

Design criteria for Sealing System consisting of:

- Rim mounted Primary mechanical shoe seal
 - Shoe mounted Tertiary seal (Top Shoe sealing improvement device)
 - Rim mounted Secondary compression plates seals
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1. Emissions Abatement Efficiency

The sealing system (The primary, secondary, Tertiary seal) shall demonstrate a calculated emission reduction efficiency of at least 98% as per API chapter 19 sec.2 latest edition.

2. Tank Construction Tolerances as per API-650

The sealing system (The primary & secondary seal) shall demonstrate an effective sealing ability under the followings conditions:

- Tolerate Shell ovality to a maximum of 1.0%
- Tolerate Shell peaking & banding to exceed API-650 para' 7.5.4 to (+/- 25mm)
- Tolerate Shell weld reinforcement cap as per API-650 para' 8.5.2

3. Pantograph Working Range & configuration

- The sealing system shall demonstrate working capacity and safe function under rim space varying from 90 mm to 425 mm.
- The pantograph shall be normally opened type with a built-in 40 N pressure force coil spring.
- The pantographs configuration shall allow the shoe plates to maintain at level position under all rim space variations.

4. Shoe plates Pressure Capacity

- Consistent shoe to shell pressure (Min 20 Kg/M²) to enable centering of the floating roof.
- Each shoe plate shall have a minimum of 14 pressure point.

5. Liquid Seal Design

- The lower part of the mounted shoe shall be projected a minimum of 150mm into the liquid.
- The gap between the projected bottom part of the shoe shall not exceed 3.2mm
- The shoe plates shall have a minimum of 4 pressure points per shoe at liquid level to provide maximum benefit of the liquid seal.

6. Sealing System Performance & Longevity (Min of 20 Years Life Span)

- Special Stainless steel Leaf Springs (St, St 301) with progressive increase of compression force.
- Vapor barriers with maximum aromatic resistance & chemical compatibility for given services.

7. Installation & In-Service Repairs and Inspection

- The sealing system shall be designed to adapt to the existing floating roof seal mounting platform with-out any hot work required.
- The sealing system design shall ensure ease of repair and inspection as per the requirements of API-650 para'C.3.13.4 and as per API-2026 guidelines.

8. Compliance With the Relevant Standards

- API-653 & API-650 & API-RP-2003 & EEMUA-159 & NFPA-11 & EPA-40 CFR

9. Acceptance Criteria

On completion of the sealing system installation the SEALING EFFECTIVENESS shall be proved by performing gap measurements and gap ratio calculations separately for the primary and the secondary seal as follow:

1. As per EPA 40 CFR-sec 63-1063 EFRT control measures.

The calculated ratio seal gap area to shell diameter shall not exceed 21.2 cm² per meter.

2. As per EFS BREF-sec 5.1.1.2

The gap between the shoe to shell of the primary seal and the gap between the top wiper tip blade of the secondary seal to shell shall be less than 3.2mm for at least 95% of the tank circumference.

10. Crude Oil Tank

When storing Crude oil, the primary shoe seal shall be equipped with a suitable shoe-type device combined with spring loaded wax scraper enabling of keeping the tank walls and floating roof area free from wax and solid oil residue.

