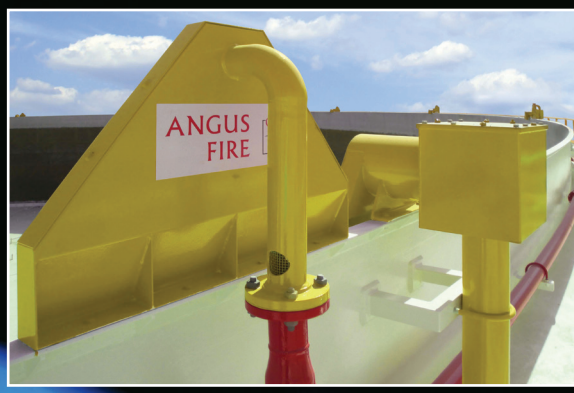
ANGUS FIRE

Foam Systems Engineering Design Manual



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Foam Systems Engineering Design Manual

SECTION THREE

Protection of Fuel Storage Tanks

3.4 RIMSEAL POURING SYSTEMS – FLOATING ROOF TANKS

For the purposes of this Section, Open Top Floating Roof (OTFR) Tanks are defined as being vertical tanks without a permanently installed fixed roof, but with a closed double-deck or pontoon type floating roof.

Two basic types of seal around the rim of the floating roof exist:

i) Mechanical shoe seal or Pantograph seal.

ii) Tube seal.

Weathershields and secondary seals of combustible or non-combustible materials may also be installed.

NOTE:

Rimseal Protection is not suitable for floating roofs where the roof is:

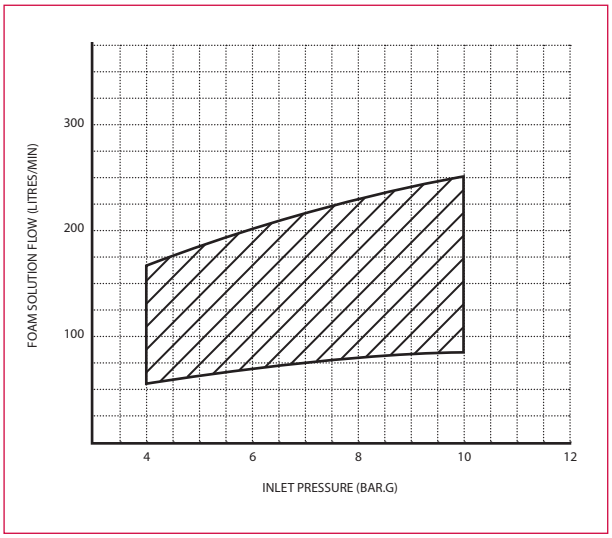
- A plastic blanket or floating diaphragm.
- Based on floatation materials which are flammable (eg. Plastic, Styrofoam).
- Reliant on floatation devices easily submerged if damaged.
- A pan roof.

The initial hazard area on an OTFR tank is identified as the area in the annular ring between the rim of the floating roof and the tank shell. There are two commonly used methods of protection:

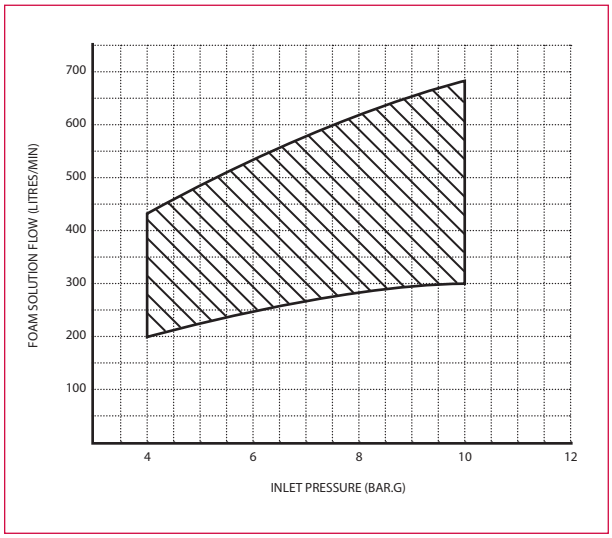
i) The discharge of aspirated foam above the mechanical or tube seal, weathershield or secondary seal.

ii) The discharge of aspirated foam either below a mechanical or tube seal directly onto the burning fuel surface, or below a weathershield or secondary seal but directly above the primary mechanical or tube seal area.

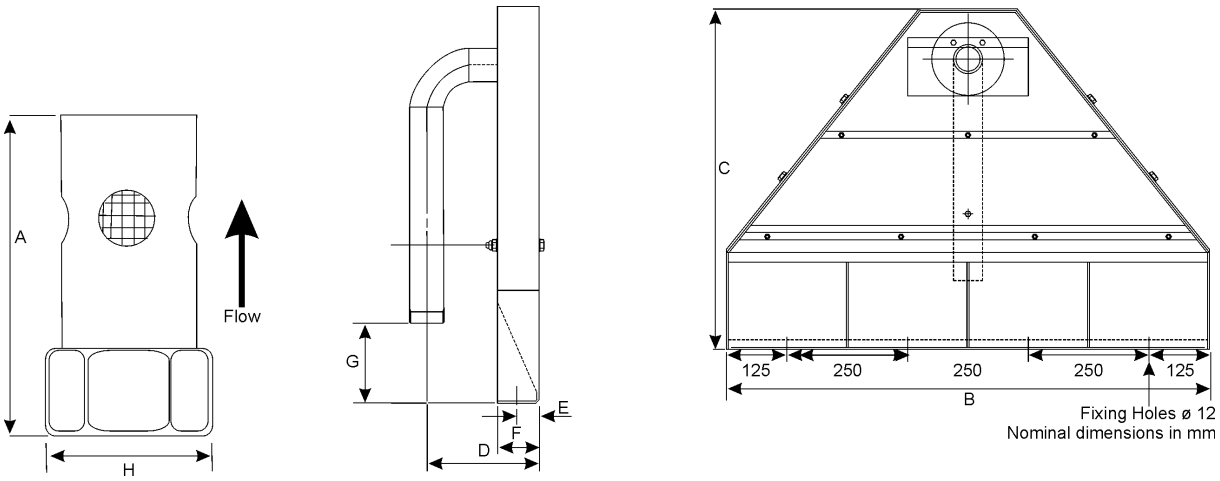
Angus Fire recommends that option (i) should be adopted wherever possible and the following information is based upon this preferred method.



Graph 3.3 – Angus RFG50 Performance



Graph 3.3.1 – Angus RFG 80 Performance



SPECIFICATION DATA

		RFG 50	RFG 80	RFP 50	RFP 80
Dimension	A (mm)	159	236	-	-
	B (mm)	-	-	1000	1000
	C (mm)	-	-	700	700
	D (mm)	-	-	200	240
	E (mm)	-	-	40	40
	F (mm)	-	-	75	75
	G (mm)	-	-	142	102
	H (mm)	75 AF Hex.	105 AF Hex.	-	-
Inlet Connection		2" NPSC (f)	3" NPSC (f)	2" NPT (m)	3" NPT (m) 2" ANSI Available
Outlet Connection		2" NPSC (f)	3" NPSC (f)	-	-
Materials	Body	Cast Iron to BS 2789 Grade 420/12		-	-
	Internal Fitting	Stainless Steel to BS 970 316S31		-	-
	Deflector	-	-	Carbon Steel	
	Internal Mesh	-	-	Stainless Steel	
	Pipe	-	-	Steel tube to BS 1387	
	Optional Clamps	-	-	Clamp: Malleable iron, natural finish	
				Bolt: Steel, zinc plated	
Finish		Yellow Thermoplastic Powder Coat			
Approx. Weight (kg)		3.5	6.5	37	41
To Install	Fixing Holes	-	-	4 x 12 mm dia. Holes	
	Optional Clamps	-	-	Min. 2 clamps per pourer	

OPERATING DATA

Operating Pressure	4 bar to 10 bar
Typical Foam Expansion	4:1 to 8:1
Typical 25% Drainage Time	1.5 to 3 minutes using Angus FP70^{C6} Foam Concentrate

Fig. 3.13 Angus RFG Rimseal Foam Generator & Pourer

3.4.1 Rimseal Foam Generators and Pourers

Angus Fire rimseal foam equipment traditionally comprises two elements - the Rimseal Foam Generator (RFG) which aspirates the foam solution and the Rimseal Foam Pourer (RFP) which delivers the finished foam gently into the rimseal area. This configuration provides the best foam quality blanket and consequently the greatest likelihood of fast and effective extinction in the seal area. The design of the RFP ensures that a cohesive blanket is produced which is protected from the effects of high winds, is directed onto the tank shell so it flows in contact with the inside wall of the tank and into the seal area. The stainless steel mesh at the RFP foam exit helps to improve foam quality and prevent blockage from insects and nesting birds.

RFGs are available in two basic body sizes (50 & 80mm) with capacities ranging from 54 litres/min. at 4 bar to 684 litre/min. at 10 bar. Each unit is factory-calibrated to deliver a specified flow at a given inlet pressure within the limits shown in Graph 3.3, and easily attaches by a screw thread to the RFP. This will enable the system designer to make the most cost-effective use of the available foam concentrate and water resources.

Rimseal foam systems do not protect a tank against a full surface fire. Although these are rare, some owners wish to protect against this eventuality either with a mobile syste (see section 3.6) or a fixed system capable of delivering sufficient foam to extinguish a fire involving the entire tar surface. The Angus Full Surface Pourer (FSP) is designed t achieve this. On tanks over 100m in diameter it is possible even the flow of foam from an FSP may not reach the cer the tank. In this instance the FSP can be complemented v the Angus Full Surface Nozzle which projects foam into tl central dead spot on the tank. Please contact Angus for fu details on these products.

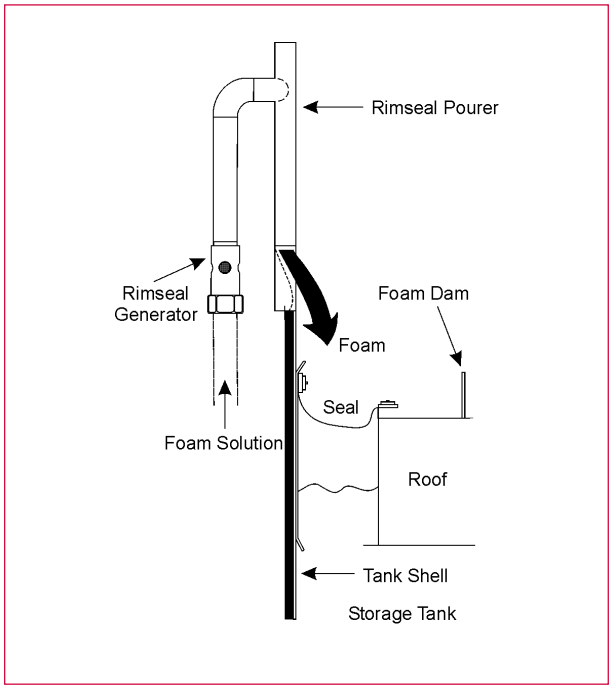


Fig. 3.14 Typical RFG Installation on Storage Tank

3.4.2 System Design Details

To apply expanded finished foam effectively above the seal, a foam dam will be required to be fitted to the floating roof to retain the aspirated foam blanket within the seal area, and prevent it from flowing across the roof. By containing the foam in this way to a "foam ring" or annulus above the seal area, a sufficient foam depth will be achieved. It will also cause the foam to flow laterally around the seal perimeter between pourers, to a point where the seal may have been ruptured.

The circular foam dam should therefore be constructed from suitable corrosion resistant materials and be at least 0.3m and more generally around 0.6m in height. There should also be a minimum width distance of at least 0.3m (but more generally 0.6m wide) between the edge of the roof and the foam dam itself. The foam dam should also incorporate suitable drainage slots to allow rain water and drained out foam to escape.

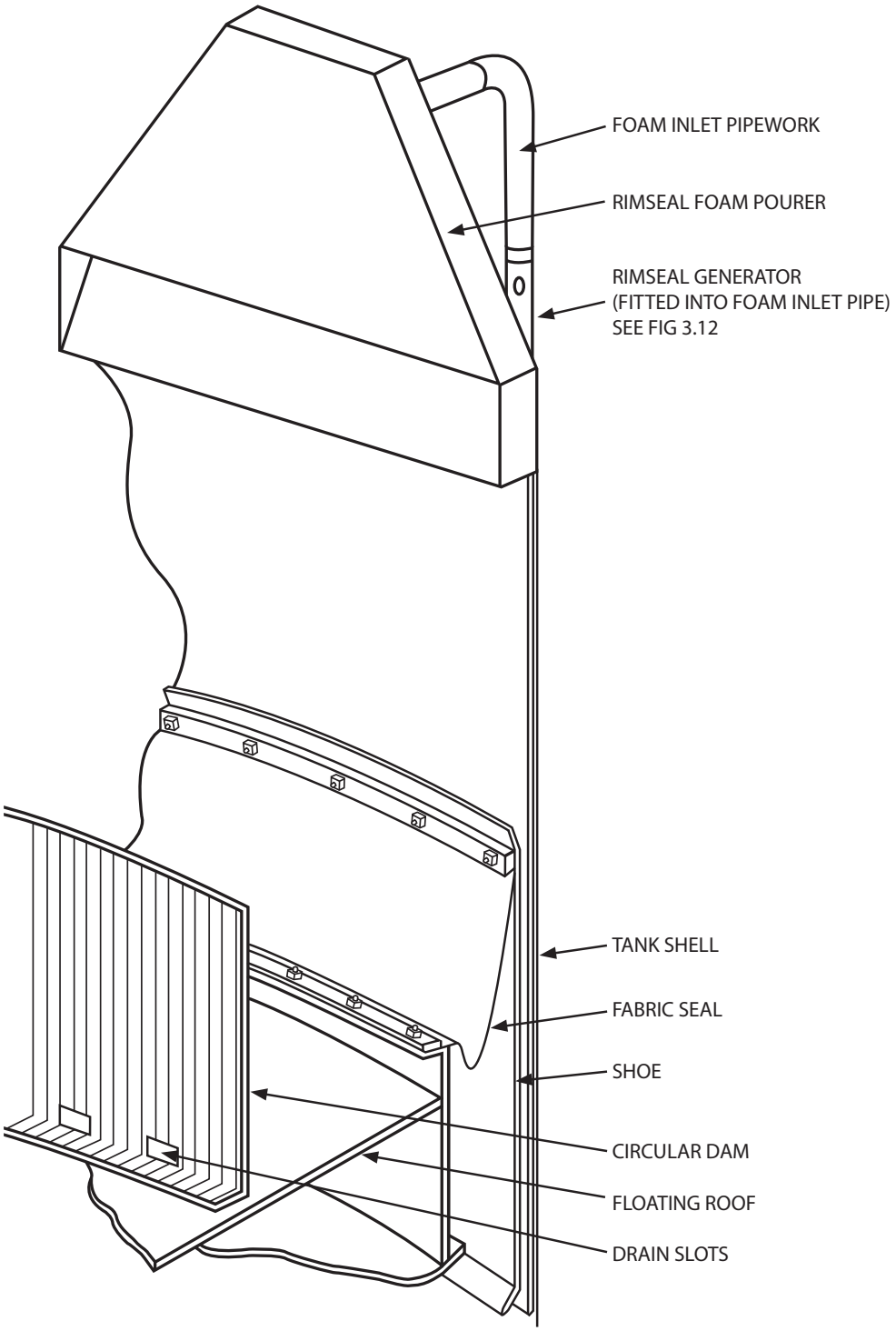


Fig 3.15 Typical Foam Dam arrangement for Open Top Floating Roof Tank, showing Rimseal Area, Pourer, Seal & Foam Dam