Flange Options for the Antineutrino Detectors

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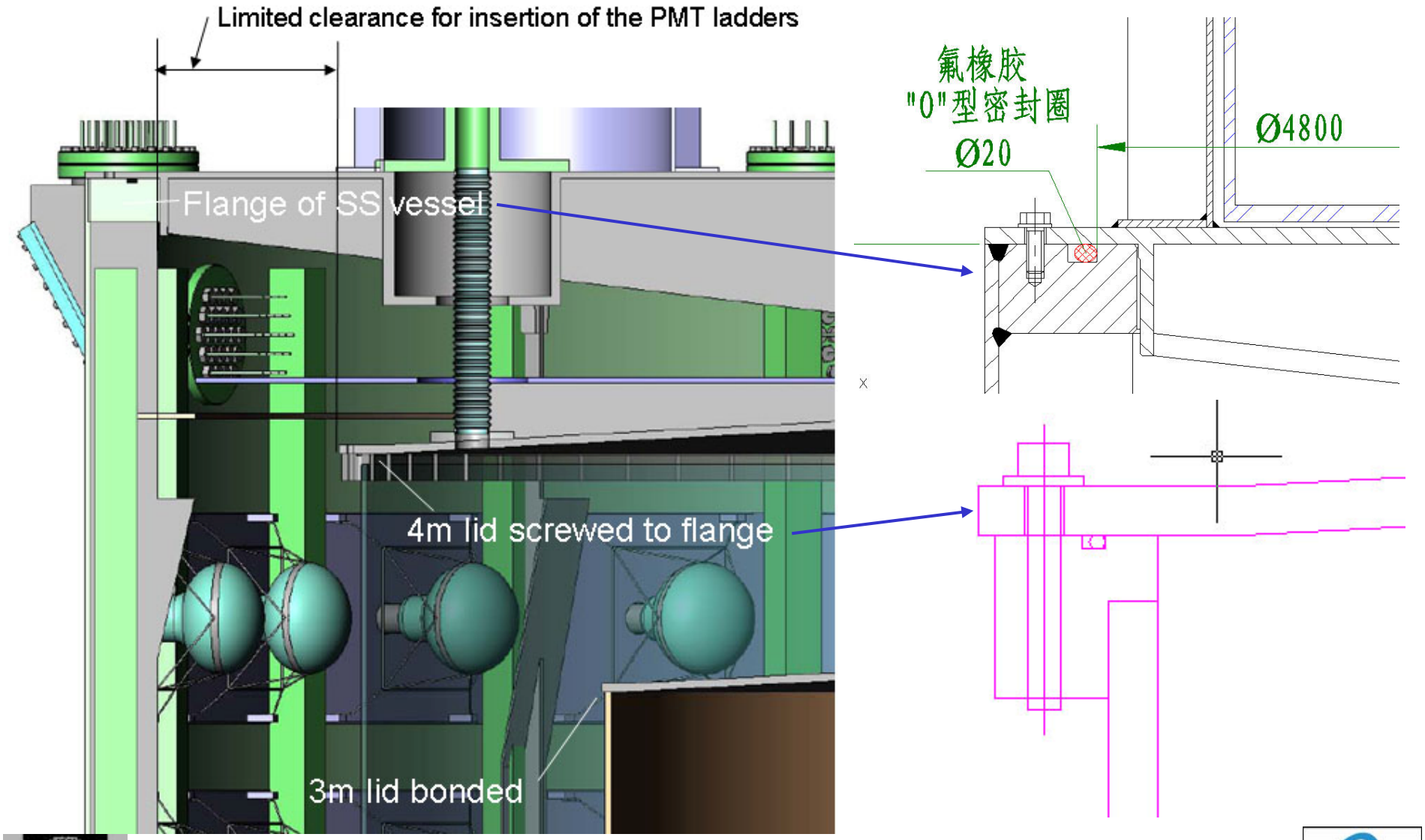
Problem: Flanges Restrict Space for PMT Ladder Insertion



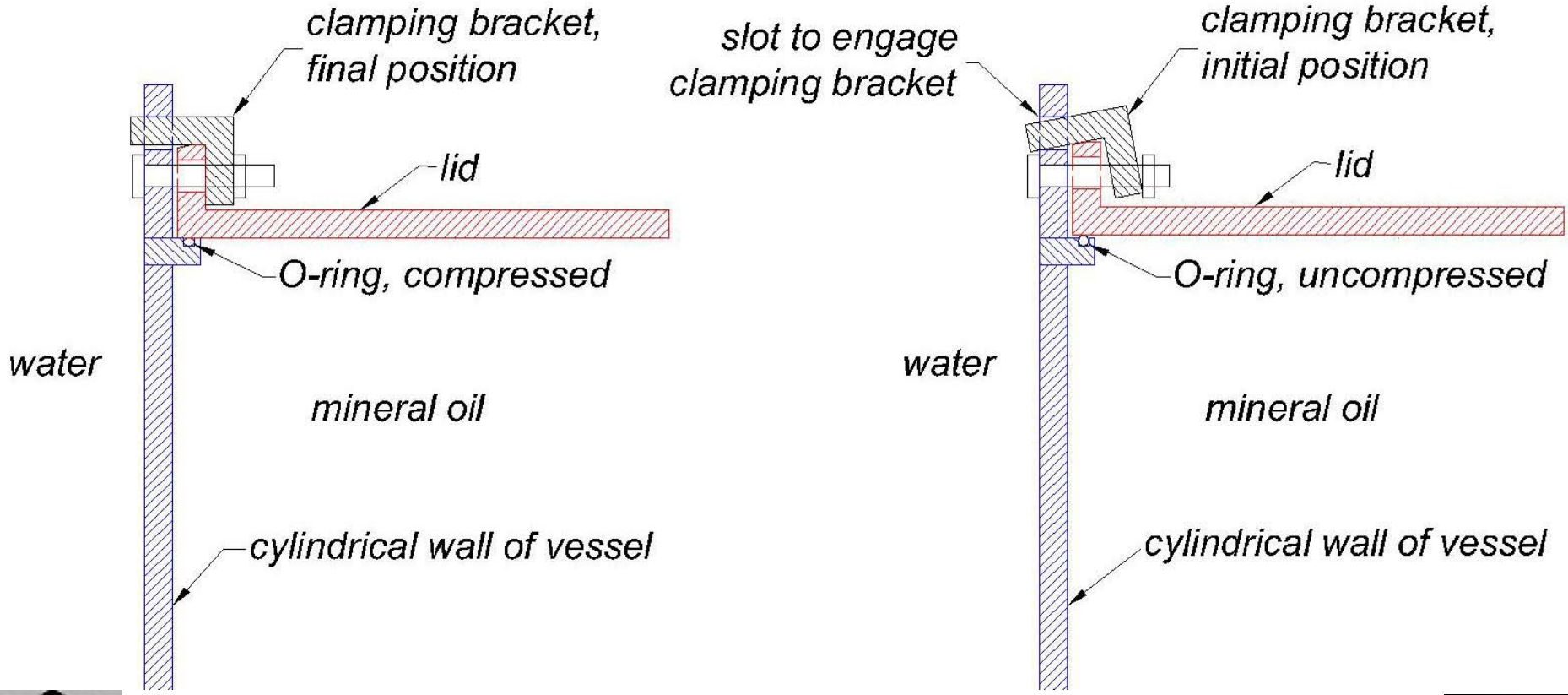
Solution: Flanges with Minimal Horizontal Extent

Use horizontal bolts to secure lid to vertical wall of vessel.

If the O-ring needs compression during assembly, use clamping brackets (one per bolt) that engage a slot in the vessel wall such as to force the lid down as the bolts are tightened.

This concept could be applied to both the SS vessel and the outer acrylic vessel.

Stress concentrations in the wall and lid around the flange bolts should be evaluated.



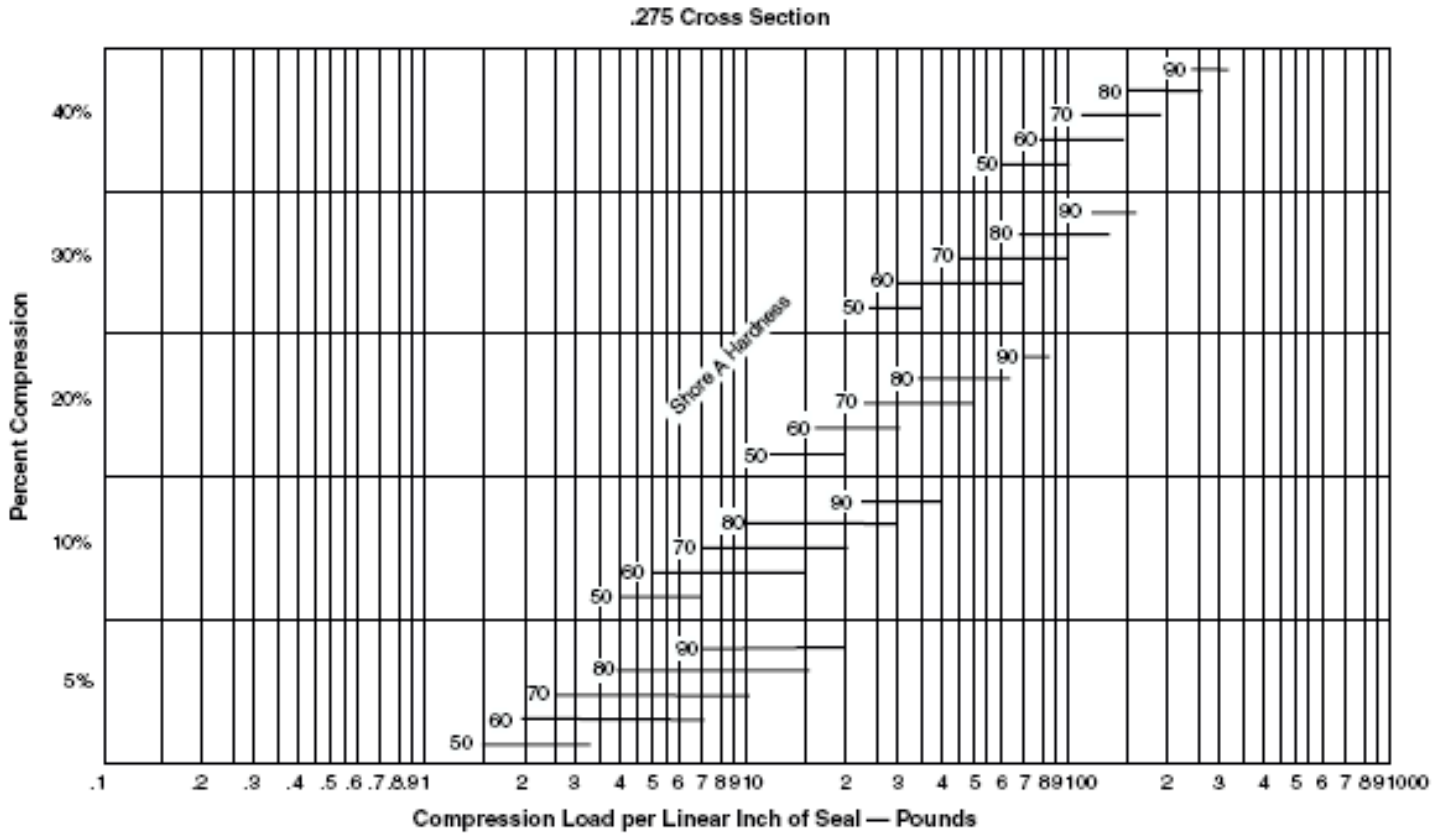
Will the O-Ring Be Compressed by the Weight of the Lid?

A 0.25"-diameter O-ring of 50 hardness requires 20 lb/in to be compressed by 20%.

⇒ Need 12,600 lb to compress a 5-m-diameter O-ring (10,000 lb for 4-m-diameter).

⇒ Since neither the SS lid nor the acrylic vessel lid weigh this much, the O-rings will need to be compressed by the clamping brackets during assembly.

From Parker O-ring handbook:



Even Better to Bond the Lid of the Outer Acrylic Vessel

Even more space for the PMT ladders would be obtained if the lid of the outer acrylic vessel were bonded rather than bolted.

The bonding would be done by the vessel manufacturer.

The flexible Teflon tubes that extend upwards from the inner and outer acrylic vessels can/should also be attached to the acrylic lids by bonded flanges -- to simplify assembly and to reduce the risk associated with blind, tapped holes in the acrylic lids.