

Extreme Challenges in Vadlaheidi Road Tunnel Case History

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ABSTRACT

Vadlaheidi road tunnel is in the Northern part of Iceland. The tunnel's cross-section is according to Norwegian design guidelines and is called T9.5, with a cross-sectional area of approximately 66 m². The total length of the tunnel in rock is 7.2 km and it connects Eyjafjörður in the west to Fnjoskadalur in the East.

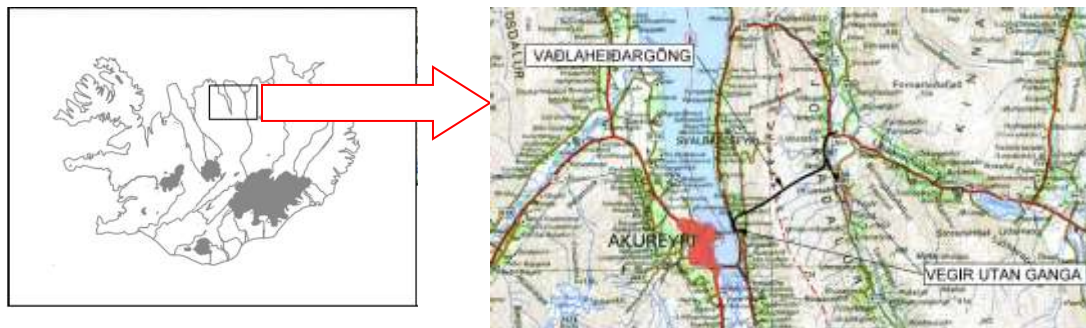


Figure 1. Location of Vadlaheidi road tunnel

Tunnel excavation started in July 2013 and the tunnel was opened for public traffic late December 2018, about two years later than originally scheduled.

There were two main reasons for this delay. Firstly, high water temperature and inflow of hot water that caused extremely poor working conditions and frequent grouting operations during the tunnel excavation from the west side. Secondly, an extreme collapse in the tunnel on the East side, causing a large inflow of relatively cold water resulting in filling and closing the tunnel for months.

Tunnel excavation from the West side started on July 3rd, 2013. On February 15th, 2014, a large inflow of 46°C hot water, approximately 350 l/s, occurred. The total length of the tunnel was at that time 1870 m. The excavation was continued with very frequent grouting operations, increasing water temperature and rapidly decreasing working conditions. It was therefore decided to post grout the area. The grouting work was executed in June and July of 2014. Although a relatively successful post-grouting operation the working conditions were extreme due to water and rock temperature up to around 63°C. Late

August the contractor decided to stop the excavation and move to the East side. The tunnel length at the west side was at that time 2695 m.



Figure 2. Inflow of 46°C hot water, total of 350 l/s.

Tunnel excavation from the East side started on September 5th, 2014. After relatively successful tunnel excavation work, an extreme collapse occurred on April 17th, 2015, from a 10 m wide fault zone. The tunnel length was at that time 1475 m.



Figure 3. Collapse in the tunnel

Shortly after the collapse, an inflow of 7°C cold water of up to 518 l/s followed. The tunnel was filled with water and tunnel excavation consequently stopped.

Pumping of water from the tunnel started in October 2015 and preparation work for continuing tunnel excavation started in January 2016. After successful grouting and consolidation grouting work, as well as very heavy reinforcement of the roof part, using a pipe umbrella, to excavate through the fault zone, tunnel excavation commenced on the East side on October 19th, 2016 and break-through was obtained on April 28th, 2017.