

POPLU Requirements, Design and Construction

Petri Koho, Petri Korkeakoski

Posiva Oy, Finland

POPLU deposition tunnel end plug test was performed in the demonstration area of ONKALO URCF at the level of -420 meters. The work included the identification of requirements for the experiment, design and test planning including instrumentation and monitoring, material development, tunnel and plug slot excavation including site selection and the construction of the experiment.

POPLU structure and performance expectations are defined in accordance with Posiva's requirements system where plug-specific requirements are given for Levels 3 (Performance Targets) to 5 (Design Specifications). Some of the specifications are undergoing revisions and some are applicable to only the Posiva's reference plug and not the POPLU alternative design.

The design of the experiment included the structural design of the experiment including the main component of concrete wedge. Materials development was done during the design phase especially for the low-pH concrete used in the concrete wedge and the low-pH grout used to contact grout the interface between the concrete wedge and rock. All the materials used in the experiment were subjected to the foreign material acceptance process of the future repository location of ONKALO. The instrumentation, data acquisition, pressurisation and leakage monitoring systems were designed in order to monitor experiment's behaviour when pressurised to 4.2 MPa.

Two demonstration tunnels numbered 3 and 4 were excavated for the experiment at -420 m level in the demonstration area in ONKALO. The slot for the concrete wedge was produced in demonstration tunnel 4 with drill-wedge-grind method after the tunnels had been approved for use. Three lead-through holes were drilled for the lead-through pipes that carry the instrumentation cabling and pressurisation pipes from one tunnel to the other. Demonstration tunnel 3 was equipped with pressurisation, monitoring and data collection systems. The construction of the experiment in demonstration tunnel 4 included several stages such as the tunnel back-wall casting, filter layer installation, lead-through pipe installation, instrumentation installation, concrete wedge construction and casting. The construction activities ended with the contact grouting of the concrete wedge and rock interface.