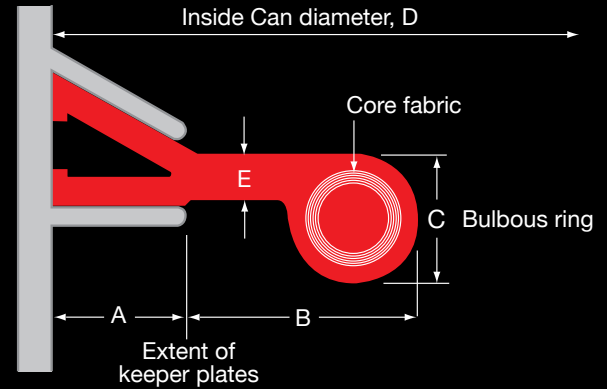


CRUX Grout Seals and Mud-Exclusion Diaphragms



The **CRUX Grout Seal** is a passive grout support system, requiring no activation. The action of pile installation through the Grout Seal sets up a hoop tension in the reinforced bulbous ring. The resultant radial reaction of the bulbous ring acting against the pile, associated with the hoop tension, then counteracts the grout pressure forces.

The system accepts the tolerance, which must be provided within pile centralisers without significant loss of capacity. The bulbous ring positions itself to locate around the pile at its position within the centraliser shims.

A single Grout Seal unit has the capacity to support 30 metres or more of submerged grout. Capacity can be increased by adding more core fabric within the bulbous ring. Where grout pressure heads exceed the level for which it is prudent to use a single unit, capacity can be achieved by provision of a dual system, with support capacity shared between two Grout Seals.

Fitting is achieved by insertion between two pre-installed keeper plates. The fixing toroid is then filled and pressurised with epoxy to provide an effective and secure fixing.

Grout Seals can be pre-fitted in Cans which are then delivered to the fabrication yard for connection to the structure or, alternatively, they may be site fitted. In either case no site commissioning is required.

This system offers many clear advantages over the conventional inflatable packer systems.

PILE SIZE in inches	DIMENSIONS in mm				
	A	B	C	D	E
20	50	65	50	702	20
24	60	71	50	830	20
30	60	75	55	980	20
36	62	78	60	1130	20
42	65	84	65	1290	22
48	65	84	65	1432	22
54	65	104	70	1614	22
60	65	104	70	1758	22
66	70	114	75	1928	24
72	70	114	75	2070	24
84	70	129	90	2382	25
96	70	134	90	2676	25
108	70	154	90	3000	25

NOTE: Inside Can Diameter, D, may be varied to a limited extent.

Mud-Exclusion Diaphragms are used to prevent seabed material from entering the annulus between the pile and pile sleeve or structure leg prior to pile insertion.

This type of Diaphragm is used in conjunction with Grout Seals where there are soft seabed conditions, such as encountered in the Gulf of Mexico. The combined action of the Mud-Exclusion Diaphragm and Grout Seal ensures that

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no seabed material ever enters the annulus.

These relatively lightweight Diaphragms are provided with a keeper plate fixing similar to that used for Grout Seals and are protected by the same patent (UK Patent Number 2194006). Similar keeper plate geometry to that used for Grout Seals of similar size is maintained, thus providing consistent Can configuration.

This type of Diaphragm is manufactured without any tooling requirement and at consequent low cost. This and the avoidance of flange machining, as required for other types of Diaphragm, leads to major cost savings.

Mud-Exclusion Diaphragms have been used with complete success on many structures with pile sizes up to the largest in present day use.

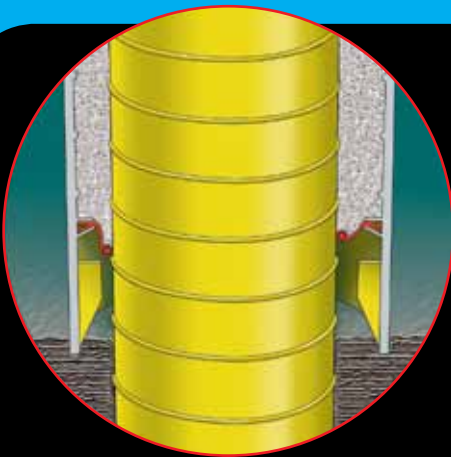
All Crux Grout Seals, Diaphragms and Mud-Exclusion/Wiper Seals are made under licence by specialist rubber manufacturing companies. All products are manufactured according to ISO 9001.

UK Patent Number 2194006

Advantages to using CRUX Grout Seal Systems

- No hoses, valves or other hardware to purchase, fit or test. This results in clear cost savings and eliminates the dominant cause of frequent grout support system failure.
- No site testing or commissioning required.
- The Grout Seal also functions as a wiper, preventing seabed material from entering the annulus to the detriment of grout connection strength.
- No offshore operation is required.
- No residual activation hardware remains to cause cathodic protection drain or diver hazard.

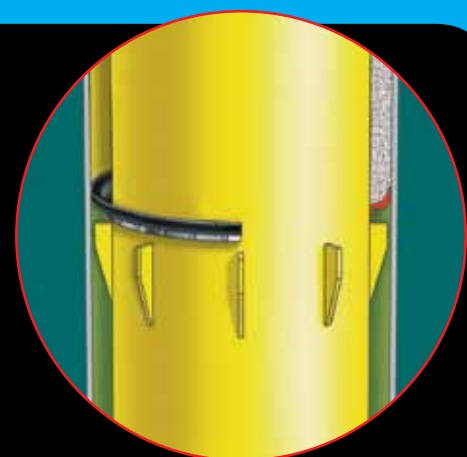
CRUX Grout Seals for Special Applications



The **CRUX ECCENT Grout Seal** is a special Grout Seal available for structures with pre-installed piles. Pile verticality and positioning tolerance dictates that greater eccentricity may occur between pile and sleeves. The special Grout Seal is designed to accept the increased annular dimension with provision of shape allowing for extension.



The **CRUX VULCAN Seal** has been developed and tested for use on structures with relatively small pile sizes. The Seal is vulcanised onto the Seal Can. The Seal Can is of similar size to the structure member (leg or sleeve). A single Seal can be used for limited pressure head (around 10 metres of grout) but two or more Seals can be used for greater pressure head (detail shows two Seals).



The **CRUX TONGUE Seal** supports grout between a pile and a pile sleeve on structures where the piles are installed by drilling. The Seal is fitted on the pile prior to the pile being lowered into pre-drilled hole and 'self activates' as grout is injected. The Tongue Seal can also be used for grouted connections of Transition Pieces to piles on Offshore Wind Energy Structures, and in situations where the Transition Piece is installed either inside or outside the pile.

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