BY	VERIF'D
B	20120320	CANCEL SEALANT ON FRESH AIR DUCT	Y.SU	H.J.PARK
D	20120820	CANCEL FOAM AT TOP AREA	J.YU	H.J.PARK



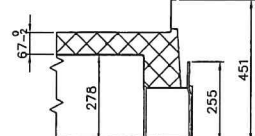
SECTION G-G



SECTION F-F



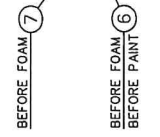
SECTION B-B



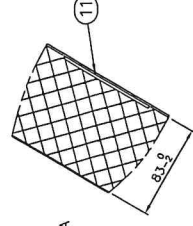
SECTION C-C



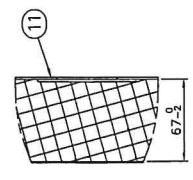
SECTION I-I



SECTION J-J



SECTION A-A



SECTION E-E

Item	PART NO.	Qty	Description
12			1.05MPVC FOAM TAPE(BOTH)
11			0.5M CLOTH TAPE(0.31*51W)
10			4*8 EPDM FOAM TAPE
9			4*8 TEROSTAT 937 SEALANT OR EQUIVALENT
8			4*8 MS or URETHANE SEALANT,WHITE
7			6 CAP FOR RIVET NUT M6(EFDM)
6			1 RIVET NUT,M6 (SU304)
5			1 PIPING DUCT, OBLONG
4			1 FRESH AIR DUCT
3			2 INSPECTION GASKET
2			1 BACK COVER ASSEMBLY
1			1 INTEGRATED FRONT ASSEMBLY

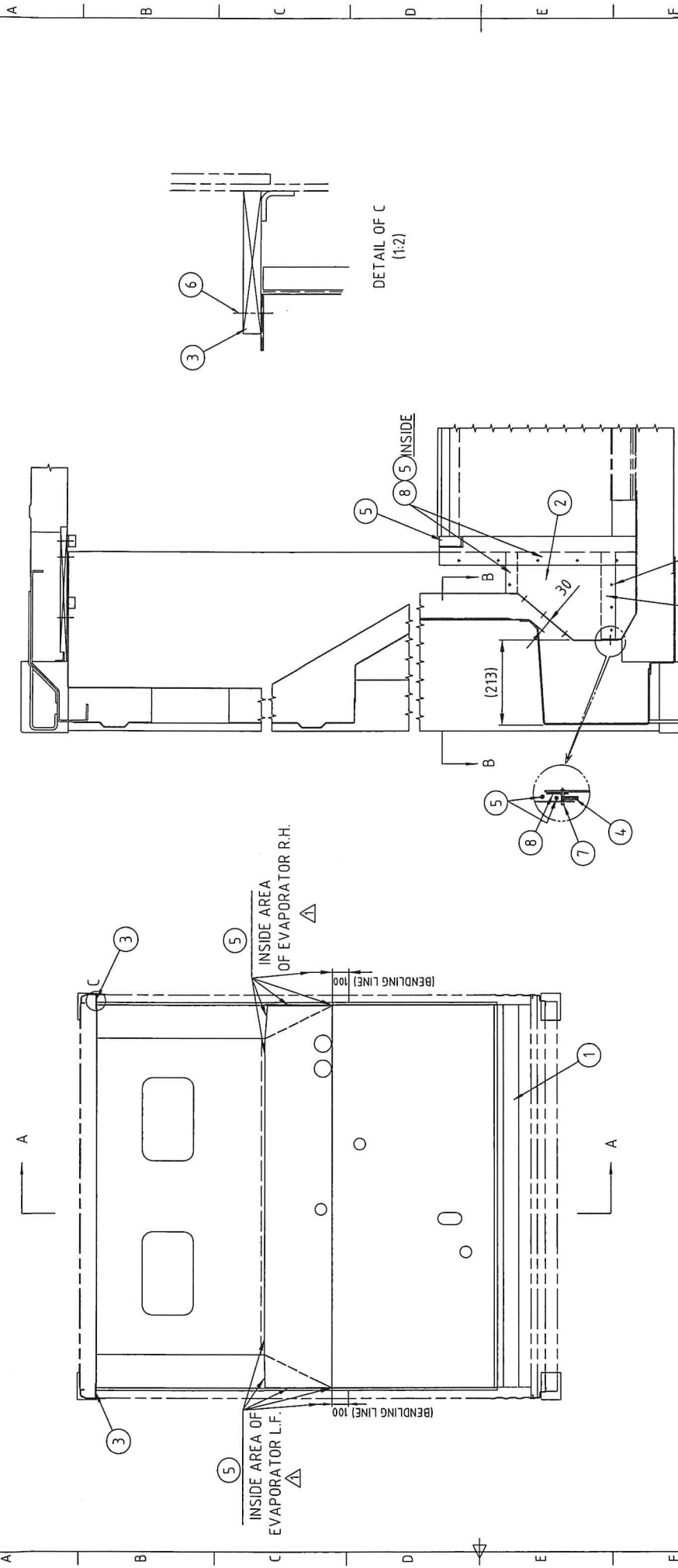
TITLE
INTEGRATED FRONT FOAM ASSEMBLY

APPE'D	H.J.PARK	CUSTOMER NAME
VERIF'D	JIM ZHANG	CONT. SIZE 40' HC
DESIGN	Q.YANG	SCALE 1:1
DRAWN	Q.YANG	DRWG NO.
		MORS-40IF-01AD



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NO.	DATE	REVISION RECORD	BY	VERIF'D
1	2010920	ADD SEALANT	Q. YANG	Y. SU



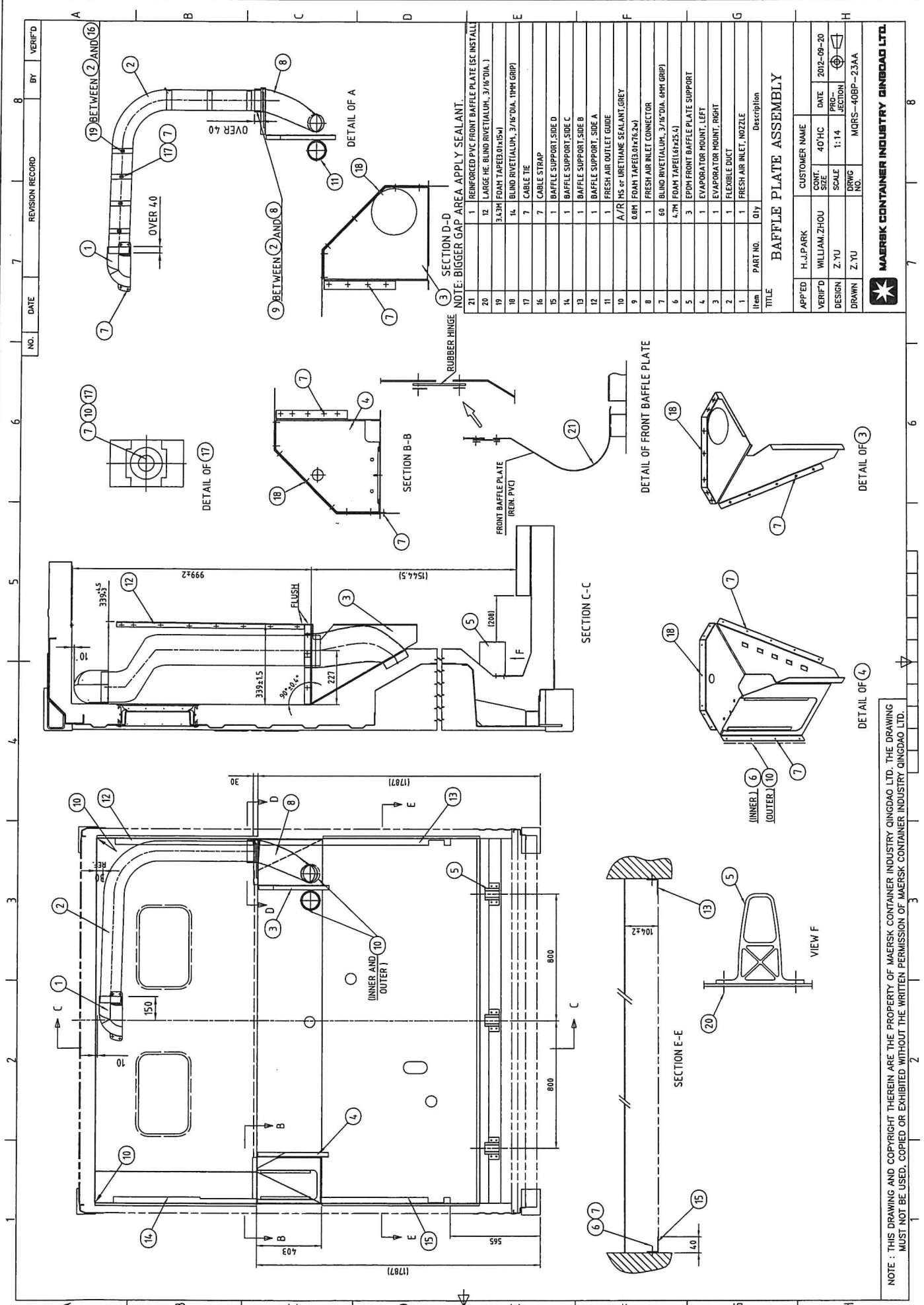
Item	Part No.	Qty	Description
8			FOAM TAPE (L61x25.4w)
7			BLIND RIVET (ALUM., 3/16" DIA., 1MM GRIP)
6			DRIVE SCREW (3/16" DIA.)
5			A/R MS or URETHANE SEALANT GREY
4			FOAM TAPE (100x20w)
3			SEAL VENEER FRONT (DPIPE)
2			FRONT BOTTOM PATCH PLATE
1			BACK COVER, BOTTOM

TITLE
FRONT LINING ASSEMBLY

APPR'D	H.J.PARK	CUSTOMER NAME	
VERIF'D	JIM ZHANG	CNVT. SIZE	40' HC
DESIGN	Q. YANG	SCALE	1:20
DRAWN	Q. YANG	DRWG. NO.	MORS-40FL-02AC
		DATE	2011-03-25
		PRO-JECTION	☉



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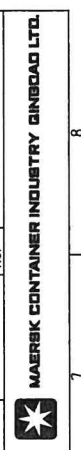
NO.	DATE	REVISION RECORD	BY	VERIFIED
7				
8				

SECTION D-D
NOTE: BIGGER GAP AREA APPLY SEALANT.

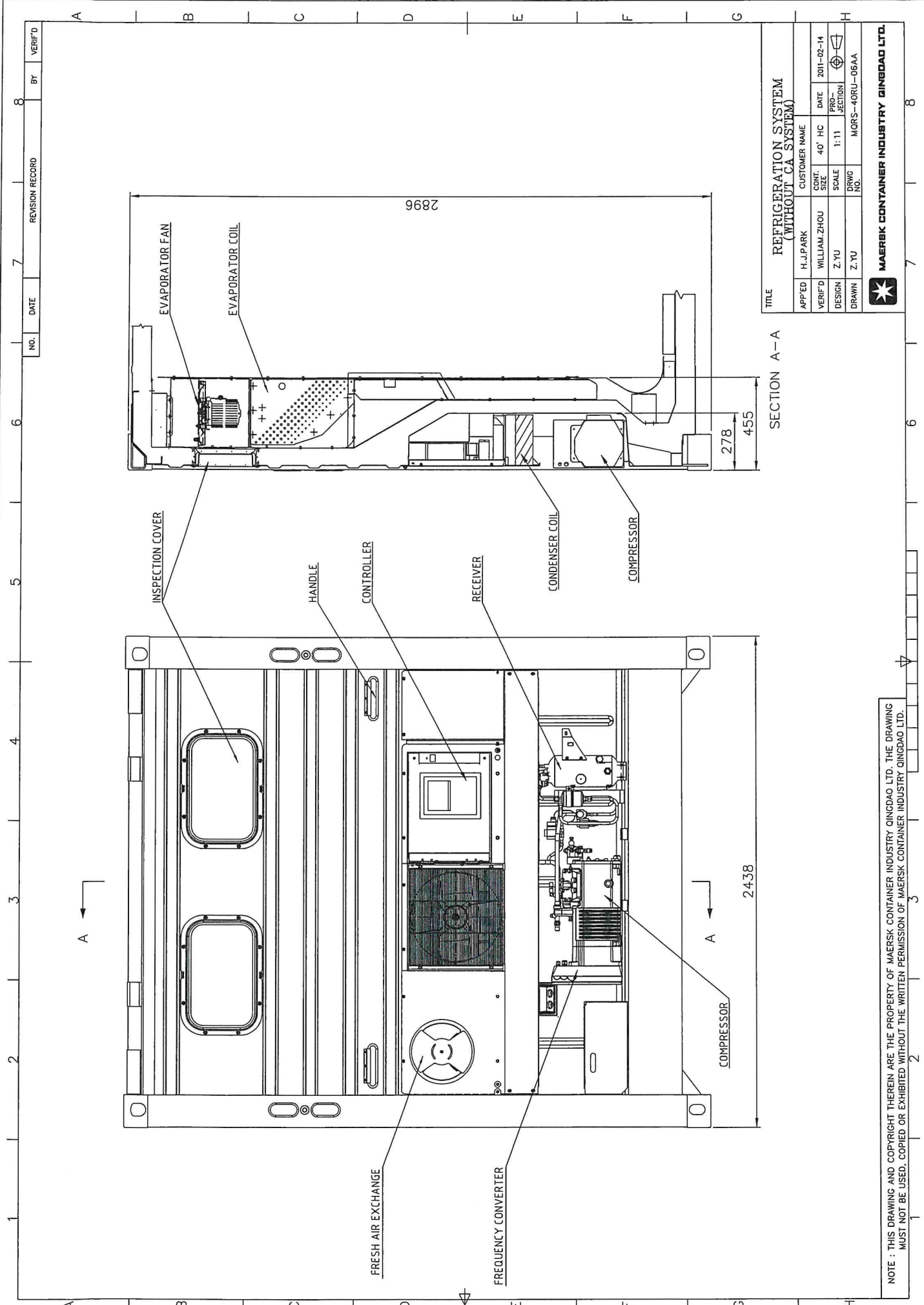
Item	Part No.	Qty	Description
21		1	REINFORCED PVC FRONT BAFFLE PLATE (SEE INSTALL)
20		12	LARGE HE BLIND RIVETALUM, 3/16" DIA.)
19		3	3.43M FOAM TAPE(0.1x15W)
18		14	BLIND RIVETALUM, 3/16" DIA, 19MM GRIP)
17		7	CABLE TIE
16		7	CABLE STRAP
15		1	BAFFLE SUPPORT, SIDE D
14		1	BAFFLE SUPPORT, SIDE C
13		1	BAFFLE SUPPORT, SIDE B
12		1	BAFFLE SUPPORT, SIDE A
11		1	FRESH AIR OUTLET GUIDE
10		1	A/R HS OF URETHANE SEALANT, GREY
9		0.8M	FOAM TAPE(0.1x7x2.4)
8		1	FRESH AIR INLET CONNECTOR
7		60	BLIND RIVETALUM, 3/16" DIA, 6MM GRIP)
6		4	7MM FOAM TAPE(1.6x25.4)
5		3	EPDM FRONT BAFFLE PLATE SUPPORT
4		1	EVAPORATOR MOUNT, LEFT
3		1	EVAPORATOR MOUNT, RIGHT
2		1	FLEXIBLE DUCT
1		1	FRESH AIR INLET, NOZZLE

BAFFLE PLATE ASSEMBLY

APPROVED	H.J.PARK	CUSTOMER NAME	CONT. SIZE	DATE
VERIFIED	WILLIAM.ZHOU	40 HC	2012-09-20	
DESIGN	Z.YU	SCALE	1:14	PRO-SECTION
DRAWN	Z.YU	DRWG NO.	MQRS-40SP-23AA	



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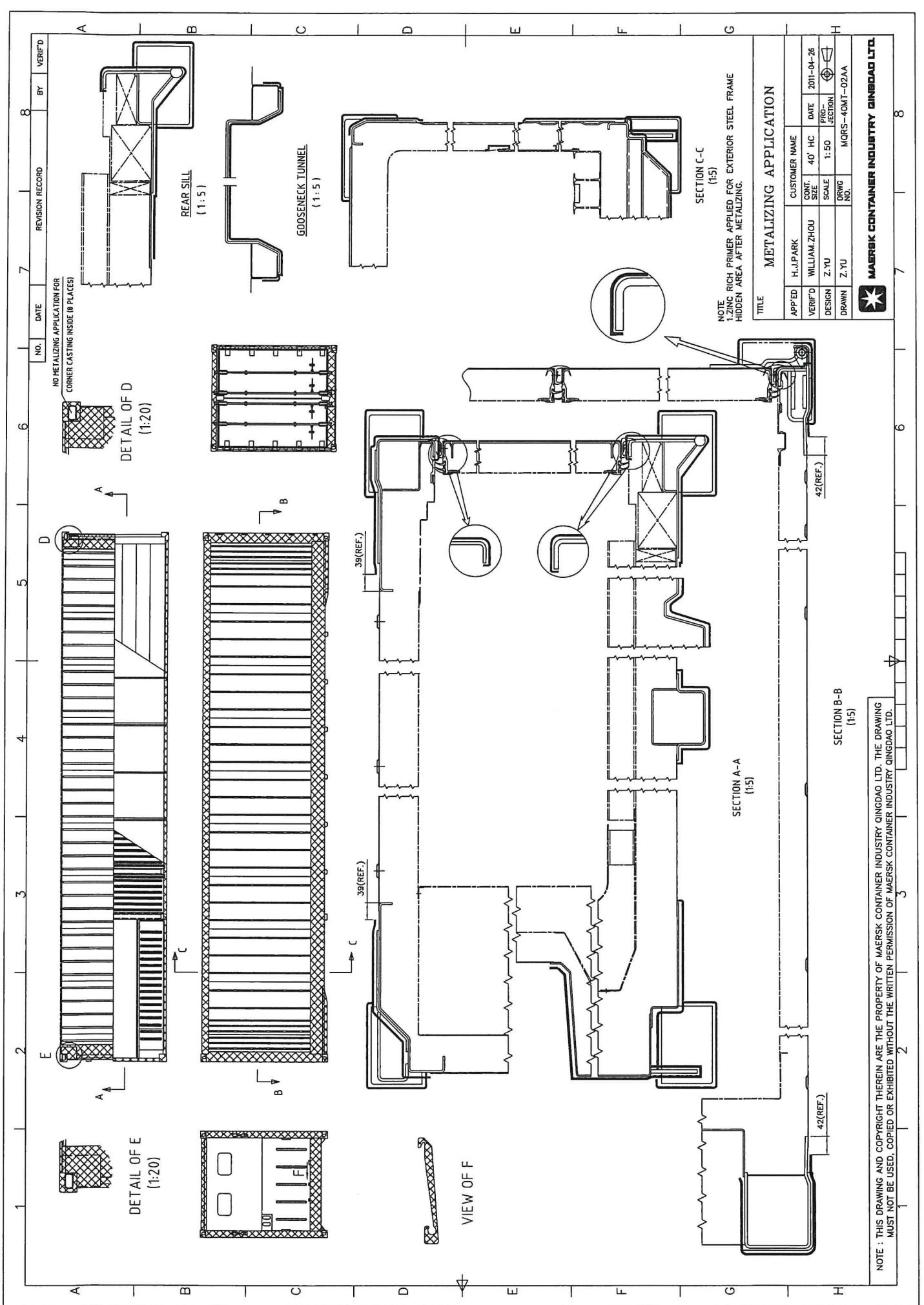


SECTION A-A

TITLE		REFRIGERATION SYSTEM (WITHOUT C.A. SYSTEM)	
APP'D	H. J. PARK	CUSTOMER NAME	
VERIF'D	WILLIAM ZHOU	CONT. SIZE	40' HC
DESIGN	Z. YU	SCALE	1:11
DRAWN	Z. YU	DRWG. NO.	MORS-40RU-06AA
		DATE	2011-02-14
		PRO. SECTION	



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NO.	DATE	REVISION RECORD	BY	VERIF'D

NOTE: ZINC RICH PRIMER APPLIED FOR EXTERIOR STEEL FRAME HIDDEN AREA AFTER METALIZING.

TITLE METALIZING APPLICATION

APPR'D	H.J.PARK	CUSTOMER NAME
VERIF'D	WILLIAM.ZHOU	CONT. SIZE 40' HC
DESIGN	Z.YU	SCALE 1:50
DRAWN	Z.YU	DRWG NO. MORS-40MT-02AA
		DATE 2011-04-26
		PROJ. NO.



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