



## Sandborn Roofs Inc.

Environmental & Investment Protection

### The Company...

Sandborn Roofs has been manufacturing and installing full-contact internal floating roof (IFR) systems since 1979, with hundreds of installations servicing oil and gas producers in North America and across the globe.

Sandborn Roofs offers its clients the industry leading combination of specialized expertise in floating roof systems with highly experienced staff and field crews. Sandborn's history of exceptional customer satisfaction is the very core of our business success. We will gladly provide a list of satisfied customer references and testimonials to back up our claim.



Sandborn Roofs' mission is to supply producers with a high-efficiency, durable floating roof system which will not only save them money by minimizing product losses and improving safety, but also make a significant reduction in harmful chemical emissions to the environment. For each Sandborn IFR installed, tens of thousands of pounds of harmful emissions can be prevented from entering the atmosphere every year.

Sandborn's key personnel are dedicated to helping our clients examine and create targeted solutions for their floating roof project. Sandborn Roofs provides design and planning support by educating project engineers and client operators to help them identify potential issues, while at the same time working closely to create project specific solutions to meet their requirements.

At Sandborn Roofs we strive to promote long term partnerships with our clients as we continue to evolve and advance the technology of floating roof systems. Each member of the Sandborn staff is dedicated to providing our clients with vital knowledge and planning to get the job done right, on schedule, each and every time.

We invite you to contact us to determine how we can help with your next project and give us the opportunity to show why we are leaders in the floating roof industry.

#### Mission Statement:

*Sandborn Roofs is dedicated to improving the safety and reducing the environmental impact of atmospheric storage tank systems using efficient floating roof technology, technical expertise, education and real world experience in partnership with our clients.*



# The System...

The Sandborn IFR is an American Petroleum Institute (API) compliant high-performance, full surface contact Internal Floating Roof (IFR) system that dramatically reduces harmful emissions from above ground storage tank systems holding volatile liquids.

## Sandborn Full Contact vs. Aluminum Pontoon



STORED FLUID    VAPOUR

### Aluminum Pontoon



### Sandborn Full Contact



The full-contact floating roof design of the Sandborn IFR reduces the exposed surface area of the liquid by over 97%, resulting in significantly lower tank emissions and greater efficiency than other pontoon-based IFR systems. With virtually no vapor cavities below the deck surface, there are minimal vapors to contain. The Sandborn IFR deck modules are also heat sealed and mechanically fastened together during construction, eliminating seams and creating a vapor tight surface area.

The Sandborn IFR not only provides a high efficiency floating roof system but also offers a feature no other floating roof system provides. One of the principal design features of the Sandborn IFR is the closed-cell polyurethane module core. The foam core is the primary method of creating floatation (ie: buoyancy) instead of using air-filled compartments like other IFR systems. The closed-cell foam core of the Sandborn IFR modules is impervious to liquids and vapor, resulting in a virtually unsinkable floating roof. This fact is backed up by years of field service and an industry exclusive 10 year anti-sinking warranty.

In addition to providing buoyancy, the closed-cell polyurethane foam core also gives the Sandborn IFR an R20 insulating value. The added insulation of the Sandborn IFR lowers heating costs for winter service tanks and also lowers the liquid surface temperature during the hot summer season, resulting in a lower vapor pressure and lower emissions.

Another unique feature of the Sandborn IFR system is the Zetabon™ coated modules. Zetabon™ is a co-polymer coating used to protect metal elements from corrosion and decay from chemical exposure. The Sandborn IFR is the only system which provides a protective coating on its aluminum skinned deck modules to prevent oxidation and protect your investment.

When not floating directly on the product surface, the Sandborn IFR is held above the tank floor by adjustable height suspension cables from the tank roof (either steel cone or aluminum domes) or by optional leg supports for retrofit installations. Each Sandborn IFR system can be installed through a standard 24" or even a 20" API manway, requiring no shell cutouts or modifications.

The Sandborn IFR comes with a variety of API recommended perimeter seal systems including a highly efficient and durable liquid mounted mechanical channel hanger mini-shoe seal system or a vapor mounted wiper seal system.

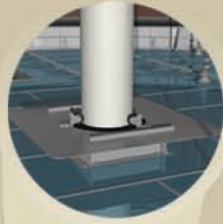
The Sandborn IFR has a proven history in rough service tanks, including pipeline and emergency overflow systems. The flexible design of the Sandborn IFR offers superior resistance to potential occurrences that may cause operational problems or sudden failure in rigid construction IFR systems. The Sandborn design also allows for easy field repairs should mechanical damage occur.

Sandborn Roofs stands behind the quality of each Sandborn IFR system with a full 2 year parts and labor warranty, as well as our industry exclusive 10 year anti-sinking warranty.

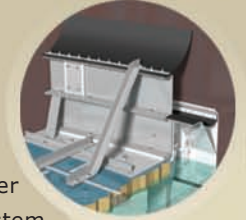
# Sandborn Internal Floating Roof System



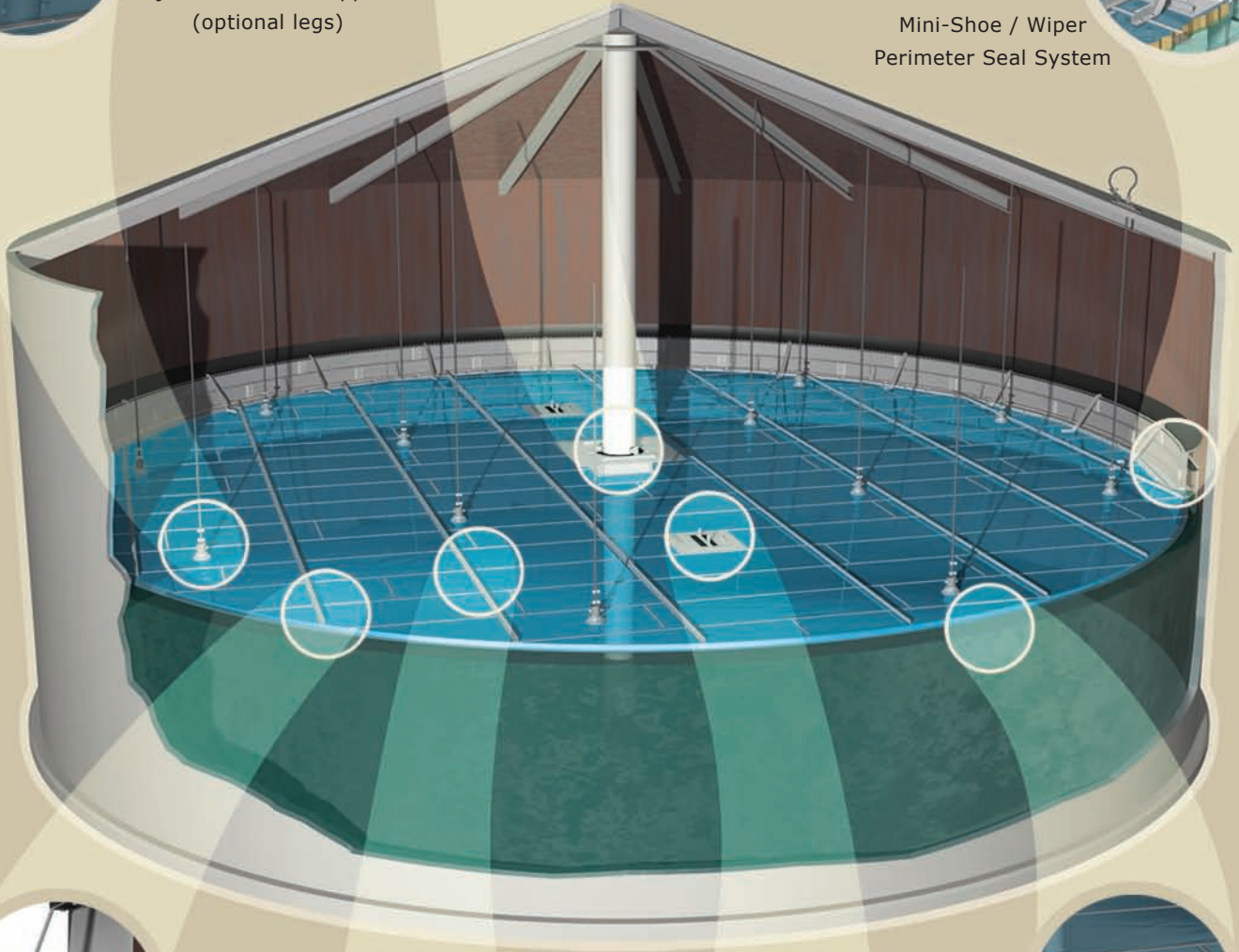
Adjustable Cable Supports  
(optional legs)



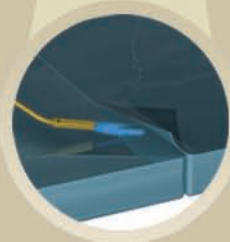
Single or Double Column  
Penetration Seal System  
With Guide Rollers



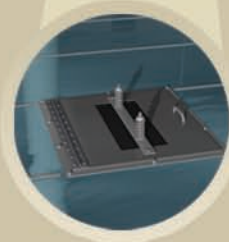
Mini-Shoe / Wiper  
Perimeter Seal System



Full-Contact Surface Design  
Reduces Emission Surface  
Area by 97%



Heat-Sealed Zetabon™ Modular  
Construction Eliminates Emission  
Loss at Deck Seams



Combination Pressure / Vacuum  
Relief with Manway Access



Closed-Cell Polyurethane  
Foam Buoyancy System  
Eliminates Risk of Sinking

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## Support Options

Sandborn Internal Floating Roof Systems can be supported by a variety of systems, including adjustable cables or legs, or fixed grid internal support.

### CABLE SUPPORT

Adjustable stainless steel cable supports eliminate the requirement for an in-service entry to set low operating or high maintenance positions on the Sandborn IFR system. Cable supports also provide an obstruction-free bottom for future tank cleaning or floor work. Cable supports are compatible with most steel cone roofs and geodesic aluminum domes.



TOP



BOTTOM

### LEG SUPPORT

Adjustable leg support systems are available for tank roofs that cannot support the weight of the Sandborn IFR system. Leg supports are available in both standard aluminum or stainless steel materials.



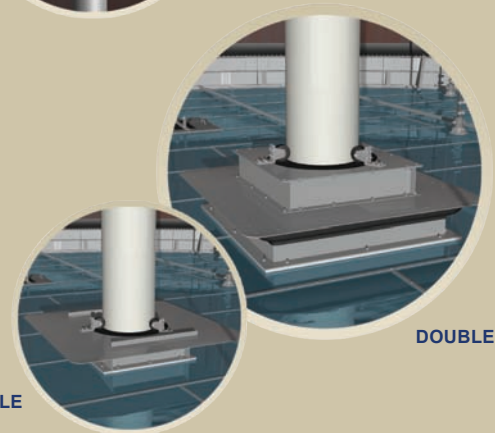
TOP



BOTTOM

## Penetration Seal Options

For column, ladder, gaugepole or floatwell penetrations, each Sandborn penetration seal includes guide rollers to ensure optimum performance and durability. Penetration seals are available in either single wiper or double wiper seal with secondary fabric skirting for additional operating efficiency.

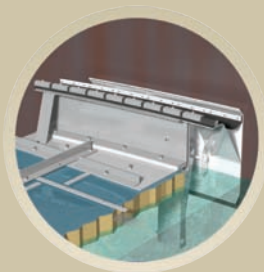


SINGLE

DOUBLE

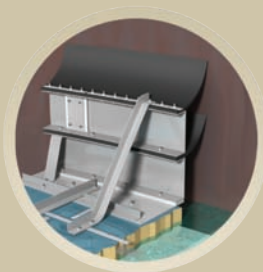
## Perimeter Seal Options

Sandborn IFR systems have a variety of high grade perimeter seal options. Each perimeter seal includes channel bracing and appropriate buoyancy to ensure optimal contact and performance during operation. All perimeter seals shown are API 650 and CCME compliant for internal floating roof systems.



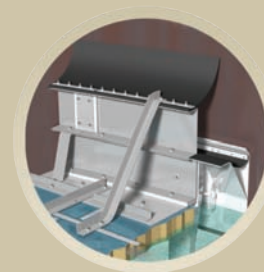
### Mini-Shoe Seal

Liquid-Mounted Channel Hanger  
Stainless Steel Shoe Seal with Vapor  
Curtain Fabric.



### Double Wiper Seal

Vapor-Mounted Double Wiper Seal.  
Available in serrated for riveted tanks.



### Mini-Shoe with Wiper Seal

Liquid-Mounted Channel Hanger  
Stainless Steel Shoe Seal Plate  
with Vapor Curtain Fabric and  
secondary wiper seal.



## Typical Evaporation Losses in Fixed Roof Tanks

Tank Sizes	Tank Diameter (feet)						
	25	50	75	100	125	150	175
Shell Height	32	40	44	48	48	48	56
Tank Capacity (Bbls)	2,800	14,000	34,700	67,200	105,000	151,100	240,000
Turnovers (per year)	24	24	24	12	12	12	12

Floating Roof Style	Yearly Losses (Pounds per year)						
No Internal Floating Roof	25,184	121,692	297,121	322,336	534,792	770,488	1,179,900
Sandborn/Full Contact IFR w/Welded Seams & Cable Supports	2,190	3,313	4,673	7,387	9,573	11,570	15,520
Aluminum Pontoon IFR w/Bolted Seams & Cable Supports	2,322	3,841	5,860	9,497	12,870	16,317	21,981
Carbon Steel Pontoon IFR w/Welded Seams & Leg Supports	2,280	3,660	5,162	7,862	11,426	14,057	19,288

All values are estimated for reference only. Actual values will vary based on IFR design, tank conditions and geographical location  
 Calculations based on US EPA Tanks 4.0.9d simulation software using RVP (10) Gasoline, Mechanical Shoe Seal, Denver, Colorado  
 Ask your Sandborn Representative for detailed documentation on evaporative losses

## Internal Floating Roof Comparison Chart

Features	Sandborn Full-Contact IFR	Aluminum Full-Contact IFR	Aluminum Pontoon IFR	Carbon Steel Full-Contact IFR
Adjustable Cable Supports	✓	✓	✓	✗
No Deck Walkways Required	✓	✓	✗	✓
No Vapour Cavities Below Deck	✓	✓	✗	✓
Sealed Deck Seams	✓	✓	✗	✓
Installs through Standard API Manway	✓	✗	✓	✗
Quick Installation	✓	✓	✓	✗
Easily Repaired in Field	✓	✗	✓	✗
Low Profile Design	✓	✓	✗	✗
Suitable for Rough Service Applications	✓	✗	✗	✓
Coated Deck Surface	✓	✗	✗	✓
Insulated Deck	✓	✗	✗	✗
Anti-Sinking Warranty	✓	✗	✗	✗