Engineered Monitoring Solutions

PROJECT PROFILE

Beacon Hill Tunnel Structural Settlement Monitoring System Seattle, Washington

Owner:

Central Puget Sound Regional Transit Authority

The light rail rapid transit system in Seattle, Washington is undergoing expansion and includes a section that will pass under an elevated portion of Interstate 5 (I-5) and into a tunnel being constructed through an area known as Beacon Hill. To accomplish the construction of the tunnel, the foundations for the elevated portion of I-5 had to be undermined while traffic continued under normal operations on the deck above. As part of the permit requirements for construction, the Washington Department of Transportation required that a real time monitoring system be designed and installed on the bridge structure to provide for early warning of any settlement of the foundations. An instrumentation system was installed that included tiltmeters and a liquid level settlement system, which were continually monitored by an automated data acquisition system (ADAS).

The tiltmeters and settlement sensors were attached to the concrete support columns under I-5. The ADAS consisted of a measurement and control unit (MCU) that collects data from the sensors, converts the raw data into the required engineering units, compares the data to alarm threshold values and stores the data. In the event that an alarm threshold is exceeded, the MCU uses wireless radio

communications to notify two additional MCUs in nearby construction trailers to activate a visual and audible alarm. One of the MCUs in the construction trailers also initiates a sequence of telephone calls to notify personnel of the alarm condition. In addition, instrument data collected by the MCU under the bridge is displayed in real time on a PC monitor in each construction trailer. Historical data is also logged for analysis and archiving.

By collecting and monitoring critical data related to movement of the bridge structure, traffic was allowed to flow normally during construction of the Beacon Hill tunnel.