

RAIL SAFETY



VITAL CONTROL SYSTEMS DESIGN AND ANALYSIS

With over forty years in the rail safety industry, international certification, and an unblemished safety record, Battelle is consistently the first choice for safety assessments, analysis, and complex analytics.

Battelle applies an independent consultancy leveraging its depth of rail industry knowledge and its proven track record in safety-critical product/system design and analysis activities for all stakeholders, providing proven solutions that meet the demands for increased scrutiny on safety due to rail accidents, the evolving technology of advanced train control systems, and new performance-based safety rules issued by the FRA and FTA.

An industry leader in the analysis of safety-critical products and systems for the rail industry, Battelle engineering experts are known for:

- Developing the use of processor-based vital products in the rail and transit industry
- 40 consecutive years of experience performing independent detailed safety analyses for processor-based products/systems
- Industry leadership in the development of fail-safe design and implementation concepts, methods, and standards for fail-safe processor-based equipment verification and validation
- Bringing a detailed knowledge of train control and associated safety requirements and implications to the analysis and evaluation of the levels of safety in rail control systems
- Performing numerous system safety/hazard analyses and system safety program development efforts in accordance with MIL-STD-882C, CENELEC, IEEE 1483-2000, AREMA, and FRA Rule Parts 236H and 236I
- Serving as Independent Safety Assessor (ISA) for several advanced train control projects, including the current New York City Transit Canarsie/Flushing CBTC modernizations; Culver Test Track CBTC Interoperability supplier certification; and the 1st Interoperable revenue service on Queens Boulevard
- Conducting numerous safety analyses of automatic train control equipment for railroads and transit authorities including CP, Alaska RR, CSXT, NYCT, BART, WMATA, MBTA, SEPTA, Hong Kong, St. Louis Metro, Sao Paulo and Rio de Janeiro (Brazil) Metros, Munich, Malaysia KVMRT, MARTA, and many others.

Markets Served

- Rail Equipment Suppliers
- Freight and Passenger Railroads
- Transit Agencies / Authorities
- Federal and State DOTs
- A&E Firms



SERVICES

Signaling and Train Control Product Design and Development

- Supporting U.S. and European suppliers in design and development of safety-critical signaling and control products
- Systems integration and engineering
- Expertise in design and V&V using accepted safety assurance concepts

Reliability, Availability, Maintainability, and Safety

- RAMS program planning, execution, and assessment
- Hazard analyses – FMEA, FMECA, FTA, SHA, SSHA, O&SHA, etc.
- Detailed, client-focused qualitative and quantitative analyses

Independent Safety Assessment

- Independent safety assessor (ISA) for major U.S. transit agencies and railroads
- Assessment of safety case to U.S or European standards (FRA, CENELEC, AREMA, IEEE)
- Accredited as ISA by Network Rail (United Kingdom)
- Developed I2S CBTC specifications and formal methods analysis utilizing the B Method

System Safety Programs and Certification

- Program planning, execution, and assessment
- Safety-critical systems and products
- Cross-Acceptance (FRA-CENELEC)

Laboratory Testing & Analysis

- Detailed analysis of relays, signals, and other safety-critical equipment
- Metallurgical, electrical, mechanical
- Crashworthiness analysis
- Vibration and shock testing

Positive Train Control (PTC) Safety Support

- Regulatory compliance
- PTCIP, PTCDP, PTCSP development
- Part 236 Subpart H and Subpart I risk assessment using Battelle's proprietary BRACE tool
- Independent safety assessment

Training

- Personnel training programs
- Development of product and system training materials

Human Factors Engineering and Analysis

- Battelle Center for Human Performance and Safety (Seattle, WA)
- Human performance research
- System design and evaluation support
- Organizational safety

System Integration Verification and Validation

- Project management oversight

For your most pressing rail and transit safety challenges, **Think Battelle first.**

Contact us today at solutions@battelle.org.

Every day, the people of Battelle apply science and technology to solving what matters most. At major technology centers and national laboratories around the world, Battelle conducts research and development, designs and manufactures products, and delivers critical services for government and commercial customers. Headquartered in Columbus, Ohio since its founding in 1929, Battelle serves the national security, health and life sciences, and energy and environmental industries. For more information, visit www.battelle.org.

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ID 388 01/17

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It can be done