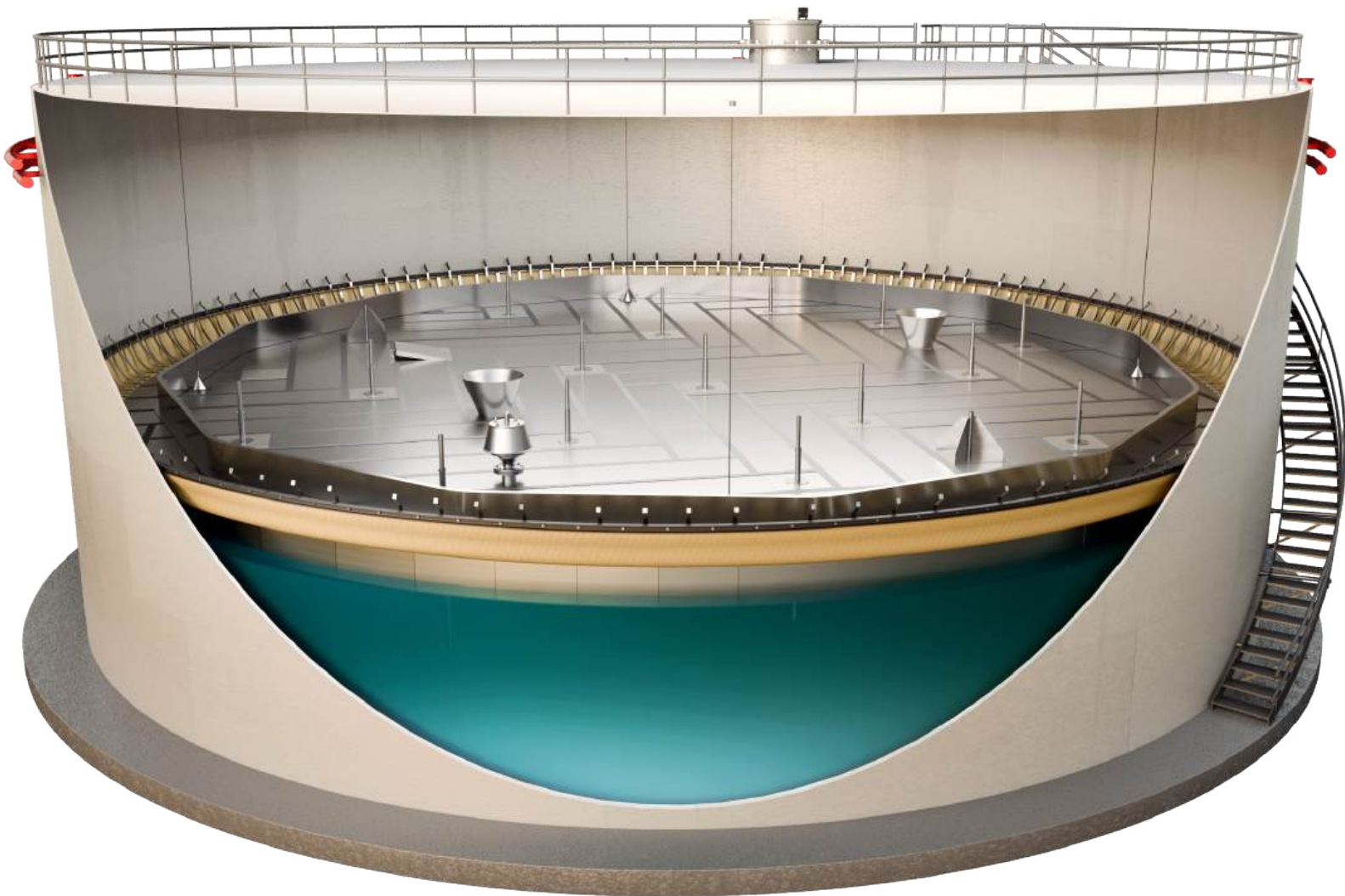


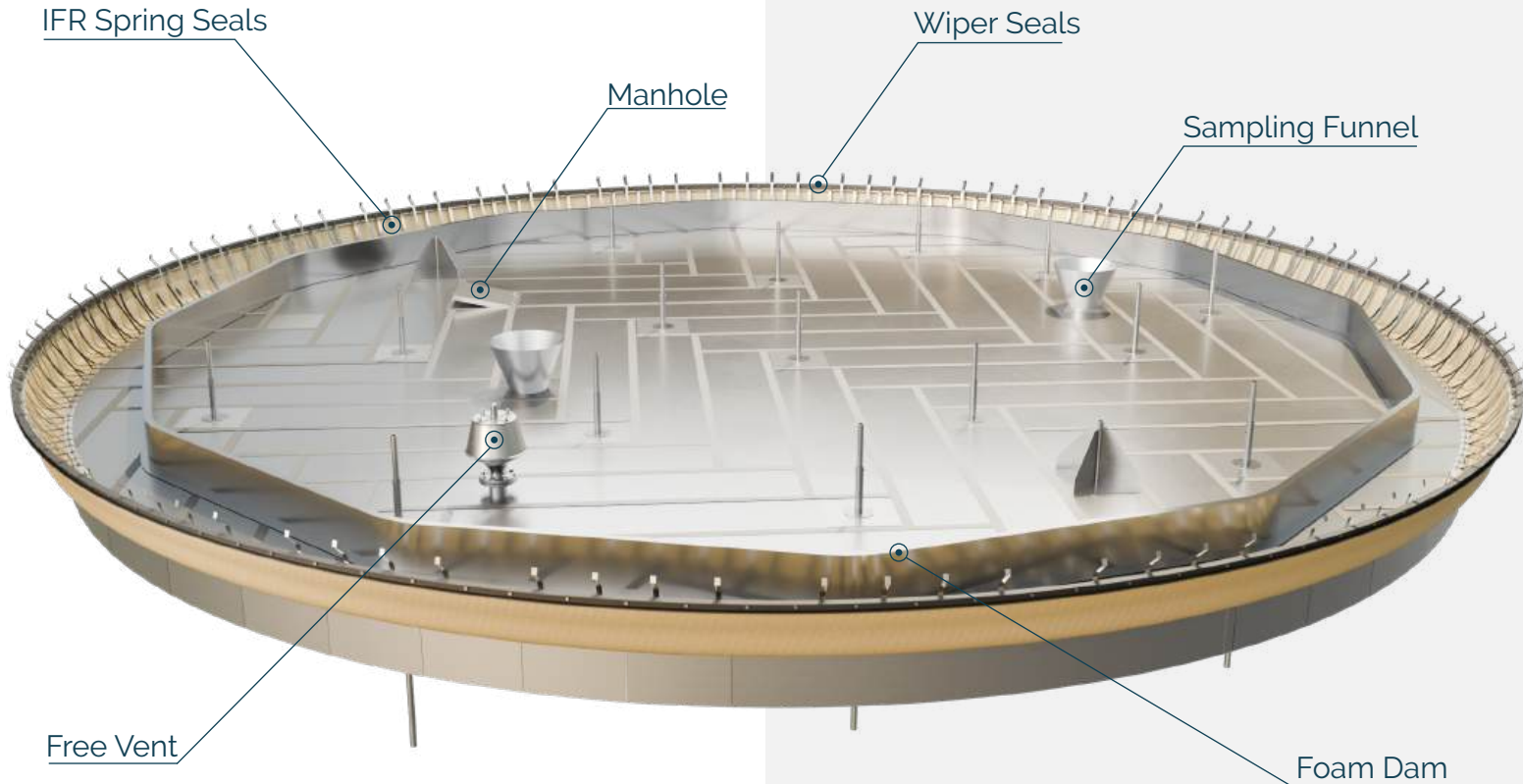
# Internal Floating Roof & Seals

## Full Contact Closed-Cell Polyurethane Module Core





## Full Contact Closed-Cell Polyurethane Module Core



StorageTech Panel Type Internal Floating Roof (IFR) is manufactured to be installed inside fixed roof storage tanks, it's a Full Contact Floating Roof with no gap, there by reducing emission and restricting vapor build up.

StorageTech™ stands as a leading provider of full contact type internal floating roofs, fully adhering to API 650 standards..

Renowned for their efficacy, these floating roofs represent the market's most effective solution. Designed to significantly reduce the evaporation losses of various stored products including jet fuels, gasoline, diesel, and crude oil, StorageTech™ offers these roofs in either aluminum or stainless steel.

Beyond their economic advantages, StorageTech™ floating roofs also contribute to environmental protection by preventing the release of toxic gases into the atmosphere.

Developed by the StorageTech engineering team, the panel-type IFR is designed to reduce evaporation in the tank to nearly 0. As it is in full contact with the product

inside the tank, it can easily move with the help of the seals on the side at the lowest and highest levels of the product.

StorageTech scissor type mechanical seal, pantograph type mechanical seal, spring seal, single and double wiper seal minimize the vapor losses and protect the environment and they have been designed to remain in full contact with the tank shell at all times reducing emissions.

**Spring seal, single and double wiper seal are used for our polyurethane module core.**

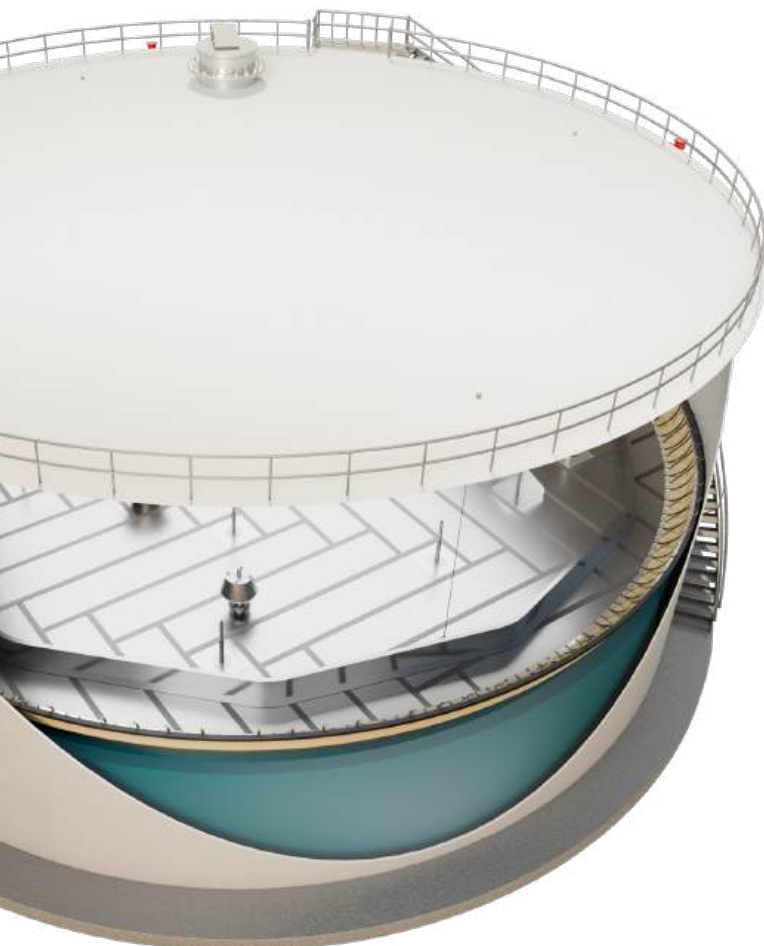
## Technical Details

StorageTech's IFR quality aluminum internal floating roof is designed to meet all current regulations and air pollution control standards (VOC) in the oil industry, including US EPA and other international regulations. Panel type IFR is made entirely of aluminum, making it a light weight product

Double Wiper Seal used in IFR is designed to provide a double sealing system using advanced technology. It is made of high quality elastic synthetic rubber and polyethylene materials. The flexible nature of the Seal allows it to adapt to small movements and changes in the tank, providing an effective seal in a variety of conditions.

The structural design of the IFR fulfills industry standards such as API Standard 650, Annex H and provides better sealing with double seals. The combined deck is robust, durable, light weight, corrosion resistant and virtually maintenance free.

The operating medium for panel type IFR include contain petroleum derived fuels. Additionally, it can with stand corrosive agents and various chemicals.



All fasteners and washers for installation of seal joints, including fabric seal joints, shall be austenitic stainless steel

The average efficiency of evaporation loss reduction is at least 98% when the floating block is in operation. The seals are designed for a temperature range from the design metal temperature below 8 °C (15 °F) to the maximum operating temperature. The annular clearance between the floating block carrier ring and the tank wall is set at 190±10mm, accommodating various tank diameters.

The internal components of the IFR have been carefully engineered to allow for easy disassembly, making maintenance procedures basic.

The internal floating roof is equipped with suitable seals according to the type of floating roof, size and type of product to be stored in accordance with API 650 standards.

Evaporation calculations are calculated during the use of the tank. It is also easy to calculate the evaporation rate after the installation of the internal floating roof. The data collected before the presence of the internal floating roof and after its installation are calculated and compared based on the TNO formula of API 2519 standards. Our Specialists perform calculations in full compliance with these standards.

### MATERIAL DATA

HOUSING BOLT, NUTS	ALUMINIUM / AL 6063 ALUMINIUM / AL 6061
PLATES LEG PIPE	ALUMINIUM / AL 1050 ALUMINIUM / AL 6063
PANEL MODULE CORE	ALUMINIUM / AL 1050 POLYURETHANE
H PROFILE F PROFILE	ALUMINIUM / AL 6063 ALUMINIUM / AL 6063
ANTI ROTATION CABLE ANTI STATIC CABLE	SS 304 SS 304
SEAL SPRING PLATE	LDPE, HDPE, TEFLON, NITRIL SS 301

## Advantages

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**Modular Versatility:** Engineered for adaptability, our internal floating roof easily accommodates various tank configurations and dimensions. The modular design streamlines installation and maintenance, minimizing downtime and operational disruptions.

Prefabricated module installation does not require any special tool, crane or labor. Its size can fit through a manhole and no need to cut the storage tank to enter.

**Long Term Performance:** The internal floating roof prevents volatile liquids from evaporating, providing a reliable solution for long term needs.

We have a proven track record thousands of full contact floating roofs and some of them are older than 25 years.

**Compliance Assurance:** Our product adheres to the highest industry standards, ensuring compliance with environmental regulations and industry best practices. Choose Storagetech for a solution that prioritizes safety, efficiency, and environmental responsibility.

**Corrosion Resistant Construction:** Crafted with materials renowned for their corrosion resistant properties, our internal floating roof stands resilient against corrosive substances, extending its life span and reducing maintenance costs. We can manufacture aluminum and stainless steel modules as per the customer specifications.

**Pressure Vacuum Relief Valve and Free Vent:** is optionally added and shipped to the Internal Floating Roof system upon request. This valve helps to maintain the structural integrity of the tank by balancing the pressure and vacuum differentials inside the tank and increases safety.

## Differences Types of Fixed and Floating Roofs

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There are two types of fuel loss in fixed roof storage systems. One is evaporation and the other is transfer loss. The level of fuel loss varies according to weather conditions, tank size, tank type, one year filling and emptying values, fuel type and systems applied to protect the fuel from loss.

Our panel inner roofs offer a flat and horizontal structure between the fuel level and the inner roof, allowing no gaps. This design minimizes evaporation losses by creating a vapor free zone between the fuel and the roof. Thus, the quality of the stored fuel is maintained and environmental impacts are reduced.

**Fixed roof tanks** have a narrow cone shaped roof, usually supported by a central column. Fixed roof tanks, by design, have a limited resistance to internal pressure and vacuum. Such tanks are at risk of structural damage in the event of excessive internal pressure or vacuum (e.g. tank collapse or explosion).

Tanks need to be protected against over pressure and vacuum during operation. This requires continuous monitoring of the pressure levels inside the tank and automatic ventilation when necessary.

Sufficient air flow must be provided regularly to protect the tank from over pressure and vacuum. It is mandatory to have ventilation holes on the tank for air evacuation.

Sampling holes on the tank, like vents, may allow fuel or gases inside the tank to escape.

The use of pressurized vacuum vents in storage tanks reduces 30% of total fuel loss.



## Why Internal Floating Roof?

The table below shows why an internal floating roof is recommended. Fixed and floating roof evaporation comparison.

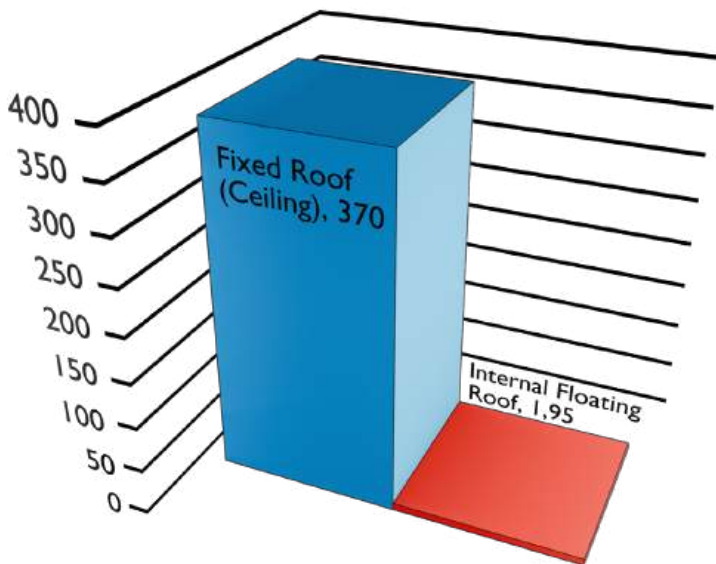
Product loss comparison between single and double seal internal floating roofs.

Evaporation calculations are calculated during the use of the tank.

It is also easy to calculate the evaporation rate after the installation of the internal floating roof.

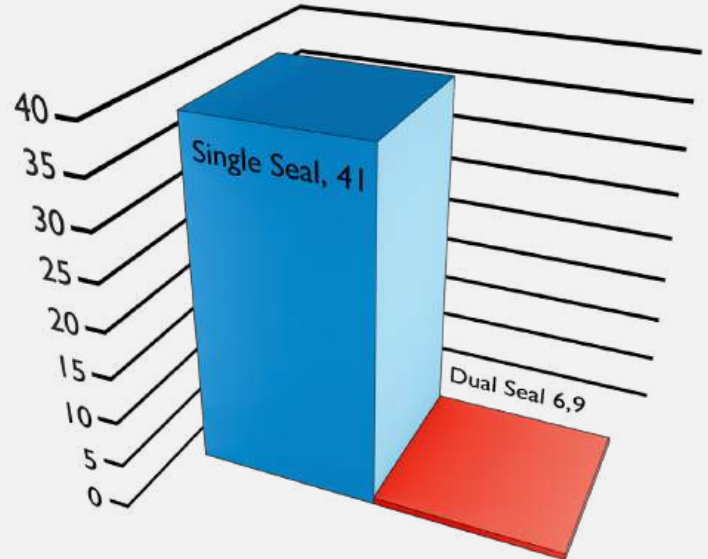
The data collected before the presence of the internal floating roof and after its installation are calculated and compared based on the TNO formula of API 2519 standards.

Our Specialists perform calculations in full compliance with these standards.



■ Fixed Roof (Ceiling)	370
■ Internal Floating Roof	1.95

Stored Product	GASOLINE
Tank Capacity	5000 M3
Tank Color	GREY
Operation Ratio	Operation Ratio
Breathing Standart	100.000 M3/YEAR
Breathing Standart	API 2518
Floating Roof Standard	API 2519
Fixed Roof Tank Loss	370 M3/Year
Floating Roof Tank Loss	1.95m3/Year



■ Single Seal	41
■ Dual Seal	6.9

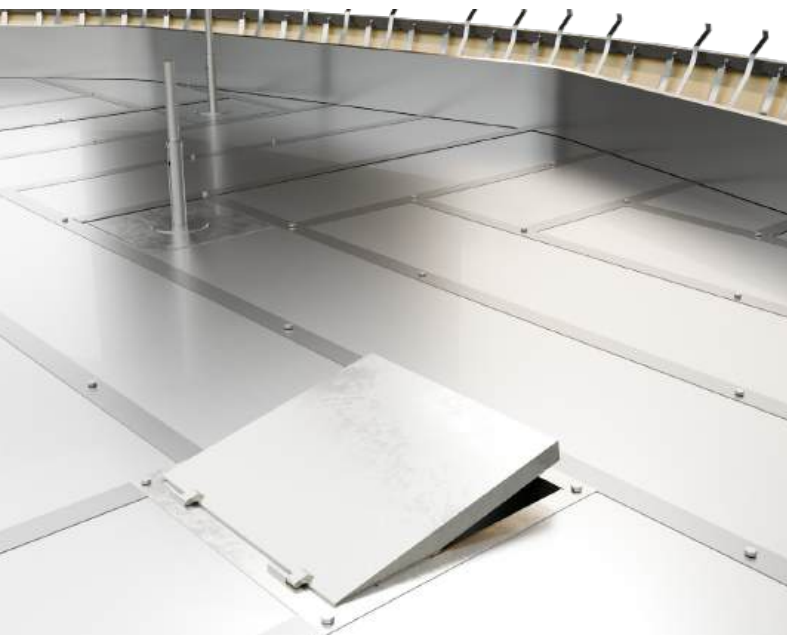
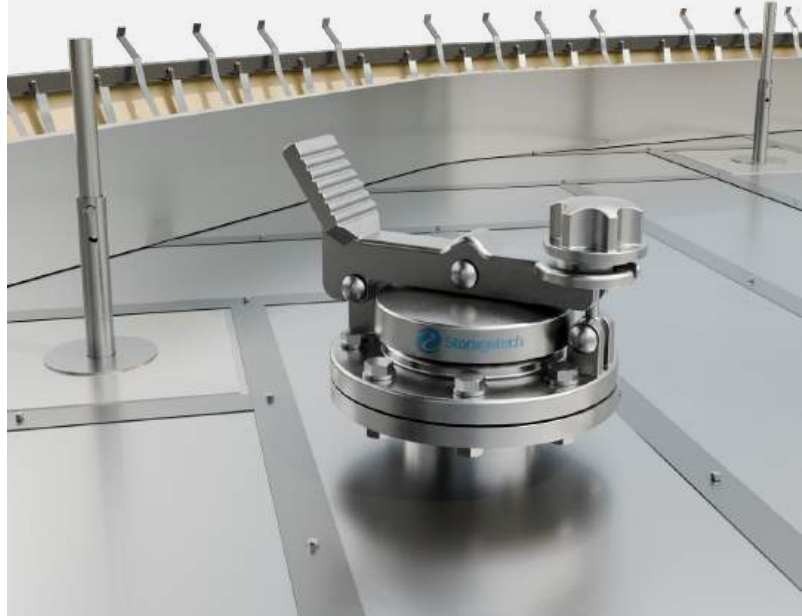
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Floating Roof Tank Loss	1.95m3/Year

# Internal Floating Roof Equipment

## Sampling Gauge Hatch

Gauge hatches can be set to your specifications so that the pallet assemblies in the housings open when specific pressure and vacuum levels are reached. Internal Floating Roof (IFR) systems, specific equipment is provided as standard for operational safety and efficiency.

The gauge cover prevents evaporation losses. Protects the environment. It prevents greenhouse gases in the atmosphere and minimizes product odors in the environment. The Gauge Hatch provides security for your storage facility. Protects your storage tank. Provides access to the tank where manual level measurement, temperature measurement or sampling is required.



## Manhole

The floating roof manhole cover is an access point that allows safe access to climb above the floating roof.

This hatch facilitates personnel to climb onto the floating roof during regular maintenance,

inspection and cleaning of the tank. It is designed to ensure safety and ease of use, so that various operations inside the tank can be carried out safely.

## Legs

We design our internal floating roofs with adjustable legs that allow you to decide the height of the legs for internal maintenance.

## Vacuum Breaker

The vacuum breaker is used to equalize the pressure of the vapor space above the deck during the seating of the floating roof on its legs or during



# Internal Floating Roof Equipment

## Foam Dam

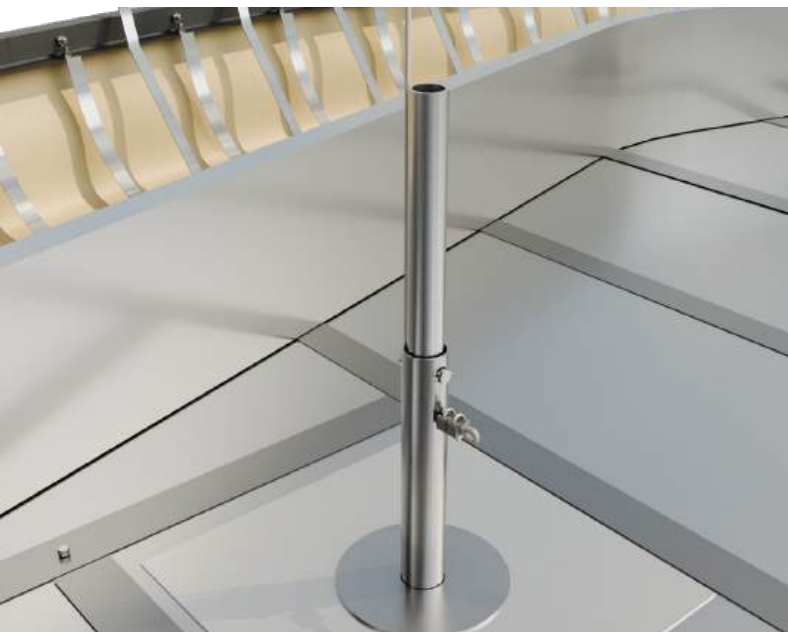
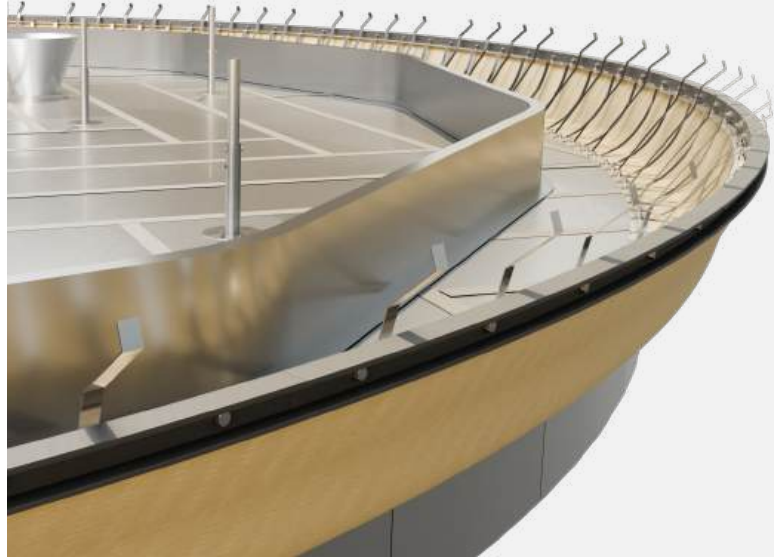
Foam dams are also installed on internal floating roofs to concentrate the firefighting foam in case of fire and to seal the sealing area. Foam dams have a modular design. This makes them both easy to install and adaptable to different secondary sealing systems.

**Maintenance Free:** No future sandblasting or painting is required, which reduces operating costs.

**Reduces Foam Consumption:** Saves more than 50% foam compared to traditional welded foam dams. This offers a more efficient use in fire suppression systems.

**Fast Foam Accumulation:** Provides effective and fast intervention in case of fire with fast foam accumulation.

**Easy Installation:** Provides easy and fast installation with detailed installation guides and project support.



## Anti-Rotation and Anti-Static System

Anti-Static and Anti-Rotation Systems: used in Internal Floating Roof (IFR) systems are essential for the safe operation of the tank. The quantity of these two systems increases depending on the size of the tank.

Especially in larger diameter tanks, a larger quantity of anti-static and anti-rotation equipment is used to ensure safety and maintain operational efficiency.

The anti rotation mechanism prevents the floating roof from rotating; and only moves it up and down. It protects floating roofs from moving along the tank shell. Depending on the tank size, the anti rotation mechanism can be more than two. Anti rotation cables are provided in SS 304 material.

The earthing cable is used as a critical safety measure to prevent the build up of static electricity by connecting to a nozzle on the floating ceiling and fixed ceiling.

This cable is designed to be compatible with all hydrocarbons and chemicals. Due to its high dielectric strength, the cable provides electrical insulation and creates a safe working environment. The cable is resistant to external influences with a low penetration rate and is not affected by chemicals.



# Internal Floating Roof Equipment

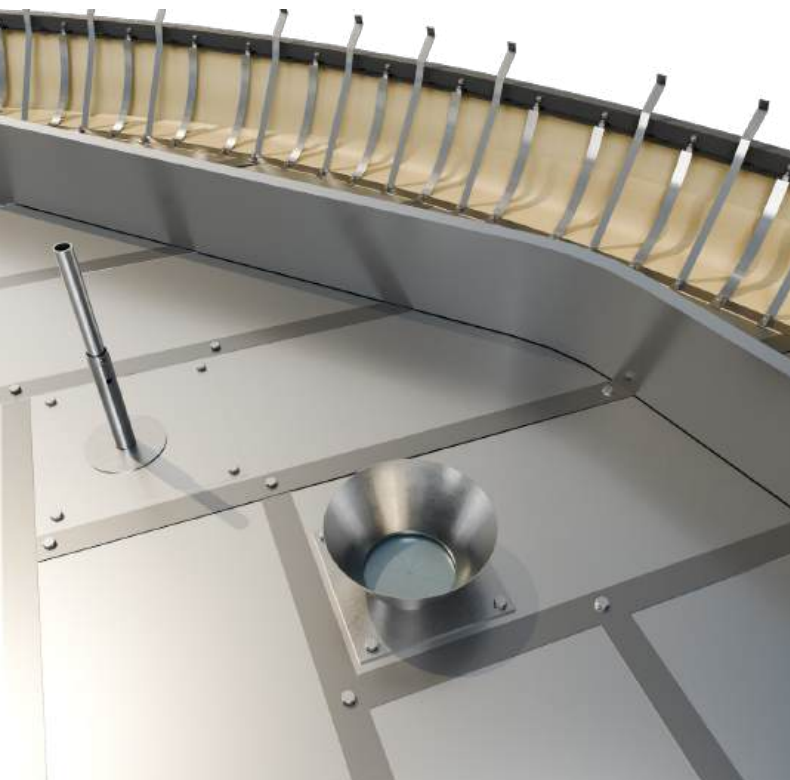
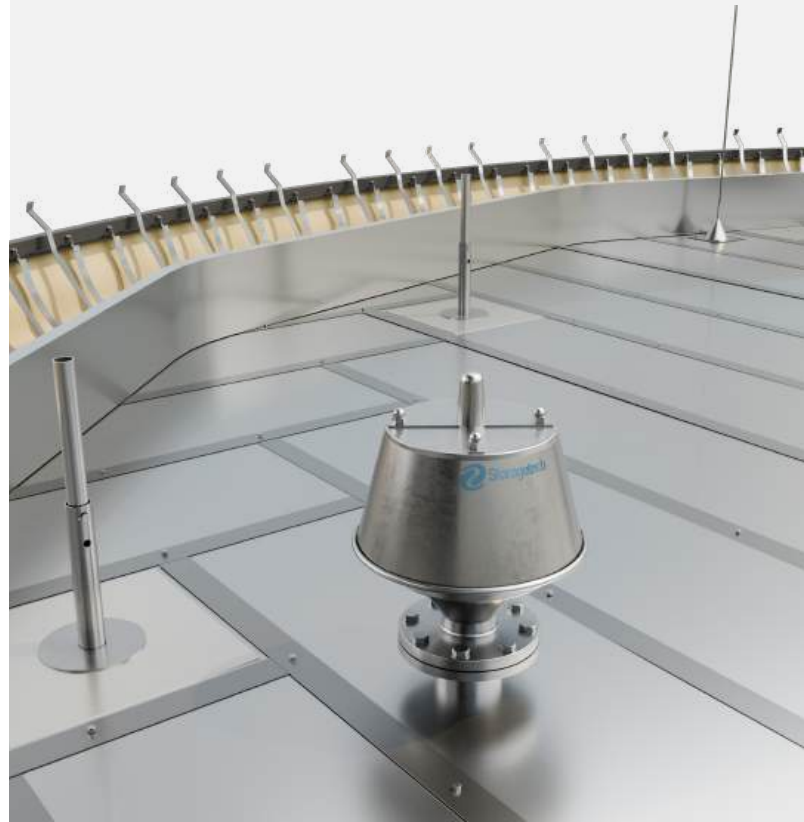
## Free Vent

Free vents allow atmosphere and vapor to flow freely in tanks or ventilation riser pipes. It offers a variety of sizes and material options to suit different application needs. By using durable and reliable materials such as stainless steel, carbon steel and aluminum, the products offer both high resistance to harsh environmental conditions and a long service life.

Project specific requirements such as special dimensions, performance requirements, connection types or special coating and protection can be met. Thanks to their engineering optimized design, the products can be assembled quickly and easily. This speeds up the field assembly process, saving labor and time.

## Automatic Bleeder Vent

Automatic Bleeder Vent improves safety by regulating in tank pressure differentials. This equipment is offered together with the IFR, ensuring safe and efficient tank operation. Automatically discharges air trapped in closed systems.



## Sampling Funnel

The Sampling Funnel allows safe sampling of the liquid inside the tank. The Sampling Funnel ensures the safety of workers during tank operations and protects product quality by preventing the liquid from contact with external factors.

Measurement level hole is like a funnel shape on the top of the floating roof, which is sealed with Teflon membrane to minimize the evaporation loss.

The sealed design of the funnel prevents liquid from escaping into the environment during the sampling process, thus minimizing environmental risks and occupational safety hazards. The Sampling Funnel is designed to be fully compatible with Internal Floating Roof (IFR) systems. The Sampling Funnel is easy to install and simple to use. This equipment is supplied with the IFR and ensures safe and efficient tank operation.



# Internal Floating Roof Sealing Systems

## Single Wiper Seal

StorageTech™ Wiper Seal is one of the most economical and effective types of rim seal available in the market with tremendous gap sealing ability, maintenance free operation and long life service. StorageTech™ Wiper Seal is designed to fit specific tank round anomalies and allows for in service installation. Wiper Seal has proven longevity and it is made of high quality, corrosion resistant, inert materials.

Wiper seals are commonly used as primary rim seals for internal floating roof tanks. Wiper seals generally consist of a continuous annular blade of flexible material fastened to a mounting bracket on the deck perimeter that spans the annular rim space and contacts the tank shell. The mounting is such that the blade is flexed, and its elasticity provides a sealing pressure against the tank shell.

Polyethylene is the material that commonly used in the Oil & Gas Industry. There are several different types of sealing materials that need to be chosen carefully as per the stored liquid. For emission control, it is important that the mounting be vapor tight, that the seal extends around the circumference of the roof, and that the blade is in substantial contact with the tank shell.



## Key Features

- Economical and effective rim seal solution.
- Exceptional gap sealing ability.
- Maintenance-free operation.
- Long service life.
- Designed to fit specific tank anomalies.
- Allows in-service installation.
- Proven longevity.
- Made of high-quality, corrosion-resistant materials.
- Flexible design provides consistent sealing pressure.
- Ideal for internal floating roof tanks.
- Continuous blade spans the entire circumference.
- Vapor-tight mounting for emission control.

# Internal Floating Roof Sealing Systems

## Double Wiper Seal

Double wiper seals can be used to provide some additional evaporator loss control above that achieved with the primary seal. The secondary seal is installed on an extended vertical side plate above the primary seal. The secondary seal serves as a supplementary layer. Capacity the vapor containment capability of the external floating roof system.

Its purpose is to create a secondary barrier that further restricts the release of vapour into the atmosphere, even in the event of minor gaps or failures in the primary seal.

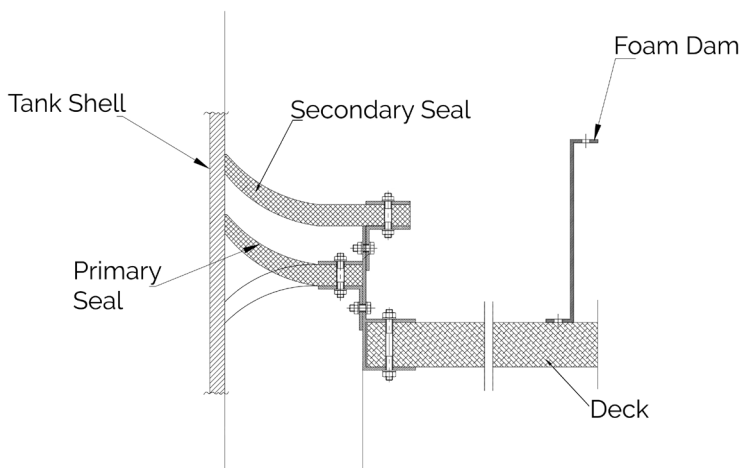
The seal material resists corrosion and can be made from various materials based on what is stored. The choice of sealing products highly depends on corrosive environment needs. It can include alloyed steel parts to increase corrosion resistance as needed.



## Design & Features

A peripheral seal positioned as indicated, it does not normally contact the surface of the stored liquid. Vapor mounted peripheral flexible wiper seals which rim seal utilizing a blade or tip of a flexible material with or without a reinforcing cloth or mesh.

All radial joints in the blade are joined by using seal chemicals. Seal Material elasticity is designed to cover all of the gaps and spacing per



## Key Features

- Multiple sealing materials available.
- Utilizes polyethylene common in the Oil & Gas industry.
- No on-site welding required.
- Easy installation without special equipment.
- Fully compliant with Std AP-42 and API 650 Appendix H.
- Protects the environment from toxic gases.
- Lowers emission rates.
- 100% resistant to aromatics.
- Ensures substantial contact with the tank shell.
- Minimizes vapor loss.

# Internal Floating Roof Sealing Systems

## Spring Seals

Spring seal on an internal floating roof consists of a continuous seal mounted on the rim of the floating roof and bridge the gap between the roof and tank wall.

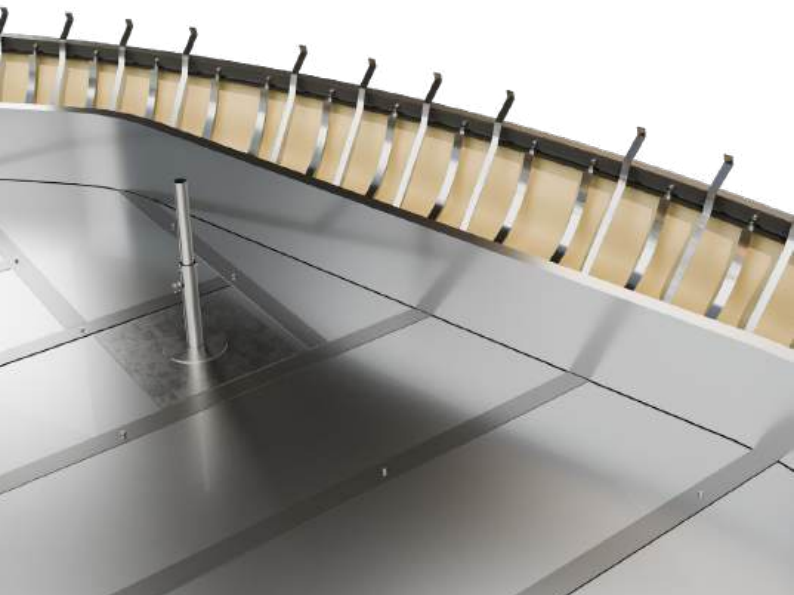
The most important issue in the use of this type of seal is to increase the compensation capacity of gaps or openings.

With its spring system, it successfully accommodates a wheel width of 200 mm and operates efficiently within a maximum tolerance range of  $\pm 100$ mm. More clearance can be tolerated according to special design requirements.

## Benefits

Seal all gaps caused by shell plate imperfections and tolerance issues due to the pressure exerted on the gasket by the Spring Plate.

The system is grounded by the earthing shunt parts to prevent electrical arc that can occur due to static electricity on entire system.



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- Protects the environment from toxic gases.
- Lowers emission rates.
- 100% resistant to aromatics.
- Ensures substantial contact with the tank shell.
- Minimizes vapor loss.
- Enhances safety.



# Internal Floating Roof Sealing Systems

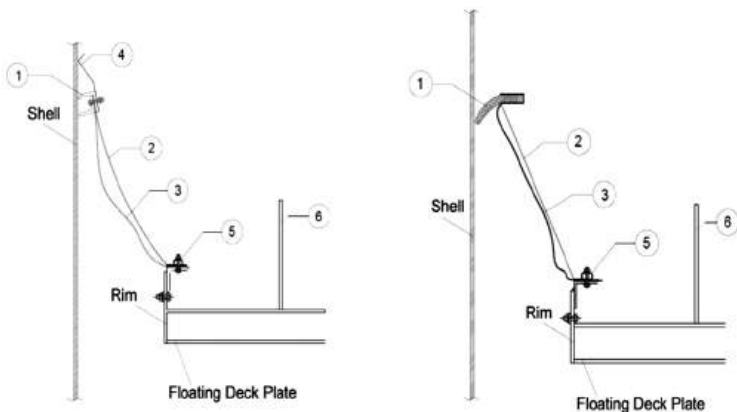
## Spring Seals Design Features

The Spring tension provided by the features of the compression plate is designed to provide the loading continuously under all conditions. Plates are produced from spring steel which is hardened material.

The most important feature of this product is that the spring tension coming from the plates can be reflected directly to the seal's tip as a pressure force.

This design has been developed to minimize emission leakage originating from any gap or openings.

The seal material has higher volatile corrosion resistance and can be produced from several different materials according to the stored content.



Part List			
No	Part Name	Material	Remarks
06	Foam Dam	Optional	---
05	Rim Clamp	A653 / G90	---
04	Earthing Shunt	ASTM SA 240 gr. 304	---
03	Vapor Barrier	Teflon	---
02	Spring Plate	SS 301	1/4 Hardened
01	Lip Seal / Wiper Seal	Nitril / Polyethylene	---

## Chemical Comparability of Wiper Seals

### Seal Materials (LDPE-Low-Density Polyethylene)

Liquid Type	Liquid	Vapor
Acetone	B	A
Acrylonitrile	A	A
Aromatic Hydrocarbons	C	B
Benzene	C	B
Cyclohexane	B	A
Diesel Fuel	C	A
Diesel Oil (2D/3D/4D/5D)	A	A
Ethyl Alcohol	B	A
Ethylene Glycol	A	A
Fuel Oils	B	A
Fuel(1/2/3/5A/5B/6)	B	A
Gasoline (High Aromatic)	A	A
Gasoline (Leaded/Unleaded)	C	B
Heptane	B	A
Hexane	D	C
Hydraulic Oils	C	B
Jet Fuels (JP3/JP4/JP5)	D	D
Kerosene	C	B
Lubricants	D	C
Methyl Acetate	B	A
Methyl Alcohol	A	A
Naphtha	A	A
Pentane	D	D
Phosphoric Acid (Crude)	B	A
Sulfuric Acid (Strong)	B	A
Xylene	B	A

### Rating - Chemical Effect

A- Excellent

B- Good : Minor Effect, Slight corrosion, or discoloration.

C- Fair : Moderate Effect, not recommended for continuous use. Softening or loss of strength, and swelling may occur.

D- Severe Effect : Not recommended for any use.

# Product Recommendations



## Flame Arrestor

End-Of-Line,  
With Automatic  
Opening Hood,

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.

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



## Pressure Vacuum Relief Valve With Flame Arrestor

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

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

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,

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### data sheet series

Full Contact Closed-Cell  
Polyurethane Module  
Core

Revision No: 02  
ST-DS-IFR.PT-09.24/V2  
storagetech.de

Storagetech™ Website  
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