

International
Progress Report

IPR-00-10

Äspö Hard Rock Laboratory

Canister retrieval test

Flow and pressure measurements
in the pilot holes

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Geosigma

June 1999

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Report no.	No.
IPR-00-10	
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Approved	Date
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Keywords: canister retrieval test, water inflow, hydrology, flow measurement

This report concerns a study which was conducted for SKB. The conclusions and viewpoints presented in the report are those of the author(s) and do not necessarily coincide with those of the client.

ABSTRACT

An approximately 15 m long tunnel was excavated at the 420 m level in the Äspö Hard Rock Laboratory for the test of canister retrieval after the bentonite has saturated and swollen. Two full size deposition holes are going to be bored in the tunnel and two pilot holes have been drilled with a diameter of 76 mm in the centre of each full size hole. Flow and pressure measurements were conducted in these holes. The flow rates were measured to be $5.3 \cdot 10^{-9}$ and $1.2 \cdot 10^{-9}$ m³/s respectively, and pressures 0 and 5 bars respectively.

SAMMANFATTNING

En cirka 15 m lång tunnel har tillretts på 420 m nivå i Äspölaboratoriet för Prov av Återtag syftande till friläggning av kapsel från en vattenmättad och svälld bentonitbuffert. Två fullstora deponeringshål skall borraras i tunneln och två 76 mm pilothål har diamantborrhåts i lägena för dem. Flöde och tryck har mätts i dessa. Flödet uppmättes till $5.3 \cdot 10^{-9}$ respektive $1.2 \cdot 10^{-9}$ m³/s och trycket till 0 respektive 5 bar.

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1 INTRODUCTION

The objectives of the Canister Retrieval Test in the Äspö Hard Rock Laboratory are to develop and to test methodology and equipment for freeing the canister from the grip of swollen bentonite and to show that a canister can be safely retrieved in an underground environment. Furthermore the project aims at developing methodology and equipment for boring full size deposition holes.

An approx. 15 m long tunnel was excavated on the 420 m level in the Äspö Hard Rock Laboratory. Geological characterisation of the tunnel was performed and two positions for boring of full size deposition holes were selected. Prior to the boring of the full size holes two pilot holes were drilled.

This report describes the flow- and pressure measurements that were carried out in these two pilot holes.

The boreholes, called KD0086G01 and KD0092G01, were vertically drilled on March 30th and March 31st respectively. The length of both boreholes is 8.00 m and the diameter is 76 mm. Both boreholes were shut in by mechanical packers between April 6th and April 20th, and packers were reinstalled on May 19th in both boreholes.

2 SCOPE

Flow- and pressure measurements were carried at one occasion in the two boreholes KD0086G01 and KD0092G01. The measurement interval was 0.30 m – 8.00 m.

3 PERFORMANCE AND EQUIPMENT USED

One week before the start of the measurements the two boreholes were shut in by mechanically operated packers manufactured by Livinstone AB. The sealing rubber length of the packers is 0.15 m. The length of the packer system is approx. 1.5 m. A valve arrangement, including a pressure gauge for manual reading, was connected to the inner packer pipe. On the top of the packer pipe a polyamide pipe (Tecalán) was vertically applied for flow measurements. The inner diameter of this pipe was 4 mm.

The pressure values were read on the pressure gauges. When necessary the packer pipes were filled up with water before the measurements. Water flow rates were determined by measuring the rise of the water level when the water flew through the Tecalan pipe.

4 RESULTS

The results of the pressure measurements and the flow measurements are presented in Table 4-1

Table 4-1 Manually measured pressures and flow rates from the two pilot boreholes. Canister Retrieval Test. May, 1998.

Borehole	Date	Section (m)	Pressure (bar)	Flow rate (ml/min)	Flow rate (m³/s)
KD0086G01	980526	0.30 – 8.00	0	$3.2 \cdot 10^{-4}$	$5.3 \cdot 10^{-9}$
KD0092G01	980526	0.30 – 8.00	5	$7.1 \cdot 10^{-5}$	$1.2 \cdot 10^{-9}$