



**GERIJ  
FOUNDED IN 2003**



**APR PROJECTS  
STRUCTURAL SPECIALISTS**



**MAX PROJECTS  
STORAGE TANK SPECIALISTS**

The logo features a stylized white graphic on the left that resembles a tank or a cylindrical container with a curved top and bottom edge. To the right of this graphic, the word "MAXWELL" is written in a large, bold, white, sans-serif font. Below "MAXWELL", the words "CONTINENTAL TANKSERV" are written in a smaller, bold, white, sans-serif font.

**MAXWELL**  
**CONTINENTAL TANKSERV**

## ➤ The story of Max Steineke his Well no.7 ...

Max Steineke was a prominent American petroleum geologist.

- His efforts, and persistence through repeated setbacks, led to the first discovery of oil in commercial quantities in Saudi Arabia...
- In December 1936, a "deep test", No. 7, was begun at the urging of Steineke, who wished to test the deeper porous limestone "Arab Zone" underlying impervious anhydrite...
- In early 1938, Steineke was called back to San Francisco to "pull the plug" on Saudi Arabian exploration...
- Steineke convinced his managers to at least wait for the results from Dammam #7, which was still drilling at a slow pace...
- During the first week of March 1938, at a depth of 1440 meters, Dammam No. 7 started producing at commercial quantities
- What Steineke had discovered was the huge Abqaiq field, and King Abdulaziz named Well No. 7 the **Prosperity Well**.



maxwelltanks.com



## Company

Founded in 2003

Continues growing global presence





## Offices

### Head Office

The Netherlands

### Representative Offices

Colombia

Singapore

Kazakhstan

Gabon

South Africa



[maxwelltanks.com](http://maxwelltanks.com)



## Factory

**The Netherlands**  
**Turkey (free zone)**

(Opening end of 2022)

**Singapore**  
**India**



## ➤ Maxwell Continental Tank Serv Engineering

"The Services Provider" you are looking for...

- Services
- Products



Engineering Service



Inspection Service

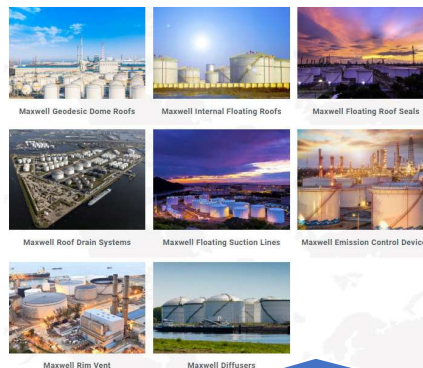


Technical Advising



Installation Service

Services



Products

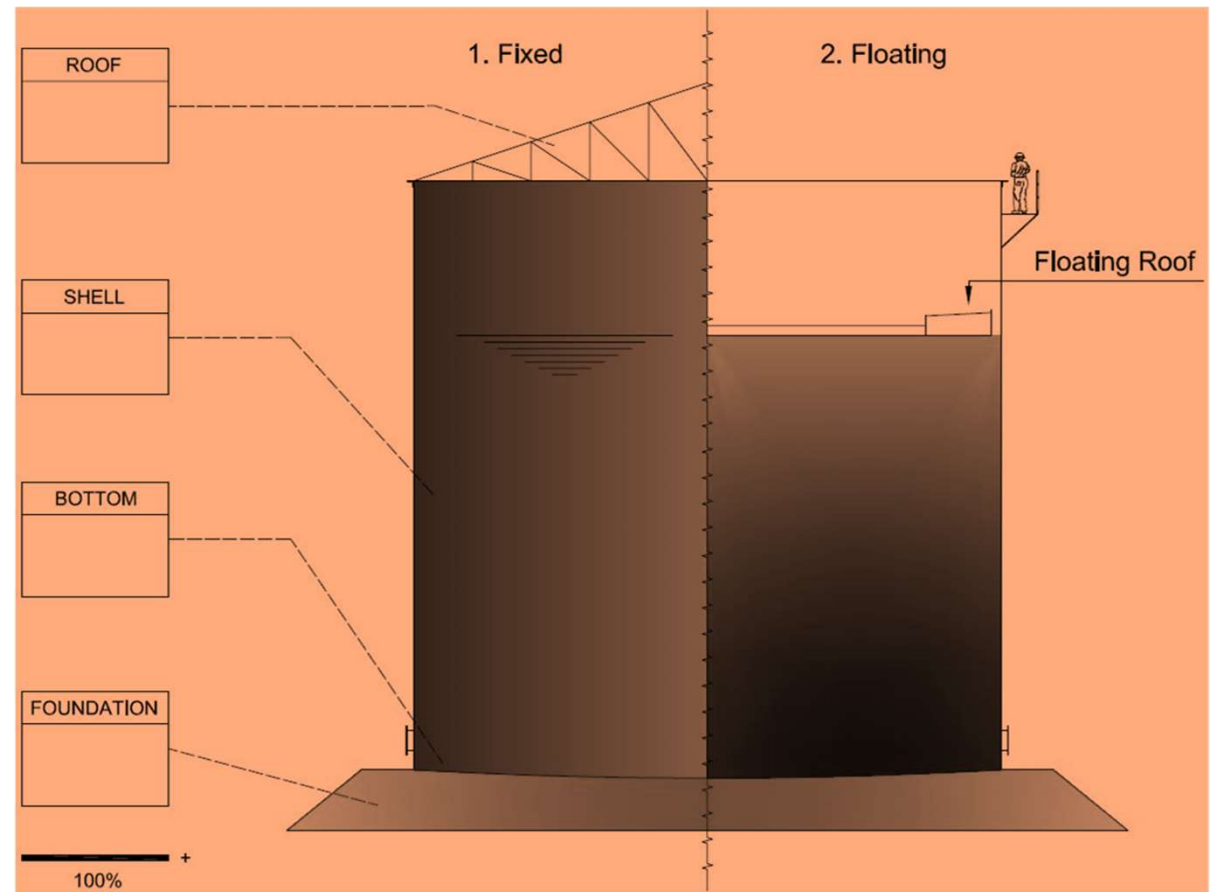


VCA\*\* certified



## Services

- Based on knowledge

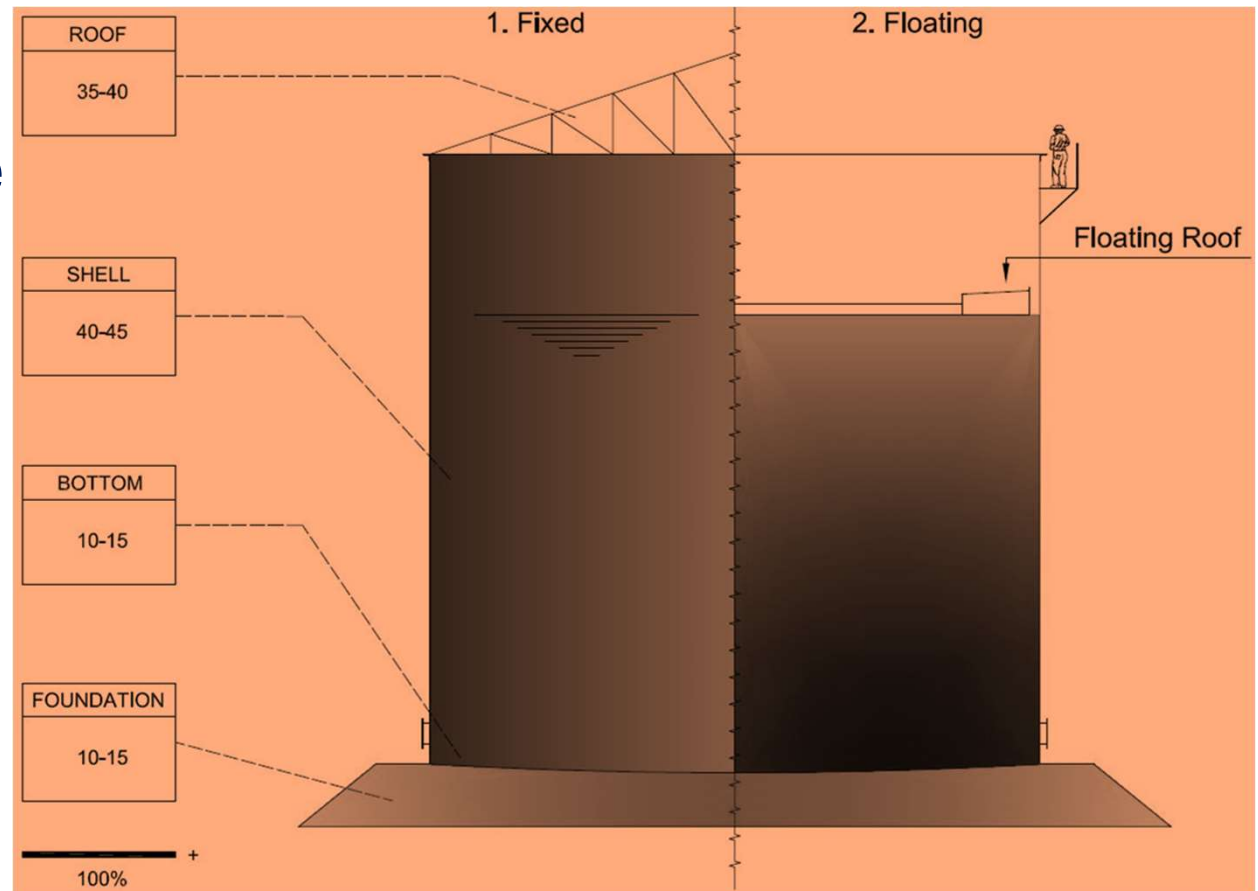






## Services

- Based on knowledge





## Services

- Based on knowledge

Tank			ID = 24,384m / 80'	
Roof	35%	40%	€ 217.000,00	€ 250.000,00
Shell	40%	45%	€ 250.000,00	€ 282.000,00
Bottom	10%	15%	€ 62.000,00	€ 93.000,00
Foundation	10%	15%	€ 62.000,00	€ 93.000,00

Tank			ID = 43.891m / 144'	
Roof	35%	40%	€ 706.000,00	€ 807.000,00
Shell	40%	45%	€ 807.000,00	€ 908.000,00
Bottom	10%	15%	€ 201.000,00	€ 301.500,00
Foundation	10%	15%	€ 201.000,00	€ 301.500,00

Tank			ID = 76.200m / 250'	
Roof	35%	40%	€ 2.128.000,00	€ 2.433.000,00
Shell	40%	45%	€ 2.433.000,00	€ 2.738.000,00
Bottom	10%	15%	€ 608.000,00	€ 912.000,00
Foundation	10%	15%	€ 608.000,00	€ 912.000,00

Tank			ID = 30,485m / 100'	
Roof	35%	40%	€ 340.000,00	€ 390.000,00
Shell	40%	45%	€ 390.000,00	€ 439.000,00
Bottom	10%	15%	€ 97.000,00	€ 145.500,00
Foundation	10%	15%	€ 97.000,00	€ 145.500,00

Tank			ID = 48.768m / 160'	
Roof	35%	40%	€ 871.000,00	€ 997.000,00
Shell	40%	45%	€ 997.000,00	€ 1.122.000,00
Bottom	10%	15%	€ 249.000,00	€ 373.500,00
Foundation	10%	15%	€ 249.000,00	€ 373.500,00

Tank			ID = 83.820m / 275'	
Roof	35%	40%	€ 2.575.000,00	€ 2.943.000,00
Shell	40%	45%	€ 2.943.000,00	€ 3.311.000,00
Bottom	10%	15%	€ 735.000,00	€ 1.102.500,00
Foundation	10%	15%	€ 735.000,00	€ 1.102.500,00

Tank			ID = 32.004m / 105'	
Roof	35%	40%	€ 375.000,00	€ 430.000,00
Shell	40%	45%	€ 430.000,00	€ 484.000,00
Bottom	10%	15%	€ 107.000,00	€ 160.500,00
Foundation	10%	15%	€ 107.000,00	€ 160.500,00

Tank			ID = 54.864m / 180'	
Roof	35%	40%	€ 1.103.000,00	€ 1.261.000,00
Shell	40%	45%	€ 1.261.000,00	€ 1.419.000,00
Bottom	10%	15%	€ 315.000,00	€ 472.500,00
Foundation	10%	15%	€ 315.000,00	€ 472.500,00

Tank			ID = 88.392m / 290'	
Roof	35%	40%	€ 2.863.000,00	€ 3.273.000,00
Shell	40%	45%	€ 3.273.000,00	€ 3.683.000,00
Bottom	10%	15%	€ 818.000,00	€ 1.227.000,00
Foundation	10%	15%	€ 818.000,00	€ 1.227.000,00

Tank			ID = 35.966m / 118'	
Roof	35%	40%	€ 474.000,00	€ 542.000,00
Shell	40%	45%	€ 542.000,00	€ 610.000,00
Bottom	10%	15%	€ 135.000,00	€ 202.500,00
Foundation	10%	15%	€ 135.000,00	€ 202.500,00

Tank			ID = 60.960m / 200'	
Roof	35%	40%	€ 1.362.000,00	€ 1.557.000,00
Shell	40%	45%	€ 1.557.000,00	€ 1.752.000,00
Bottom	10%	15%	€ 389.000,00	€ 583.500,00
Foundation	10%	15%	€ 389.000,00	€ 583.500,00



## Design

### Policies (law)

- EC-CODES
- PGS 29



### Int./Reg. Standard (quality)

- ISO (International)
- CEN – EN 14015 ( Europe)



### Nat. Standard

- ANSI (USA)
- BS 2654 (England)
- DIN 4119 Part 1,2 (Germany)
- Codap / Codres (French)



### Guide Lines (Non-Mandatory)

- API 620 and API 650 (USA)
- NFPA-11 (USA)





## Products

Aluminium Geodesic Dome Roofs  
 Internal Floating Roofs  
 External Floating Roofs  
 Floating Roof Rim Seals  
 Rim seal Accessories  
 Drain Systems  
 Floating Suction & Oil Skimmers  
 Gauge Pole Pipe & Leg Seals  
 Rim Vents  
 Tank Inlet Diffusers



"ADVANCED ENGINEERED TANK TECHNOLOGIES"



### MAXWELL products

001-0PRT V2203

#### DOMED FLOATING ROOF TANK

##### All Geodesic Dome Roofs

- Air Flat Cover
- Wastewater Treatment Plant
- Oil Separating Basin

#### INTERNAL FLOATING ROOFS (IFR)

##### Full Contact

- MFC BOX
- MFC HEX
- MFC GSP
- MFC Open Deck

##### Non-Contact

- MSP-Aluminium
- MSP-Hybrid
- MSP-Stainless Steel

#### FLOATING ROOF RIM SEALS

##### EFR

##### Mechanical Shoe Seal

- MRS-1 Primary Scissor Shoe Seal
- MRS-1 Primary Heavy Duty Mechanical Shoe Seal
- MRS-1 Shell Int. Petr. Mechanical Shoe Seal
- MRS-1 Horton Hanger Weight Shoe Seal
- MRS-1 Wiggins - Safety Shoe Seal
- MRS-12 Secondary Shoe-Mounted Seal
- MRS-3 Primary Spring Plate Shoe Seal

##### Liquid-Mounted Seal

- MRS-5 Primary Liquid Filled Tube Seal
- MRS-7 Primary Foam Filled Seal

##### Vapor-Mounted Seal

- MRS-20P Primary Compression Plate Seal
- MRS-20S Secondary Compression Plate Seal
- MRS-25 Weather Shield

##### IFR

##### Mechanical-Shoe Seal

- MRS-1 Primary Mechanical Shoe Seal
- MRS-3 Primary Spring Plate Shoe Seal

##### Liquid-Mounted Seal

- MRS-7 Primary Foam Filled Seal

##### Vapor-Mounted Seal

- MRS-60 Primary Wiper Seal
- MRS-70 Secondary Wiper Seal

#### RIM SEAL ACCESSORIES

##### Floating Roof centring Positioner Bumpers

##### Integral Foam Dam

- Wax Scrapers
- Independent Mounted
- Integral-Mounted
- Shoe-Mounted

#### INLET DIFFUSERS

- Liquid Inlet Diffusers
- Gas Inlet Diffusers

#### FLOATING ROOF DRAIN SYSTEMS

##### Articulated Pipe Drain Systems

- Pro-Drain Flexible Pivot-Hose Joints (Roof Drain Systems)
- Swivel Joints (Pipe Drain Systems)
- Swing Joints (Pipe Drain Systems)

##### Roof Sump Drain Valves

- Non-Return Roof Sump Valve

##### Flexible Drain Hose Systems

- Composite Drain Hose
- Rubber Drain Hose
- Drain Hose Add-On Parts - Drain Hose Leg Protector Seal
- Drain Hose Add-On Parts - Drain Hose Suspender

##### Spill Stopper

#### FLOATING SUCTIONS AND OIL SKIMMER

##### Floating Suction Systems

- Pro-Drain Pivot Hose Joints
- Swivel Joints
- Swing Joints

##### Oil Skimmer Systems

- Pro-Drain Pivot Hose Joints
- Swivel Joints
- Swing Joints

#### FLOATING SUCTION AND OIL SKIMMER ACCESSORIES

##### Floating Sampling Lines

- Pro-Drain Pivot Hose Joints (Floating Sampling Lines)
- Swivel Joints (Floating Sampling Lines)
- Swing Joints (Floating Sampling Lines)

#### COMMON EMISSIONS CONTROL DEVICES

##### Gauge Pole Pipe Seal

- Gauge Pole Well Seal
- Gauge Pole Pipe Cover

##### Roof Leg Support Seals

- Leg Tube Transition Seal
- Leg Pin Hole Seal
- Leg Sock Seal

#### COMMON EMISSIONS CONTROL DEVICES ACCESSORIES

##### Roof Rim Vents Systems

- PRV Rim Vent
- PVRV Rim Vent

#### PONTOON FLOTATION RECOVERY DEVICES

##### Pontoon

- Inflatable Pontoon Balloon

#### COMMON ACCESSORIES

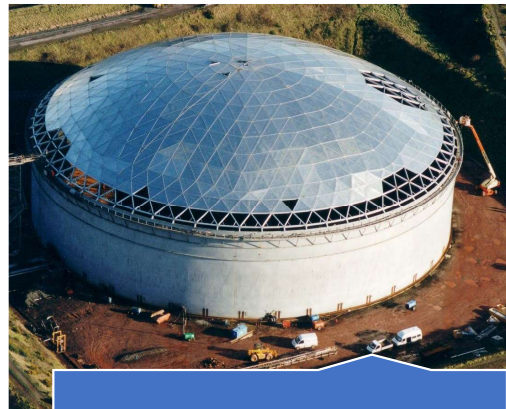
- Retractable Earthing Reel System
- Separation batching pig

## ➤ **Domed Floating Roof Tank**

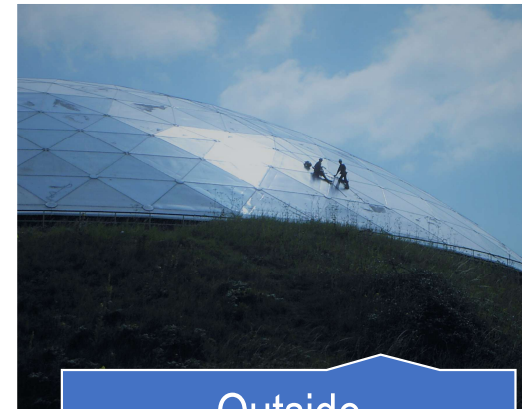
- Alu Geodesic Dome Roofs



Inside



Outside



Outside  
Completion

## ➤ Alu Geodesic Dome Roofs # Features

### Fire Risks

- reduction lightening impact

### VOC emission control

- reduction wind turbulence

### Prevents buoyance issues

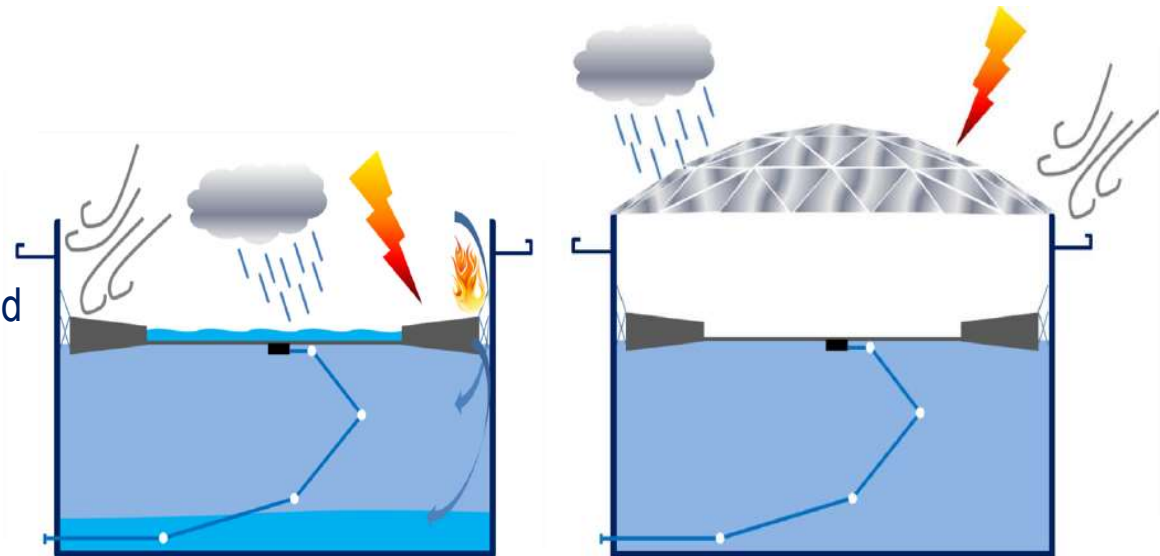
- reduction snow / (rain)water load

### OPEX cost reduction

- corrosion prevention

### Prevents product contamination

- water ingress



(AST) Above ground  
Storage Tank

(DFRT) Domed  
Floating Roof Tank

## ➤ Alu Geodesic Dome Roofs # Features

Sun (heat) radiation

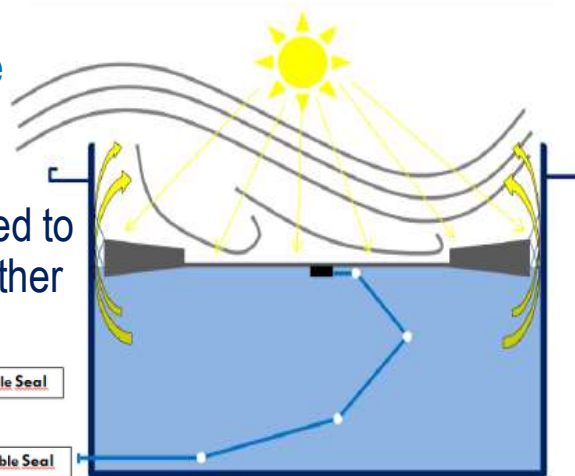
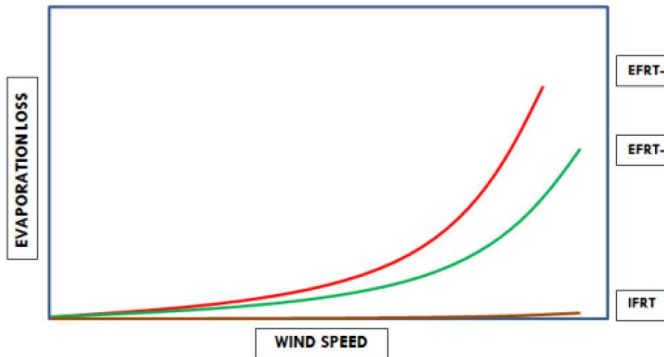
- radiation elimination

Negative wind / under pressure

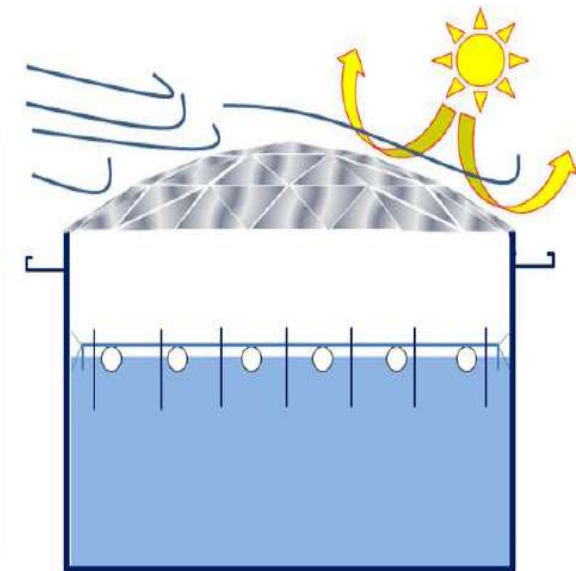
- eliminates emission losses

Loss of tank working capacity

- secondary rim seal not needed to prevent rim from wind and weather

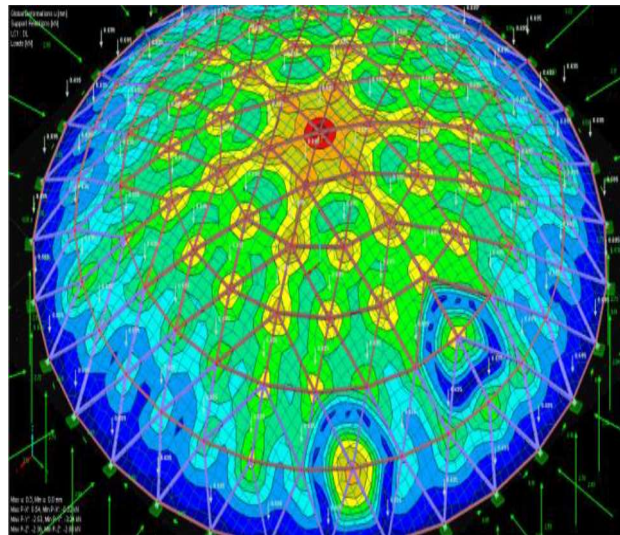
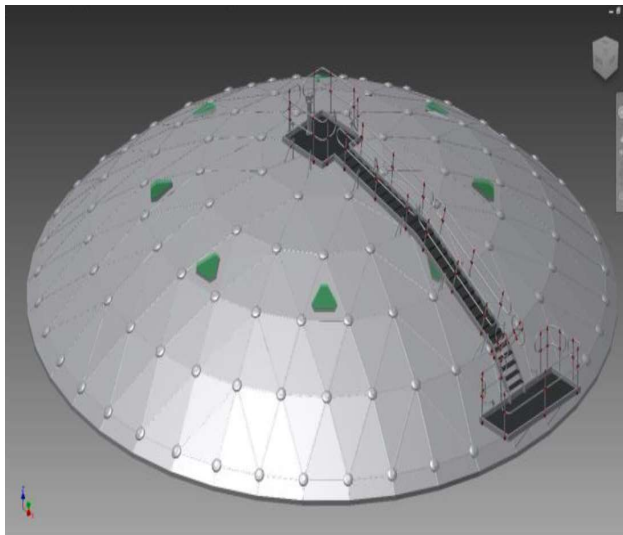


(AST) Above ground Storage Tank



(DFRT) Domed Floating Roof Tank

## ➤ Alu Geodesic Dome Roofs # ADR Design



Alu Geodesic Dome  
Roofs



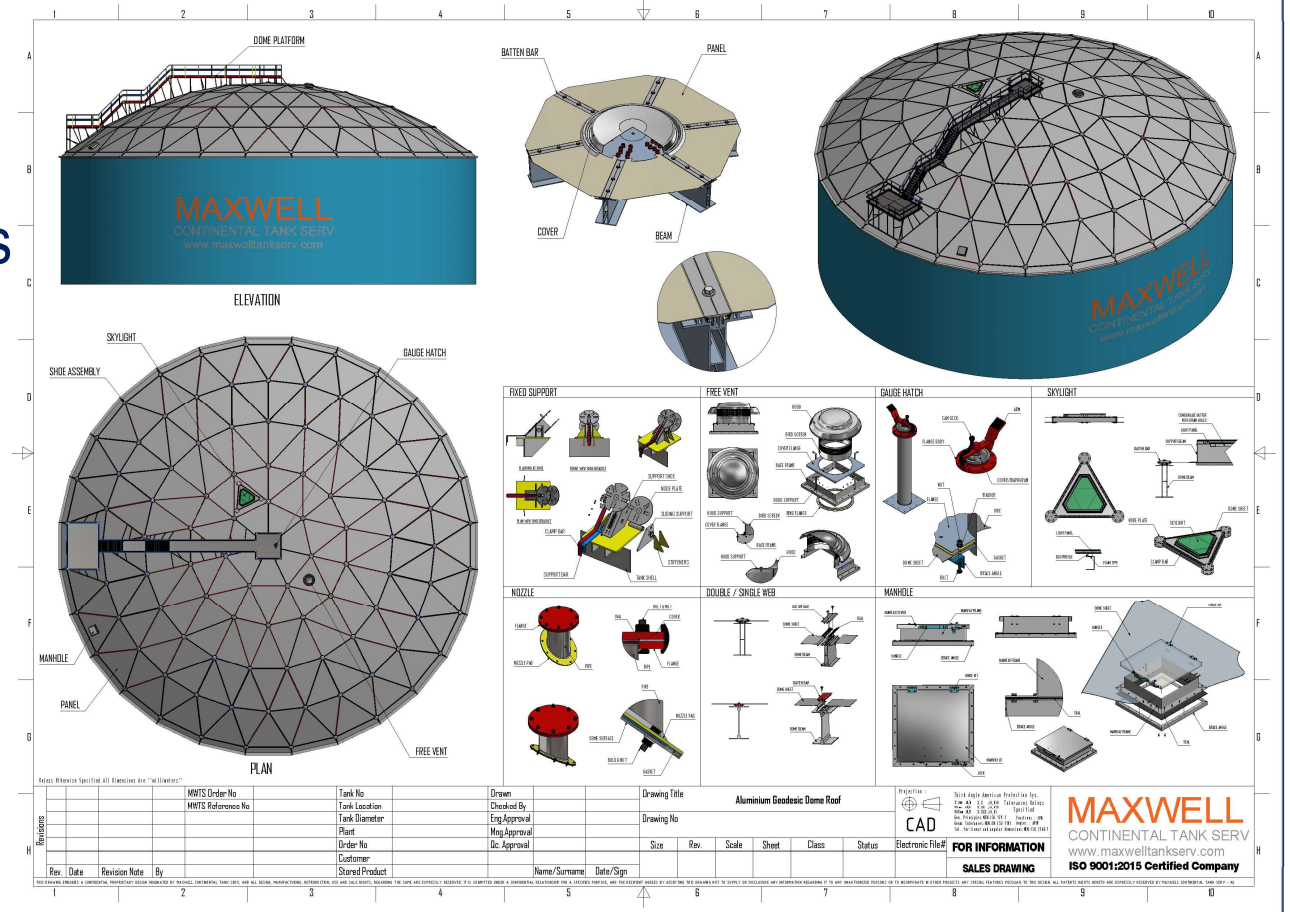


## ADR Design

Own design

Low maintenance costs

Service life 50 years

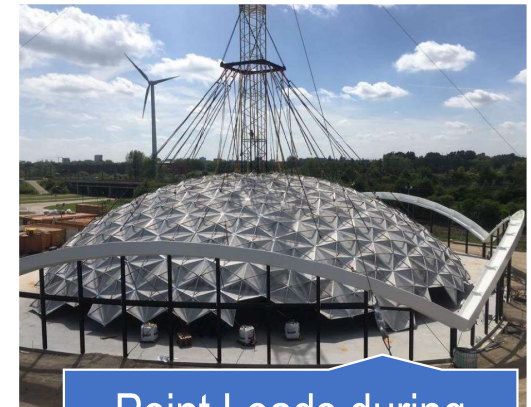


## ➤ Alu Geo Dome Roofs # Design Loads

- Dead Loads (DL)
- Min. Live Loads (LL): 0.96 kPa (20 psf) @ ASCE 7: 0.72 kPa (15 psf)
- Wind load (WL) : 120 mph (53.6 m/s) 3 second gust (Basic Wind 27 m/s)
- Snow Load (SL)
- Seismic Load (EQ)
- Friction @ coefficient 0.1
- Load for Accessories



Unbalanced Snow Load



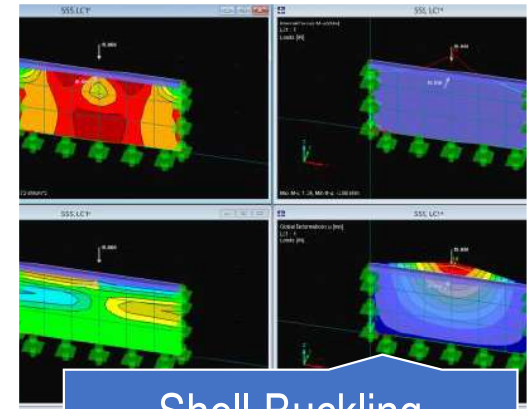
Point Loads during Lifting

## ➤ Alu Geo Dome Roofs # Design Criteria

- Sliding supports (Integral Tension Ring) or fixed supports
- Temperatures: Min. / Max. design + operating
- Level alarms adapted to (new) tank configuration
- Penetrations
- Flow rates: Inlet + Outlet
- Load forces on tank
- Tank shape (rejection)
- Shell Buckling Calculation



Level Alarms and Penetrations



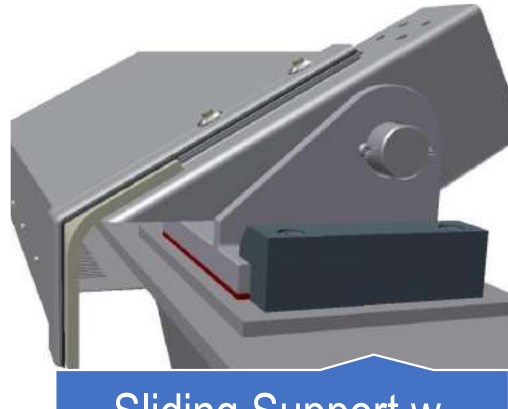
Shell Buckling Calculation

## ➤ Alu Geo Dome Roofs # Support Anchors

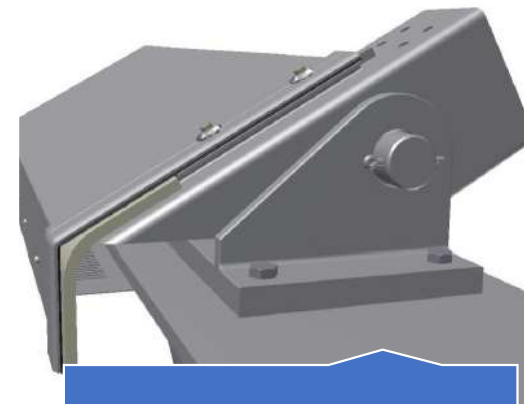
- Sliding supports (Integral Tension Ring)
- or
- Fixed supports



Sliding



Sliding Support w.  
Integral Tension Ring

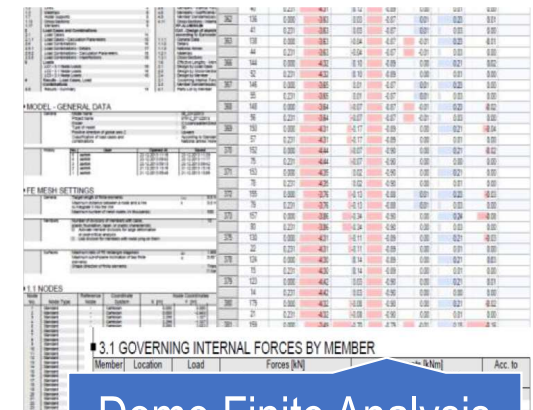


Fixed Support

## ➤ Alu Geo Dome Roofs # Standards

- 2015 Aluminum Design Manual
- AISC Design Guide 27 Structural SS 2013
- ASTM B209-10 Alu and Alu-Alloy Sheet and Plate
- ASTM B221-13 Alu and Alu-Alloy Extrusions
- ASTM F593-13 SS Bolting hardware
- ASTM F594-98 SS Nuts
- ASCE 7-10 Min. Design Loads Buildings
- CE Marking and Execution class:

*“Not Applicable, since structure is manufactured separately on a custom made design in a non-series process where it is assembled at site”*

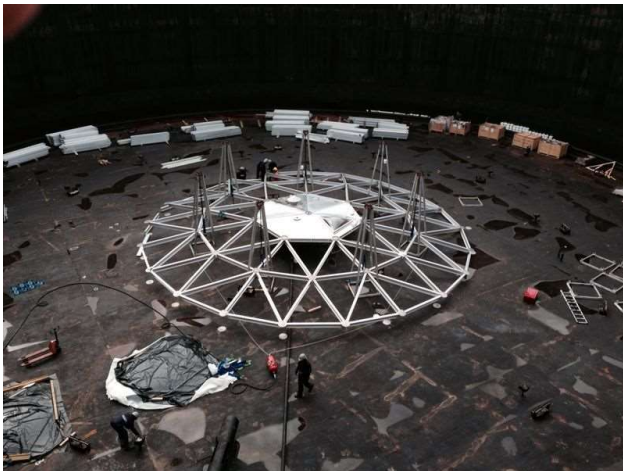


3.1 GOVERNING INTERNAL FORCES BY MEMBER

Member	Location	Load	Forces (kN)						Acc. to
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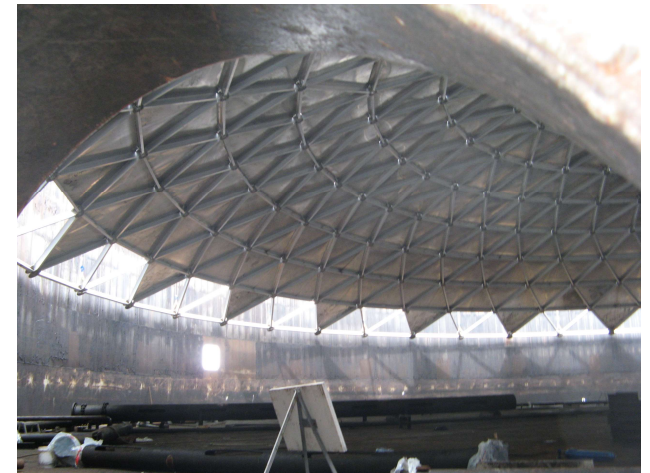
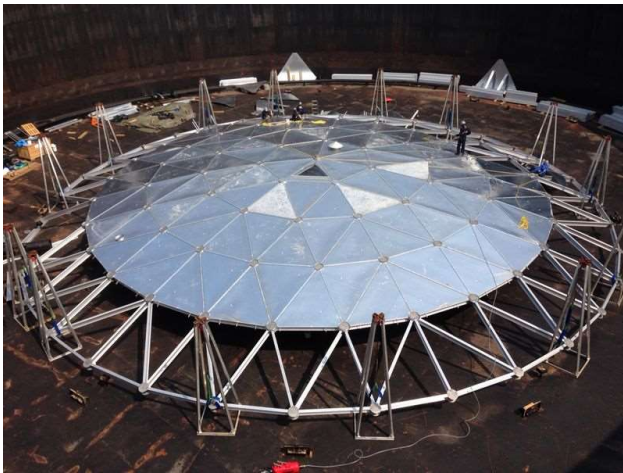
Dome Finite Analysis Programmed

## ➤ Alu Geodesic Dome Roofs # Installation



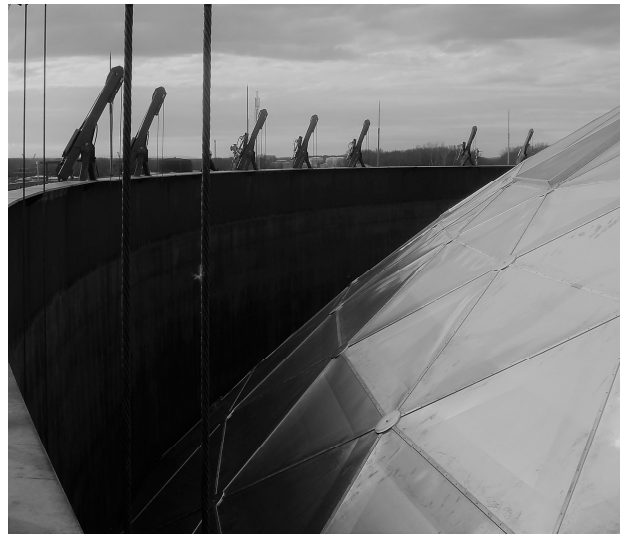
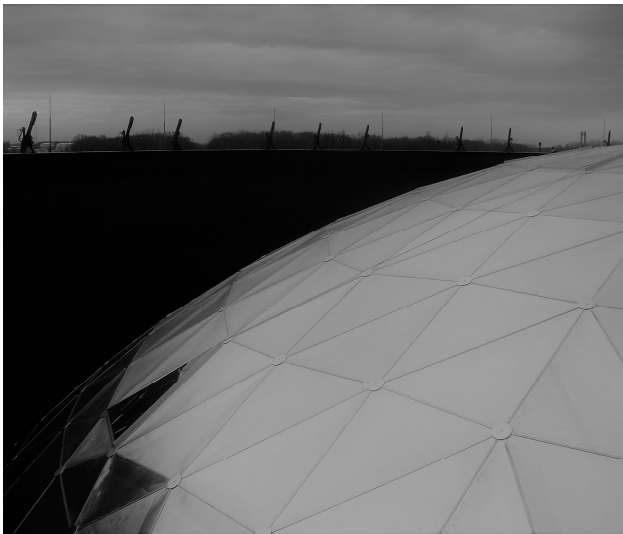
Alu Geodesic Dome  
Roofs

## ➤ Alu Geodesic Dome Roofs # Installation



Alu Geodesic Dome  
Roofs

## ➤ Alu Geodesic Dome Roofs # Installation



Alu Geodesic Dome  
Roofs



## ➤ Alu Geodesic Dome Roofs # Installation



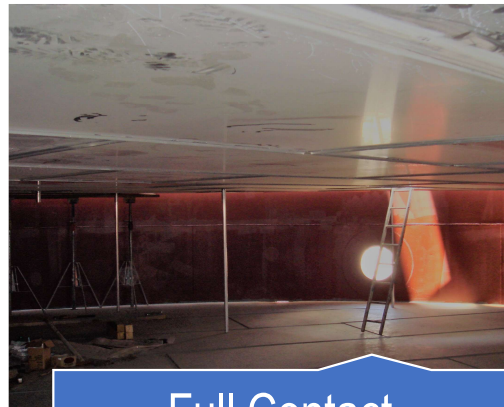
Alu Geodesic Dome  
Roofs

## ➤ Internal Floating Roofs

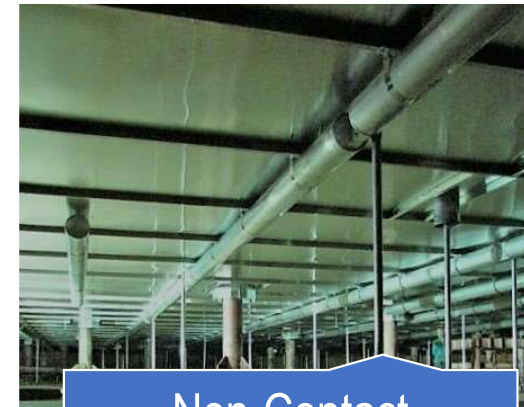
- Full Contact IFR
- Non-Contact Pontoon IFR



Top View IFR



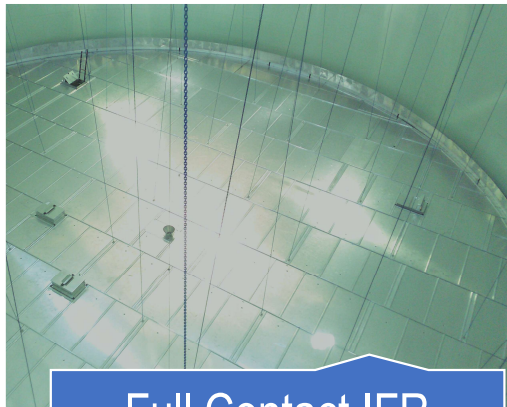
Full Contact  
IFR



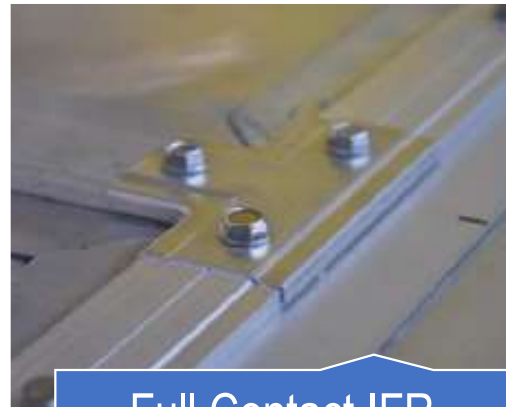
Non-Contact  
IFR

## ➤ Full Contact - Internal Floating Roofs

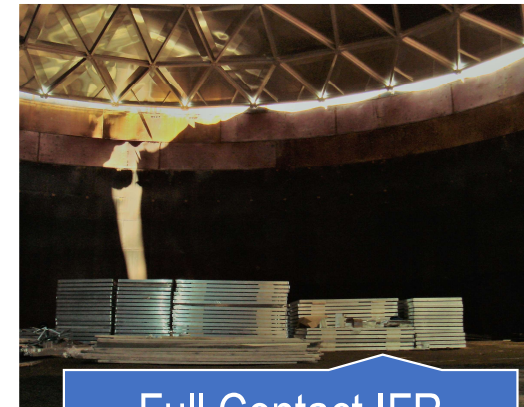
- No vapour space, means no room for saturation
- Results in 97-99,9% emission reduction over roof surface
- Seam covers to reduce seam emission



Full Contact IFR  
Top View



Full Contact IFR  
Seam Covers



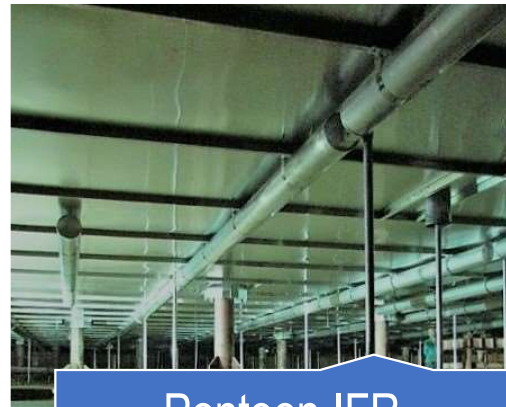
Full Contact IFR  
Installation

## ➤ Non Contact - Internal Floating Roofs

- Cost effective Initial Investment
- Modular pontoon design
- Prevents product contamination



Pontoon IFR  
Top view



Pontoon IFR  
Bottom view

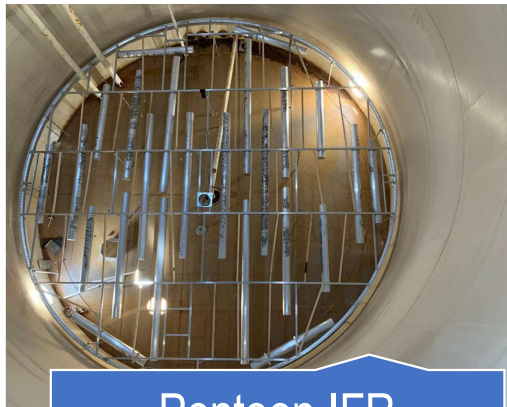


Modular Assembly



## Skin & Pontoon Internal Floating Roof

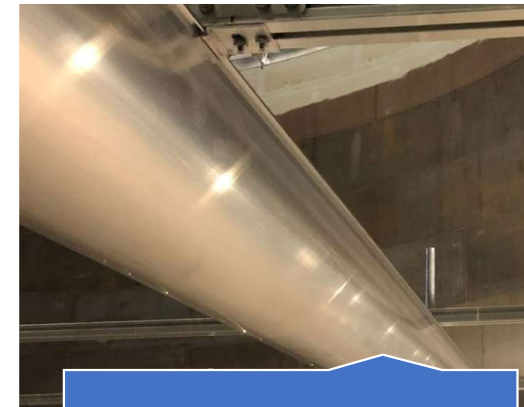
- For Light-duty (A-500) and Heavy-duty (A-1000) applications
- Hybrid
- SS



Pontoon IFR  
Top view



Pontoon IFR  
Deck Sheeting

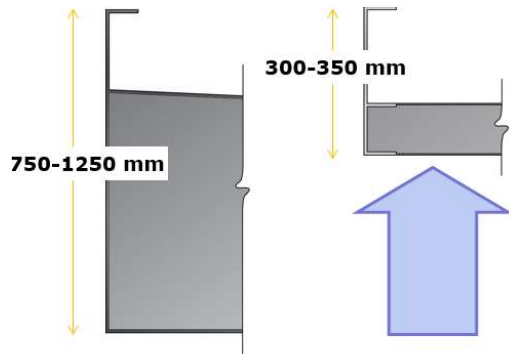


Modular Assembly

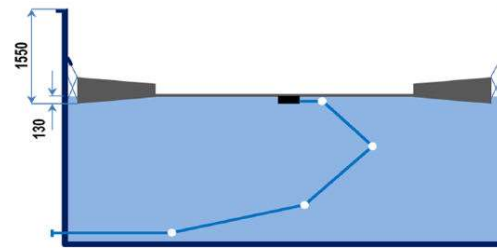


## Internal Floating Roofs # Features

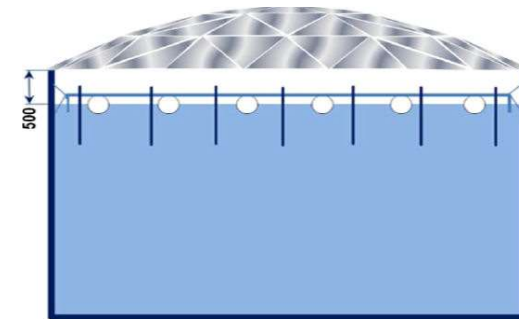
- Low Profile
- Recapture of increased working capacity



Capacity Capture  
Internal Floating Roof

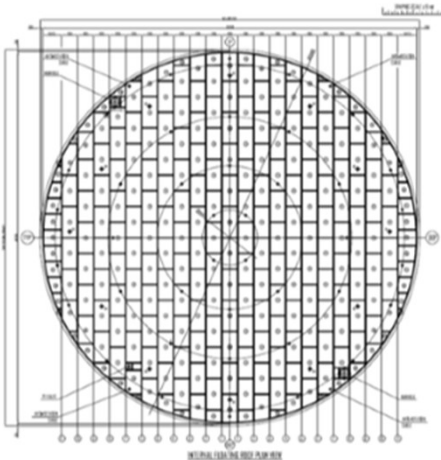


External Floating Roof

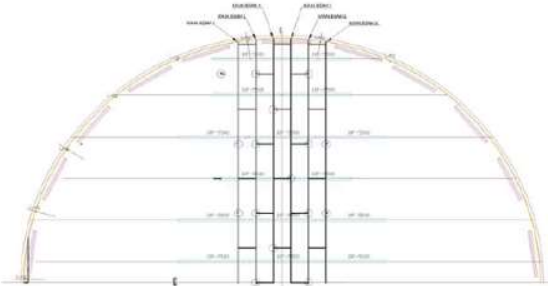


Dome Covered  
Floating Roof

# ➤ Internal Floating Roofs # Design



- APPURTENANCES FIELD FIT
- DECK DRAIN
  - MANWAY
  - COLUMN WELL
  - PRESSURE / VACUUM VENT
  - GAUGE FUNNEL

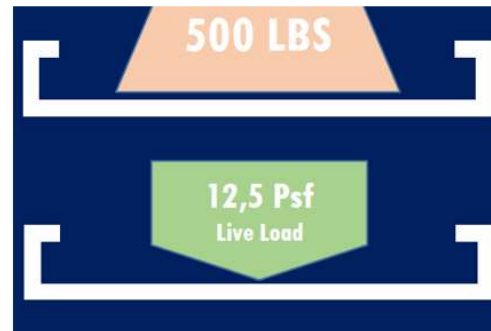


Internal Floating  
Roofs

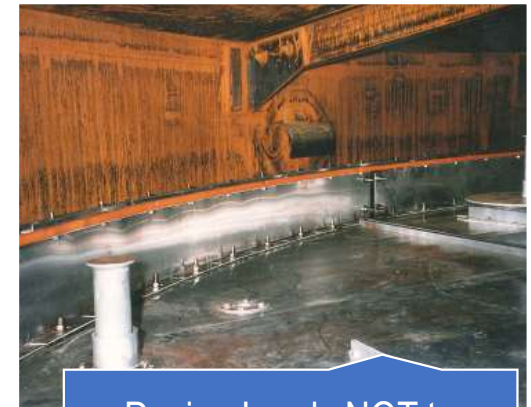


## Internal Floating Roofs # Design Loads

- Minimum buoyancy 200% in liquid w. specific gravity of 0.7
- Dead Load (DL)  $\geq 5$  psf (or 500 lb. concentrated load)
- Friction force exerted by perimeter seals
- Load for Accessories



Average Life Load of FC is  
2.5x average



Design Loads NOT to  
handle internal obstructions



## ➤ Internal Floating Roofs # Design Criteria

- Materials used to be suitable for prolonged immersion (> 15 years)
- Center breather vent to close 150mm above the fixed support height
- Level alarms adapted to (new) tank configuration
- Flow rates: Inlet + Outlet
- Max. filling velocity 1 m/s
- Inlet pipe/diffuser
- Temperatures: Min. / Max.
- Penetrations
- Tank shape (rejection)



Materials used to be suitable for prolonged immersion

### Storage Tank tolerances Tank shells

For new construction (API 650) and in service (API 653) rejection criteria

New construction tolerances API 650		Acceptable In Service Tolerances API 653	
<b>Plumbness</b>		<b>Plumbness</b>	
Top of tank relative to the bottom not to exceed 1/200 of total tank height H. Per shell course ref; ASTM codes Roof columns & guide poles < 1/200 total H For tanks with IFR annex H		Top of tank relative to the bottom not to exceed 1/100 of total tank height Max. 127 mm! (also for fixed roof columns ) For tanks with IFR see annex H 4.1.1 Roundness (radii at 0.3m above the corner weld)	
<b>Roundness (radii at 0.3m above the corner weld)</b>	<b>Tanks diameter</b>	<b>Tanks diameter</b>	<b>Radius Tolerance</b>
< 12 m	+/- 13 mm	< 12 m	+/- 13 mm (39)
12 m - < 45 m	+/- 19 mm	12 m - < 45 m	+/- 19 mm (57)
45 m - < 75 m	+/- 25 mm	45 m - < 75 m	+/- 25 mm (75)
> 75 m	+/- 32 mm	> 75 m	+/- 32 mm (93)
		Values between [...] tolerances measured higher than 0.3 m above the corner weld	

Tank Shell Shape (rejection criteria)



# Internal Floating Roofs # Standards

- Fire Resistance per NFPA® 11
- Rim seal fabrics flame retardant in accordance to DIN 22100
- Hardware min. stainless steel

**DESIGN**

**Policies (law)**

- EC-CODES
- PGS 29

**Int./Reg. Standard (quality)**

- ISO (International)
- CEN - EN 14015 ( Europe)

**Nat. Standard**

- ANSI (USA)
- BS 2654 (England)
- DIN 4119 Part 1,2 (Germany)
- Codap / Codes (French)

**Guide Lines (Non Mandatory)**

- API 650 (USA)
- NFPA-11 (USA)



Design from law  
to guide lines



'Owner'  
Needs the best



'Landlord'  
Needs a permit

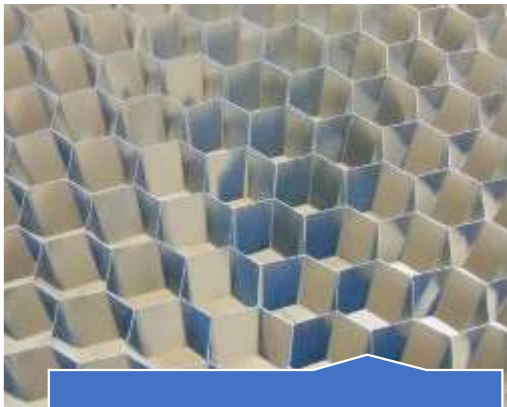
## ➤ Internal Floating Roofs # Installation



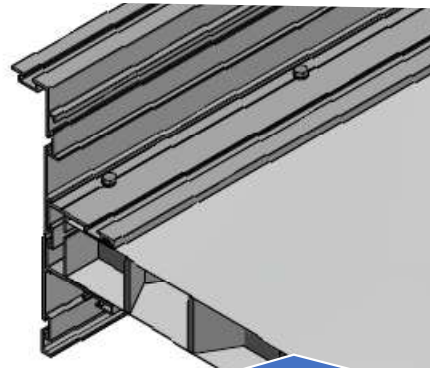
Internal Floating  
Roofs

## ➤ FC Internal Floating Roofs # MFC-HEX

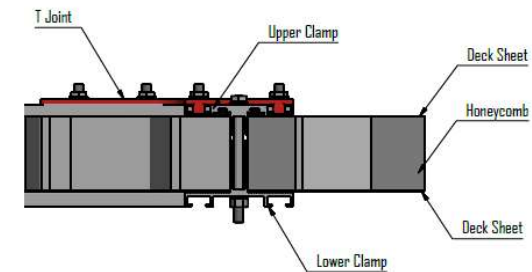
- Strong sandwich panels with honeycombed core
- Seal welded and pressure-tested at fabrication facility
- Module joints are double side clamped design



Inside Core



Module to rim joint



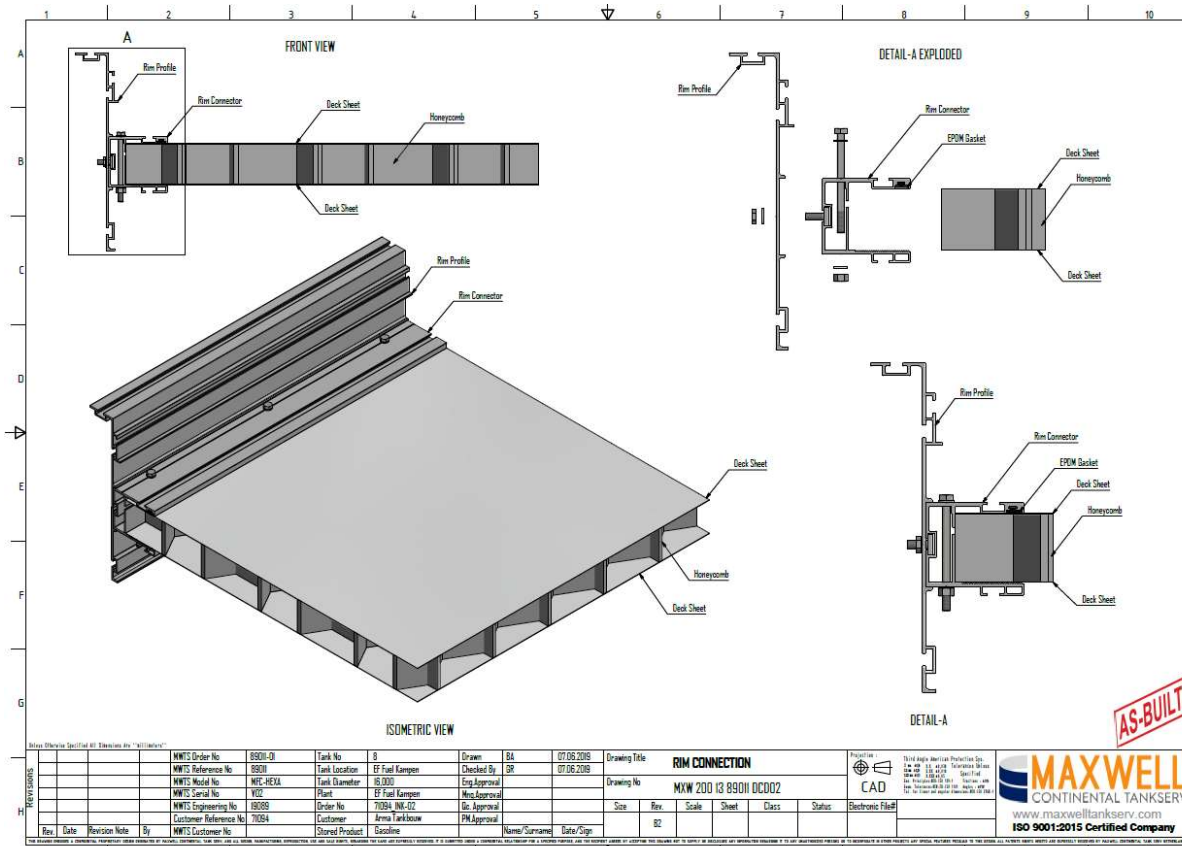
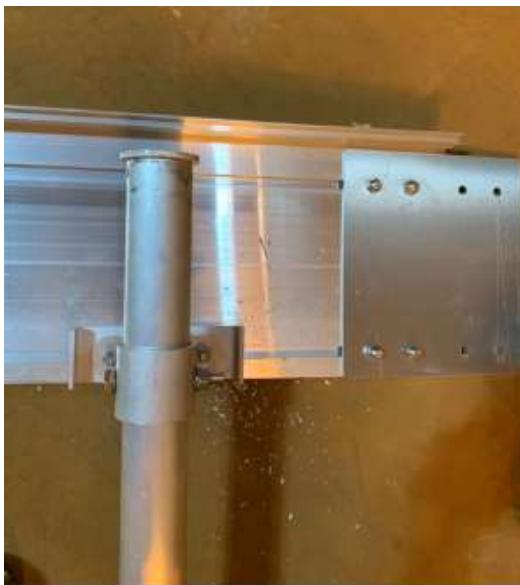
Double side clamp design





## MFC-HEX

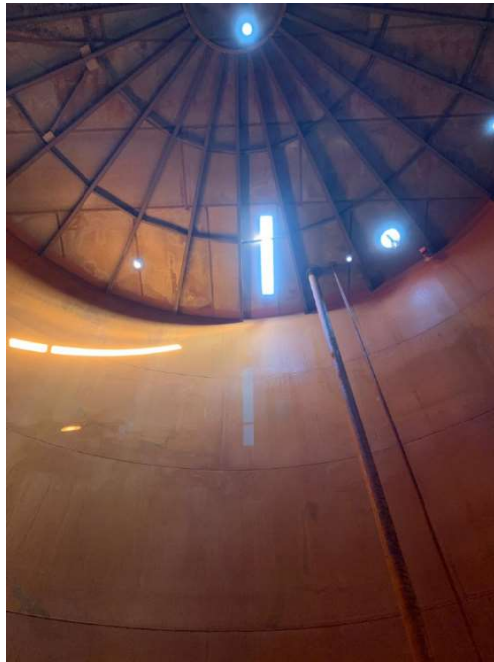
- Rim Joint





## MFC-HEX

- Panel through envelope...





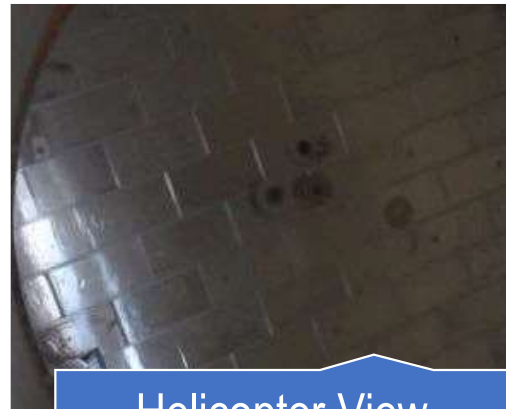


## ➤ FC Internal Floating Roofs # MFC-BOX

- Hollow gas-tight modules
- Seal welded and pressure-tested at fabrication facility
- Unwanted load cases can not travel via core from top to bottom deck



Top View  
FC Box type IFR



Helicopter View  
FC Box type IFR



Bottom View  
FC Box type IFR

## ➤ FC Internal Floating Roofs # MFC-PAN

- Pan type modules
- Not recommended option



Top  
Pan type IFR



Top View  
Pan type IFR

## ➤ Non-Contact IFR # MSP - Pontoon

- Aluminium, hybrid or stainless-steel design available
- Extrusions design meeting or exceeding EPA, API, ASME and Aluminum Association guidelines



Packing



Top View  
Pontoon IFR



Bottom View  
Pontoon IFR

➤ **CS Above Ground Storage Tank # w. EFR**



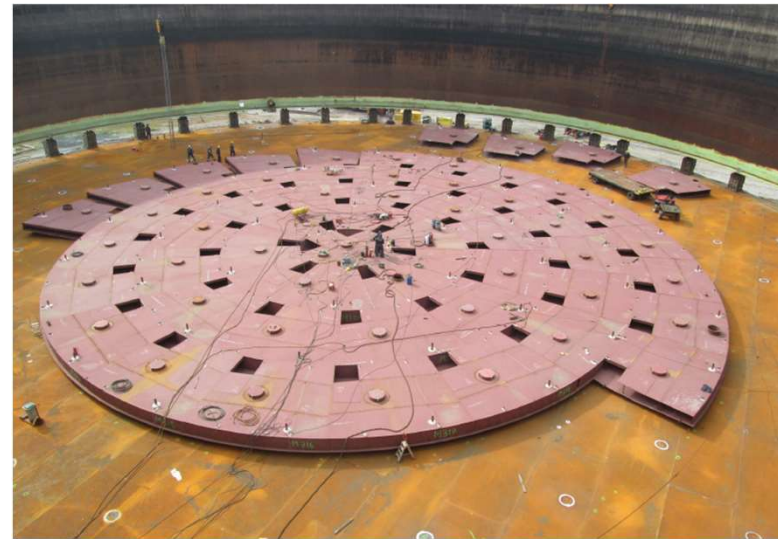
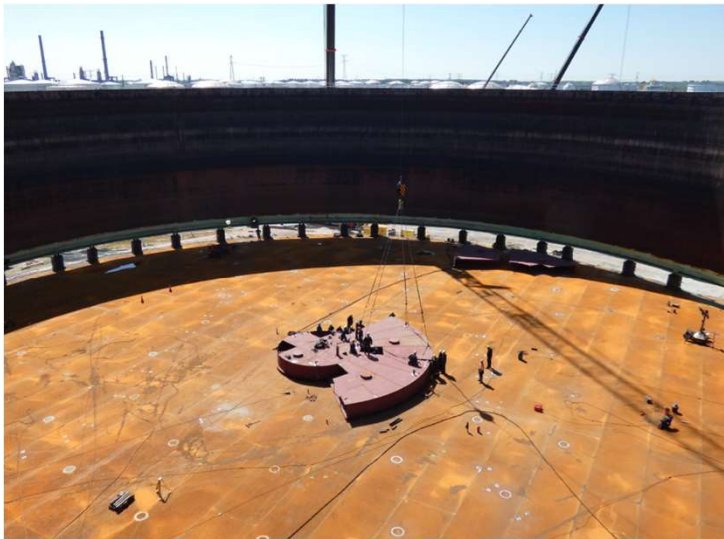
External Floating  
Roofs

➤ **CS External Floating Roofs # Prefab**



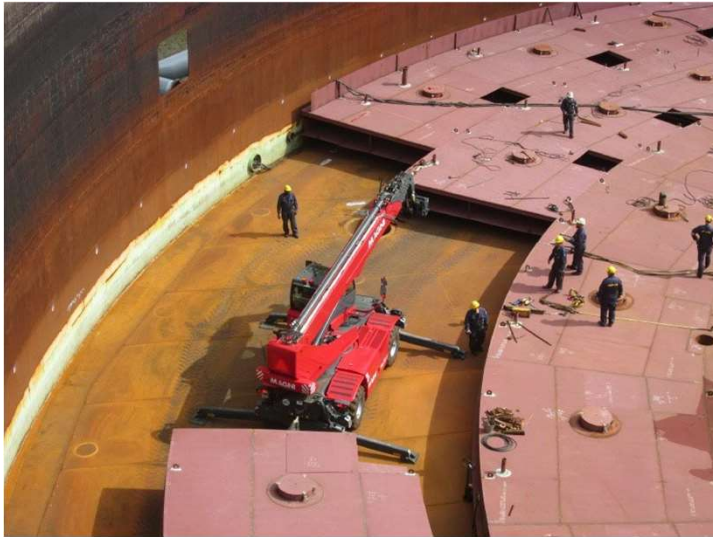
External Floating  
Roofs

## ➤ CS External Floating Roofs # Installation



External Floating  
Roofs

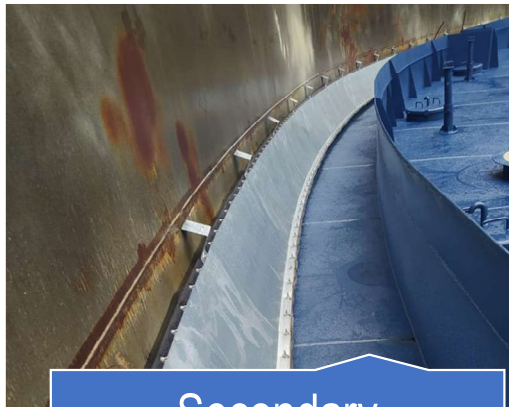
➤ **CS External Floating Roofs # Installation**



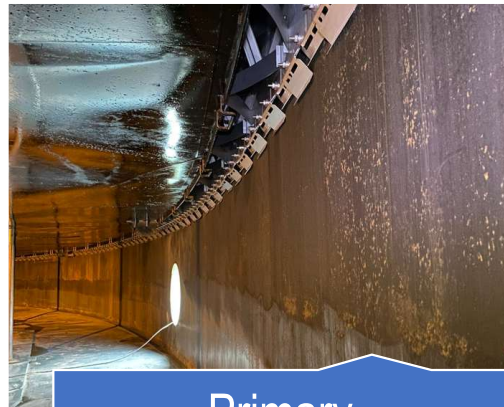
External Floating  
Roofs

## ➤ Floating Roof Rim Seals

- Primary for IFRs and EFRs
- Secondary for IFRs and EFRs



Secondary  
Rim Seals



Primary  
Rim Seals



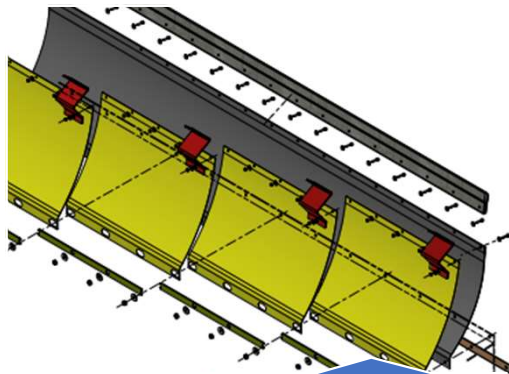
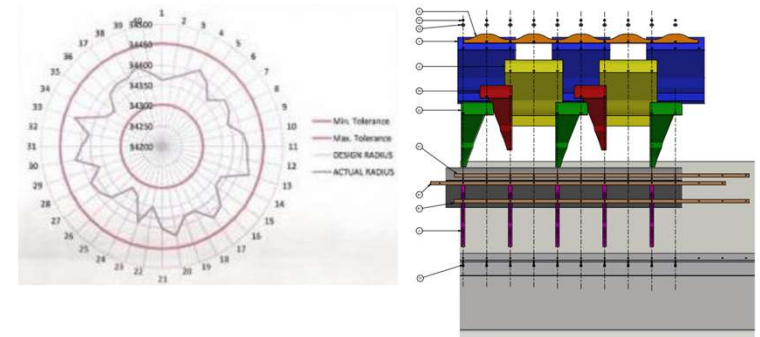
Rim Seal  
Accessories



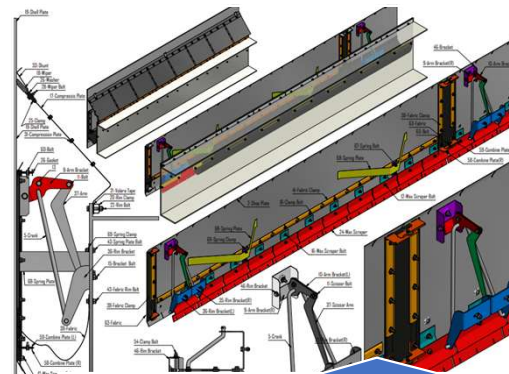


# Floating Roof Rim Seals

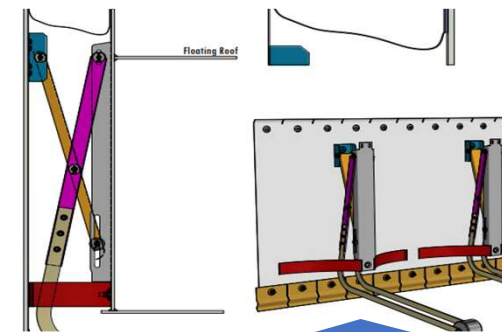
- Design and Manufacturing



Compression Plate



Wiggins / SIPM



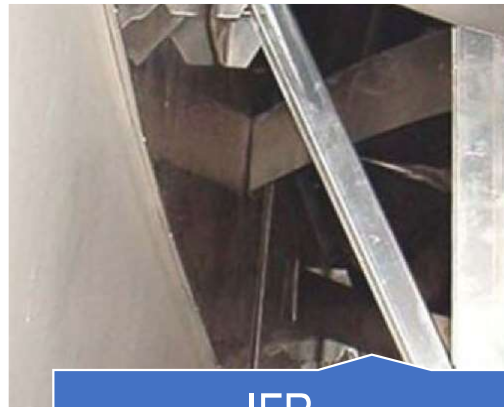
Pantograph

## ➤ Floating Roof Rim Seals # Types

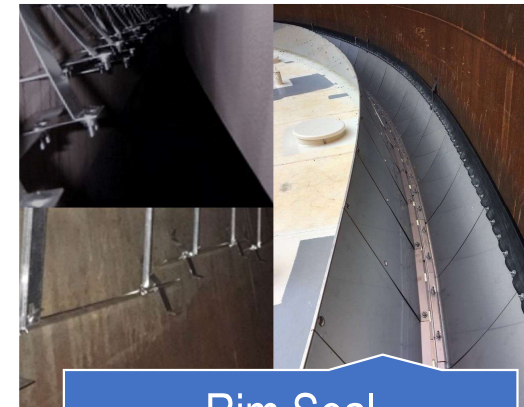
- EFR Rim Seals
- IFR Rim Seals
- Seal Accessories



EFR  
Rim Seals



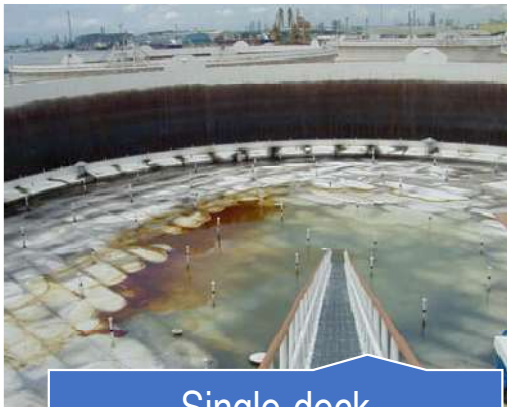
IFR  
Rim Seals



Rim Seal  
Accessories

## ➤ Floating Roof Rim Seals # EFR Typicals

- Single-deck w. pontoon
- Double-deck
- Pan type; Single-deck w. radial beam stiffeners



Single-deck  
w. pontoon



Double-deck



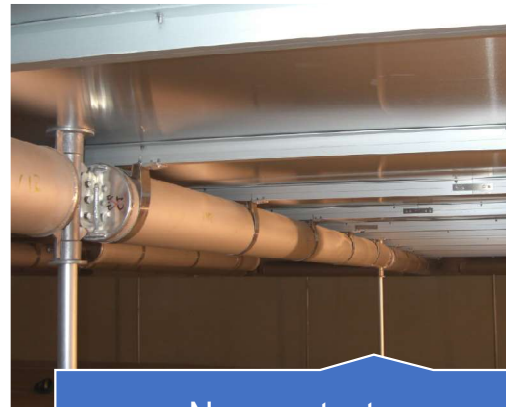
Single-deck w. radial  
beam stiffeners (SIPM)

## ➤ Floating Roof Rim Seals # IFR Typicals

- Contact Internal Floating Roofs
- Non-contact Skin & Pontoon



Full Contact



Non-contact  
Skin & Pontoon

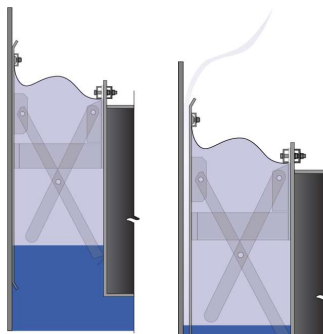


Mini-pontoons complement  
existing buoyancy



## Floating Roof Rim Seals # Basic Designs

- Mechanical-Shoe Seal
- Liquid-Mounted Seal
- Vapor-Mounted Seal

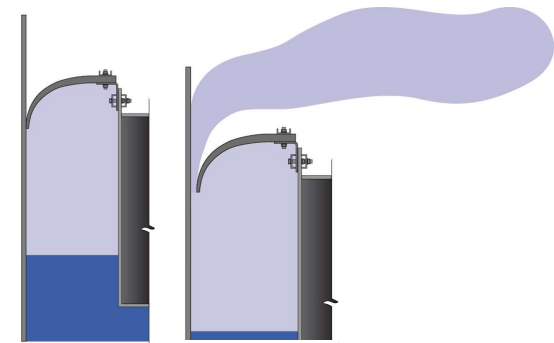


Mechanical-Shoe Seal

Ideal emission control

- hard to get
- difficult to maintain

Liquid-Mounted Seal



Vapor-Mounted Seal



## Floating Roof Rim Seals # Design Criteria

### • A rim seal should...

- Materials in contact with product to be Product resistant
- Materials subject to the atmosphere to be UV resistant
- Sliding parts in contact with tank shell to be Wear resistant
- Should center the floating roof
- Damp the horizontal roof movements
- Have an adequate working range for efficient annular rim gap
- Prevent vapor losses
- Prevention ingress of rainwater
- Cause minimal reduction in tank capacity
- Avoid evaporation of the stored product
- Have minimal (capex) investment and installation costs
- Be designed as longevity and with no maintenance
- Materials must be antistatic and product-resistant
- Service in bolted tank configuration
- Be available as Internal Floating Roof seal
- Have a low weight for fitting in IFR situation
- Be available as External Floating Roof seal
- Be available in wax scraping design
- Secondary seal to be fire retardant
- Have low height/rise of secondary seal to allow more filling capacity
- Have a high Expected Lifetime
- Be in compliance with API-650/653
- Be in compliance with EEMUA-159
- Be in compliance with pressure test per TÜV/TH-Luft Mb 908/A

## ➤ Floating Roof Rim Seals # should be...

- Summarised as...

1. Product Chemical resistant
2. UV resistant
3. Wear resistant
4. Centre floating roof
5. Damp roof movement
6. Having adequate working range
7. Prevent vapor loss
8. Prevention rainwater ingress

## ➤ Rim Seals – 1 – Product Chemical Resistant





## ➤ Rim Seals – 1 – Chemical Compatibility

### Chemical Compatibility Chart

**Notes** -- Insufficient data available

\* Reduced service life can be expected when this elastomer is exposed to certain types, grades, or concentrations of this chemical. Actual service life will depend on the proximity of the elastomer to the product, concentration of the chemical and temperature of the service environment. Materials in direct contact with the stored product or exposed to concentrated vapors may have a shorter life than materials exposed to air containing varying amounts of the product vapors.

\*\* Do not use galvanized steel for aviation fuels.

Note 1) Sour tanks with levels of H<sub>2</sub>S in excess of 300 ppm should be evaluated separately.

Note 2) The above guidelines were compiled from data believed to be accurate. However, due to unique environmental conditions and contaminations, these recommendations are guidelines only.

Chemical	Urethane	Neoprene	Buna-N	Viton	PTFE (Teflon)	Aluminum	304/316 SS	Galvanized Steel
Acetone	N	N	N	N	Y	Y	Y / Y	Y
Acetyl Bromide	N	N	N	--	Y	--	--	--
Acetyl Chloride	N	N	N	Y	Y	N	Y / Y	--
ASTM Fuel A	Y	Y	Y	Y	Y	Y	Y / Y	Y
ASTM Fuel B	Y	N	Y *	Y	Y	Y	Y / Y	Y
ASTM Fuel C	Y *	N	Y *	Y	Y	Y	Y / Y	Y
ASTM Oil #1	Y	Y	Y	Y	Y	Y	Y / Y	Y
ASTM Oil #2	Y	Y	Y	Y	Y	Y	Y / Y	Y
ASTM Oil #3	Y	Y	Y	Y	Y	Y	Y / Y	Y
Alcohol - Ethyl	N	Y	Y	Y	Y	N	Y / Y	N
Alcohol - Methyl	N	Y	Y	N	Y	N	Y / Y	N
Aviation Gasoline	Y	N	Y	Y	Y	Y	Y / Y	N **
Benzene	N	N	N	Y	Y	Y	Y / Y	N
Butyl Acetate	N	N	N	N	Y	Y	Y / Y	Y
Crude Oil (Sour)	Y	Y *	Y	Y	Y	Y	Y <sup>1</sup> / Y	Y <sup>1</sup>
Crude Oil (Sweet)	Y	Y *	Y	Y	Y	Y	Y / Y	Y
Cyclohexane	Y	N	Y	Y	Y	Y	Y / Y	Y
Diesel Oil	Y *	Y *	Y	Y	Y	Y	Y / Y	Y
Ethylene Glycol	Y	Y	Y	Y	Y	N	Y / Y	N
Gasoline	Y	Y *	Y	Y	Y	Y	Y / Y	Y
Heptane	Y	N	Y	Y	Y	Y	Y / Y	Y
Hexane	Y	Y	Y	Y	Y	Y	Y / Y	Y
Isooctane	Y	Y	Y	Y	Y	Y	Y / Y	Y
Jet Fuels	Y	N	Y	Y	Y	Y	Y / Y	N **
Kerosene	Y	Y	Y	Y	Y	Y	Y / Y	Y
MTBE	Y *	N	Y *	N	Y	Y	Y / Y	Y
Methyl Ethyl Ketone	N	N	N	N	Y	Y	Y / Y	Y
Naptha	Y *	N	Y	Y	Y	Y	Y / Y	Y
Pentane	N	Y	Y	Y	Y	Y	Y / Y	Y
Propylene Glycol	Y	Y	Y	Y	Y	Y	Y / Y	Y
Toluene	Y *	N	N	Y	Y	Y	Y / Y	Y
Vinyl Acetate	N	N	N	N	Y	Y	Y / Y	Y
Xylene	N	N	N	Y	Y	Y	Y / Y	Y

➤ **Rim Seals – 2 – UV Resistant**



➤ **Rim Seals – 3 – Wear Resistant**



## ➤ Rim Seals – 4 – Centre Floating Roof



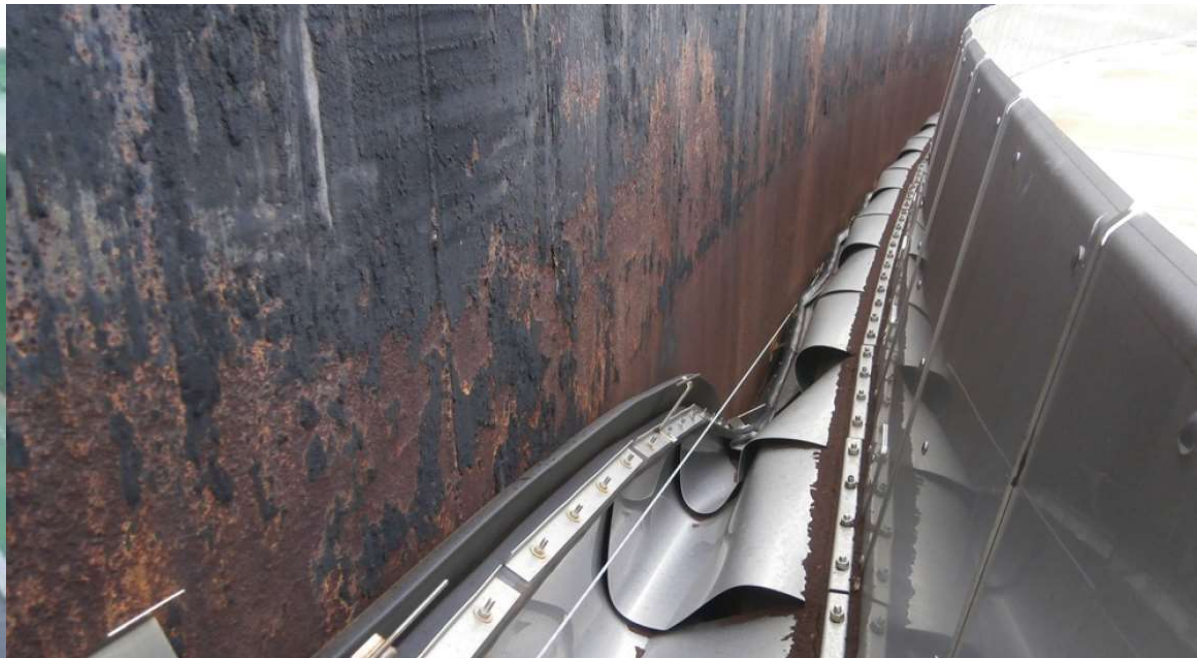
## ➤ Rim Seals – 5 – Damp Roof Movement



## ➤ Rim Seals – 6 – Adequate Working Range



➤ **Rim Seals – 6 – Adequate Working Range**



## ➤ Rim Seals – 7 – Prevent Vapour Loss





➤ **Rim Seals – 8 – Prevent Rainwater Ingress**



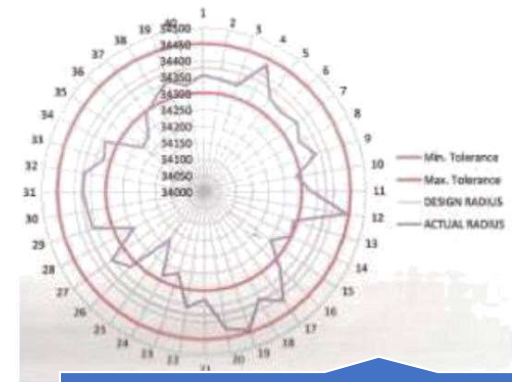
# ➤ Storage Tank (Shell) Tolerances # Standards

- New construction tolerances # API 650 (H=1/200)
- Acceptable In Service Tolerances # API 653 (H=1/100 # max. 127 mm)
- EEMUA 159 (-X/+3X)

Tanks diameter	Radius Tolerance	Tanks diameter	Radius Tolerance
< 12 m	+/- 13 mm	< 12 m	(39)
12 m - < 45 m	+/- 19 mm	12 m - < 45 m	(57)
45 m - < 75 m	+/- 25 mm	45 m - < 75 m	(75)
> 75 m	+/- 32 mm	> 75 m	(93)

Tolerances per API

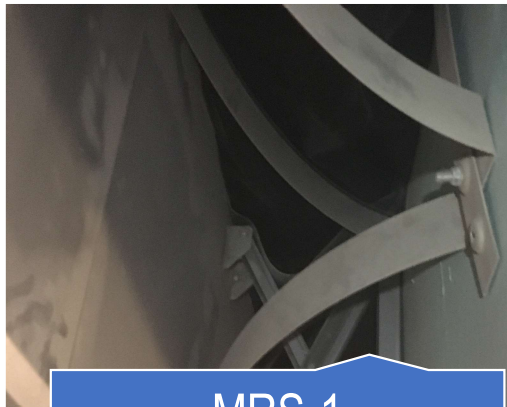
Translated into EEMUA-159



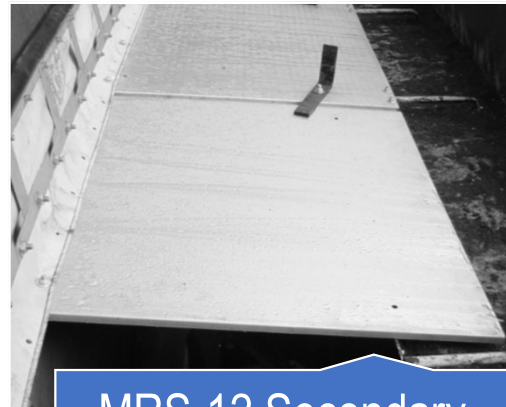
Out of Roundness is NOT Out of verticality

## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Mechanical-Shoe Seal (HD/Scissor/SIPM/Wiggins/Pantograph)
- MRS-12 Secondary Shoe-Mounted Seal
- MRS-3 Primary Spring Plate Shoe Seal



MRS-1  
Mechanical-Shoe Seal



MRS-12 Secondary  
Shoe-Mounted Seal



MRS-3 Primary Spring  
Plate Shoe Seal

## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Heavy Duty + MRS-12 Shoe-Mounted Secondary



## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Heavy Duty + MRS-12 Shoe-Mounted Secondary



## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Heavy Duty + MRS-12 Shoe-Mounted Secondary



## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Heavy Duty + MRS-12 Shoe-Mounted Secondary



## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Heavy Duty + MRS-12 Shoe-Mounted Secondary

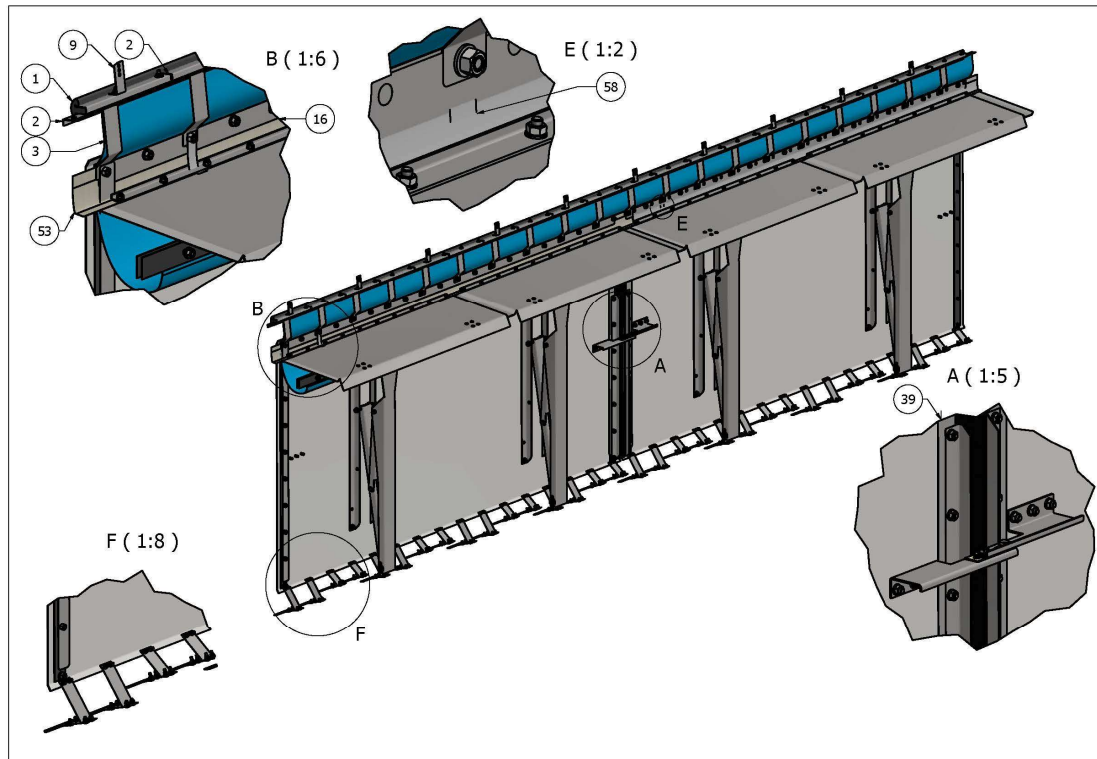






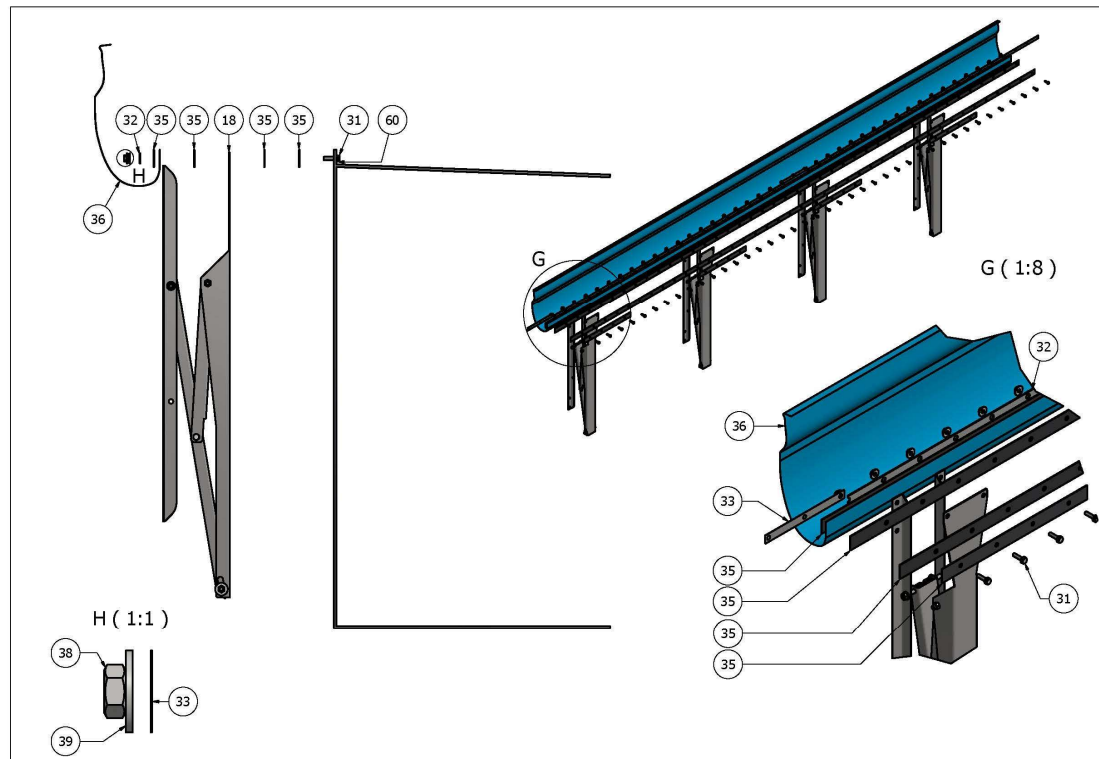
## EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Heavy Duty
- MRS-12 Secondary



## ➤ EFR Rim Seals # Mechanical-Shoe Seal

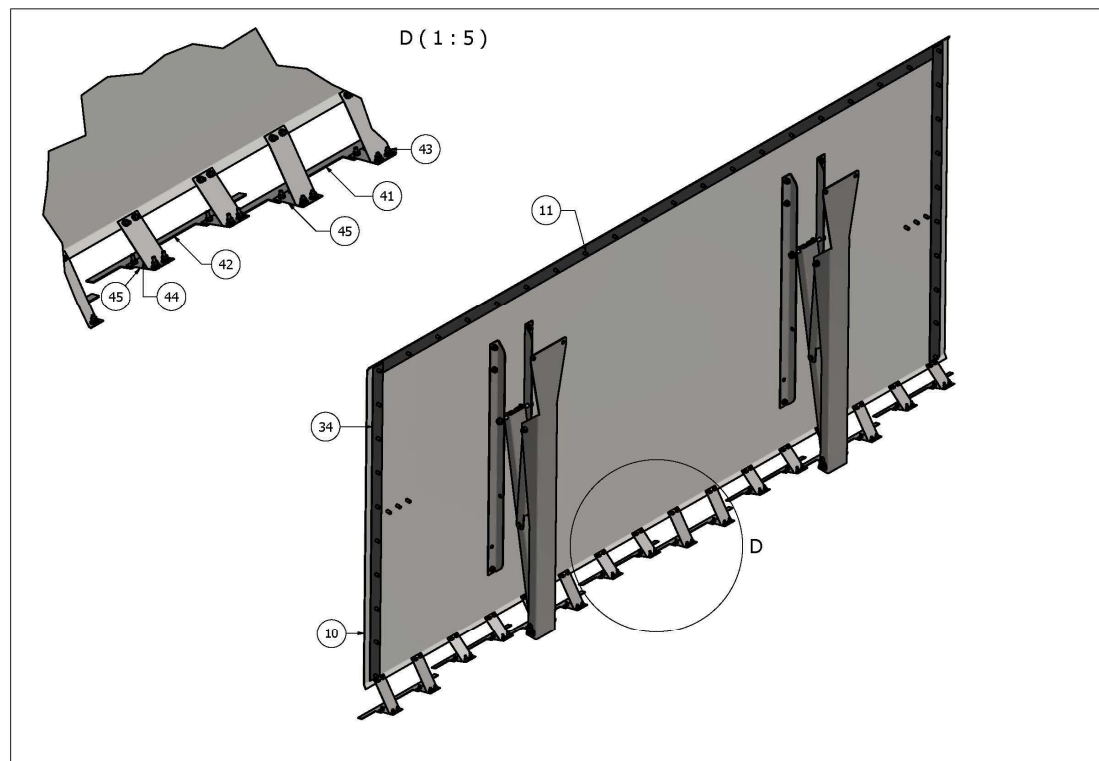
- MRS-1 Heavy Duty
- MRS-12 Secondary





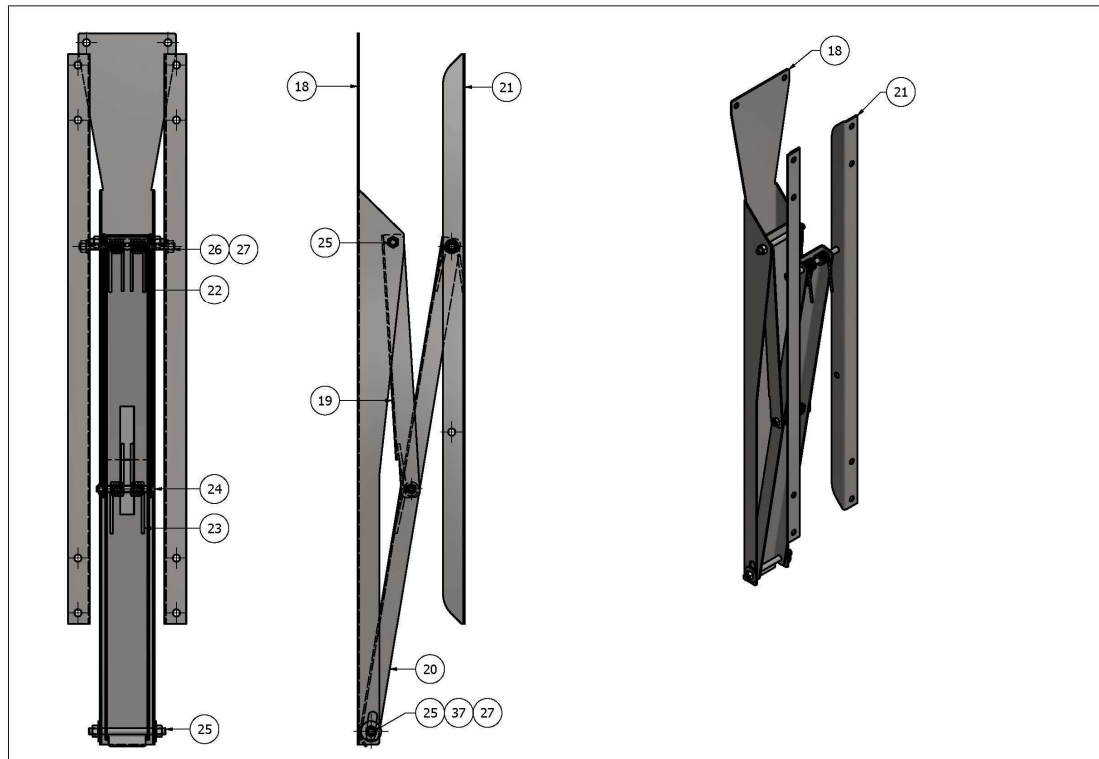
## EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Heavy Duty
- MRS-12 Secondary



## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Heavy Duty
- MRS-12 Secondary

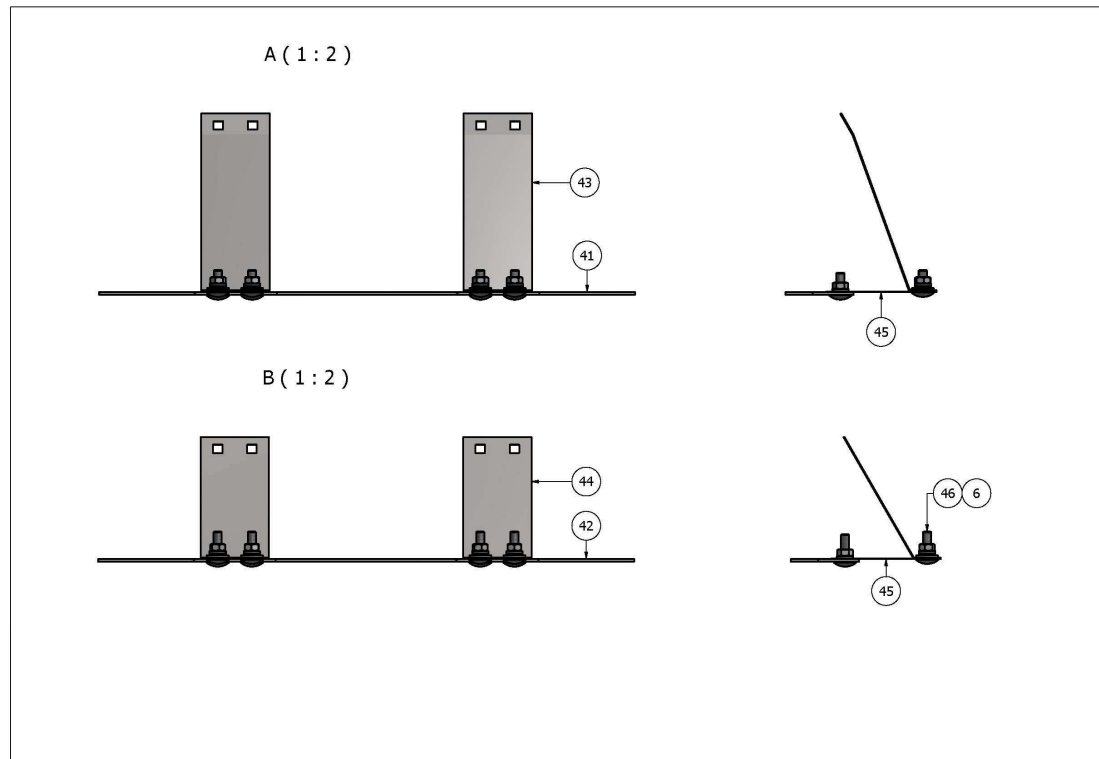






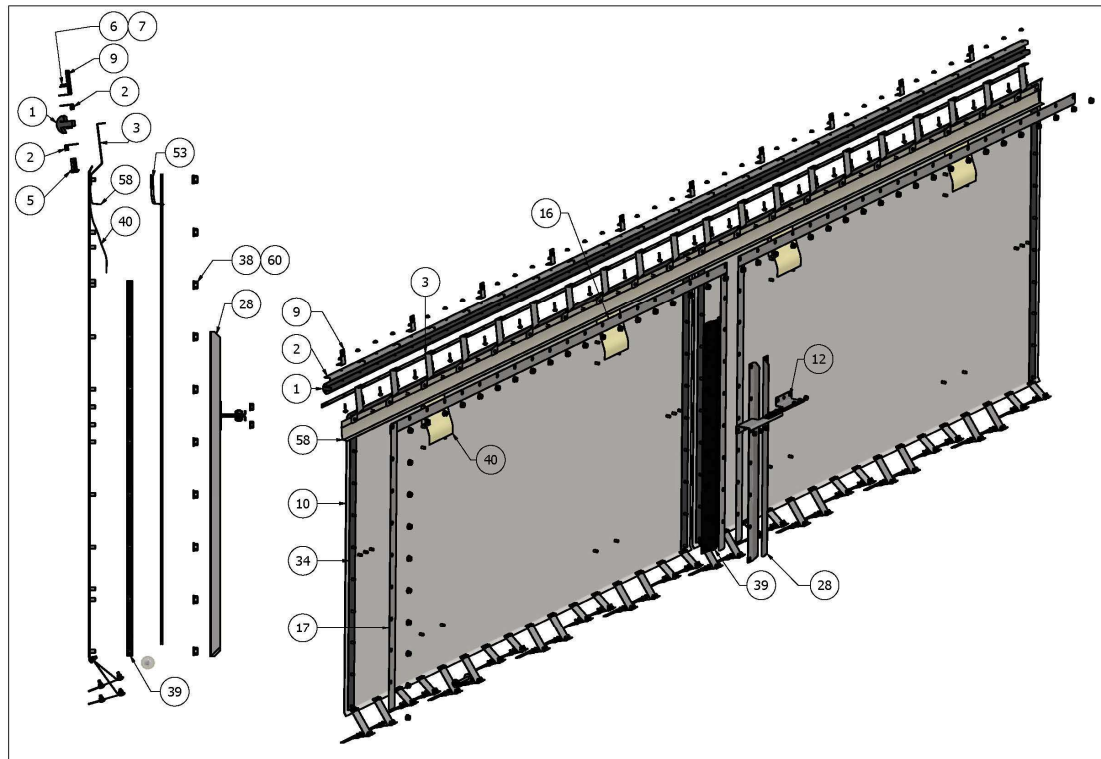
## EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Heavy Duty
- MRS-12 Secondary



## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Heavy Duty
- MRS-12 Secondary



## ➤ EFR Rim Seals # Mechanical-Shoe Seal

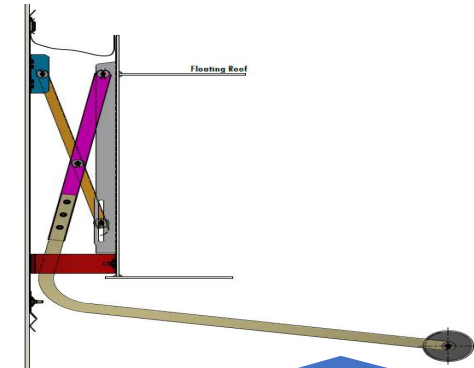
- MRS-1 Pantograph
  - The initial idea... named as SR-1



MRS-1  
Pantograph



MRS-1  
Initial



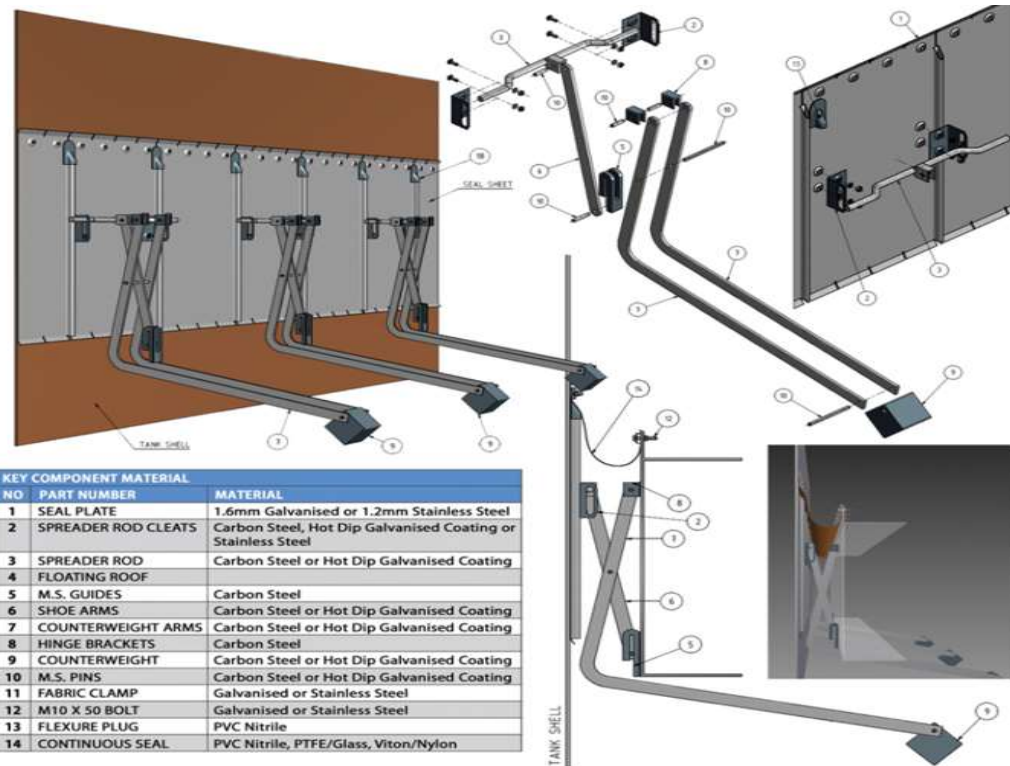
MRS-1  
Revitalized





# EFR Rim Seals # Mechanical-Shoe Seal

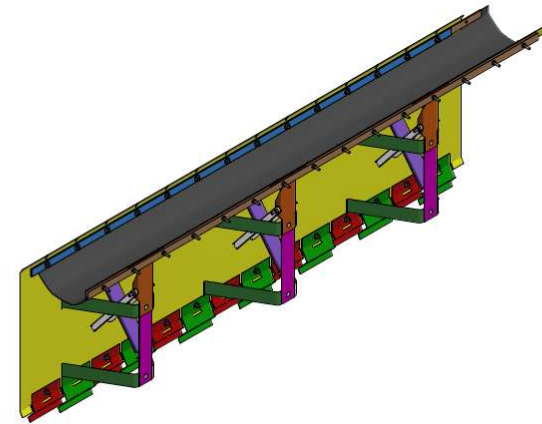
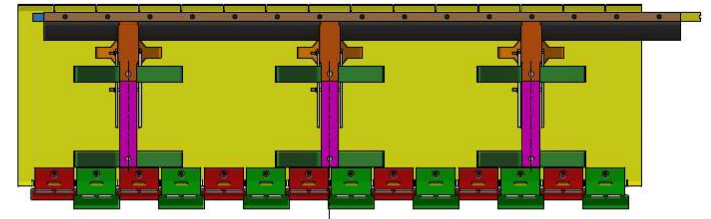
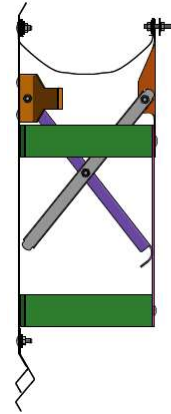
- MRS-1 Pantograph



KEY COMPONENT MATERIAL		
NO	PART NUMBER	MATERIAL
1	SEAL PLATE	1.6mm Galvanised or 1.2mm Stainless Steel
2	SPREADER ROD CLEATS	Carbon Steel, Hot Dip Galvanised Coating or Stainless Steel
3	SPREADER ROD	Carbon Steel or Hot Dip Galvanised Coating
4	FLOATING ROOF	
5	M.S. GUIDES	Carbon Steel
6	SHOE ARMS	Carbon Steel or Hot Dip Galvanised Coating
7	COUNTERWEIGHT ARMS	Carbon Steel or Hot Dip Galvanised Coating
8	HINGE BRACKETS	Carbon Steel
9	COUNTERWEIGHT	Carbon Steel or Hot Dip Galvanised Coating
10	M.S. PINS	Carbon Steel or Hot Dip Galvanised Coating
11	FABRIC CLAMP	Galvanised or Stainless Steel
12	M10 X 50 BOLT	Galvanised or Stainless Steel
13	FLEXURE PLUG	PVC Nitrile
14	CONTINUOUS SEAL	PVC Nitrile, PTFE/Glass, Viton/Nylon

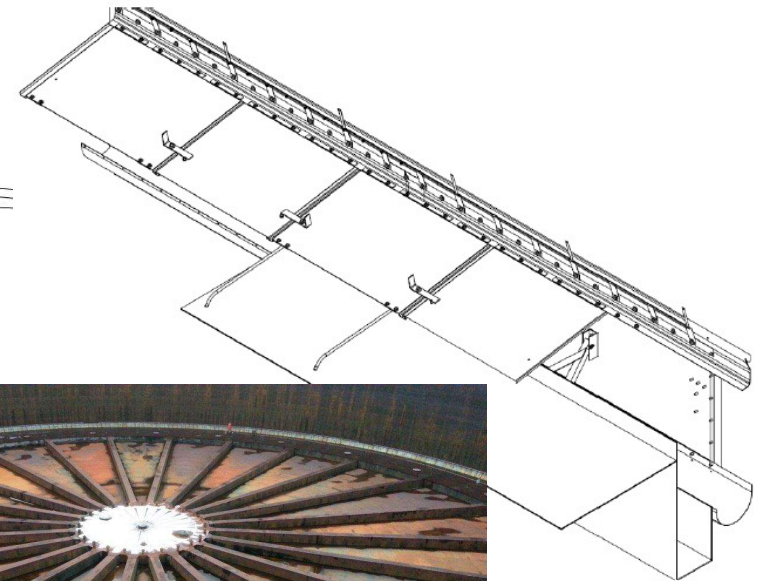
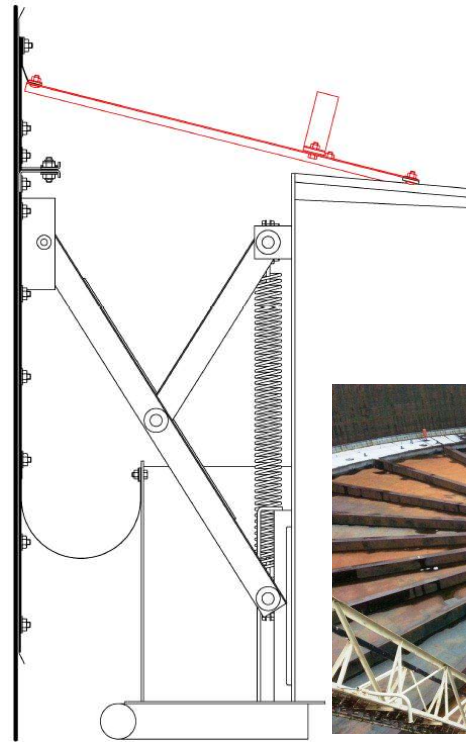
## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Scissor



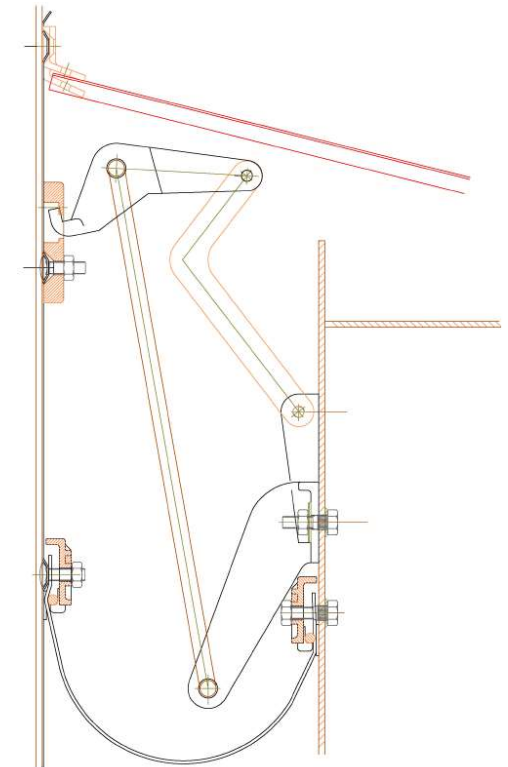
## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 SIPM



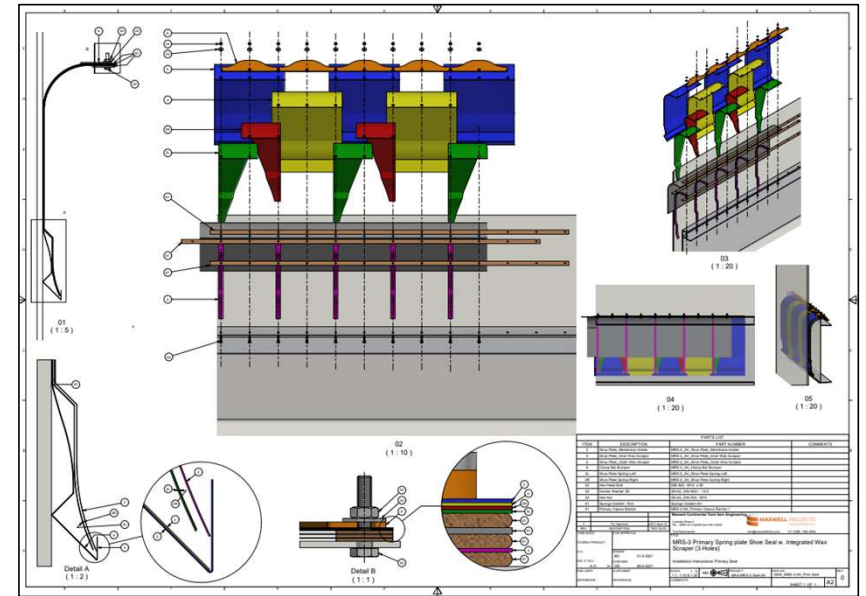
## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Wiggins



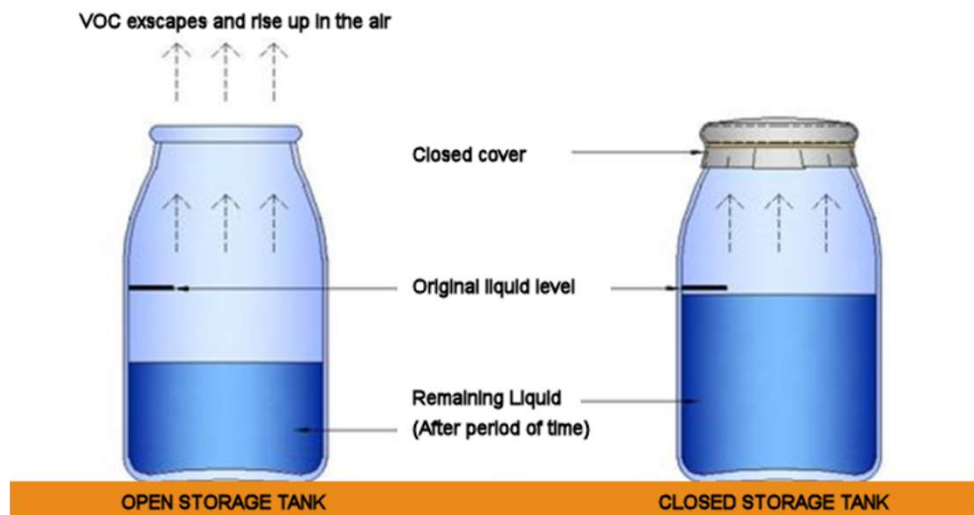
## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-3 Primary Spring Plate Shoe Seal
- Gas-tight shoe seal with equal emission saving as liquid mounted seals



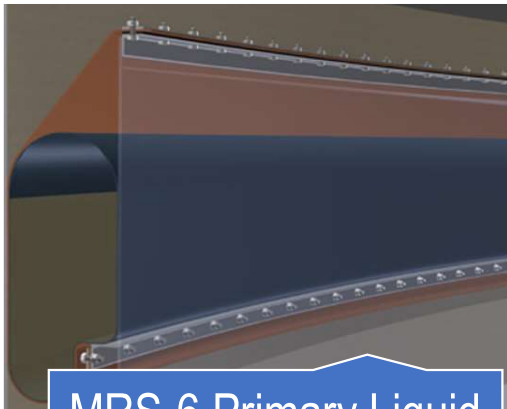
## ➤ EFR Rim Seals # Mechanical-Shoe Seal

- MRS-3 Primary Spring Plate Shoe Seal
- **Gas-tight Conceptually speaking...**



## ➤ EFR Rim Seals # Liquid-Mounted Seal

- MRS-6 Primary Liquid Filled Tube Seal
- MRS-7 Primary Foam Filled Seal



MRS-6 Primary Liquid Filled Tube Seal

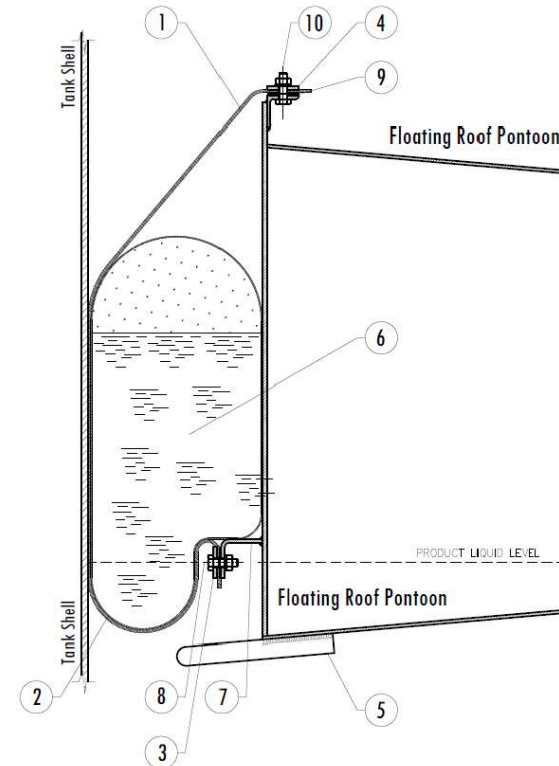


MRS-7 Primary Foam Filled Seal



## EFR Rim Seals # Liquid-Mounted Seal

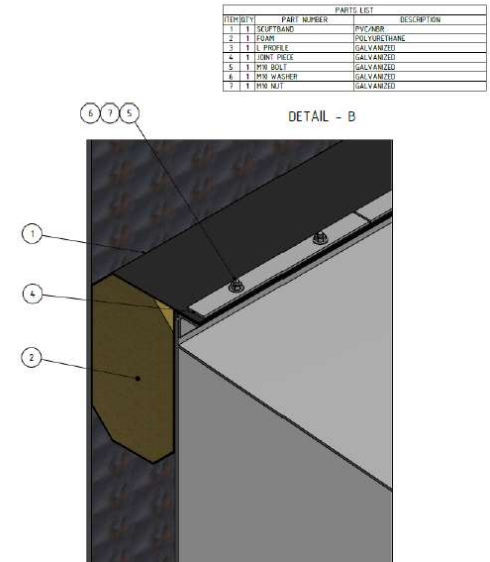
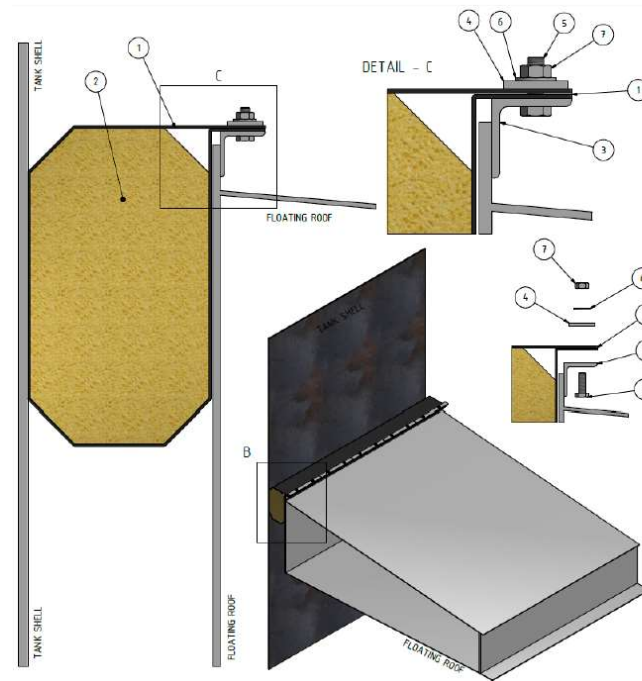
- MRS-6 Primary Liquid Filled Tube Seal





# ➤ EFR Rim Seals # Liquid-Mounted Seal

- MRS-7 Primary Foam Filled Seal



## ➤ EFR Rim Seals # Vapor-Mounted Seal

- MRS-20P Primary Compression Plate Seal
- MRS-20S Secondary Compression Plate Seal
- MRS-25 Weather Shield



MRS-20P Primary  
Compression Plate Seal



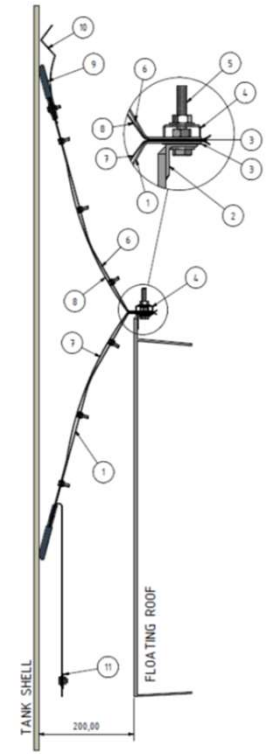
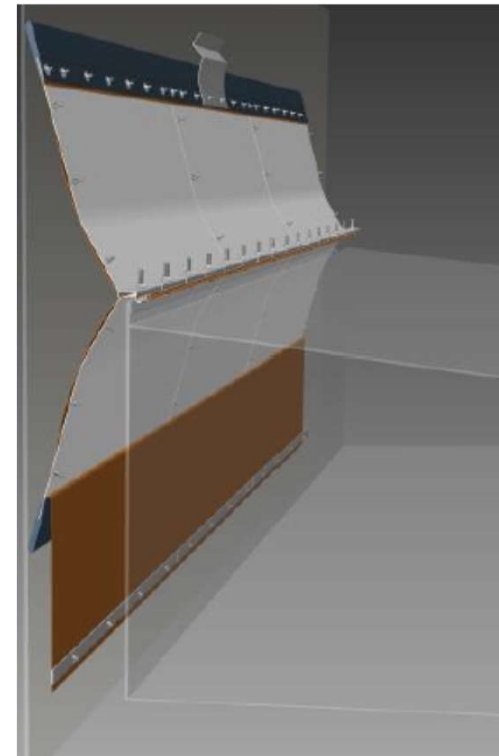
MRS-20S Secondary  
Compression Plate Seal



MRS-25  
Weather Shield

## ➤ EFR Rim Seals # Vapor-Mounted Seal

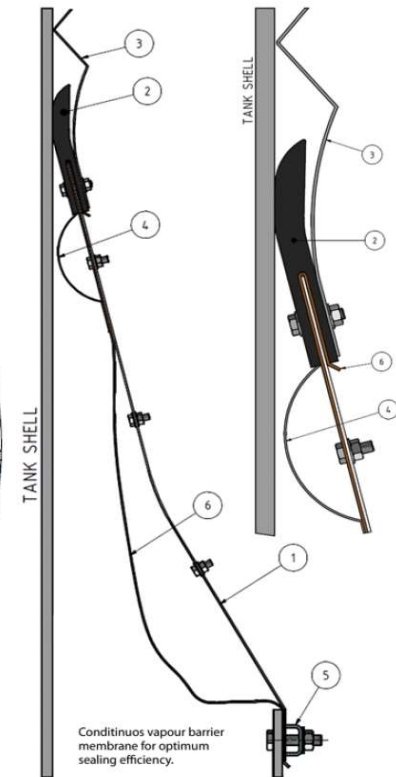
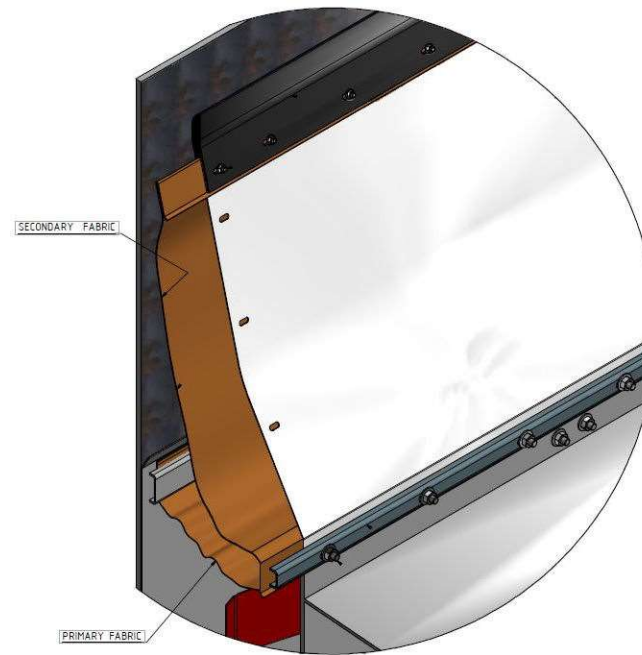
- MRS-20 Compression Plate Seal





## EFR Rim Seals # Vapor-Mounted Seal

- MRS-20 Compression Plate Seal



## ➤ IFR Rim Seals # Mechanical-Shoe Seal

- MRS-1 Mechanical-Shoe Seal
- MRS-3 Primary Spring Plate Shoe Seal



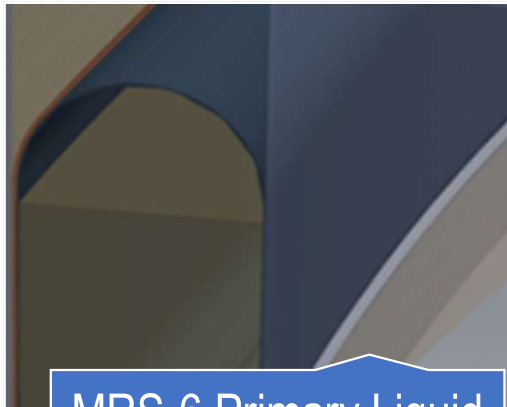
MRS-1  
Mechanical-Shoe Seal



MRS-3 Primary Spring  
Plate Shoe Seal

## ➤ IFR Rim Seals # Liquid-Mounted Seal

- MRS-6 Primary Liquid Filled Seal



MRS-6 Primary Liquid Filled Seal



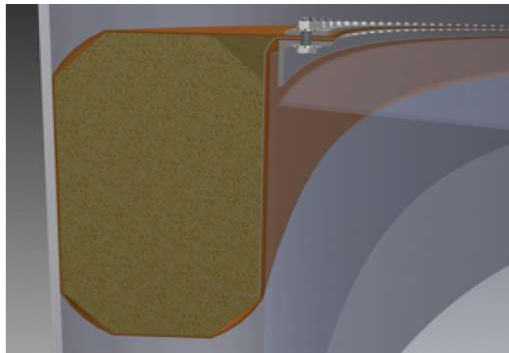
Static Shunt



Vulcanised Enveloppe Weld

## ➤ IFR Rim Seals # Liquid-Mounted Seal

- MRS-7 Primary Foam Filled Seal



MRS-7 Primary Foam Filled Seal



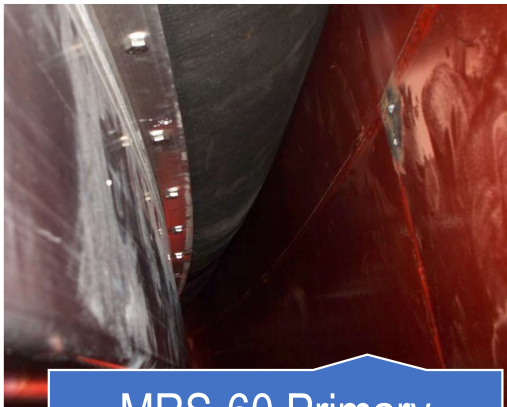
Static Shunt



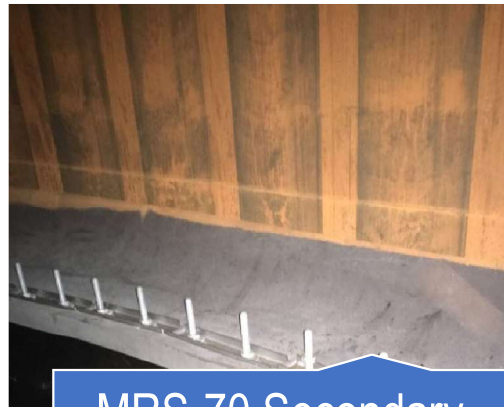
Vulcanised Enveloppe Weld

## ➤ IFR Rim Seals # Vapor-Mounted Seal

- MRS-60 Primary Wiper Seal
- MRS-70 Secondary Wiper Seal
- Double Wiper Seal



MRS-60 Primary  
Wiper Seal



MRS-70 Secondary  
Wiper Seal

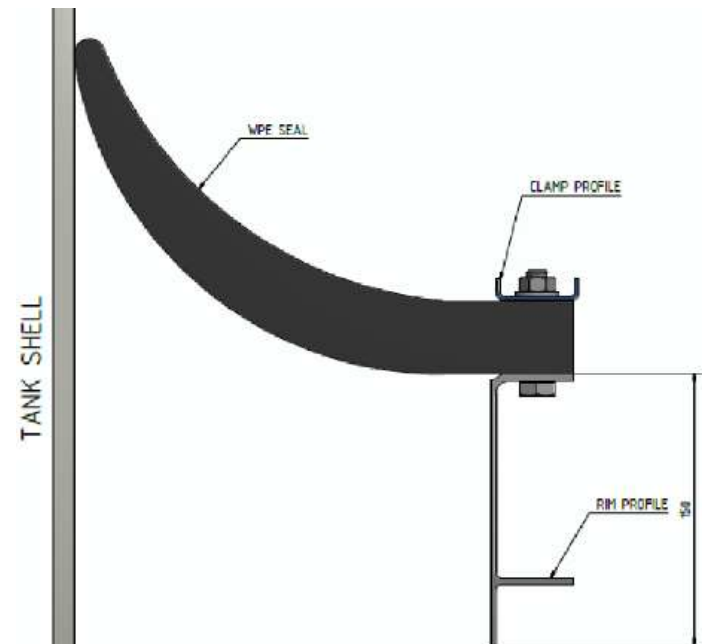
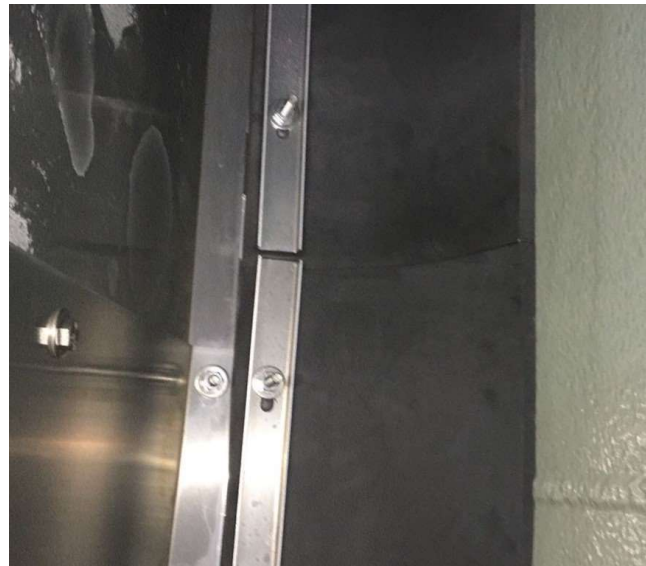


Double  
Wiper Seal



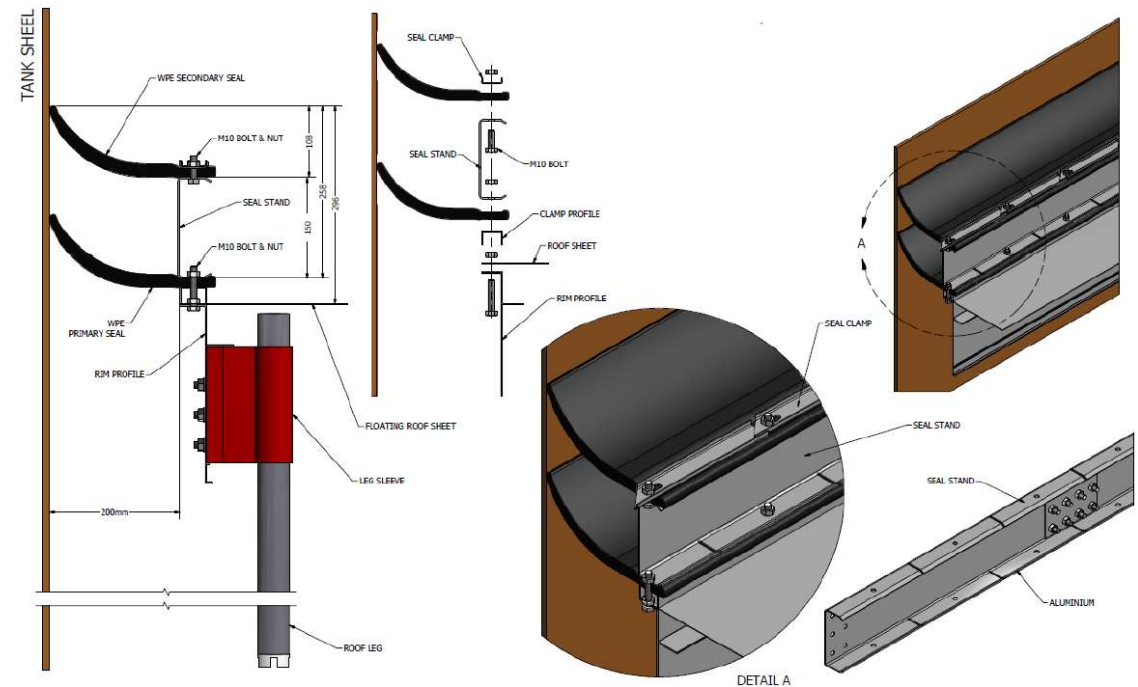
## ➤ IFR Rim Seals # Vapor-Mounted Seal

- MRS-60 Primary Wiper Seal



# ➤ IFR Rim Seals # Vapor-Mounted Seal

- MRS-60\_70 Double Wiper Seal



## ➤ Rim Seals Accessories # Wax Scraper

- Independent
- Shoe Mounted
- Integral



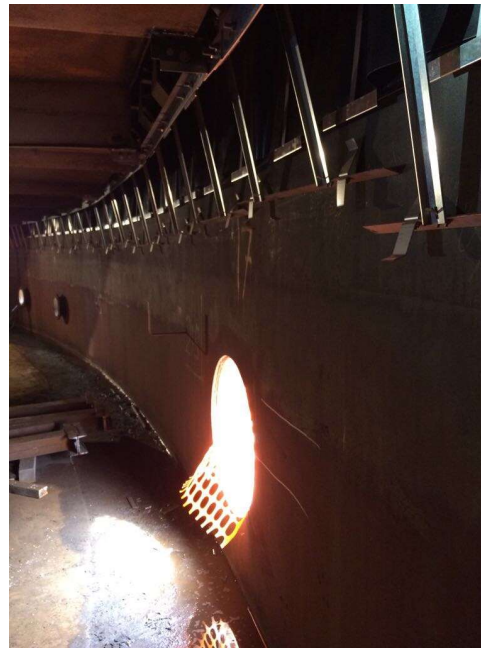
Floating Roof crude  
collection



Rim Seal contaminated  
with Crude

## ➤ Wax Scraper # Independent

- Excellent / Best



## ➤ Wax Scraper # Shoe Mounted

- Good / Average



## ➤ Wax Scraper - Integral

- Poor



## ➤ Rim Seals Accessories # Foam Dam

- Rim Fire Scenario



To prevent...  
Fire Fighting



Field Test...



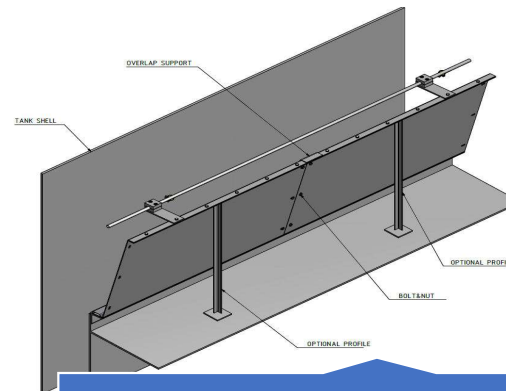
...to prevent

## ➤ Rim Seals Accessories # Foam Dam

- Integral
- Box



Integral Foam Dam



Design and Engineering criteria

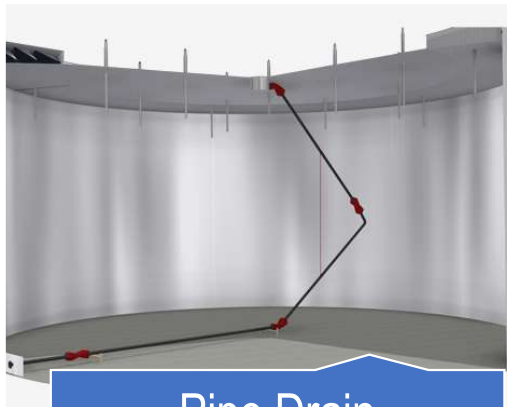


Foam Dam Box around Gauge Pole



## ➤ Roof Drain Systems

- Pipe Drain Systems
- Hose Drain Systems
- Roof Sump Drain Valves



Pipe Drain  
Systems



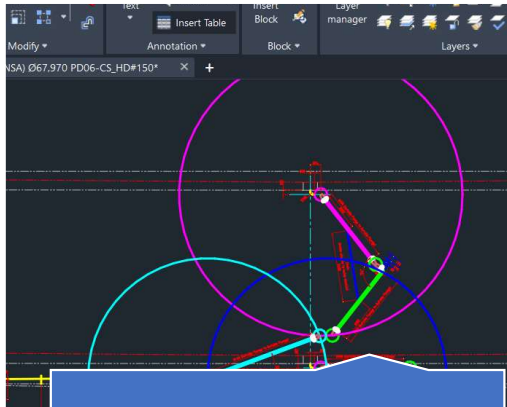
Hose Drain  
Systems



Roof Sump  
Drain Valves

## ➤ Pipe Drain # Pro-Drain (pivot joints)

- Maintenance Free



Engineering



Installation

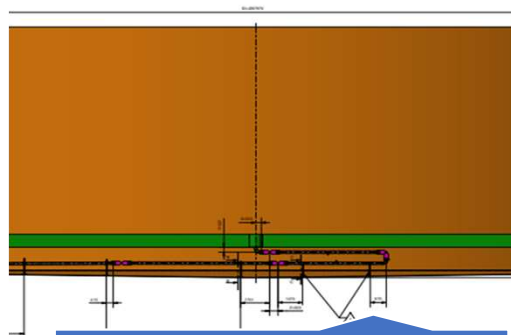


Handover

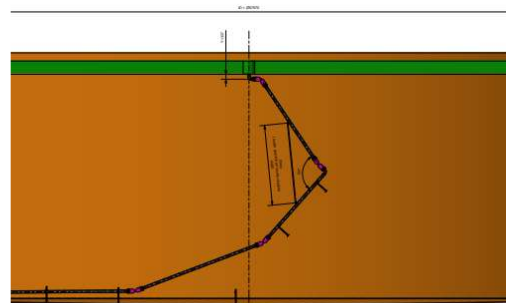


# ➤ Pipe Drain # Pro-Drain (pivot joints)

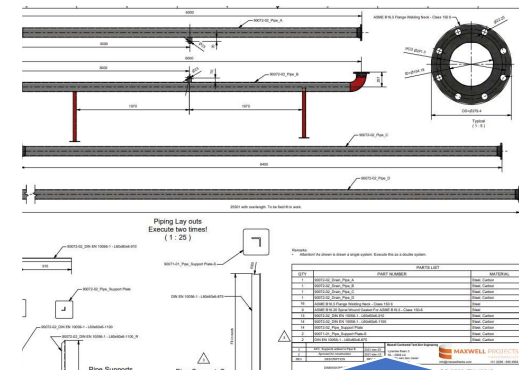
- Engineering



Engineering  
Low Drain Height



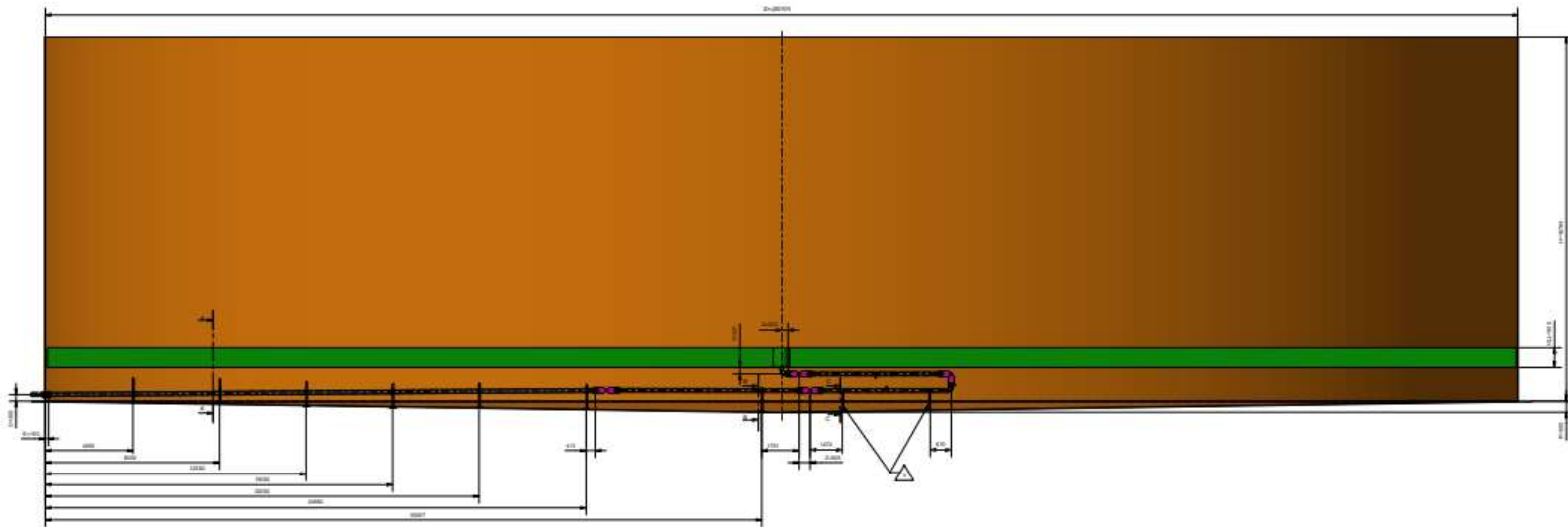
Engineering  
High Drain Height



Engineering  
Articulated Piping Parts

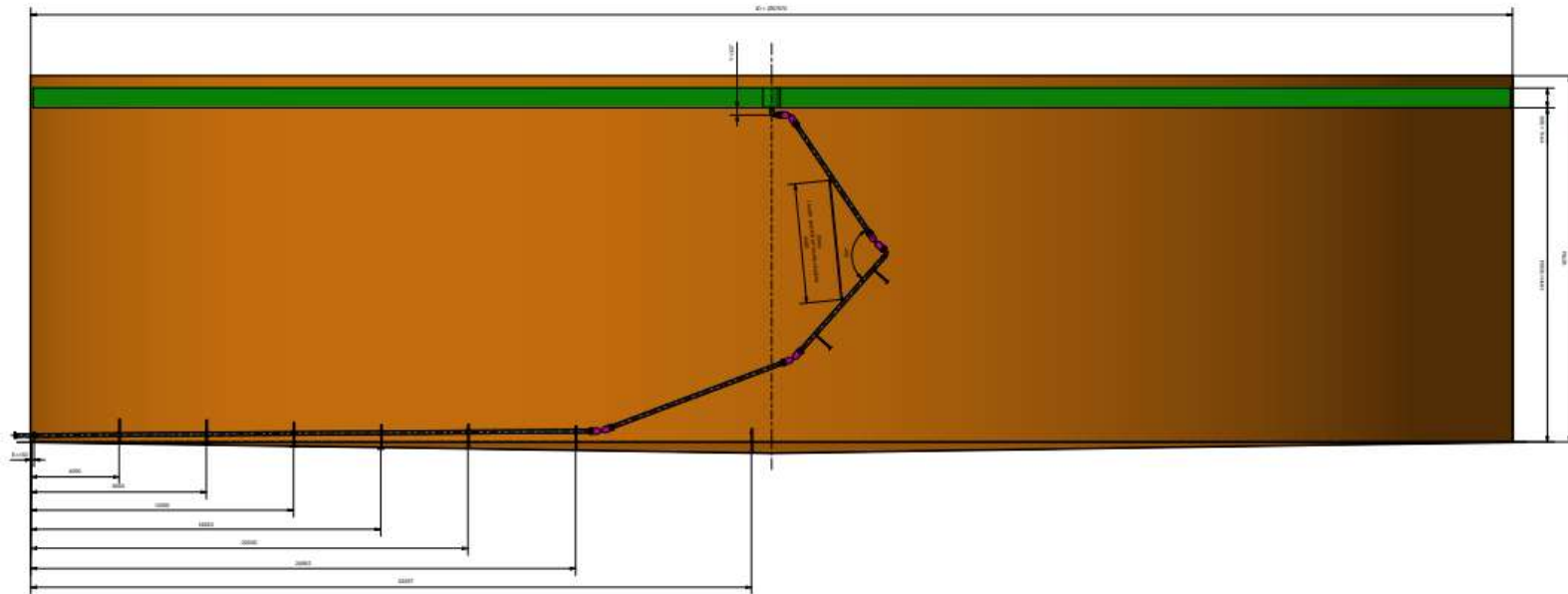
## ➤ Pipe Drain # Pro-Drain (pivot joints)

- Low Drain Height



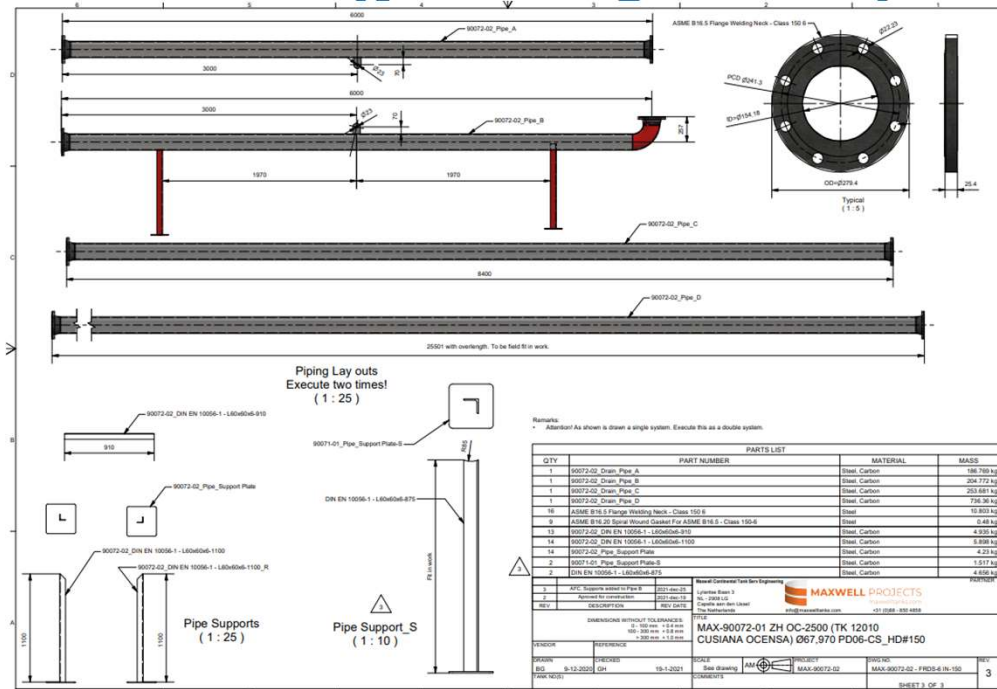
## ➤ Pipe Drain # Pro-Drain (pivot joints)

- High Drain Height



# ➤ Pipe Drain # Pro-Drain (pivot joints)

- Articulated Piping Parts



## ➤ Pipe Drain # Pro-Drain (pivot joints)

- Assembly to packing



Assembly



Marking

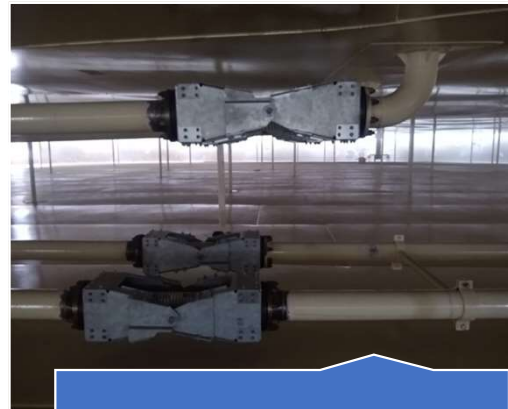


Packing



## ➤ Pipe Drain # Pro-Drain (pivot joints)

- After installation



## ➤ Pipe Drain # Pro-Drain (pivot joints)

- After installation



## ➤ Pipe Drain # Pro-Drain (pivot joints)

- Handover inspection

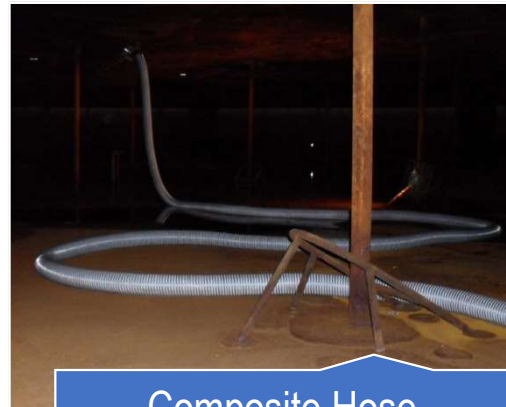


## ➤ Hose Drain # Composite or Rubber

- Maintenance Free



Rubber Hose  
Drain Systems



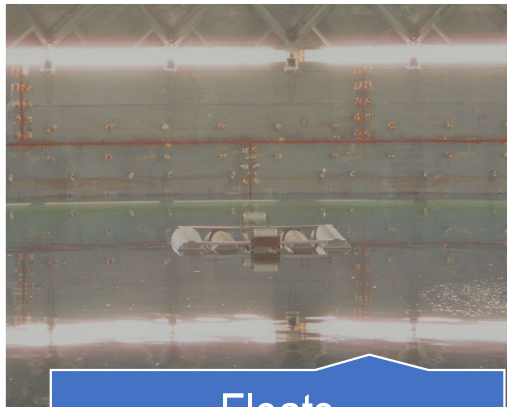
Composite Hose  
Drain Systems



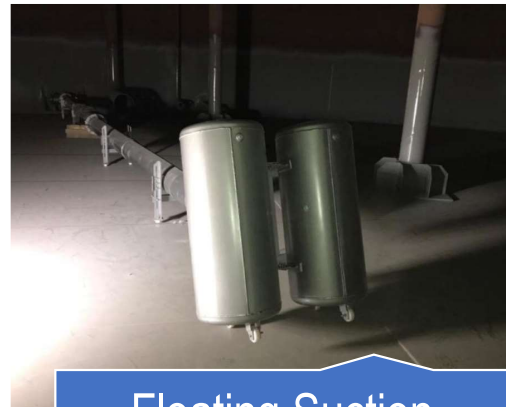
Roof Sump  
Connection

## ➤ Floating Suction / Skimmer

- Floating Suction Systems
- Oil Skimmer Systems



Floats  
(during water test)



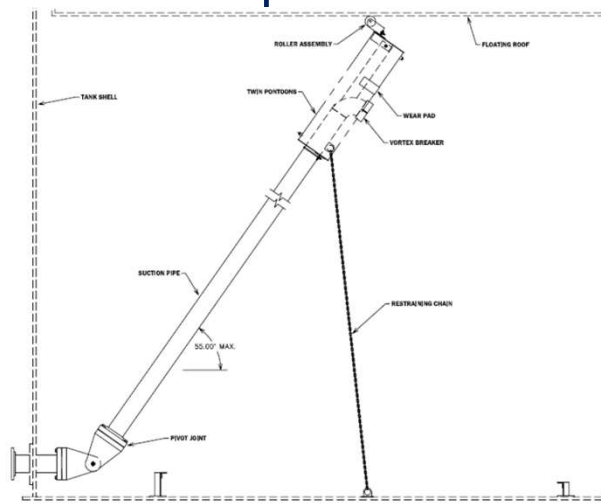
Floating Suction  
Systems



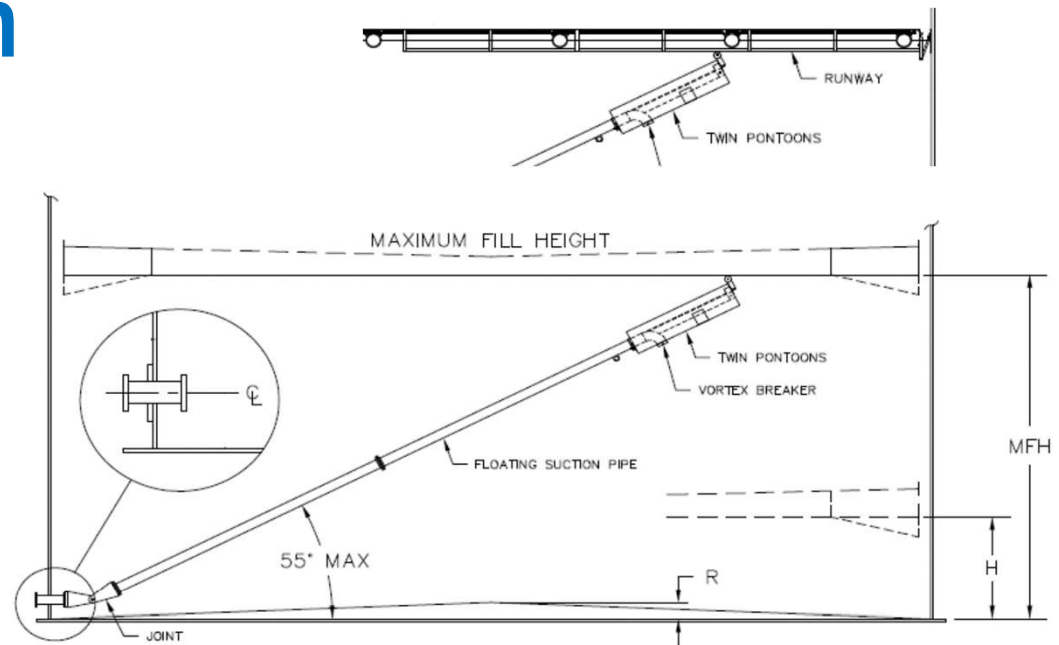
Oil Skimmer  
Systems

# ➤ Floating Suction

## • Principle



Oil Skimmer  
with floats



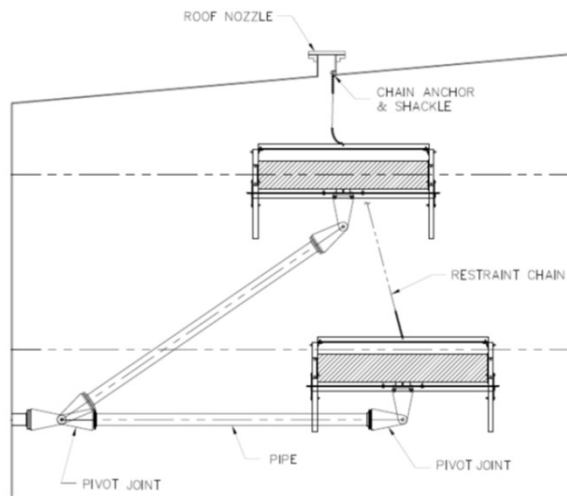
Articulated piping  
under EFR deck

Floating Suction  
under Alu IFR dek

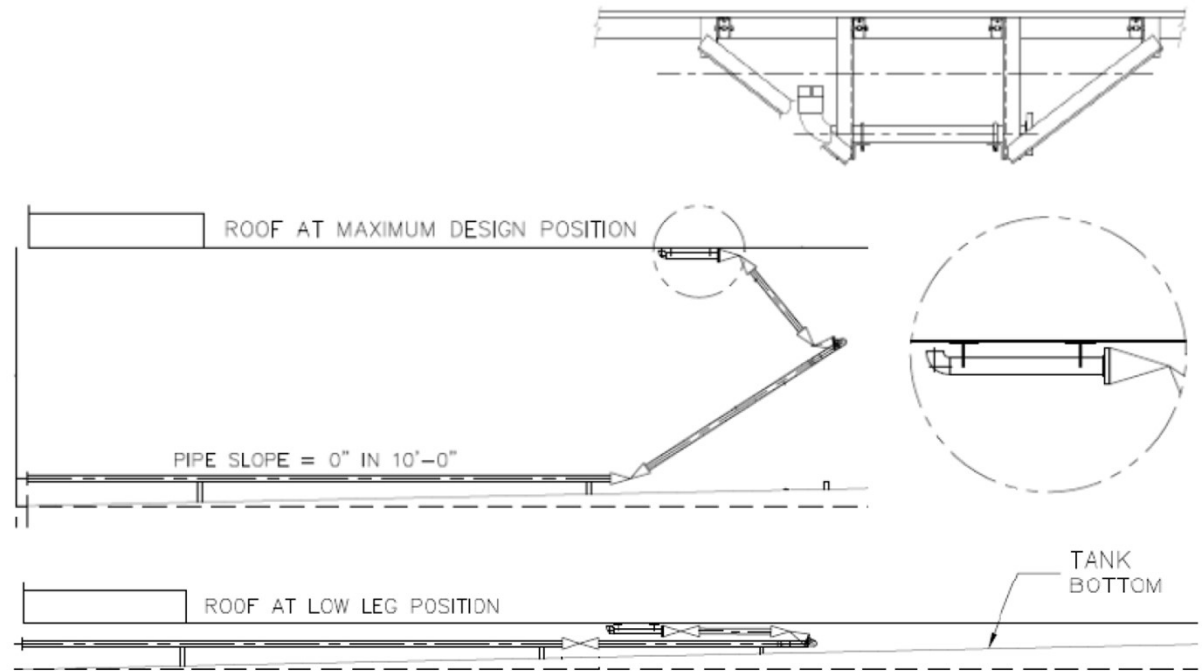


# Oil Skimmer

## • Principle



Oil Skimmer  
with floats

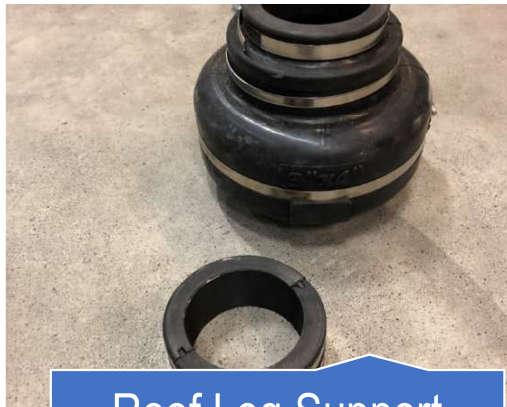


Articulated piping  
below deck

Oil Skimmer Inlet  
below deck

## ➤ Emissions Control / Devices

- Roof Leg Support - Seals
- Gauge Pole - Seals
- Inflatable Pontoon Balloon



Roof Leg Support  
Seals



Gauge Pole Seals



Inflatable Pontoon  
Balloon





# Emissions Control / Gauge Pole Pipe Cover

- Assembly



Installation  
Step



by

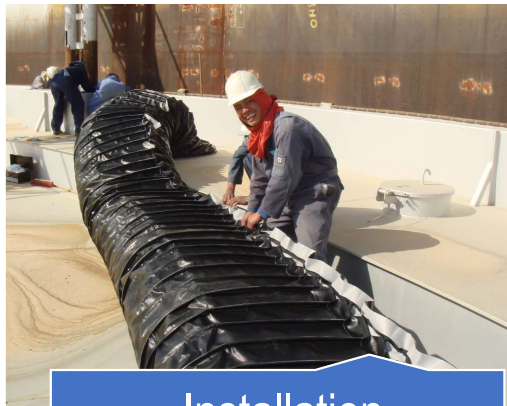


Step



# Emissions Control / Gauge Pole Pipe Cover

- Assembly



Installation  
Step



by

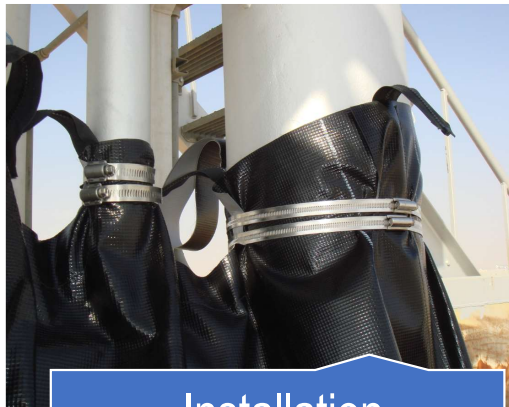


Step



## Emissions Control / Gauge Pole Pipe Cover

- Assembly



Installation  
Step



by



Step



# Emissions Control / Gauge Pole Pipe Cover

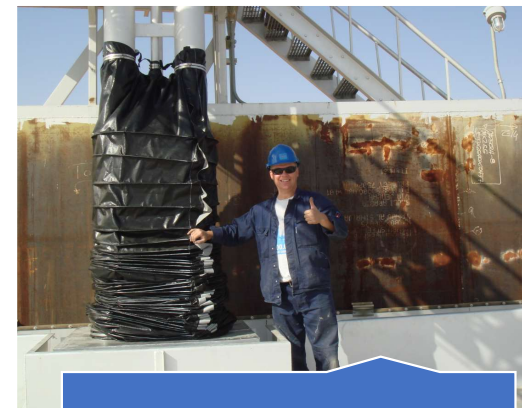
- Assembly



Installation  
Step



by



Step



## Rim Vents

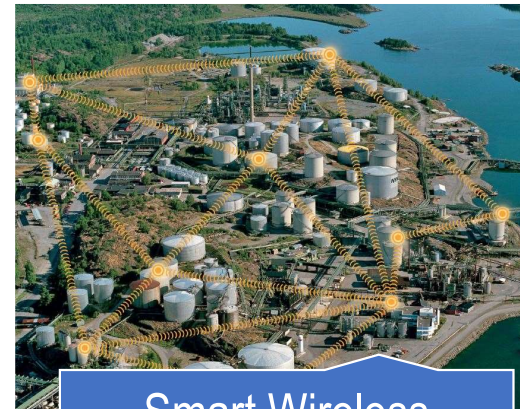
- PRV Rim Vent
- PVRV Rim Vent
- Smart Wireless Solutions



PRV Rim Vent



PVRV Rim Vent



Smart Wireless  
Solutions



## Difusers

- Liquid Diffusers
- Gas Diffusers



Gas Diffuser



Liquid Diffuser



Square  
Perforated Plate

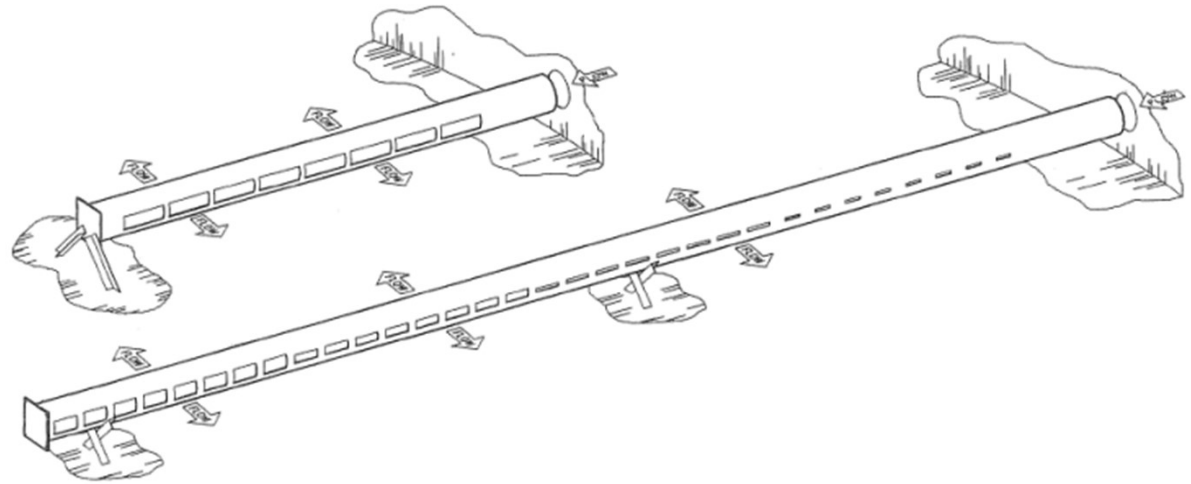


## Diffusers

- Sludge (Gas) Diffusers



Sludge  
Diffusers



Technical Detail  
-

## ➤ Common service Offerings



### PUMPS

Specialised in fast delivery of pumps and pump parts with over 90% coverage of brands

- Trade
- Engineering
- Repair

### MECHANICAL SEALS

Extensive experience in trade, engineering and repair of mechanical seals

- Trade
- Engineering
- Repair

### ELECTRO MOTORS

Offering a full budget range of electro motors from a large variety of brands

- Trade
- Engineering

### OTHER SUPPLIES

Offering a full range of technical support



## ➤ Pump Engineering



### PROJECTS

- Independent advisory on pump installations
- Calculation and selection of pump installations

#### Options

- Frequency driver Engineering
- Base plates
- Sealing systems

Offshore High Voltage Sub Station Building and engineering of (pump) skids

Retrofitting of Diesel Boosting Pumps, Transfer Pumps, Closed drain Pumps

Upgrading platform supply for Vessels to comply with latest standards



## ➤ Pump & Parts



In-line centrifugal pumps



End suction pumps



Eccentric screw pumps



2 & 3 spindle pumps



Gear pumps



Multistage pumps



Diaphragm pumps



Other pump types

## ➤ Pump & Part Brands

- Garbarino
- Seim
- Fluiten
- Xylem Lowara
- Someflu
- MTH Pumps
- Jurop
- Travaini
- Thistlebond
- GTO High pressure pumps
- System one
- K-purnp (Begemann)
- Simsite
- Flex-a-seal

- Depa Diaphragm pumps
- Tru- Flo

- Stork
- Thune Eureka
- Kral
- Leistritz
- Calpeda
- Blagdon
- Speck
- Sandpiper
- Desmi
- Versa-matic
- Borger
- Wilden
- Azcue
- Itur
- Guinard
- Grundfos

- Moineau
- Bryne Mek
- Debem
- Depa
- Yamada
- KSB
- Zeilfelder
- Johnson pump
- Duivelaar pompen
- JMW
- Hydroster
- Allweiler
- Seepex

- Hamworthy
- Allweiler
- Shinko
- Taiko Kikai
- Teikoku
- Heishin
- Naniwa
- Shin Shin
- Ishii
- Saskura
- Seepex
- Guinard
- Thune Eureka
- Merser
- Iron
- Imo

- Gothia
- Thermomeccanica

DEALERSHIPS

ORIGINAL PARTS

ALTERNATIVE

## ➤ Pump Repairs



High quality modern and well equipped repair facility (14.000 m<sup>2</sup>)

Testing facility with pressure up to 150 bar with capacity of 10.000 m<sup>3</sup>/hr

Each reconditioned pump is pressure tested and comes with pump-report

All types and brands centrifugal (Split case, multi-stage etc.)

All types and brands of positive displacement pumps (gear-, lobe-, screw- and mono pumps)

All brands vacuum pumps  
All brands can be repaired



## ➤ Mechanical Seals



### PROJECTS

- Independent advisory on mechanical seal solutions
- Calculation and selection of mechanical seal

#### Options

- Sealing systems (single / double)
- Variety of Material selection
- Customer specific solutions

Mechanical seal design for sealing range from 55 to 260 mm

Mechanical seal design for bitumen pumps up to 280 °C

Main shaft propellers from 40 to 300 mm



## ➤ Mechanical Seals & Parts



Seals with ATEX and API



Sealing systems



Range of Brands



Stock of Seals and Cartridge



Engineered Seals

## ➤ Mechanical Seals



- Sealing Service Department with state of the art equipment for seal repair and seal failure analyses

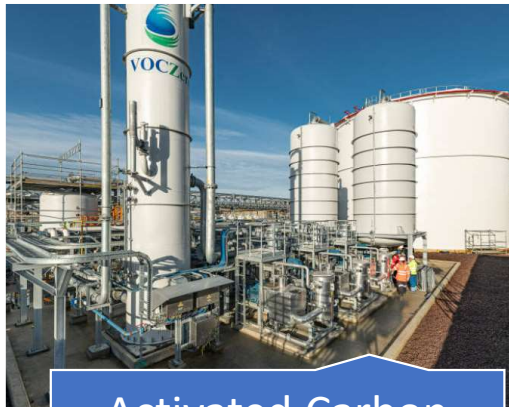
- All seals are tested after reconditioning and come with test report and certificate

- Customer consignment for complete seals and repair parts are possible

- Repair, modification and mounting of any type of seal

## ➤ Common service Offerings

- Vapour Recovery Units



Activated Carbon  
Filtration



Membrane Filtration



Regenerative Thermal  
Oxidizers



## ➤ Vapour Recovery Units

- DTL Vapour Recovery Units # high concentrations VOC vapour
- TRAC Vapour Recovery Units # low concentration VOC vapour
- VOC Vapour Abatement Systems # odorous components absorption



DTL  
Vapour Recovery Units



TRAC  
Vapour Recovery Units



VOC Vapour Abatement  
Systems



## Common service Offerings

- Pipeline Filters # Horizontal en Vertical design
- Design Code ASME Sec.VIII.Div.1
- Wire Mesh – SS316 Perforated Sheet



Basic Design  
Principle



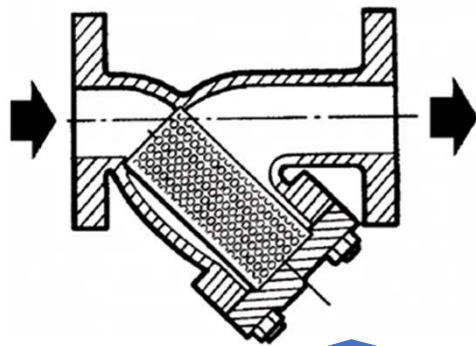
Accessories add-on  
Options



Filter Basket Options

## ➤ Pipeline Filter # Horizontal

- Side # filter loading



Top View  
Impression



Schematic



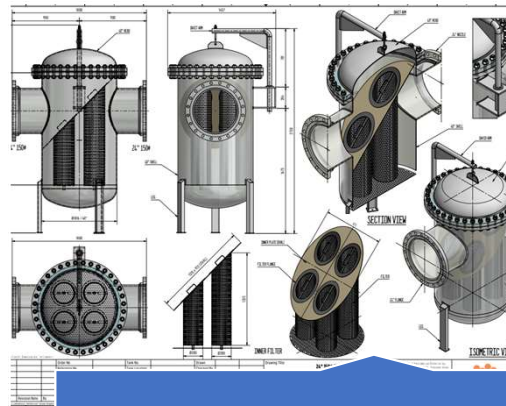
Prefab Unit

## ➤ Pipeline Filter # Vertical

- Top # filter loading
- Bolted Cover with Davit Arm



Side View  
Impression



Schematic



Prefab Unit

## *AGDR Aluminium Geodesic Dome Roof*



Tank 81,382 mtr  
Wales – United Kingdom

# *PROJECTS*

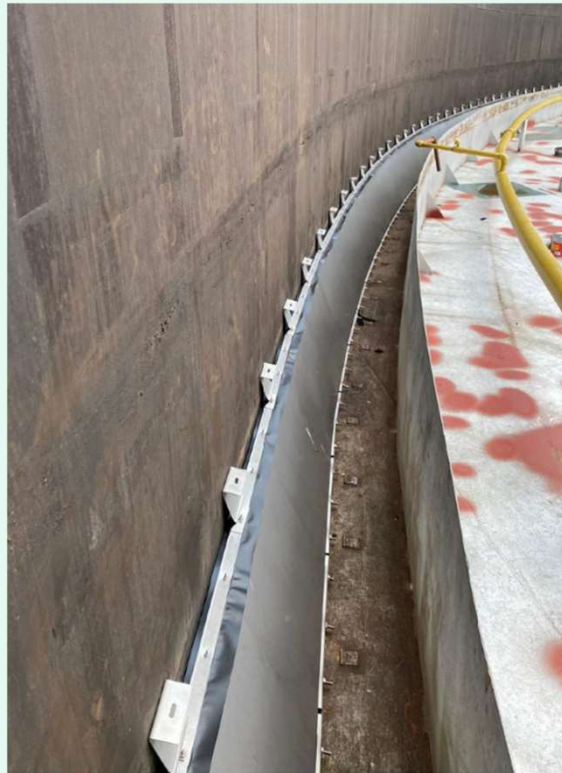


*MRS-1 Primary Scissor Shoe Plate Seal with  
Wax Scrapers and combined with a  
MRS-20 Secondary Compression Plate Seal*



*Tank ID 64,000 mtr  
Ecuador*

# PROJECTS

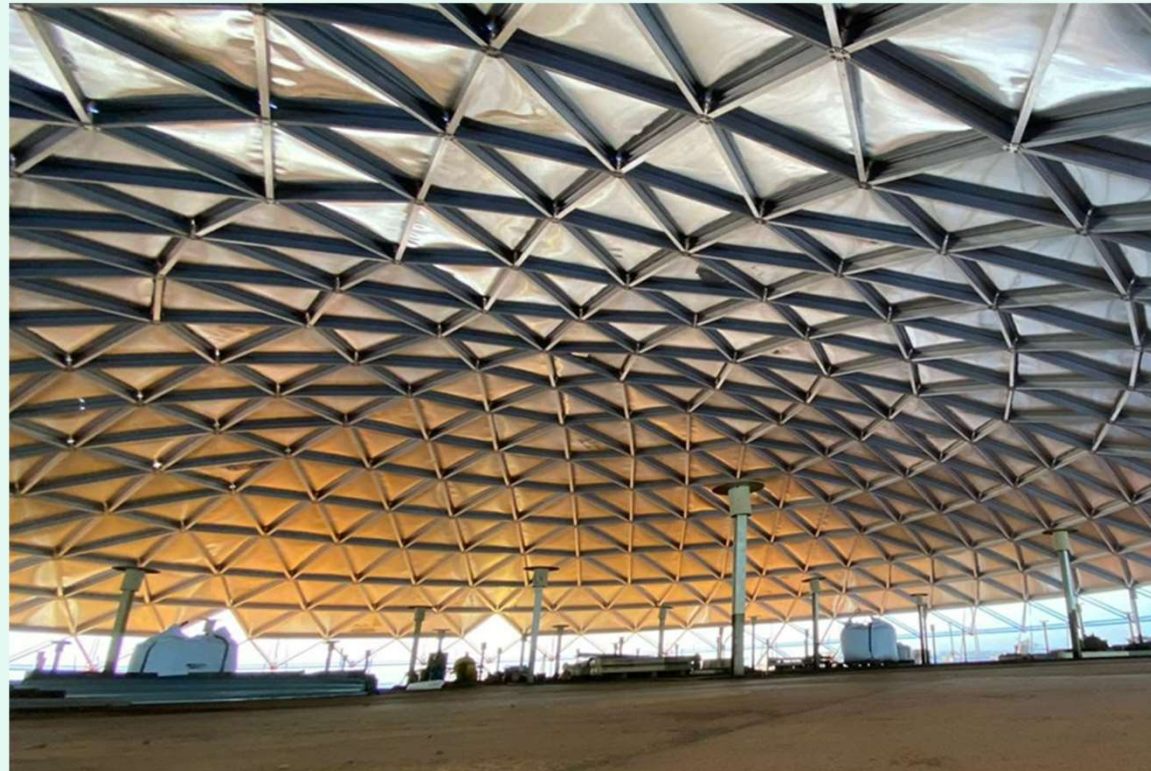


*AGDR Aluminium Geodesic Dome Roof  
with walkway*



Tank 67,066 mtr  
The Netherlands

**PROJECTS**

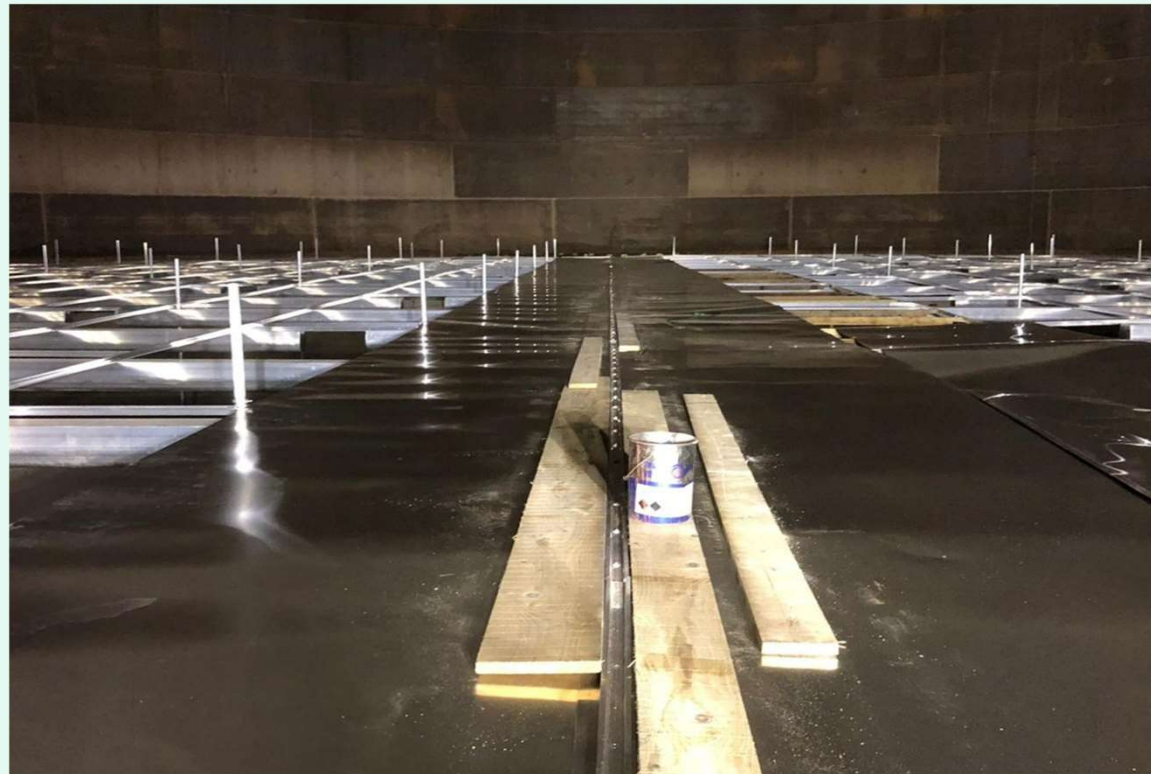


*IFRT-MSP-A Aluminium  
Skin & Pontoon Internal Floating Roof  
with Double Wiper Seal and Foam Dam*



Tank ID 42,670 mtr  
Zagreb, Croatia

# PROJECTS



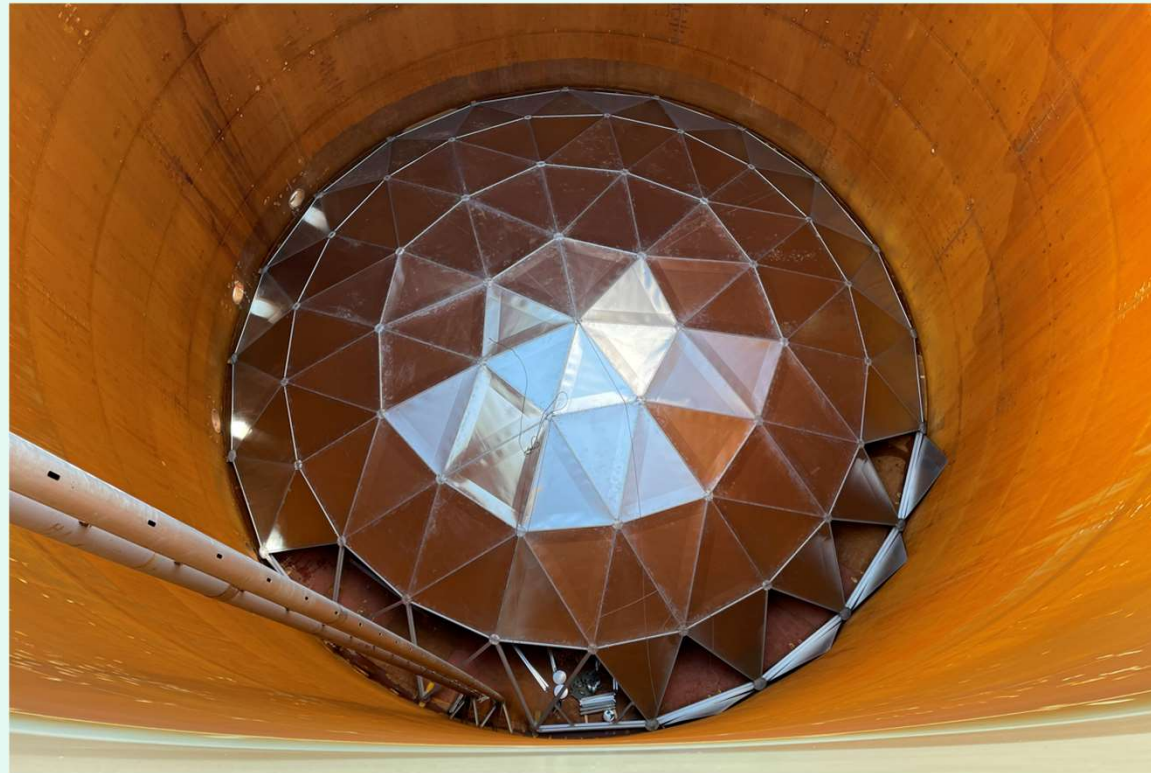


*AGDR Aluminium Geodesic Dome Roof  
with walkway*



Tank 29,000 mtr  
The Netherlands

**PROJECTS**

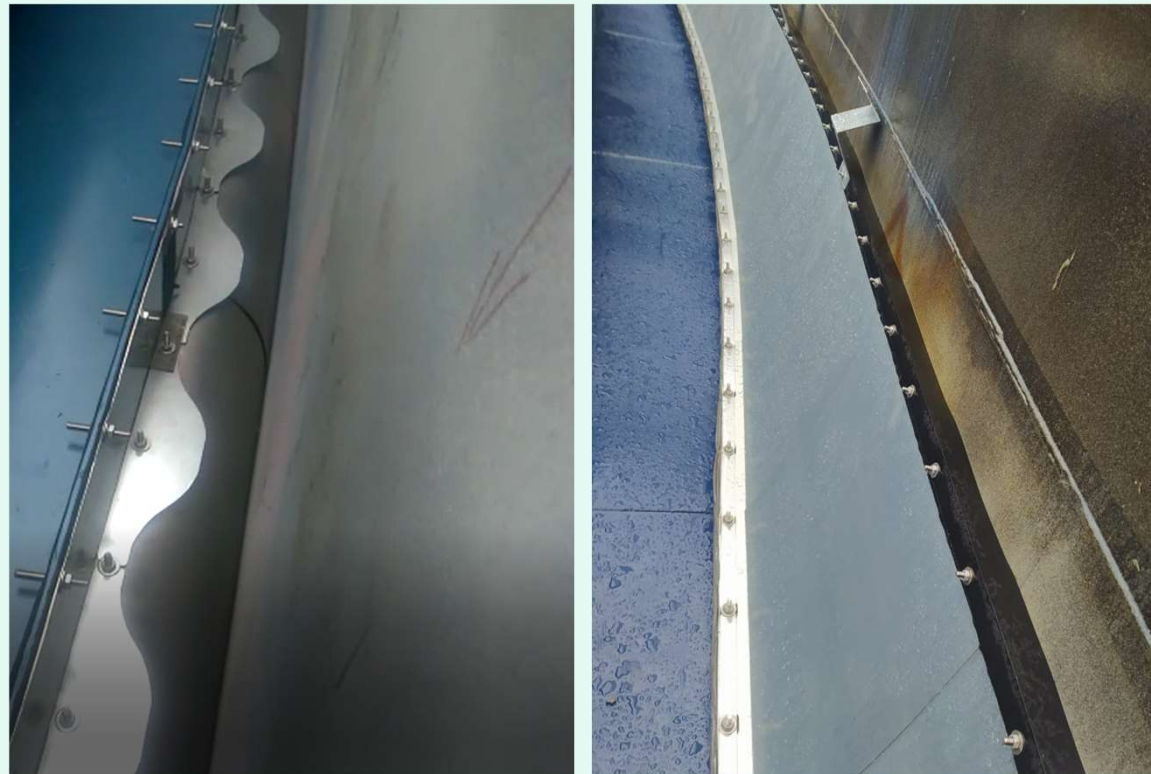


*MRS-3 Primary Spring Plate Shoe Seal w.  
Drop Down Bracket and combined with  
MRS-20 Secondary Compression Plate Seal*



Tank ID 73,152 mtr  
Colombia

# PROJECTS

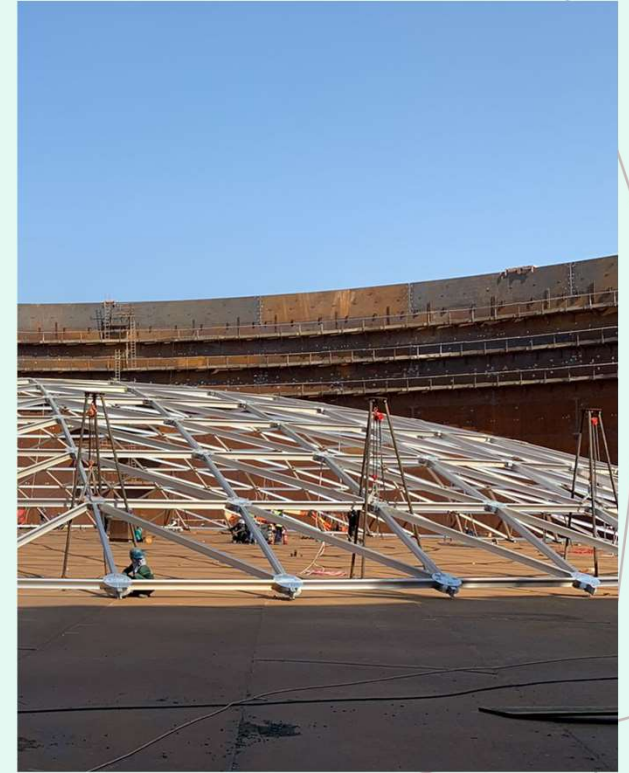


*AGDR Aluminium Geodesic Dome Roof  
with walkway*



Tank 106,000 mtr  
Saudi Arabia

**PROJECTS**



The logo features a stylized white graphic on the left consisting of three horizontal bands that curve to form a partial cylinder. To the right of this graphic, the word "MAXWELL" is written in a large, bold, white, sans-serif font. Below "MAXWELL", the words "CONTINENTAL TANKSERV" are written in a smaller, bold, white, sans-serif font.

**MAXWELL**  
**CONTINENTAL TANKSERV**

maxwelltanks.com



**Progressive technologies  
for the ground tank farm**

**In Iraq**

October 2024

**MAXWELL**

Gerhard Rijdsdijk



maxwelltanks.com



*THANKS*

Gerhard Rijdsdijk - Chief Executive Officer

C: +31 6 2033 2554

E: [gerhard@maxwelltanks.com](mailto:gerhard@maxwelltanks.com)

The logo features a stylized white graphic on the left that resembles a tank or a cylindrical container with a curved top and bottom edge. To the right of this graphic, the word "MAXWELL" is written in a large, bold, white, sans-serif font. Below "MAXWELL", the words "CONTINENTAL TANKSERV" are written in a smaller, bold, white, sans-serif font.

**MAXWELL**  
**CONTINENTAL TANKSERV**