

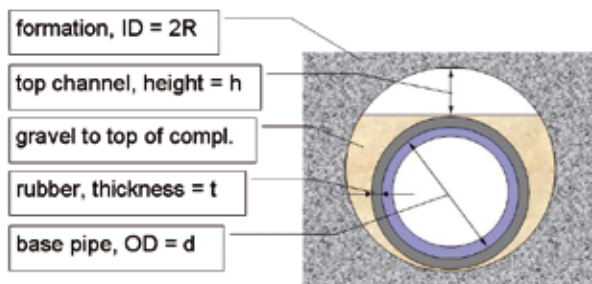


Overview

The G-ZIP was designed for gravel pack wells following research conducted for Shell. The G-ZIP provides a positive seal that prevents the migration of fine sands along the casing exterior, improving gravel pack performance. The G-ZIP does this by swelling and lifting the gravel up to fill the channel horizontal wells and create an effective packed annulus.

- Swellable rubber is bonded to the external of the gravel pack base pipe.
- The G-ZIP is optimised for gravel pack applications
- The rubber reacts to oil/water and swells, ensuring the annulus is sealed at that point.

Gravel Pack Top Channel Flow Restriction



- Height of top channel: $h = 2R - 2t - d$
- Area of top channel: $A_c = R^2 \arccos\left(\frac{R-h}{R}\right) - (R-h) \cdot \sqrt{(2Rh - h^2)}$
- Area of rubber: $A_r = \pi/4 \cdot [(d+t)^2 - d^2]$
- t follows from $A_c = A_r$

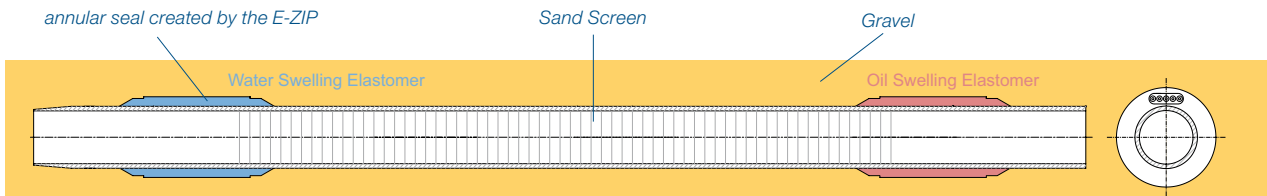
Features and Benefits

- Provides significant cost savings
- Improves gravel pack effectiveness
- Prevents annular flow
- No additional running tools or site crew
- Long life span
- Strong and durable packer
- Simple - there are no moving parts
- Self Healing
- Available for water or oil activation

Installation Process

The G-ZIP swellable elastomer is vulcanized directly onto the casing to creating a strong and durable packer. The G-ZIP is shipped from our manufacturing plant to the well site or customer's warehouse in a ready to run condition. All that is required for installation is that the rig crew remove the protective covering prior to the G-ZIP being made up to the casing string. No additional assembly, running tools, or personnel are required for G-ZIP installation.

Typical Installation Layout



G-ZIP's are a bespoke design integrated into the gravel pack assembly. Using our own modelling software they are designed to conform to the well size and conditions. This attention to detail ensures the optimal performance of the G-ZIP and the gravel pack itself.

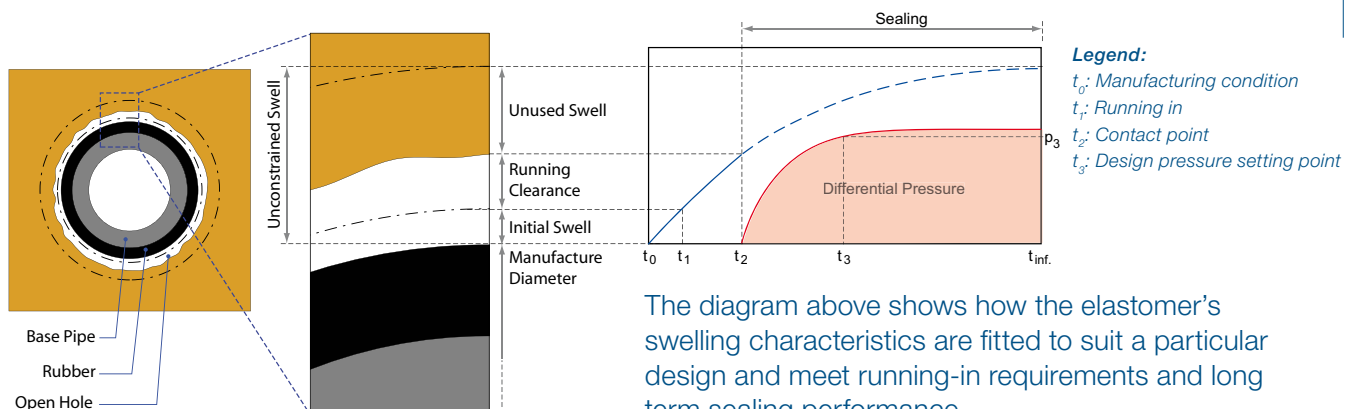
Typical Sleeve Specification

Base Pipe OD (in)	5 1/2" - 20"	Time to set	1 - 20 days
Temperature (oC)	40 - 150*	Operates in Oil	Yes
Salinity (ppm)	0 - 200,000**	Operates in Water	Yes
Elastomer Selection	Water and / or Oil	Base Pipe Material	Any, including most coatings
Sealing Pressure (psi)	200 - 6,000	Standard Lengths	R3(38') R2 (20')
Running Tools	None	Bespoke Lengths	yes
Additional Crew	None	Chemically Resistant	Yes
Handling Equipment	As base pipe	Life Span	Life of Well
Training Required	none		

* not all combinations are available - ask for details

** only water swellable elastomers - ask for further details

Swell Design Parameters



The diagram above shows how the elastomer's swelling characteristics are fitted to suit a particular design and meet running-in requirements and long term sealing performance.