

# OMNIA

## Cascade Tunnel

Design, install and commission of a communications system throughout the 10.42 mile-long Cascade Tunnel.

 Cascade Mountain Range, Washington, USA.



## OVERVIEW

PBE Axell were initially contracted in April 2020 to design, install and commission a communications system throughout the Cascade Tunnel in the Cascade Mountain Range located in Washington, USA.

## THE CHALLENGE

The Cascade Tunnel boasts an impressive combined length of 10.42 miles, solidifying its position as one of the most expansive freight rail tunnels in the United States. Located within the Cascade mountain range, spanning several US states, including Washington, Oregon, and parts of California and British Columbia, Canada. The tunnel serves as a crucial transportation link connecting the eastern and western regions, which are geographically separated by the Cascade Mountain Range. The tunnel facilitates the flow of traffic and transportation between these regions, allowing for efficient rail freight operations and reducing the need for longer surface routes over the mountains. Its strategic location within the mountain range adds to its significance as an essential route of the transportation infrastructure in the region.

The task entrusted to PBE Axell involved the replacement of the previous communications system with a refined and enhanced solution that was easier to maintain and more resilient, eradicating the prolonged downtime that had plagued the entire tunnel for years resulting in high costs due to down-time. By prioritising improved reliability, the aim was to mitigate the disruptions and inefficiencies previously encountered. Improved system resilience was required with current solutions architecture such that a loss in one dDA caused the entire system to go fail. Improved voice communication quality with current solution using VHF simplex and half duplex low power.

## THE SOLUTION

PBE Axell initiated an extensive design process incorporating three meticulous design phases to develop a state-of-the-art, fiber-fed, multi-plexed mini DAS system known as OMNIA.

OMNIA represents PBE Axell's cutting-edge solution for railroad tunnel communication and data, seamlessly integrating three systems into one comprehensive platform: positive train control, tunnel and service VHF simplex and duplex voice communications, and distributed power. This advanced system is fully monitored through Vantage.

## THE BENEFIT

The improved OMNIA system proved to be more suitable for purpose and less costly than the original solution with reduced install costs and vastly less required cable. Simplification - Current solution is three separate systems that each require maintenance. Maintainability - Current solution does not monitor or report system health. Serviceability - Current solution requires multiple components to be kept on site and is difficult to troubleshoot. Expandability - Current solution does not use up-to-date technology allowing the system to be expanded or new functionality to be added.

OMNIA can be fully monitored through our system: VANTAGE. Vantage provides a full picture of system health in real-time down to component level, providing preventative maintenance opportunity through early identification of potential issues. Alert notifications and accurate location diagnosis result, the implementation of OMNIA brings about a notable reduction in tunnel operation downtime, ensuring enhanced operational efficiency and reliability.

## The Cascade Tunnel

The Cascade Tunnel Project was a significant engineering achievement, constructing a railroad tunnel through Washington State's Cascade Mountains. This project aimed to create a direct and efficient route for the Great Northern Railway, overcoming the steep grades and heavy snowfall of Stevens Pass, which caused frequent delays and dangers.

Construction began in 1925 and was completed in 1929, utilising advanced techniques like explosives and steam-powered drills. The primary tunnel is 7.79 miles (12.53 kilometers) long, significantly reducing travel time and improving safety. Additionally, the "Big Hole" tunnel, 2.63 miles (4.23 kilometers) long, provided an alternative route.

Today, the Cascade Tunnel is operated by the Burlington Northern Santa Fe (BNSF) Railway, playing a crucial role in modern rail transportation by mitigating the challenges of mountainous terrain and harsh weather. It features sophisticated ventilation systems and regular maintenance to ensure smooth and reliable service.

Overall, the Cascade Tunnel remains a vital component of the Pacific Northwest's railway infrastructure, demonstrating early 20th-century engineering prowess.

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