Storagetech
STORAGE TANK EQUIPMENT
An Äager Brand

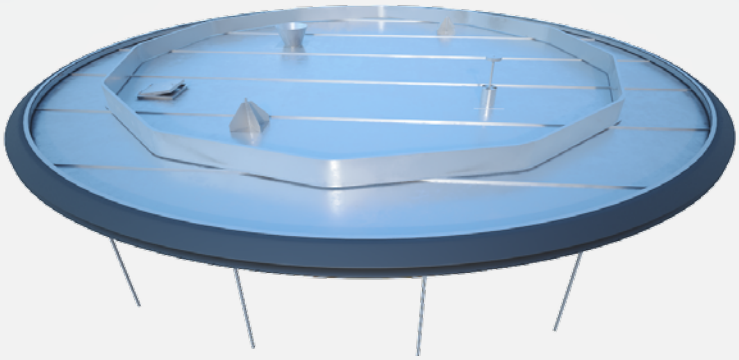
# Internal Floating Roof

Pontoon Type IFR

## 1. GENERAL

## 1.1 ENGINEERING

**1.1.1** Aluminum Pontoon Type Internal Floating Roof is designed according to API650 Appendix H. Structure weight is minimized and provides the best price performance balance to fully meet API requirements. In the entire connections of framework structure are assembled using special joining pieces. The Joint Clamps are provided to prevent any deformation in case of a load on the connection points of Rafter and Girders.



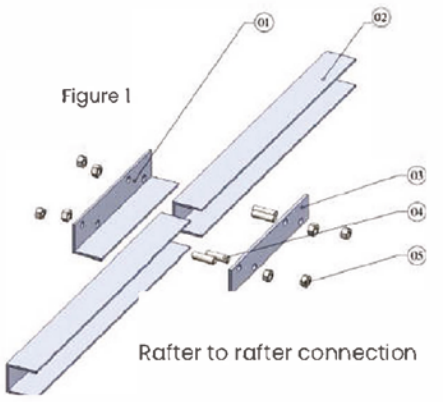


Figure 1

| Part List | | |
|---|---|---|
| **Object** | **Description** | **Material** |
| 1 | Rafter Joint Support | Aluminium-6063 |
| 2 | Rafter | Aluminium-6063 |
| 3 | Connection Plate | Aluminium-6063 |
| 4 | Stud, M6x20mm | Aluminium-6063 |
| 5 | NUT, M6 | Aluminium-6013 |

The system is designed to be lightweight, precise and easy to install. The legs which sit on the bottom of the tank are optionally provided in an adjustable type. The bolts are provided in stainless steel or aluminum basis according to customer demand and price performance analysis. The sealing system is provided as single & double wiper seal, mechanical seal with secondary barrier as required. These systems eliminate emission losses in the range of 95-99%.

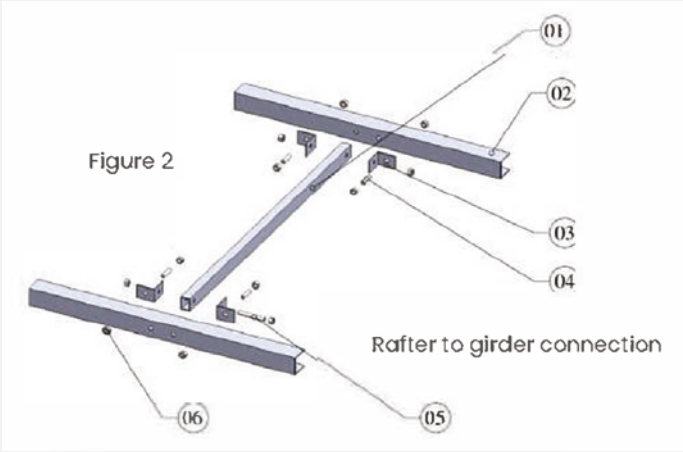


Figure 2

| Part List | | |
|---|---|---|
| **Object** | **Description** | **Material** |
| 1 | Girder | Aluminium-6063 |
| 2 | Rafter | Aluminium-6063 |
| 3 | Connector | Aluminium-6063 |
| 4 | Stud, M6x20mm | Aluminium-6063 |
| 5 | Stud, M6x50mm | Aluminium-6013 |
| 6 | NUT, M6 | |

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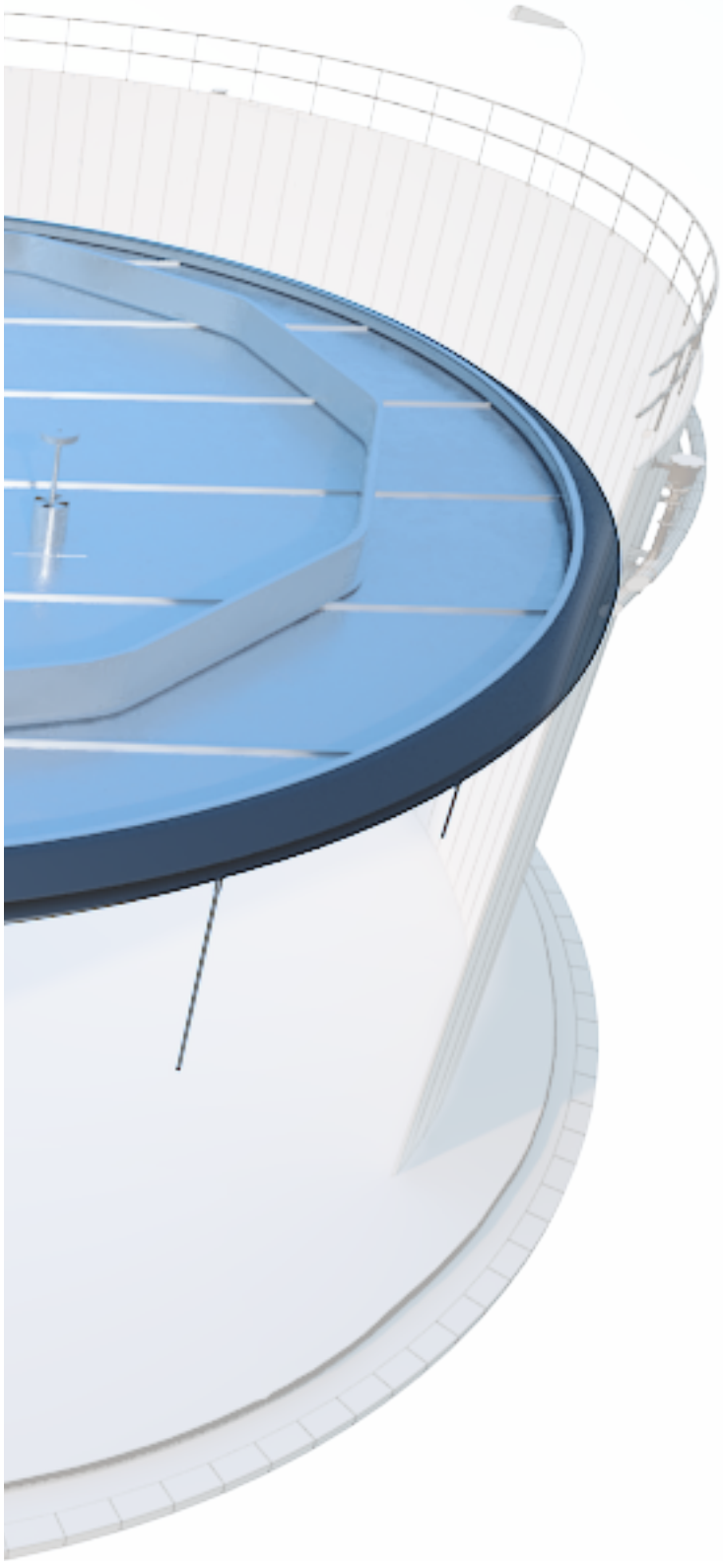
**Part List**

| Object | Description | Material |
|---|---|---|
| 1 | Pantoon | Aluminium-6063 |
| 2 | Rafter | Aluminium-1050/H14 |
| 3 | Stud, M6x30mm | Aluminium-6063 |
| 4 | NUT, M6 | Aluminium-6063 |
| 5 | Buoy Strap | Aluminium-6013 |



**1.1.2** Aluminum deck laid on an aluminum grid framework supported above the liquid surface by tubular aluminum pontoons. The deck skin for the noncontact-type floating decks is typically constructed of rolled aluminum sheets (about 1.5 meters [m] wide and 0.5 millimeter [mm] thick. The overlapping aluminum sheets are joined by bolted aluminum clamping bars that run perpendicular to the pontoons to improve the rigidity of the frame. The deck skin seams can be metal on metal or gasketed with a polymeric material. The pontoons and clamping bars form the structural frame of the floating deck.

**1.1.3** Internal Floating Roof system is designed, fabricated, and installed in applicable international codes.

• API Standard 650 "Welded Steel Tanks for Oil Storage

• Emission Factor Documentation for AP-42 Organic Liquid Storage Tanks

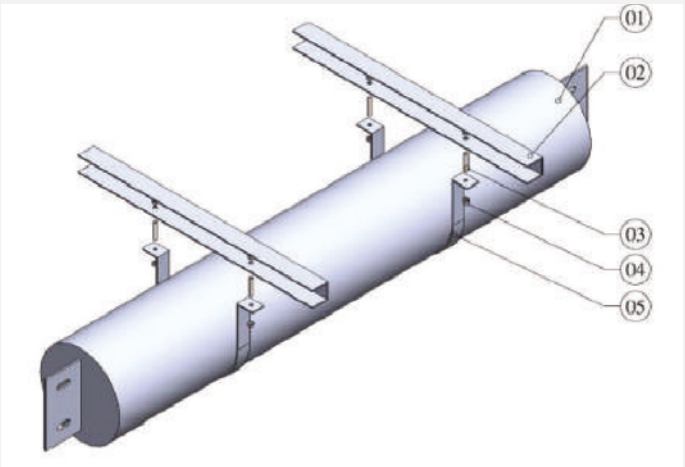
• EN 14015

• New Source Performance Standards (NSPS) for Volatile Organic Liquid Storage Vessels

• EEMUA 213

**1.1.4** Buoyancy calculations shall be performed as per the specific stored liquid density of 0.7.

**1.1.5** All internal floating roofs shall include buoyancy required to support at least twice its dead weight. (including the weight of the flotation compartments, seal and all other floating roof and attached components), plus additional buoyancy to offset the calculated friction exerted by peripheral and penetration seals during filling.




**1.1.6** All internal floating roofs with multiple flotation compartments shall be capable of floating without additional damage after any two compartments are punctured and flooded.

**1.1.7** The internal floating roof shall be designed to meet safely support at least two men walking anywhere on the roof while it is floating without damaging the floating roof.

**1.1.8** A vapor-tight rim (or skirt), extending at least 150 mm (6 in.) above the liquid at the design flotation level, shall be provided around both the internal floating roof periphery and around all internal floating roof penetrations.

## 1.2 STRUCTURE

### 1.2.1 Rim Connections

• Because of setovered bolts on rim plate making the assembling works easier on site.

• Rim plate to be used 3m. instead of 6m to increase balance of system.

• Because of setovered bolts on rim plate making the assembling works easier on site.

• Rim plate to be used 3m. instead of 6m to increase balance of system.

• Lap jointed Rims decrease the number of connection plates, total weight and forced to system further balanced.

### 1.2.2 Rafter Connections

• All connection points to be fixed by equal angle for demanding further strength to connection points.

• Joint plates with bolted connections provide ultimate strength on fix points.

• Any rafter connection points cannot be come upon pontoons by software basis designs.

• All connection points to be drilled on facility and girders delivered to site area to be pre-assembled for easier erection progress.

• Setovered bolts make the assemblies easier.

• 40 mm width rafters and 30x20 mm sq. tubing provide less weight and uniform load balance.

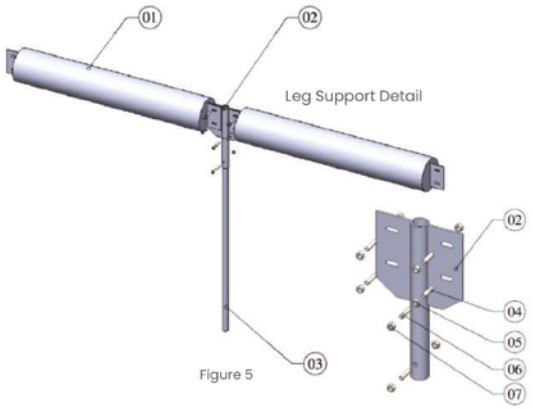
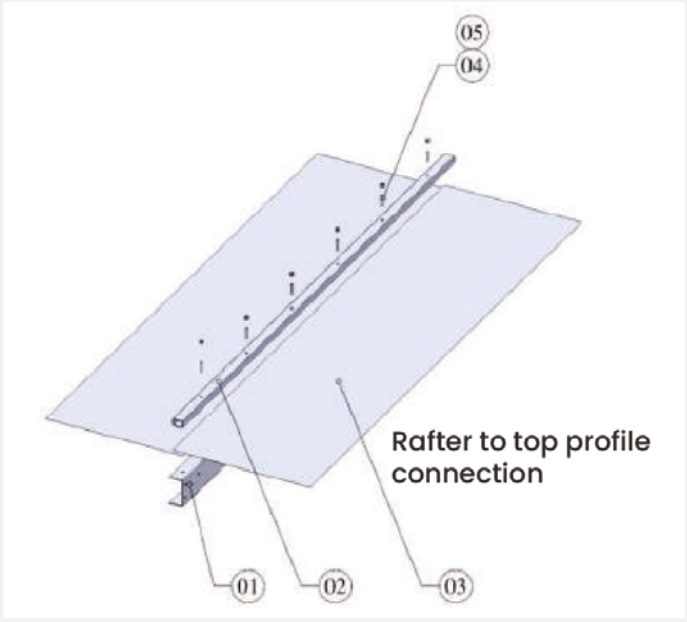


Figure 5

| Part List | | |
|---|---|---|
| **Object** | **Description** | **Material** |
| 1 | Pantoon | Aluminium-1050/H14 |
| 2 | Leg Support | Aluminium-1050/H14 |
| 3 | Leg Pipe | Aluminium-6063 |
| 4 | STUD, M10x30mm | Aluminium-6063 |
| 5 | NUT, M10 | Aluminium-6013 |
| 6 | STUD, M8x70mm | Aluminium-6013 |
| 7 | NUT, M8 | Aluminium-6013 |




| Part List | | |
|---|---|---|
| **Object** | **Description** | **Material** |
| 1 | Rafter | Aluminium-6063 |
| 2 | Top Profile | Aluminium-1050/H14 |
| 3 | Cover | Aluminium-6063 |
| 4 | STUD, M6x40mm | Aluminium-6063 |
| 5 | NUT, M6 | Aluminium-6013 |

### 1.2.3 Leg Connections

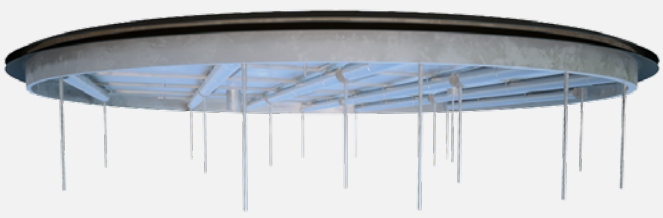
• Leg connections on rim plate to be supplied from the rim connection points, accordingly sloshing down cannot be appeared in time.

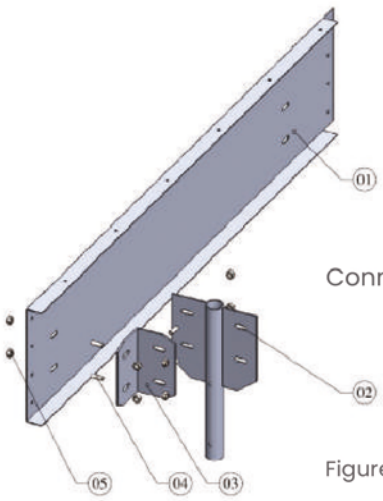
• Leg fixment holes to be provided on site for arrangement of the leg lengths because of bottom plate slopes.

• Legs can be arranged as rafter or pontoon connected according to the requirement of tank design.

• Ceiling suspended type connections can be supplied instead of legs.

• Polyamide or teflon insulating pads sit on the bottom of the tank



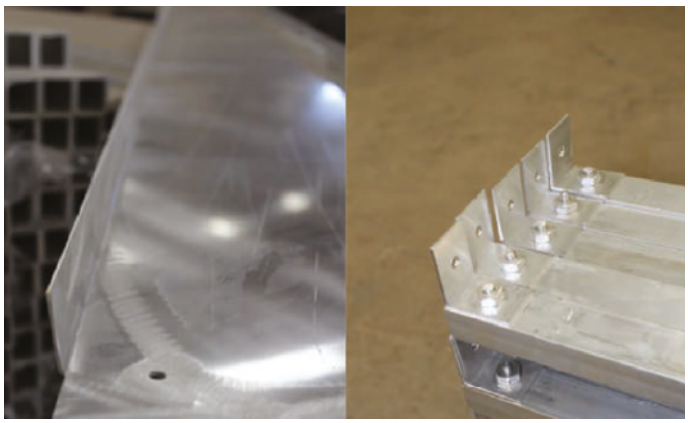



Connection Rim-Rim Float

Figure 6

**Part List**

| Object | Description | Material |
|---|---|---|
| 1 | Rim Profile | Aluminium-1050/H14 |
| 2 | Leg Support | Aluminium-1050/H14 |
| 3 | Connection Profile | Aluminium-1050/H14 |
| 4 | Stud, M10x30mm | Aluminium-6063 |
| 5 | NUT, M10 | Aluminium-6063 |



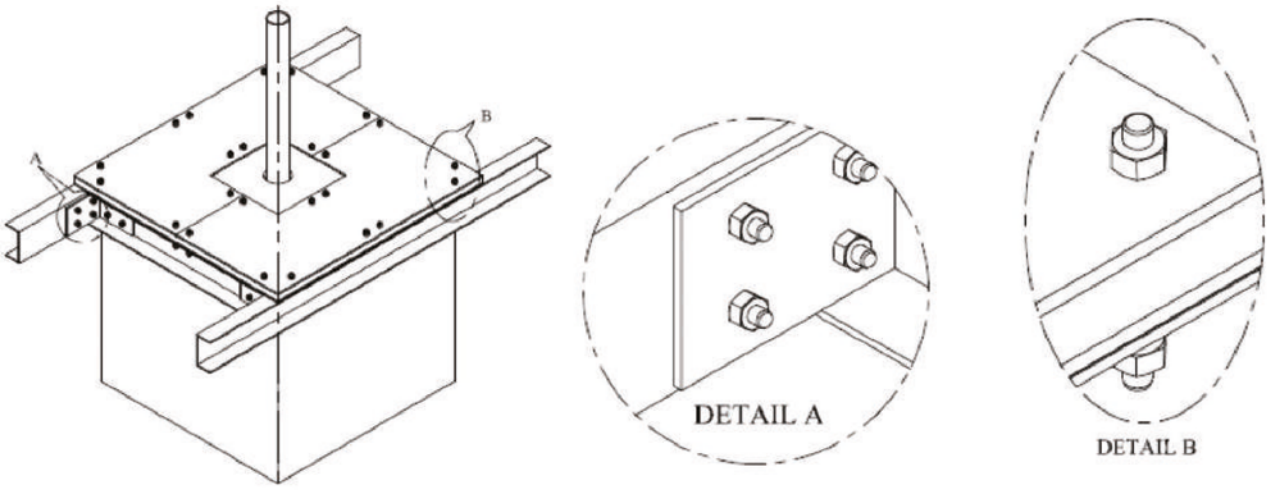
## 2. MANUFACTURING

Manufacturing has been oriented in order to make installations most effective at site. Thanks to the ERGİL's experiences that have been coming over the years considering the problematic situations reflecting to our manufacturing facilities. All relevant bolt holes are delivered as drilled all openings and negotiators are pre-assembled, all regarding plates are delivered bended in our workshop.

Parts are delivered to site with full intercompatibility with each others. The systems has been automated to prevent staff-based mistakes.

Parts are manufactured perfectly and the compatibility has been confirmed by QC. Each pieces are inspected and reported by means of strengths, pressure resistance, sealing tests, material deformations caused by goods are detected and these are removed from the system by the quality control.

Each piece of material is individually packaged and tagged. A copy of all listings is delivered in the quality documentations to the relevant department of the client to ensure so that the maximum product performance is achieved.




# 1.2 AUXILIARY EQUIPMENTS AND MATERIAL

## 2.1 Standart Roof Equipments

**2.1.1** Aluminium or Stainless Steel Hardware

**2.1.2** Sample Pipes or Wells

A sample well may be provided to allow liquid stock sampling.

**2.1.3** Ladder Wells

Some tanks are equipped with internal ladders that extend from a manhole in the fixed roof to the tank bottom.

**2.1.4** Vacuum Breakers

The purpose of a vacuum breaker is to allow for the exchange of vapor and air through the floating roof during filling and emptying.

**2.1.5** Deck Legs

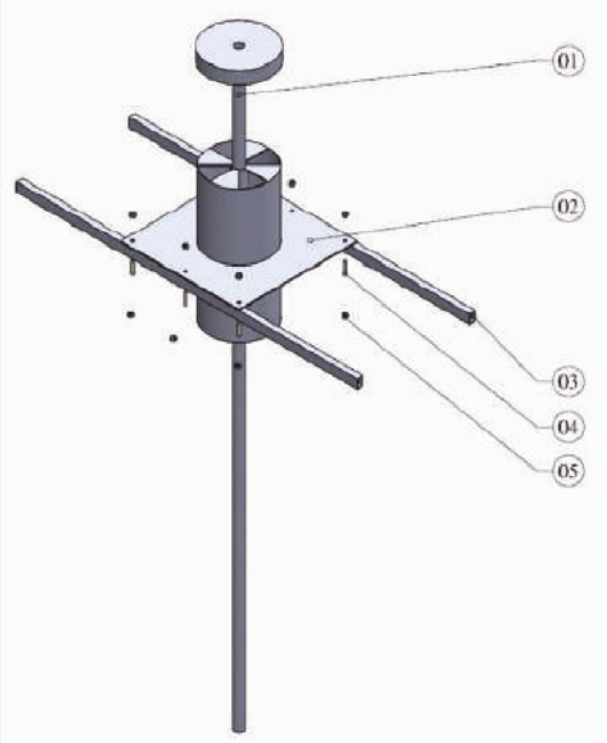
Deck legs prevent damage to fittings underneath the deck and allow for tank cleaning or repair by holding the deck at a predetermined distance from the tank bottom.

**2.1.6** Deck Drains

Deck drains permit removal of liquid collected from the surf ace of floating decks.

**2.1.7** Gauge Hatch / Sample Ports

Gauge hatch / sample ports provide access for hand gauging the level of stock in the tank and for taking samples of the tank contents.




**Part List**

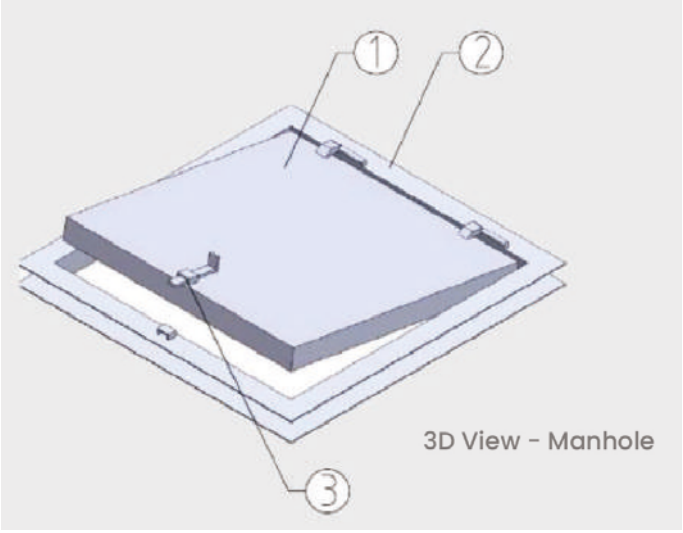
| Object | Description | Material |
|---|---|---|
| 1 | Leg Cover | Aluminium-1050/H14 |
| 2 | Body Support | Aluminium-6063 |
| 3 | Grider | Aluminium-6063 |
| 4 | STUD, M6x50mm | Aluminium-6063 |
| 5 | NUT, M6 | Aluminium-6063 |

### **2.1.8** Access Hatches

An access hatch consists of an opening in the deck with a peripheral vertical well attached to the deck: and a removable cover to close the opening.

### **2.1.9** Anti-Rotations

Anti-rotation device is a guide pole that is fixed at the top and bottom of the tank.




### **2.1.12** Polyamide or teflon insulating pads

Insulating pad material, polymer, elastomer, or adhesive must be pre-approved by the Purchaser.

### **2.1.13** Column Wells

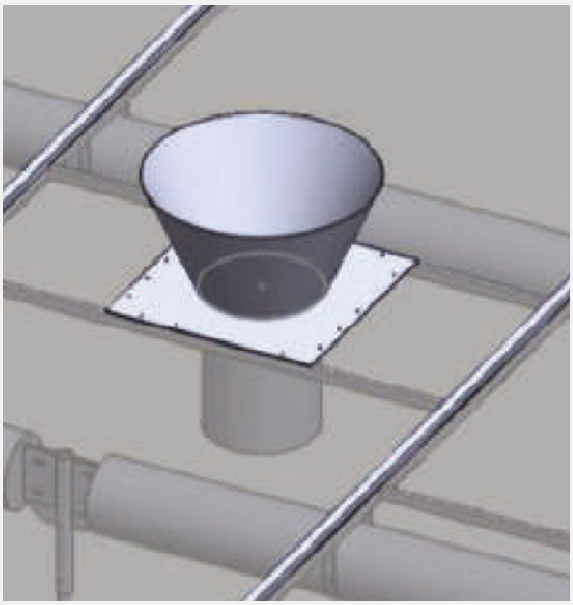
The most common fixed-roof designs ore normally supported from inside the tonic by means of vertical columns.

### **2.1.14** Guide Polee and Welle

The guide pole passes through a well in the deck.

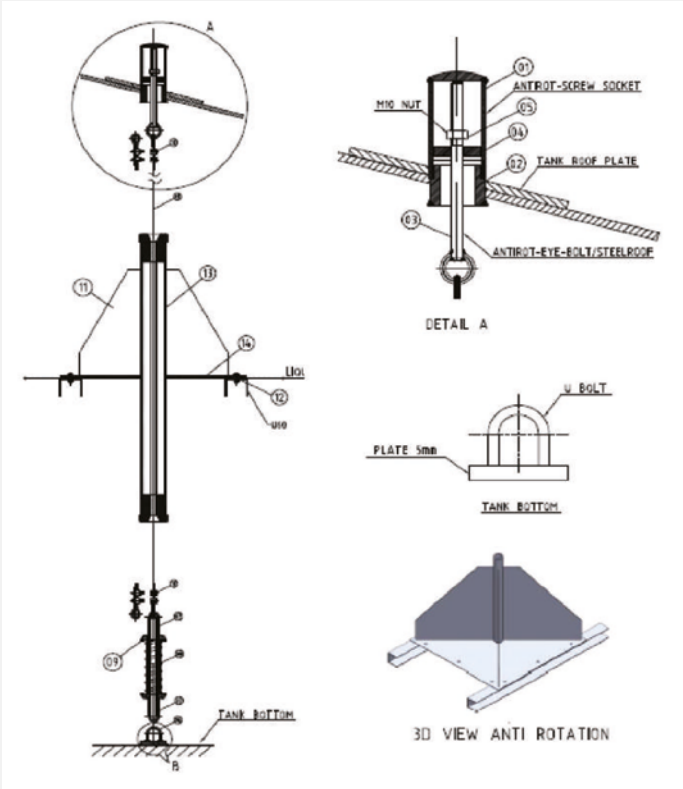
**Part List**

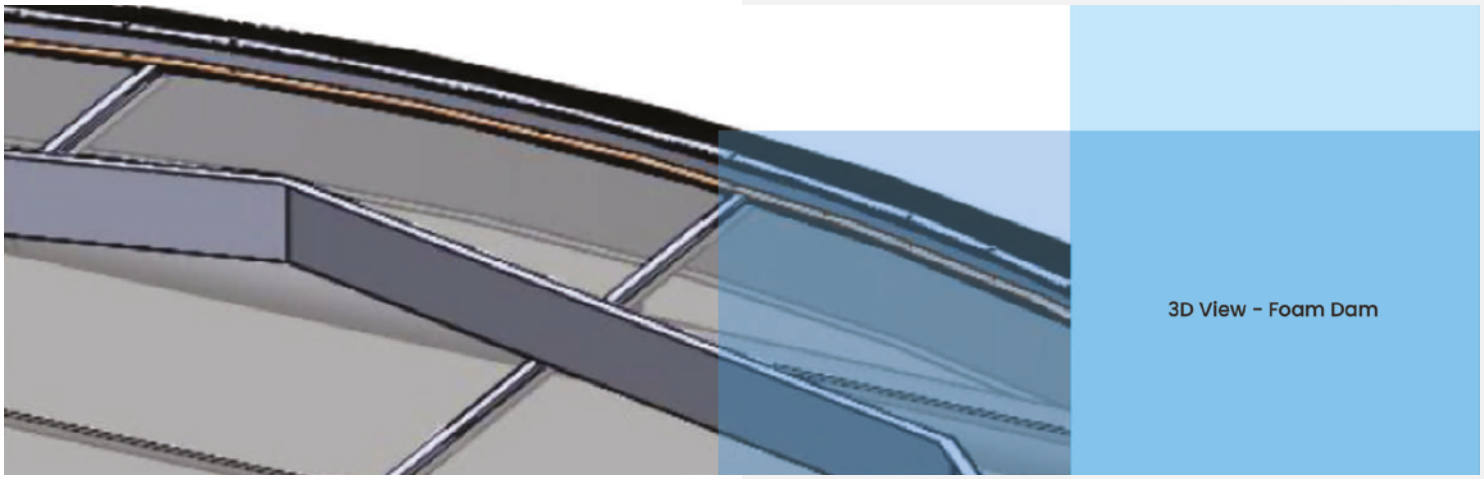
| Object | Description | Material |
|---|---|---|
| 1 | Cover | CS Galvanizet |
| 2 | Coupling | CS Galvanizet |
| 3 | Eyelet | CS Galvanizet |
| 4 | Washer | CS Galvanizet |
| 5 | Nut | CS Galvanizet |
| 6 | Bottom Ring | CS Galvanizet |
| 7 | Tensioning Rod | CS Galvanizet |
| 8 | | CS Galvanizet |
| 9 | | CS Galvanizet |
| 10 | | CS Galvanizet |
| 11 | | Aluminium-1050/H14 |
| 12 | | CS Galvanizet |
| 13 | | CS Galvanizet |
| 14 | | Aluminium-1050/H14 |



**Part List**

| Object | Description | Material |
|---|---|---|
| 1 | Manhole Cover | Aluminium-1050/H14 |
| 2 | Manhole Frame | Aluminium-1050/H14 |
| 3 | Manhole Handle | Aluminium-1050/H14 |



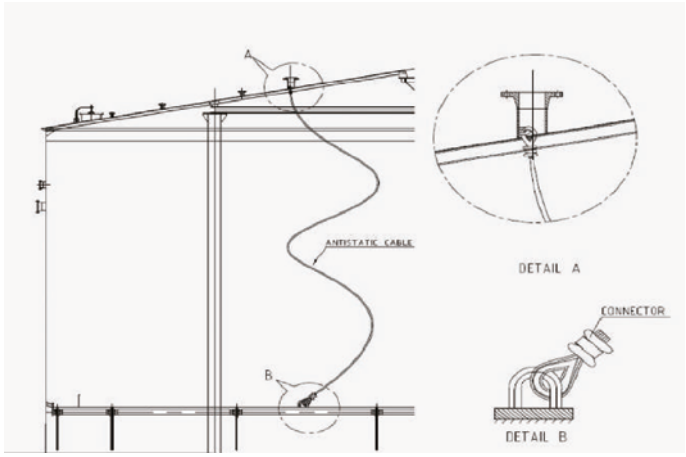


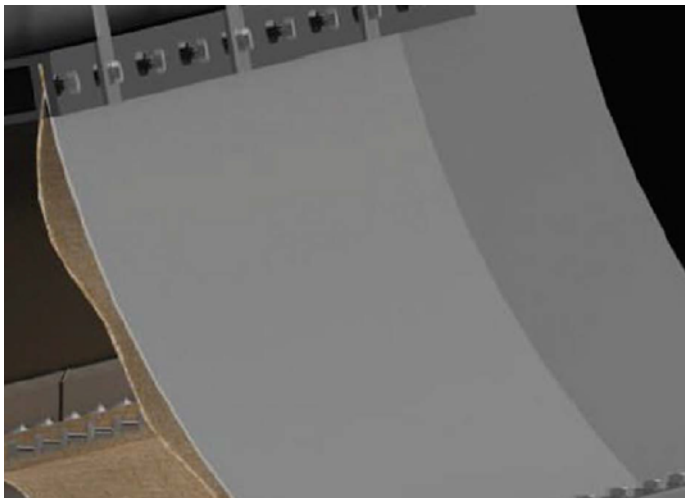

**2.1.10** Foam Dam

A foam dam shall be fabricated and installed in compliance with NFPA 11.

**2.1.11** Anti-Static Cable

Connected to fixed roof by ropes made by stainless steal.

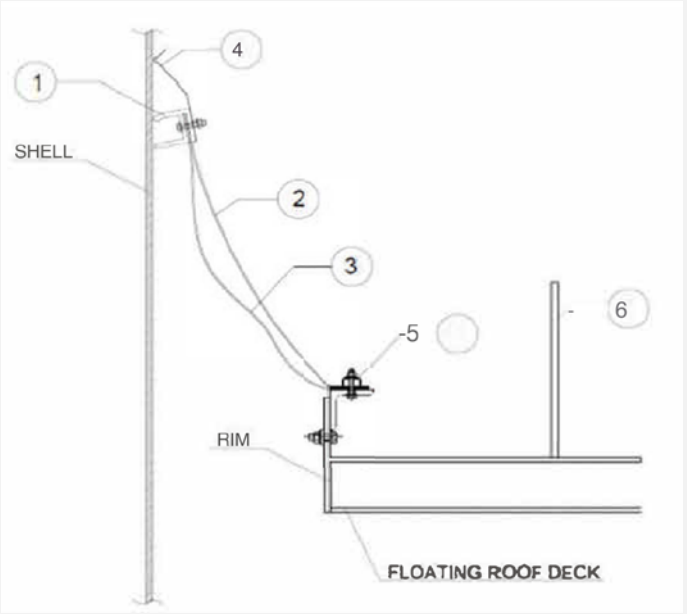


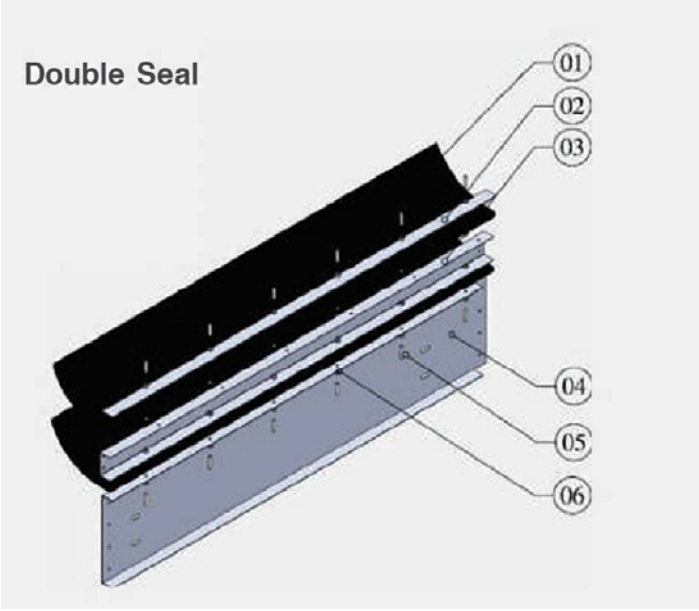
**2.1.15** Wiper or Mechanical Shoe Seals w/ Secondary Barrier

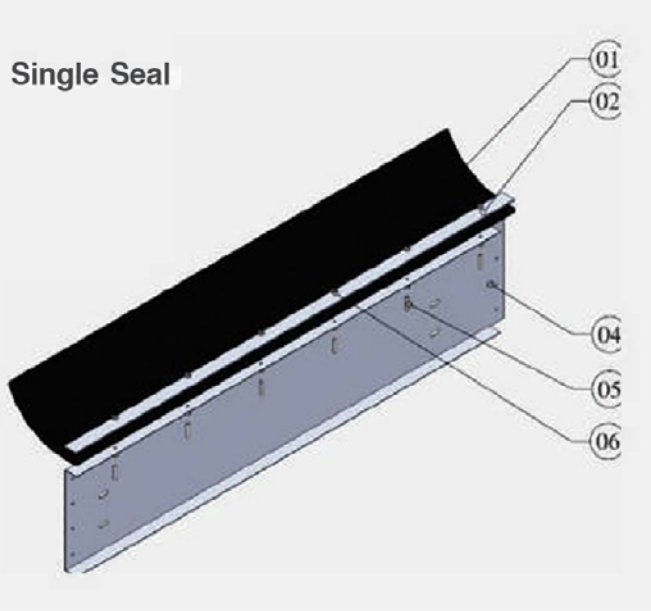
Wiper seals are commonly used as primary rim seals for internal floating roof tanks.

Secondary seals may be used to provide some additional evaporative loss control over that achieved by the primary seal.




| No. | Part Name | Material |
|---|---|---|
| 05 | Rim Clamp, Thk.3mm, C30x900 Lg | A653/ G90 |
| 04 | Ground Shunt, Thk.0.5mm | ASTM SA 240 gr. 304 |
| 03 | Fabric/ Teflon Envelope | Teflon |
| 02 | Compression Plate | A653/ G90 |
| 01 | Double Wiper / Wiper Seal | Nitril / Polyethylene |

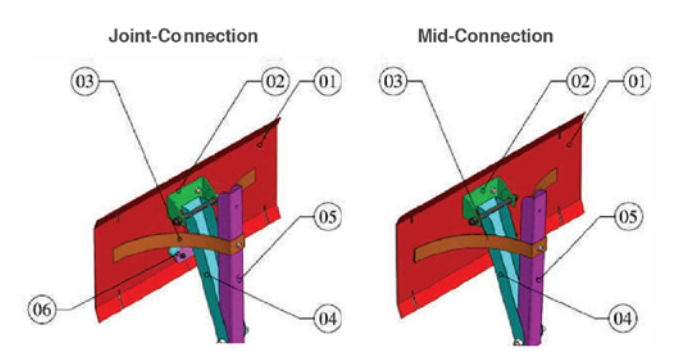



| Part List Double Seal | | |
|---|---|---|
| **Object** | **Description** | **Material** |
| 1 | Double Seal | Polyethylene |
| 2 | Metal Sheet | Aluminium-2050/H14 |
| 3 | Profile | Aluminium-6063 |
| 4 | Rim Profile | Aluminium-2050/H14 |
| 5 | Stud, M6x50mm | Aluminium-6063 |
| 6 | NUT, M6 | Aluminium-6063 |

| Part List Single Seal | | |
|---|---|---|
| **Object** | **Description** | **Material** |
| 1 | Double Seal | Polyethylene |
| 2 | Metal Sheet | Aluminium-2050/H14 |
| 3 | Rim Profile | Aluminium-2050/H14 |
| 4 | Stud, M6x50mm | Aluminium-6063 |
| 5 | NUT, M6 | Aluminium-6063 |

Characterized by a metallic sheet (the "shoe") that is held against the vertical tank wall.




## Mechanical Seal Isometric Details

| Part List | | |
|---|---|---|
| **Object** | **Description** | **Material** |
| 1 | Seal Ring | AISI 304 |
| 2 | Bracket | AISI 304 (V2A) |
| 3 | Spring-Sheet | Spring-Steel 14310 |
| 4 | Connection Profile-1 | AISI 304 |
| 5 | Connection Profile-1 | AISI 304 |
| 6 | Connection Plate | AISI 304 |

## 3.2 Material Specification

| Item | Specification | Material |
|---|---|---|
| **Deck** | | |
| Deck Plate | 1500 x 0.5 mm thk | AL 1050/1-114 |
| Sealant Adhesive | High Density Scaflex | |
| **Structure** | | |
| Rafter & Girder | Extrusion 2mm thk. | AL6063 |
| Rim Plate | Formed sheet - 2mm thk. | AL6063 |
| Seal Plate | Extrusion 2mm thk. | AL6063 |
| Seal Ring | Extrusion 2mm thk. | AL6063 |
| Anti-Rotation | Extrusion 4mm thk. | AL 1050/1-114 |
| Pantoon Strap | 2mm thk. | AL 1050/1-114 |
| Rim Clamp | Extrusion 2mm thk. | AL6063 |
| **Support System** | | |
| Support Legs | Pipe - 1" 3mm thk. | AL6063 |
| Leg Sleeve | Pipe - 1 1/4" 3mm thk. | AL6063 |
| Leg Sleeve Reinforcing Plates | Sheet - 0 .090" thick | AL 1050/1-114 |
| Leg Insulating Pad | Molded | Polyamid / Teflon |
| Support Cables | Wire rope 8mm thk. | SS304 |
| Cable Attachment Plates | Sheet - 14 gauge | SS304 |
| Anti-static Rope | Wire rope 4mm thk. | SS304 |
| Spring | Spring Steel | SS302 |
| **Wells & Appurtenances** | | |
| Pipe & Gauge Wells | Sheet 4mm thk. | AL 1050/1-114 |
| Seals for Wells | 5 mm thk. / 15 mm thk. | Buna-N / PE |
| **Mechanical Shoe** | | |
| Shoe Plate | Sheet - 1.5mm thk. / 1.2mm thk. | CS Galvanised/ SS304 |
| Shoe Seal Spring | Sheet - 1 mm thk. | SS301 |
| Fabric | 0,38mm thk. | Teflon |
| Secondary Vapour Barrier | Single Wiper / Dual Wiper Lip | PE /Buna-N |
| Support Leg I Scissor | Sheet - 10mm thk. / 3mm thk. | AL 1050/1-114 |
| Fabric Seal Clamp | 1.5mm thk. | AL 1050/1-114 |
| Ground Shunt | 0.5mm thk. | SS304 |
| Compression Plate | 1mm thk. | SS304 |
| Counter Weight | 30mm thk. | AL 1050/1-114 |
| **Wiper Seals** | | |
| Wiper Seal | 300mm wide 15mm thk. / Extrusion | PE / Buna-N |
| Seal Clamps | Sheet 2mm thk. | AL 1050/1-114 |
| **Fasteners** | | |
| Bolts | M6 /M8 /M10- Stud /Bolt | AL6061 / SS304 |
| Nuts | M6/M8/M10 | AL6061 / SS304 |

* Material can be changed as per customer requirement.

# Product Recommendations

Storagetech™ manufactures storage tank equipment, such as flame arresters, breather valves, gauge hatches, floating roofs, and floating suction pipe.

## Flame Arrestor

End-Of-Line, With Automatic Opening Hood, Deflagration

**Model: 312**

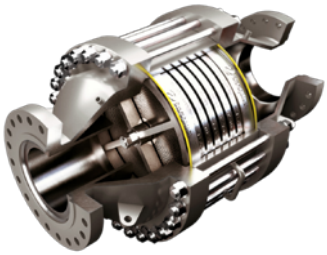
Storagetech™ Flame Arrestors ( End-of-line, with Automatic Opening Hood) are passive devices that prevent the propagation of a flame or fire from entering into an opening in a pipeline or vessel discharging flammable vapor. As different from model 310, Model 312 end of line flame arrestor's weather hood is designed to react fire instantly tanks to it's fusible link, which is melted during the fire and let the weather hood release the gas/fire to the atmosphere.

## Pressure Vacuum Relief Valve With Flame Arrestor

End-Of-Line, Weight Loaded, Combination, Atmospheric Deflagration Proof

**Model: 330**

Storagetech™'s Model 330 Pressure Vacuum Relief Valve with Flame Arrestor provides protection to bulk storage tanks and vessels from over and under pressurization.



## Flame Arrestor

Vertical, In-Line, Detonation

**Model: 320**

Storagetech™'s Model 320 In-line Detonation Flame Arrestor (also called flame arrestor or fire arrestor) is designed for installation in gas pipelines. Detonation occurs when a flame travelling through the pipeline reaches supersonic velocities, usually as a result of the pipeline configuration or pipeline surface roughness. Changes in gas density and pressure causes the flame velocity to metamorphose from subsonic to supersonic.

## Flame Arrestor

Horizontal, In-Line, Detonation

**Model: 321**

Storagetech™'s Model 321 In-line Detonation Flame Arrestor (also called flame arrestor or fire arrestor) is designed for installation in gas pipelines. Detonation occurs when a flame travelling through the pipeline reaches supersonic velocities, usually as a result of the pipeline configuration or pipeline surface roughness. Changes in gas density and pressure causes the flame velocity to metamorphose from subsonic to supersonic.

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**data sheet series**

Internal Floating Roof
Pontoon Type IFR

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