

Permanent Canal Seal

Outage Performance Solutions

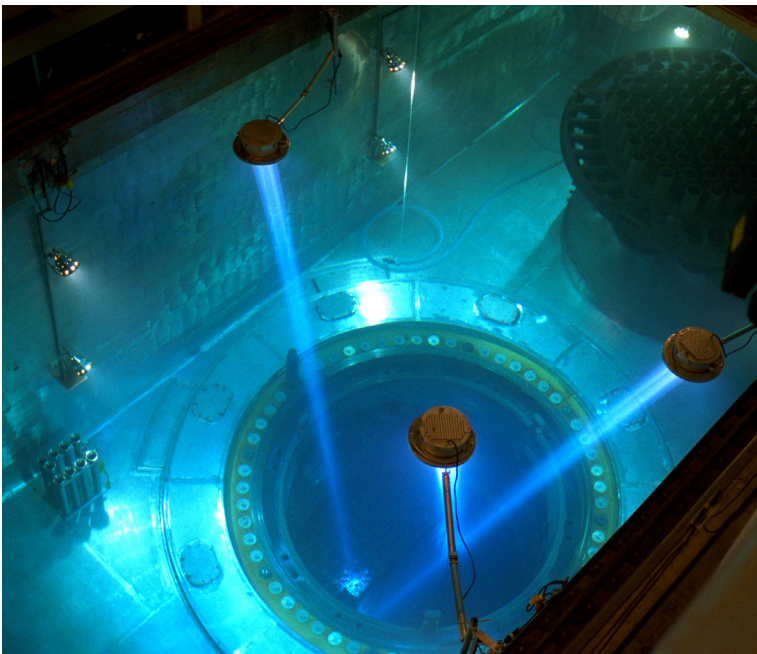
Challenge

Utilities need to mitigate leakage between the refuel canal and reactor vessel flange during refueling operations.

Solution

Framatome's Permanent Canal Seal (PCS) eliminates potential canal seal leakage associated with current temporary seal designs mitigating reactor vessel erosion/corrosion issues, while improving safety and schedule.

Framatome offers a permanent solution for wide and narrow annulus refuel canal — to reactor vessel temporary seals. Our PCS eliminates the risk associated with temporary seals, and can also mitigate nuclear instrumentation and reactor vessel nozzle access cover leakage.



Your performance
is **our** everyday **commitment**

Customer benefits

PCS enhances personnel safety by:

- Eliminating handling of temporary canal seal
- Eliminating open areas between the vessel and canal floor when canal seal is not installed

PCS improves human performance defenses by:

- Reducing the need for recovery plans and outage plan interruptions experienced when a temporary canal seal leaks
- Simplifying processes
- Eliminating the potential for temporary seal leakage masking loss of Reactor Coolant System (RCS) inventory

PCS simplifies the process by:

- Reducing the complexity of an outage activity
- Removing a task requiring technical expertise
- Reducing the amount of fasteners, improving FME

PCS reduces schedule by:

- Providing outage schedule predictability
- Eliminating polar crane picks for temporary seal plate installation and removal
- Eliminating temporary canal seal installation and testing
- Allowing earlier stud removal setup
- Allowing parallel RV Head removal activities

Options:

Narrow Annulus PCS:

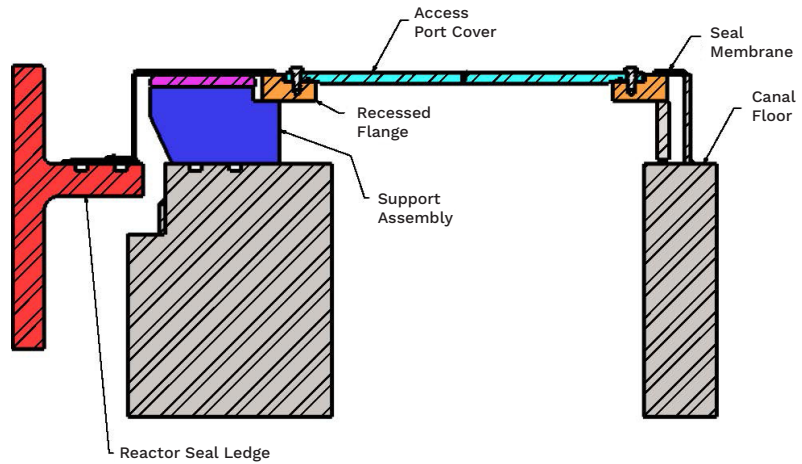
- Framatome offers a permanent solution for narrow annulus refuel canal-to-reactor vessel temporary seals. Our PCS is designed for plants with a narrow annulus (<15 cm), eliminates the risk associated with temporary seals, and may also mitigate nuclear instrumentation and reactor vessel nozzle access cover leakage as well.

Large Annulus PCS:

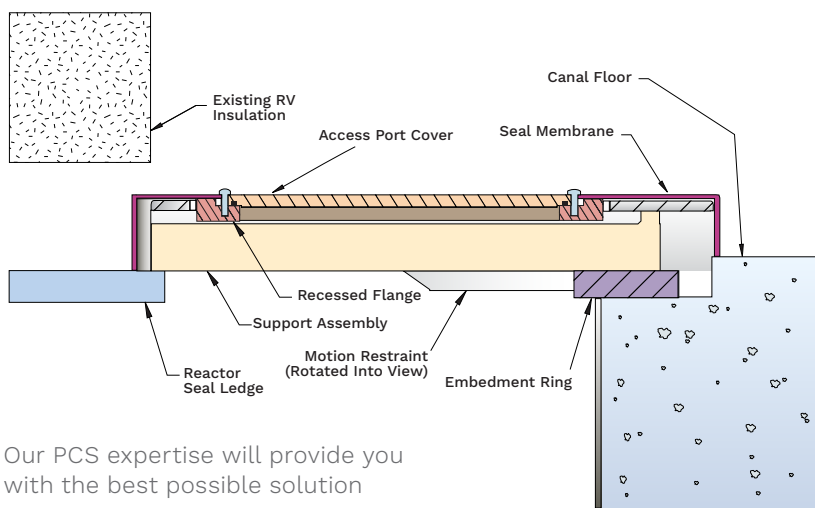
- Framatome also offers a permanent solution for large annulus refuel canal-to-reactor vessel temporary seals. Our large annulus PCS design has been installed in 12 units across the U.S. resulting in zero leakage since installation starting in 1993.

Neutron Shielding:

- For large annulus refuel canal designs, Framatome has also provided replacement neutron shielding. Most original shielding designs did not account for accessing the upper vessel from the refuel canal level. Our replacement neutron shielding option provides safe, simple access from the refuel canal floor to the upper vessel for inspections and maintenance.



Narrow Annulus PCS



Our PCS expertise will provide you with the best possible solution

Financial Benefits	Plant Benefits	PCS Features
Outage delays due to canal seal leaks can equal 1% loss in operating profit	Predictable outage durations	Permanent refuel canal seal between vessel and canal floor
		High potential for Head Area Maintenance schedule improvement
		Zero history of leaks after installation of the Framatome design
Eliminates variables/eliminates latent design issue. Estimated recovery cost of \$200,000 per event	Improved risk mitigation and human performance	Design eliminates high potential leak path
		Prevents RCS leakage from being masked by canal seal leaks
		Prevents Reactor Vessel erosion/corrosion issues due to leaks
Reduces potential for \$20,000 cost per recordable injury	Nuclear and industrial safety enhancement	Eliminates pinch points, cables, rigging, and sealant application
		Eliminates probability of canal seal failure during fuel handling

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