The Role of Äspö Hard Rock Laboratory for the Swedish Nuclear Fuel and Waste Management´s Research, Developing and Demonstration Programme for a Final Repository of Spent Nuclear Fuel – 15378

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ABSTRACT

The Äspö Hard Rock Laboratory (HRL), located in the Simpevarp area in the municipality of Oskarshamn in Sweden, Figure 1, constitutes an important part of the Swedish Nuclear Fuel and Waste Management (SKB) work with design and construction of a deep geological repository for final disposal of spent nuclear fuel. One of the fundamental reasons behind SKB’s decision to construct an underground laboratory was to create an opportunity for research, development and demonstration in a realistic and undisturbed rock environment down to repository depth. Most of the research has concerned with processes of importance for the long-term safety of a future final repository and the capability to model the processes taking place at repository depth. Demonstration addresses the performance of the engineered barriers and practical means of constructing a repository and emplacing the canisters containing spent fuel. SKB will in the coming years more focus on using the Äspö HRL for demonstrating technology for and function of important parts of the repository system before constructing and operate the spent nuclear fuel repository in Forsmark. Äspö HRL includes both a research village with office space for 100 persons and different laboratories, e.g. Chemistry and Material Science Laboratory and Bentonite Laboratory, and an underground research laboratory to a depth of 460m. The Äspö HRL is also open for other organisations to be used for their own projects and experiments not only related to nuclear waste management research.

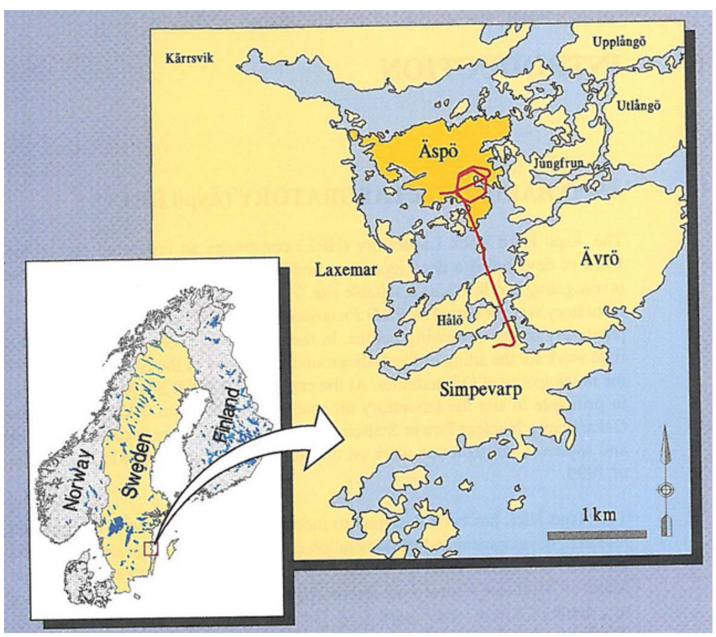

Fig. 1. Location of the Äspö HRL.

INTRODUCTION

The Äspö Hard Rock Laboratory (HRL), in the Simpevarp area in the municipality of Oskarshamn in Sweden, constitutes an important part of Swedish Nuclear Fuel Management (SKB) work with design and construction of a deep geological repository for final disposal of spent nuclear fuel.

This work includes the development and testing of methods for use in the characterisation of a suitable site. One of the fundamental reasons behind SKB´s decision to construct an underground laboratory was to create an opportunity for research, development and demonstration in a realistic and undisturbed rock environment down to repository depth. Most of the research is concerned with processes of importance for the long-term safety of a future final repository and the capability to model the processes taking place at repository depth. Demonstration addresses the performance of the engineered barriers, and practical means of constructing a repository and emplacing the canisters with spent fuel.

The underground part of the laboratory consists of a main access tunnel from the Simpevarp peninsula to the southern part of the Äspö island where the tunnel continues in a spiral down to a depth of 460 m, see Figure 2. The total length of the tunnel is 3,600 m where the main part of the tunnel has been excavated by conventional drill and blast technique and the last 400 m have been excavated by a tunnel boring machine (TBM) with a diameter of 5 m. The underground tunnel is connected to the ground surface through a hoist shaft and two ventilation shafts.

The work with Äspö HRL has been divided into three phases: Pre-Investigation phase, Construction phase and Operational phase.

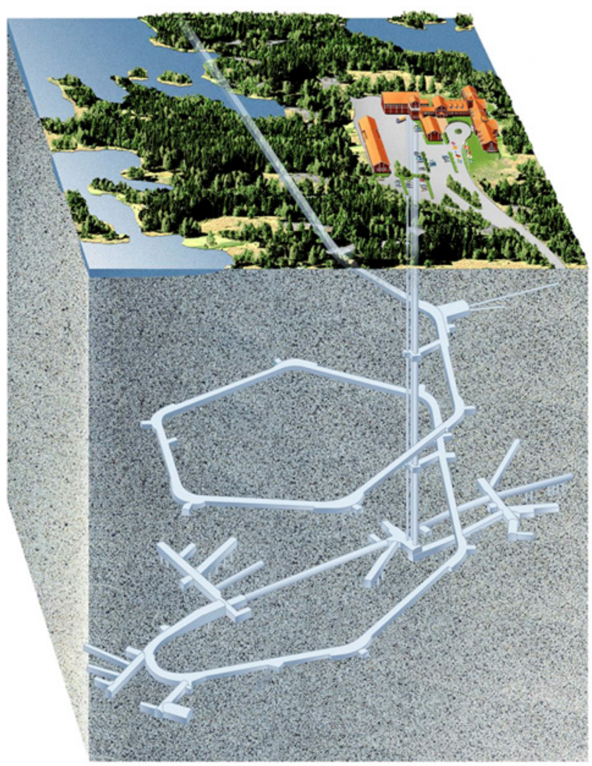

Fig. 2. Overview of the Äspö HRL with the research village and the underground research facility.

During the Pre-Investigation phase, 1986–1990, studies were made to provide background material for the decision to locate the laboratory to a suitable site. The natural conditions of the bedrock were described and predictions made of geological, hydrogeological, geotechnical and rock-mechanical conditions to be observed during excavation of the laboratory. This phase also included planning for the construction and operational phases.

During the Construction phase, 1990–1995, comprehensive investigations and experiments were performed in parallel with construction of the laboratory. The excavation of the main access tunnel and the construction of the Äspö Research Village were completed. The Operational phase began in 1995. A preliminary outline of the programme for this phase was given in SKB´s Research, Development and Demonstration (RD&D) Programme 1992. Since then the programme has been revised every third year and the detailed basis for the period 2014–2019 is described in SKB´s Research Develop &Demonstration (RD&D) Programme 2013 [1].

To meet the overall time schedule for SKB`s RD&D work, the following stage goals were initially defined for the work at the Äspö HRL [2]:

1. *Verify pre-investigation methods* – Demonstrate that investigations on the ground surface and in boreholes provide sufficient data on essential safety-related properties of the rock at repository level.
2. *Finalise detailed investigation methodology* – Refine and verify the methods and the technology needed for characterisation of the rock in the detailed site investigations.
3. *Test models for description of the barrier functions at natural conditions* – Further develop and at repository depth test methods and models for description of groundwater flow, radionuclide migration and chemical conditions during operation of a repository as well after closure.
4. *Demonstrate technology for and function of important parts of the repository system* – In full scale test, investigate and demonstrate the different components of importance for the long-term safety of a final repository and show that high quality can be achieved in design, construction and operation of repository components.

The outcome of 1 and 2 was further developed into a methodology for the site investigations, 2002-2009, performed at Simpevarp/Laxemar in the municipality of Oskarshamn and at Forsmark in the municipality of Östhammar.

The tasks in stage goal 3 has increased the scientific understanding of the final repository's safety margins and provided data for safety assessments of the long-term safety (SR-Site) which was an important part of SKB's license application for construction and operation of a final repository for spent nuclear fuel in Forsmark submitted in 2011.

In order to reach stage goal 4 SKB has now started to focus on the following important tasks at Äspö HRL:

- Develop, test, evaluate and demonstrate methods for repository design and construction as well as deposition of spent nuclear fuel and other long-lived waste.
- Develop and test alternative technology with the potential to reduce costs and simplify the repository concept without sacrificing quality and safety.
- Increase the scientific understanding of the final repository's safety margins and provide data for safety assessments of the long-term safety of the repository.
- Provide experience and train personnel for various tasks in the repository.
- Provide information to the general public on technology and methods that are being developed for the final repository.

These tasks will be an important input for SKB to get the license to construct and start the operation of the final repository for spent nuclear fuel in Forsmark.

THE ÄSPÖ RESEARCH VILLAGE

To reach the stage goals for the Äspö HRL the facility has during the years been developed with additional facilities and also the competence of the staff has been developed as well increased the amount of personal working there. Today the Äspö research village accommodate office space for 100 persons with many different occupational roles as engineers, geoscientists, chemists, administrators, entrepreneurs, etc.

Annually 5-6 000 visitors are visiting the Äspö HRL. The visitors represented the general public, teachers, students, professionals, politicians, journalists and visitors from foreign countries. To provide information to the general public, stakeholders, etc on technology and methods that are being developed for the final repository by visiting Äspö HRL supports SKB to create public acceptance.

Fig. 3. Äspö research village with the Chemistry, Material Science and Bentonite Laboratories.

Below different facilities of the Äspö village are presented and their purposes [2].

Bentonite Laboratory

Before building a final repository, further studies of the behaviour of the buffer and backfill under different installation conditions are required. SKB has built a Bentonite Laboratory at Äspö, designed for pre-studies of buffer and backfill materials before doing underground tests in full scale. The laboratory has been in operation since spring 2007. The Bentonite Laboratory enables full-scale experiment under controlled conditions and makes it possible to vary the experiment conditions in a manner which is not possible underground in the Äspö HRL. The laboratory, a hall with dimensions 15×30 m, includes two stations. One station is for the emplacement of buffer material at full scale in an 8 m deep vertical deposition hole, Figure 4. The other station is used for testing of different types of backfill material and the further development of techniques for the backfilling of deposition tunnels, Figure 5.

The laboratory is also equipped with a mixer with a load capacity of 1000 kg to allow mixing of bentonite with desired water ratio. In begin of 2015 a bentonite pellets manufacturing machine was installed to produce pellets for experiments both in the Bentonite Laboratory and underground in Äspö HRL.

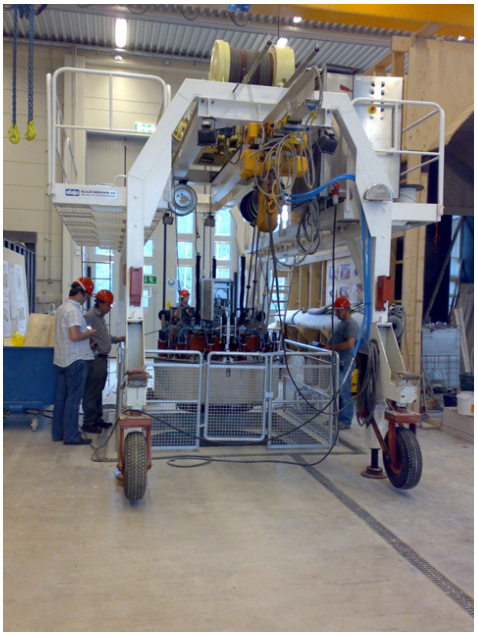

Fig. 4. Testing of installation of buffer blocks in the Bentonite Laboratory.

Fig. 5. Testing of installation of backfill blocks in the Bentonite Laboratory.

Chemistry Laboratory

The Chemistry Laboratory at Äspö HRL was built in the late 1990's. The main purpose is to perform the sampling and analyses on water samples collected in streams, lakes and boreholes in the surrounding area and in the Äspö HRL underground tunnels. In combination with groundwater flow, groundwater composition is of great importance for repository performance in both the short and long term. Before the site investigations started in 2002, a decision was made to accredit the Chemistry Laboratory. This was fulfilled in 2003. The laboratory serves all of SKB and its projects, not only Äspö HRL. In 2011 new adjacent laboratory areas was built and this makes it possible for external research organisations to use the laboratory for sample preparations and other laboratory work while performing experiments at Äspö HRL.

For the moment the Chemistry Laboratory can perform 14 different analyses for water samples. Nine of these analyses are accredited – pH, electrical conductivity, alkalinity, potentiometric measurements for chloride and fluoride, ion chromatography (IC) for anions such as chloride, bromide, fluoride and sulphate and UV/VIS spectroscopy for nitrogen such as ammonia, sulphide and iron (Fe2+ and Fe_{tot}). During 2013 and 2014 the Chemistry Laboratory has implemented two new instruments, a Total Organic Carbon analyzer for total organic carbon (TOC) and dissolved organic carbon (DOC) and a Liquid Water Isotope Analyzer (LWIA) for the determination of ^{18}O and ^{2}H. The validation procedure is soon to be finished. External laboratories are used for analysing cations (ex. sodium, calcium and sulphur), lanthanides and other trace elements, nutrient salts and isotopes such as ^{3}H, ^{34}S, ^{87}Sr, ^{37}Cl, ^{18}O and ^{2}H.

Fig. 6. Chemistry laboratory at Äspö.

Twice a year the Chemistry Laboratory performs a monitoring programme in the tunnel. At that time approximately 25 sections of different boreholes are collected and analysed at the laboratory. This programme has been ongoing since the tunnel was built in the 1990's and the data is used for modelling the groundwater in the Äspö HRL and understanding the ground-water conditions at site.

Material Science Laboratory

There are many current and future challenges regarding the bentonite buffer and backfill materials related to long term safety assessment, as well as industrial scale quality control. As a part of the needed infrastructure, a Material Science Laboratory has been constructed at Äspö, with focus on material chemistry of bentonite issues and competence development. The key focus areas are long term safety related research and development of methods for quality control.

During 2013 a number of methods and equipment's have been implemented and developed. Wet chemical methods such as cat ion exchange capacity (CEC) and exchangeable cat ions (EC) have been implemented. Equipment's implemented during 2013 are X-ray diffraction (XRD) for the determination of crystalline solids, X-ray fluorescence (XRF) spectroscopy for elemental composition, Fourier Transformed IR (FT IR) spectroscopy for detailed analysis of the clay mineral structure and amorphous material, and UV/Vis for the CEC method.

A μ-Raman equipment was installed in the late 2013 as a complement for analysis of corrosion products, accessory minerals and precipitates all with a very high spatial resolution in a non-destructive manner. Planned installations are swelling pressure and hydraulic conductivity measurements.

Work is ongoing to develop the quality control from an industrial aspect. Method documents describing the laboratory measurements of key parameters such as montmorillonite content, organic carbon, total sulphur content, hydraulic conductivity and swelling pressure and being compiled. The long term stability of various bentonites is studied in different SKB projects and the Material Science Laboratory is supporting these projects with analyses. Beside of the key areas, various more or less related works in different fields is conducted with the purpose of competence development and problem solving in other projects or areas of SKB.

Facility for Testing Borehole Deviation Equipment

Drilling of boreholes in conjunction with construction and operation of a repository for spent nuclear fuel at Forsmark requires careful control of borehole geometry in various applications. Foreseen pilot holes for deposition tunnels, up to 300 m long, where the boreholes are required to stay within the tunnel perimeter calls for careful control of the drilling process. This requires development not only of drilling methodology but also of instruments and methodology for providing the necessary steering and successive verification of borehole geometry. To this end SKB has devised a facility where indirect deviation measurements can be verified relative to the known geometry of a simulated borehole on ground surface.

The 300 m long near horizontal simulated borehole with a diameter of 76 mm was constructed during 2013 on the Äspö island. The equipment consists of a plastic tube anchored to the rock. The tube, which essentially follows ground surface topography, has been carefully surveyed geodetically.

Initial tests of deviation equipment of different types, including magnetic tools, gyro based tools have been carried out during 2014. These measurements have provided important results that have been used in the planning and execution of recently concluded drilling operations at the Äspö HRL. Experiences gained during the initial testing will be used to improve the facility and the methodology for carrying out and comparing results and different instruments. These results will guide SKB in the selection of methodology and equipment to be employed in the planned repository.

Fig. 7. Test facility for borehole deviation measurement equipment at Äspö.

PROJECTS AND EXPERIMENTS AT THE ÄSPÖ HRL

The license application for the final repository for spent nuclear fuel is based on the KBS-3V method. In the KBS-3V method the spent nuclear fuel is encapsulated in copper canisters which are deposited in vertical deposition holes in crystalline rock. The canisters are surrounded by a buffer of bentonite clay which protects them and limit the flow of water. The deposition tunnels are filled with backfill material, pre-compacted blocks of bentonite, after the deposition of canisters and buffer.

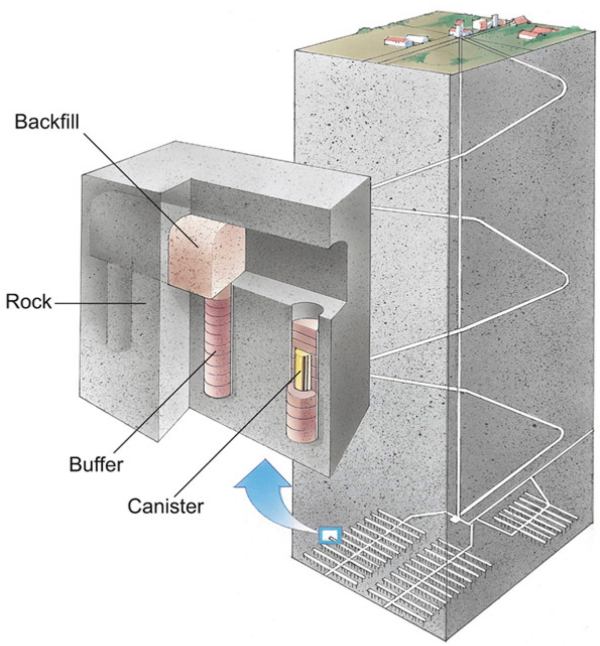

Fig. 8. KBS-3 with vertical deposition (SKB´s reference design).

The Äspö HRL and the belonging surface facilities have an important role in the development, testing and demonstration on different components in the system. In the following sections are examples of such projects and experiments presented.

Backfill Development

The reference concept for backfilling involves use of pre-compacted bentonite blocks to fill the majority of the tunnel volume. Bentonite pellets are used as bed material to even out the blasted tunnel floor before placement of the backfill blocks. Pellets are also used to fill the gap between the deposition tunnel walls and the backfill blocks to protect the blocks from direct water flow. The concept for installation and manufacturing of backfill in deposition tunnels has been further developed during the last years. The development and testing of methods for manufacturing, installation and quality assurance of the backfill material have been carried out [3]. For these have the Bentonite Laboratory, the Material Science Laboratory and the Äspö HRL been used.

As mentioned above bentonite is used to manufacture backfill blocks and pellets. Material studies were carried out on the different backfill material candidates; Ibeco RWC-BF from Greece and Asha NW BFL-L from India. Three batches of bentonite were delivered; 250 tons of Asha in 2010, 100 tons of Ibeco in 2011 and 600 tons of Asha in 2012. The materials were used for tests of block and pellet manufacturing as well as laboratory investigations. Water content determination, swelling index determination, CEC (cat ion exchange capacity) determination, hydro-mechanical tests, chemical and mineralogical analyses have been carried out.

The laboratory investigations showed that Ibeco 2011 was a homogenous bentonite with moderate smectite content. However the hydraulic conductivity was relatively high and the swelling pressure low compared to other bentonite deliveries of Ibeco RWC-BF. Both of the batches of Asha had low hydraulic conductivity and high swelling pressure. The scatter between samples for swelling index, granule size distribution and water content was however high which indicated a rather inhomogeneous bentonite.

Backfill blocks were manufactured of bentonite from Asha 2010, Asha 2012, Ibeco 2011, Minelco and MX-80. Blocks with required density, geometry and strength could be produced of all the different bentonites, except Asha 2010, after adjustment of the water content. Asha 2010 contained a rather large amount of coarse material which resulted in blocks with undesirably low strength. Blocks with required strength were achieved after crushing the material. Laboratory tests performed showed that water content, granule size distribution and material composition affect the strength of the blocks and the quality of the block surfaces. Investigations of how the blocks were affected by the relative humidity in the surrounding air were carried out both in laboratory scale and in full scale. The tests showed that the full-sized blocks are very sensitive to the surrounding atmosphere. The block exposed to 75 % relative humidity was little affected since it was almost in equilibrium with the surrounding air. Cracks were formed in the blocks exposed to both higher and lower relative humidity after rather short exposure to the surrounding air.

An industrial robot was purchased and developed to be used for the installation of backfill blocks in order to provide a backfill with a high block filling degree in short time. The equipment included development of a gripper, a platform, a measurement system and a control system. The conceptual functionality of the robot was tested by using dummies of concrete blocks in the Bentonite Laboratory.

Fig. 9. Backfill installation robot operating in the Äspö HRL.

After the installation was completed in the Bentonite Laboratory a full-scale installation test was performed underground at Äspö HRL (situated at -450m level) to demonstrate that the installation of backfill can be carried out as intended in a realistic environment. In total 12 meters of backfill with bentonite blocks was installed. The installation was performed with prototype equipment and many temporary solutions that will not be used in the future repository. The installation of the blocks and pellets was carried out without any major problems. The block filling degree was 71% and the installed density about 1, 420 kg/m3, which is within the requirement (1, 280 kg/m3) set for this bentonite material. In total, 89 hours was used for the installation. The prototype equipment worked quite well with the current stacking speed, further development is needed though to increase the pace.

Deposition Tunnel Plug Development

The reference design of the KBS-3V deposition tunnel end plugs consists of an arched concrete dome, a bentonite seal, a filter zone and delimiters. Furthermore, a backfill transition zone has been introduced to moderate the swelling pressure from the backfilling in the tunnel, with the purpose of attaining a static load on the plug.

In the final repository, the plugs will be unreinforced and made of low-pH concrete. The advantages of being able to perform a concrete dome without reinforcement is to avoid risks for corrosion of reinforcement and risk for cracks related to the reinforcement due to the shrinkage of low-pH concrete. In addition, time and cost savings are obtained at installation. The reason for using low-pH concrete is to avoid the negative effects that alkaline materials can have on bentonite clay properties.

A project with the aims to ensure that the reference configuration of the KBS-3V deposition tunnel end plug works as intended started in 2011. By testing the design in a full-scale demonstration it was to be proven that the method for plugging of a deposition tunnel is feasible and controllable. The requirements on tightness of the plug are to be given a definite form. The main goal of the full-scale testDomplu (Dome plug) at Äspö HRL was to determine leakage through the plug and in the contact surfaces between the rock and the concrete, at the design pressure of 4 MPa. Furthermore, a load-test of the plug up to 10 MPa will be performed if possible.

The Domplu test is part of the EU-project DOPAS, which receives funding from the European Atomic Energy Community's (Euratom) Seventh Framework Programme FP7/2011–2013, (http:/www.posiva.fi/en/dopas). DOPAS aims to improve the adequacy and consistency regarding industrial feasibility of plugs and seals, the measurement of their characteristics, the control of their behaviour over time in repository conditions and also their hydraulic performance acceptable with respect to the safety objectives. The DOPAS project is carried out in a consortium of 14 organisations representing waste management organisations, research organisations, academia and consulting.

The site for the Domplu-test is located at Äspö HRL -450 m level, where good and dense rock conditions prevail. The experiment is monitored by a total of about 100 sensors. More than half of the sensors are measuring the concrete dome stress performances, temperatures and movements while the remainder sensors are monitoring water pressure, total pressure, relative humidity and movements in the bentonite seal, filter and the backfill zone.

A key objective is to monitor the water leak through the plug over time (about 36 months). For this purpose, a measurement system for leakage control has been developed and the water will be dammed up within a dense plastic sheeting just downstream of the concrete dome and directed by gravity to a pendent scale for on-line registration of effluent water. The experiment is pressurised artificially with water in the backfill behind the plug, stepwise up to 4 MPa for the tightness test, and up to 10 MPa for strength test verification. The experimental set-up and pressurisation program is targeted to reflect the real conditions expected in the final repository.

In 2012, a suitable plug location was determined by core drilling and high pressure water injection tests (10 MPa) in a 30 meter long pilot hole. A test-tunnel was then excavated to 14 meters length by using drill and blast methods, with a modified blast sequence to ensure a minimal Excavation Damaged Zone (EDZ). The contour boreholes were blasted in a separate round. The tunnel dimensions correspond to the reference design of SKB`s deposition tunnels, which are 4.8 meters high by 4.2 meters wide, for a cross sectional area of 18.9 m^2. The plug slot area was excavated to obtain smooth surfaces using the wire sawing technique in an octagonal shape, almost 9 meters in diameter. The wire-sawing method is assumed to minimise risk of continuous EDZ and it provides smooth rock surfaces for the concreted dome.

The tested rock excavation method was functional, but influence from rock stresses made the performance different compared to common sawing at shallower depth. As a consequence the wire-sawing took longer than initially scheduled. The originally planned pulling cuts were changed to blind cuts and accordingly a new drilling campaign was needed.

A temporary safety beam construction and steel nettings was used for workers protection during the excavation. When all sawing-cuts had been completed, the rock segments and the safety beams were removed simultaneously by blasting.

The entire slot was finally measured in detail by laser scanning. The installation of the inner parts of the plug began in late 2012 and was completed in the beginning of 2013. Domplu was constructed with 45 sensors in the backfill and seal layer and another 56 sensors within the concrete. The sensors in the backfill and seal layers are lead through pipes in the rock to the neighbouring tunnel, a distance of about 21 meters. Sensors within the concrete are lead out the front face of the concrete plug. The properties being measured by the array of sensors includes temperature, relative humidity, strain, displacement, pore pressure and total pressure.

On March 13, 2013 the casting of the concrete dome took place. A total amount of 94 m^3 concrete was used. The monitoring of the Domplu experiment started in September 2013 when the bentonite seal had been artificially wetted by flooding of the filter during the summer. The hydrostatic pressure has mid 2014 reached 4 MPa and the measured leakage is 2,0 l/h and is decreasing.. The experiment will be under continued observation until 2016.

Fig. 10. The constructed deposition tunnel end plug at Äspö HRL.

KBS-3 Method with Horizontal Emplacement

SKB and Posiva are co-operating on a programme for the KBS-3 Method with Horizontal Emplacement (KBS-3H). A continuation phase of the concept development is ongoing and the target is to reach a level of understanding so that comparison of KBS-3H and KBS-3V (reference concept for both SKB and Posiva), and preparation of a PSAR, becomes possible. The current project phase is planned for 2011–2016. It covers all areas of the KBS-3 method but the focus is on the KBS-3H specific issues.

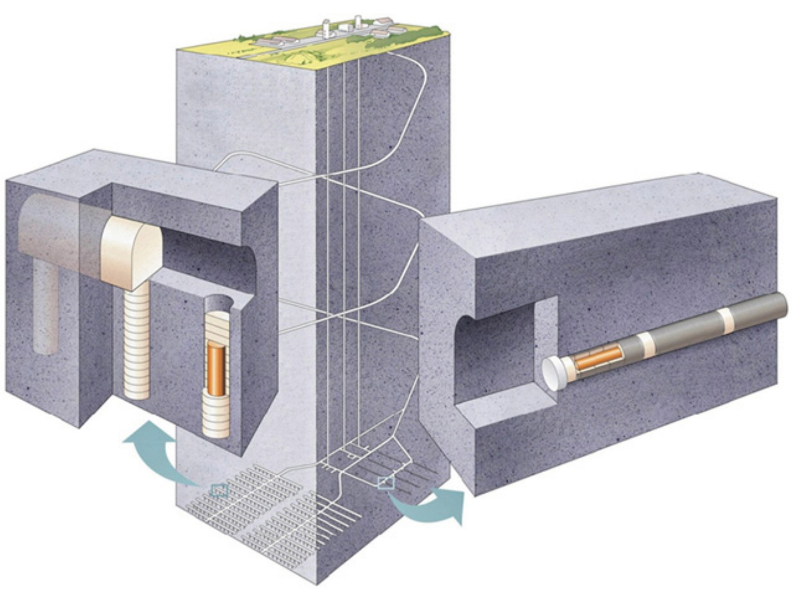

Fig. 11. Schematic drawing of the KBS-3V reference design (left) and KBS-3H (right).

One of the main steps in the ongoing work is the verification of the selected KBS-3H design. This includes verification that:
a) The design solution meets the requirement specification.
b) The system components can be manufactured such that the requirement specification is fulfilled (control program).

These steps are carried out mainly at the Äspö HRL, the focus of which is to verify the functionality of equipment, methods and components developed. Two main activities are initiated, the Multi Purpose Test (MPT) at the -220 m level and the excavation and preparation of a new KBS-3H drift at the -410 m level.

The MPT, which is also part of the EU-project LucoeX (which receives funding from European Union’s European Atomic Energy Community’s (Euratom) Seventh Framework Programme FP7/2007–2013, (http://www.lucoex.eu) is basically a large-scale non-heated installation of the reference design, DAWE, and includes the main KBS-3H components. It is installed at the -220 m level which implies that the hydraulic boundary conditions differ from those foreseen at a typical repository depth.

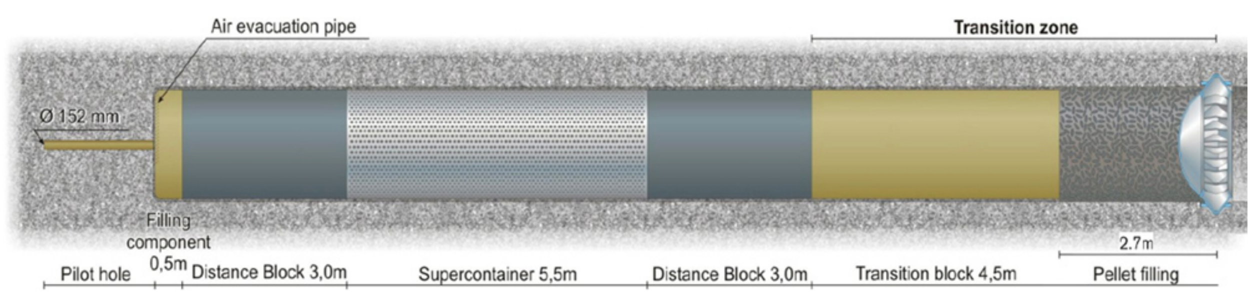

Fig. 12. Schematic illustration of the Multi Purpose Test layout.

The MPT was installed end 2013 according to the KBS-3H design in a 20 m section at the end of the 95 m long full face drift (d=1.85 m). The test has been set up with two main objectives:

- Test the system components in full scale and in combination with each other to obtain an initial verification of design implementation and component function.
- This includes the ability to manufacture full scale components, carry out installation (according to DAWE) and monitor the initial system state of the MPT and its subsequent evolution.

Verification is the overarching objective and the test has provided important experiences from working in full-scale at ambient *in situ* conditions, although not fully representative of typical repository depth. It has also enabled the recognition of potential implementation issues related to the design such as the Super-container being designed with blocks of different water content.

Fig. 13. Picture from the installed Multi Purpose Test (MPT).

A new KBS-3H test site is being established at the -410 m level of the Äspö HRL, and hence more representative of typical repository depth. The excavation and preparation of a KBS-3H drift have several objectives. One of them is demonstration, comparison and verification of performance of pilot borehole drilling techniques over a 300 m length scale, including fulfilment of defined geometrical requirements. This includes test and verification of deviation measurement equipment in the deviation facility currently being developed at the Äspö HRL. The new facility for Borehole Deviation testing at Äspö has been an important part to verify the deviation measurement equipment accuracy.

CONCLUSIONS

During the pre-investigation and construction phase of Äspö HRL the investigation methods used was an important experience to develop the methodology used at the site investigations performed at Simpevarp/Laxemar in the municipality of Oskarshamn and at Forsmark in the municipality of Östhammar.

The Äspö HRL with the underground facility, the Bentonite Laboratory, Chemistry Laboratory, Material Science Laboratory and the facility for testing borehole deviation measurement equipment have a very important role for the planning, design and construction on a final spent fuel repository. Äspö HRL has been in operation since 1995 and the type of projects and experiments in the facility have been changing over the years. Up until some years ago focus has been on scientific understanding of the final repository's safety margins and provided data for safety assessments of the long-term safety (SR-Site) which was an important part of SKB's license application for construction and operation of a final repository for spent nuclear fuel in Forsmark. Since SKB's license application for construction and operation of a final repository for spent nuclear fuel in Forsmark was submitted in begin of 2011 more focus has been on the stage goal *Demonstrate technology for and function of important parts of the repository*. Several full-scale tests have been and will be carried out by using the Äspö HRL the coming years.

The Äspö HRL attracts considerable international interest for the experiments and projects performed there. SKB will develop the flexibility for other organisation to take part in SKB projects, participate in special organised courses as well as open Äspö HRL for other organisations, both related and not related to waste management research, to perform their own experiments.

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