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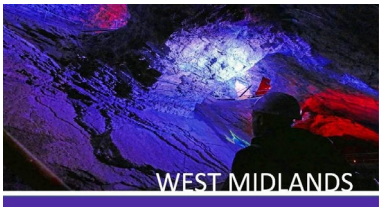

Geotechnical Instrumentation & Monitoring in Tunnel Construction: Special Insights from HS2 Bromford Tunnel

Jitendra Kumar

(Instrumentation & Monitoring Manager - Geotechnical, Balfour Beatty VINCI Joint Venture)
Email: jitendra.kumar@balfourbeattyvinci.com

14th April 2026 | Cundall, Floor 4, 15 Colmore Row, Birmingham, B3 2BH | 6:30pm start

Abstract:

Instrumentation and Monitoring (I&M) are fundamental to the safe and effective delivery of tunnelling and underground construction projects. Monitoring systems provide early identification of potential hazards, enable construction control, verify design assumptions, and help protect surrounding infrastructure and the environment.

Geotechnical and structural monitoring in tunnel construction involves the design and implementation of integrated monitoring systems across all construction stages, including TBM launch and verification zones, main tunnel drives, cross passages, shafts, and sprayed concrete lining (SCL) works. Monitoring frameworks typically combine designer and contractor monitoring plans, incorporating monitoring layouts, trigger levels, data management procedures, and response action plans.

A wide range of monitoring techniques is employed, including borehole instrumentation such as piezometers, extensometers, inclinometers, and shape accelerometer arrays, together with surface levelling, building and structural monitoring, automated total station networks, and tunnel lining instrumentation. Continuous and near real-time data acquisition allows ground and structural behaviour to be assessed and compared with predicted performance during construction.

Historic case studies, including the Nicoll Highway collapse in Singapore, demonstrate the consequences of inadequate interpretation and response to monitoring data, reinforcing the importance of robust monitoring strategies. Experience from large-scale infrastructure projects, including the HS2 Bromford Tunnel, highlights how comprehensive instrumentation and monitoring systems support risk mitigation, asset protection, and the safe construction of complex tunnels in sensitive environments.

The photograph shows an Automatic Total Station (ATS) installed beside the Network Rail tracks

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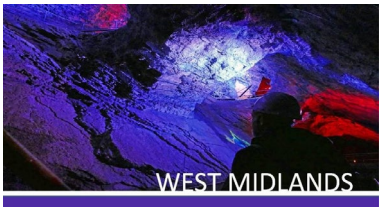

About the Speaker:

Jitendra Kumar is an Engineering Geologist with over 20 years of experience working on major infrastructure and tunnelling projects across the UK, Qatar, and India. He specialises in tunnelling, underground excavations, and geotechnical instrumentation and monitoring in complex urban environments.

He is currently the Instrumentation & Monitoring Manager (Geotechnical) at Balfour Beatty VINCI (BBV), where he leads the delivery of geotechnical and structural monitoring systems for the HS2 high-speed rail project, including the Bromford Tunnel. His role involves overseeing monitoring for TBM-driven and sprayed concrete lining (SCL) tunnelling works, shafts, cross passages, and critical third-party interfaces.

Jitendra has extensive experience in geotechnical instrumentation and monitoring for underground and surface works. He has contributed to major international projects including the Doha Metro Gold Line, the Wakrah and Wukair Drainage Networks in Qatar, and the Chennai Metro in India. His professional expertise spans geotechnical investigations, geological mapping, ground improvement, dewatering, environmental management, and the delivery of large-scale monitoring programmes for risk mitigation and asset protection.

Forthcoming Talks:

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