



RAIL AND MASS TRANSIT

Independent assurance
Operations and maintenance
Systems engineering
Clean energy solutions

RAIL EXPERTISE YOU CAN TRUST

WE WORK WITH GOVERNMENTS, OPERATORS, INFRASTRUCTURE MANAGERS AND MANUFACTURERS TO ENSURE RAILWAYS DELIVER THE HIGHEST POSSIBLE VALUE TO THEIR CUSTOMERS AND WIDER COMMUNITIES.

Whether you are looking to develop new regional transport plans, introduce low-emission technologies, or improve the journey experience for your customers, we bridge the divide between core engineering disciplines and the economic and environmental challenges of rail transport.

Find out how we can help you:

Web: rail.ricardo.com

Email: rail@ricardo.com



INDEPENDENT ASSURANCE

A comprehensive portfolio of safety and quality assurance services.



SYSTEMS ENGINEERING

Specialist activities that can realise the intended performance of a complete and integrated system.



OPERATIONS AND MAINTENANCE

Services and products that deliver long-term efficiencies.



CLEAN ENERGY SOLUTIONS

Integrated solutions to help the rail sector adopt sustainable technologies and practices.

HOW WE HELP

Our mix of strategic consultancy, in-house engineering, independent assurance and testing means we can approach your project from a unique vantage point.

Within our teams are experts who know your expectations, but also understand the rail industry's structures and idiosyncrasies, its complex interfaces, and the global standards and local practices that underpin day-to-day operations.

Our role is to bring the expertise you need to navigate the industry's operational, commercial and regulatory challenges, and ensure you have all the resources required to deliver a safe, reliable and sustainable railway in any part of the world.

**94% OF OUR CLIENTS
CHOOSE TO WORK
WITH US AGAIN WITHIN
TWO YEARS***

*Measured by value in August 2018



“ Commitment and hard work are the strengths of Ricardo.

BANGKOK EXPRESSWAY AND METRO PUBLIC COMPANY LIMITED

A TRUSTED PARTNER WHO UNDERSTANDS YOUR PRIORITIES

GLOBAL PERSPECTIVES

Our international network of offices and technical centres supports the transfer of skills and experience from one region of the world to the next.



WHOLE-SYSTEM MINDSET

We will help your teams apply systematic processes so that your engineering projects deliver a positive contribution to the wider rail system.



COLLABORATIVE APPROACH

We add value by working alongside your teams in an open and constructive partnership, offering balanced and insightful perspectives on the bigger picture.

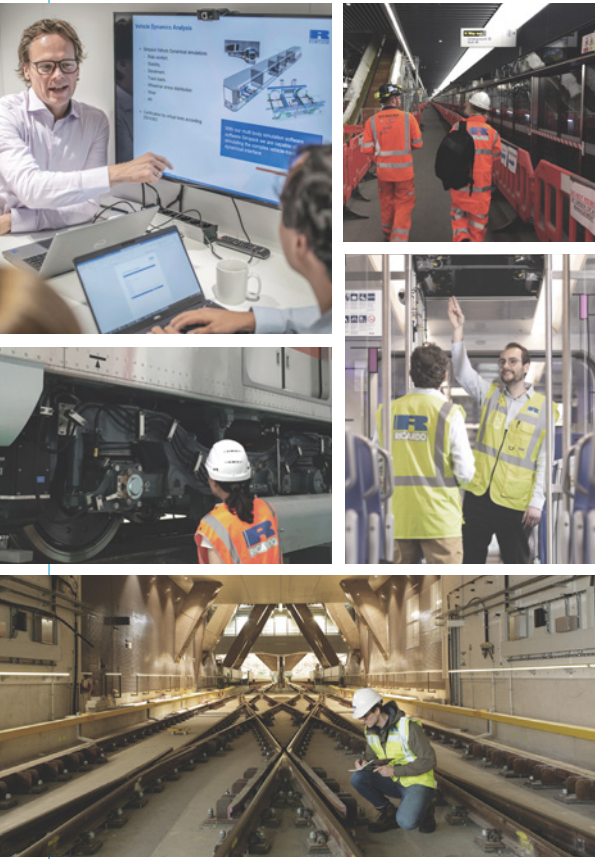


AN INDUSTRY VOICE

Our experts are leading contributors to the international committees, working groups and professional forums that define the rail industry's technical standards.



GLOBAL RAIL AND TRANSIT EXPERTISE



We are performing safety assessments for the design stages of Toronto's network upgrade.

Produced a study for the Federal Railroad Administration to help cross-compare international high-speed rail noise reduction measures and regulations.

RAMS support for new elevated monorail route in Panama City

Our technology is providing real-time monitoring of pantographs on Scotland's network, helping protect overhead wires from damage.

Helping prepare the Dutch ERTMS programme for national rollout.

Supporting Latvia's rail operator in procuring a new electric-powered fleet.

Independent Safety Assessor for the construction of Riyadh's metro system.

Technical Advisor for the procurement of vehicles for the Mumbai Monorail.

Independent Safety Assessor of choice for the expanding Beijing Metro network.

Technical support for the design and build of GTX-A, the first line of South Korea's new higher-speed commuter network.

Verification and validation services for the construction of the Green Line in Taoyuan.

Shadow Operator for construction of Manila's MRT-4

Shadow Operator of Sydney Metro's 'West' and 'Western Sydney Airport' projects.



CASE STUDY:

METROLINX



“ This is a complex and multi-faceted programme of works. We will bring our experience of similar major projects around the world to ensure safety remains at the forefront throughout the design stages. **RICARDO CERTIFICATION** ”

We are the Independent Safety Assessor (ISA) for the transformation of rail transport across the Greater Toronto and Hamilton Area.

The 'GO Expansion' programme will deliver faster and more frequent services throughout the network, and includes new track, signalling and the introduction of electric-powered rolling stock.

As the ISA, our expert teams will support the programme throughout the design phase to assess whether Metrolinx and ONxpress transportation partners have developed relevant safety documentation – including the System Definition, System Safety Plan and Safety Case – in full compliance with standards such as the Canadian Method for Risk Evaluation and Assessment and EN50126.





INDEPENDENT ASSURANCE

Like many safety-critical sectors, railways have influential stakeholders – governments, regulators, financial institutions and passengers – who expect a degree of third-party oversight on issues related to safety and quality.

We also support clients with test and measurements services, including type testing for the authorisation of new or refurbished fleet and infrastructure.

Whether we are assessing new signalling products against international standards such as EN 50126, or the construction of entire rail systems, we offer an extensive portfolio of assurance services. These include accredited Notified Body, Designated Body and Assessment Body services, as well as Independent Safety Assessment, Independent Verification and Validation, and Product Certification.

CLIENTS INCLUDE:

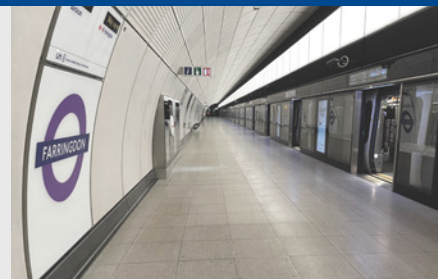
- Hyundai Rotem
- Banedanmark
- Metro de Madrid
- Stadler
- Thales Group
- Etihad Rail
- Bangkok Metro
- DB Netz AG

IN ACTION

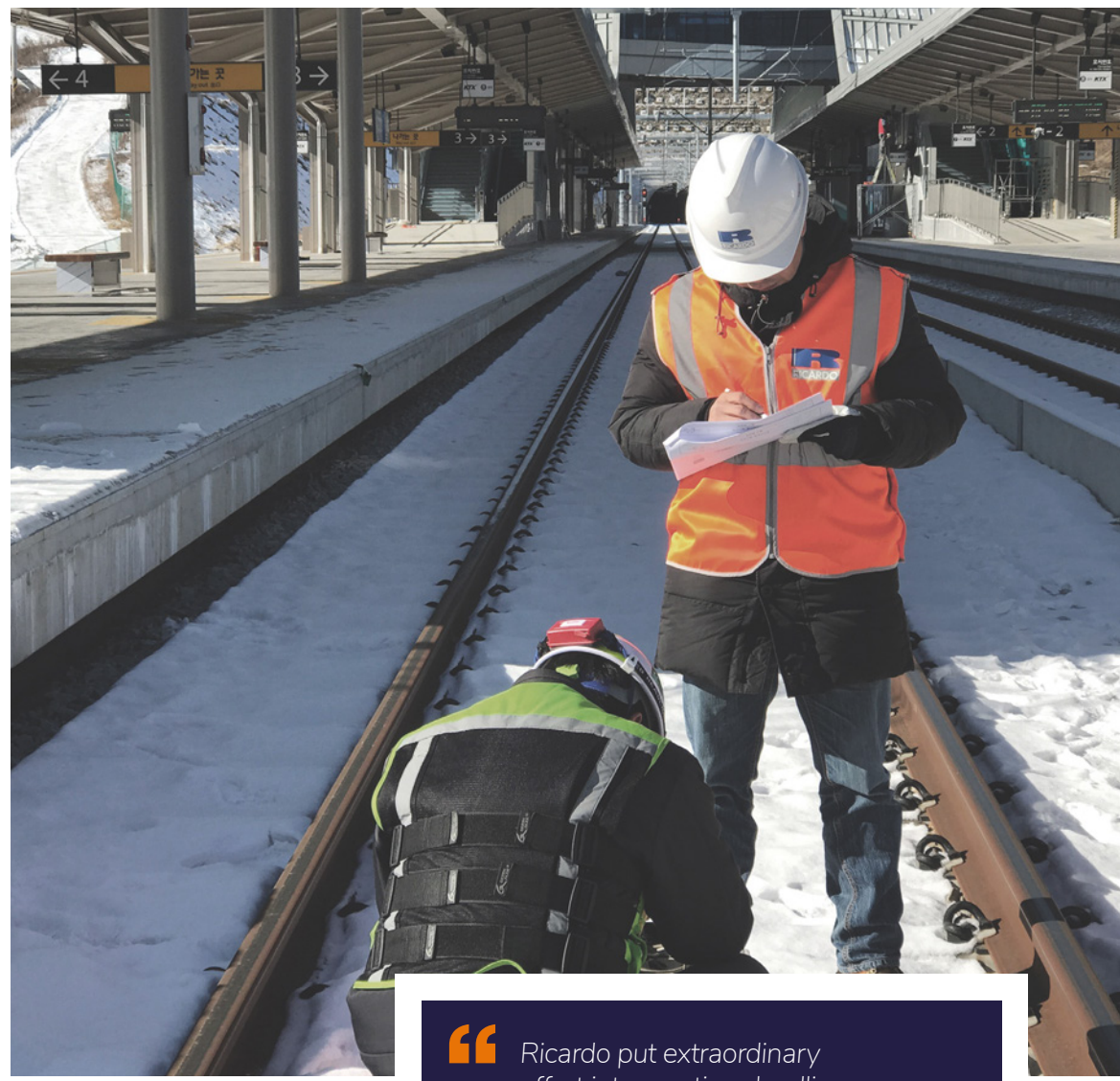
ELIZABETH LINE

Accredited Assurance Services

Ricardo joined the construction of London's Elizabeth Line in 2012 - when it was known as Crossrail - to perform assessment services on the central tunnelled section through to its opening in 2022. Our experts assessed more than 6,000 evidence submissions – including design drawings, safety cases and hazard records – against national and international specifications.



Our final outputs were required by the National Safety Authority in order to issue authorisation to commence passenger service.



“ Ricardo put extraordinary effort into meeting deadlines and deliverables. ”

AARHUS LETBANE



SYSTEMS ENGINEERING

Bringing extensive experience of systems engineering on major rail projects around the world - and techniques such as those set out in ISO 26702 - we can help your teams apply the systematic processes to ensure engineering projects deliver a positive contribution to the wider rail system.

We offer a range of services, from the integration of components through to the development of entire railways, including:

- Requirements management
- Configuration management
- Digital resilience
- Design management
- Installation management
- Verification and validation
- Functional safety
- Reliability, Availability and Maintainability (RAM)
- Human factors
- System commissioning

Each specialist area can be provided individually or as part of a multi-discipline 'package' of systems engineering support throughout the whole project life-cycle.

CLIENTS INCLUDE:

- Alstom
- CRRC
- Siemens
- MTR Corporation Limited
- Korea Railroad Research Institute

“ Working with Ricardo has been very enjoyable. We were kept regularly informed throughout and the document was comprehensive and well-produced.

LONDON & SOUTH EASTERN RAILWAY LIMITED



IN ACTION

BANGKOK METRO BLUE LINE Verification and Validation

In 2017, Bangkok Expressway and Metro Public Company Limited appointed Ricardo to provide verification and validation support for the extension of the Blue Line. Our responsibility was to assess whether the extended route was ready for passenger service by undertaking expert reviews of aspects such as the project's safety and risk assessment processes, RAM management, system integration



and overall operational readiness. The priority was to ensure a seamless integration of the new section without impacting on the safety and performance of the entire route.



OPERATIONS AND MAINTENANCE

Our experience in railway maintenance and operations comes from our work on critical and complex projects for clients around the world.

Using bespoke measurement and analysis techniques, our experts will help you gain new insights into your asset base so that you can make better, evidence-backed decisions.

We can support your teams across a wide range of assignments, from asset condition monitoring to implementing information security measures.

SERVICES INCLUDE:

- Rolling stock asset management
- Reliability and maintenance engineering
- Condition monitoring
- Procurement support
- Vehicle-track interface
- Noise, vibration and harshness
- Signalling and train control

CLIENTS INCLUDE:

- NS Group
- Network Rail
- Government of South Australia
- HTM (The Hague)
- Iarnród Éireann
- ProRail

IN ACTION

INFRABEL Pantograph monitoring

Ricardo's pantograph monitoring units have been installed in the Brussels area to prevent faulty units causing costly damage to the overhead catenary. According to Belgian infrastructure manager, Infrabel, "The systems have identified damaged pantographs that needed immediate actions to avoid possible overhead wire breaks."



“Great response every time. All analysis is completed quickly no matter the time of day.”
HITACHI RAIL



CLEAN ENERGY SOLUTIONS

Sustainable solutions require an appreciation of the complex interrelationships between economic, social and environmental drivers. Drawing on our deep, cross-sector expertise, we help clients develop integrated solutions to complex environmental and sustainability issues.

We support a range of initiatives, from feasibility through to delivery and commissioning. Recent projects include a partnership role in the world's first solar-powered railway and providing technical support converting diesel rolling stock to hybrid-battery or hydrogen power.

SERVICES INCLUDE:

- Environmental measurement and modelling
- Organisational policy and strategy
- Emissions inventories
- Clean transport technologies and fuels
- Regulatory advice
- Air quality measurements
- Energy efficiency

CLIENTS INCLUDE:

- Hitachi Rail
- Porterbrook
- Edinburgh Trams
- European Investment Bank
- Province of Friesland



IN ACTION

HYDROFLEX

Safety and certification expertise

We provided safety and certification expertise for the first hydrogen-powered train to operate on the UK's network. The vehicle was fitted with hydrogen fuel tanks, a fuel cell and a battery pack and can operate with zero carbon emissions. The aim was to demonstrate a safe transition to hydrogen power on track sections where electric power is not provided.



Professional yet adaptable in the ever-changing production environment.

EUROSTAR INTERNATIONAL LIMITED

THE RICARDO GROUP

CREATING A SAFE AND SUSTAINABLE WORLD

Our global teams of consultants, environmental specialists, engineers and scientists are helping clients around the world respond to their most complex strategic and operational challenges.

Previous assignments have included developing technologically advanced solutions to ensure access to clean air and water; implementing enterprise-wide safety management and regulatory compliance systems; and supporting entire industry sectors in defining pathways from fossil-based energy generation to low-carbon alternatives.

And in everything we do, in every assignment we undertake, we remain committed to the ethos of our founder, Sir Harry Ricardo, one of the most innovative mechanical engineers of his time, who in 1915 set out on a mission to 'maximise efficiency and eliminate waste'.

OVER 3,000 ENGINEERS,
CONSULTANTS AND
SCIENTISTS ACROSS
20 COUNTRIES



RAIL EXPERTISE YOU CAN TRUST

We offer access to a truly international network of rail expertise, with teams based in cities such as:

Beijing	London	Sydney
Copenhagen	Madrid	Taipei
Dubai	Ontario	Toronto
Folsom	Seoul	Utrecht
Hong Kong	Shanghai	Yokohama

FIND OUT HOW WE CAN HELP YOU:

Web: rail.ricardo.com

Email: rail@ricardo.com

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