



Railways

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Skills and services

Key services

Planning

Demand forecasting
Feasibility studies
Integration and interchange
Project procurement method
Regulatory advice
TWA and planning applications

Economics and finance

Business case development
Cost-benefit studies
Lifetime cost management
Revenue protection
Transport modelling

Systems assurance

ALARP and CBA assessment
RAM assessment
Regulatory safety cases
Risk and accident models
Safety assessment and plans
System failure analysis

Design

Concept and detail design
Construction methodology
Environment and sustainability
Notified body for all disciplines

Management and maintenance

Construction supervision
Procurement
Programming and control
Project and programme management
Specification and control

Railway operations and franchising

Depot and station design
Ergonomics
Freight logistics
Network Rail VAB
Operational studies
Timetabling and diagramming

Infrastructure management

Asset audit and GIS
Asset management
Condition valuation
Earthworks stabilisation
Strategic and structure assessment
Usage maximisation

Special skills

Train control and communications

CCTV networks and security
Customer information and signage
ETCS/ERTAS cab and fixed
Lineside and GSMR telephony
SCADA and operations centres

Signalling

Asset condition assessment
Detailed design
Enforcement (AWS, ATP, ATO, ATS)
IRSE licensing body
Scheme planning

AC and DC electrification

Corrosion protection
Earthing and bonding
EMC safeguarding
Overhead line and third rail
Power supply
Stray current control

Permanent way

Alignment optimisation
Line speed improvements
Reconditioning and renewal
Survey and gauging
Switches and crossings
Trackform

Rolling stock

Certification
Design scrutiny (VAB)
Maintenance and modification
Procurement management
Safety cases

Advanced simulations

3D CFD analysis
Emergency response
Evacuation modelling
Fire and smoke safety
Railway aerodynamics
Ventilation modelling

Associated services

Railways Little Black Book
Spon's Railway Construction Book
STEPS 3D simulation
TARQUIN track assessment
TRAIN operational studies

For details see www.railways.mottmac.com

Our clients are the focus of our attention in the planning and delivery of projects

We are providing management, design and environmental services for 260 miles of the California High Speed Rail system, which crosses seismic fault zones and environmentally sensitive areas.



Mott MacDonald led the joint venture appointed as the Secretary of State for Transport's Project Representative on the £6 billion, 108km Channel Tunnel Rail Link project to ensure the private sector developer complied with project agreements.

Reputation in railways

Mott MacDonald is an independent consultancy with a globally respected reputation. We have over 100 years' experience in the development of railway systems and are working in more than 140 countries around the world. At any given moment, more than 2500 of our staff – 1500 of them railway specialists – are at work on railway projects.

From engineering to project management, from individual consultancy commissions to a complete project, from a single inspection report to a major high speed line, from concept to commissioning – Mott MacDonald undertakes all aspects of the engineering and programme management of a railway's life cycle, with particular attention to the environment and sustainability.

The requirements of our clients are the focus of our attention at all times in the planning and delivery of projects. By maintaining this approach, in which no detail is too small, we have many successful and long-term client relationships.

For all our clients, Mott MacDonald seeks to be the consultant of choice.

The £220 million, 5.5km Palm Jumeirah monorail in Dubai is designed to carry 6000 passengers per hour. Mott MacDonald was technical advisor on mechanical, electrical and process, civil and systems engineering and reviewed all design documentation to ensure it complied with client requirements. We also undertook a technical review of the operation and maintenance tenders and represented the client on site from construction and testing through to commissioning.



Mott MacDonald has acted as technical advisor to the Greater Manchester Passenger Transport Executive for the development of six new tram routes totalling over 70km. We provided planning, engineering, safeguarding and TWA expertise, as well as contract documentation and construction supervision services.

Planning and economics

Mott MacDonald looks at every facet of project feasibility. Money and people, project drivers and project impacts are all taken into account.

We offer authoritative advice on a project's financial viability through cash flow forecasting, conceptual cost estimates, price structuring, expenditure modelling and planning, whole life valuation and project funding. With specialist demand modelling and revenue forecasting models, we provide practical strategic advice from the outset.

Our integrated team of project engineers and transport economists can draw on in-house expertise in transport modelling and strategy, intermodal opportunities, train service development, reliability modelling, route optimisation, timetabling and operational capacity. Our highly respected construction economists in Franklin + Andrews, which is part of the Mott MacDonald Group, are on hand to support the team.

We have considerable experience of the planning consents process, working closely with clients' lawyers and their stakeholders to reach a successful conclusion.

The Lantau Link provides a vital transport connection between Hong Kong's commercial heart and the city's international airport at Chek Lap Kok. It carries a six-lane highway and twin rail tracks. Mott MacDonald conceived, planned, designed and managed the Lantau Link through all stages of the project, including a planning study to identify hazards to the safe and reliable operation of the railway.



We were lead consultant in a joint venture and served as independent checking engineer and site engineer for the entire US\$25 billion, 345km Taiwan High Speed Rail project. This included over 250km of major bridges and viaducts.



Mott MacDonald provided pre-contract technical services, project design and quality and safety management for the US\$6 billion Kaohsiung Metro. The two metro lines serve the 3 million inhabitants of Kaohsiung, Taiwan's second largest city. The 14.4km Orange Line comprises 14 stations, a main depot and an operational control centre. The 28.3km Red Line has 23 stations and two line depots.

Infrastructure

Well engineered infrastructure is essential for a trouble free railway service. Mott MacDonald provides a total engineering service from inception to completion for every component of the infrastructure.

As part of our expertise in civil engineering we provide specialist, innovative, cost-effective solutions for the stabilisation and strengthening of earthworks, minimising costly maintenance and train service disruption. Using the latest computer modelling techniques we predict tunnel movement in urban areas. We have engineered numerous major bridges on high speed lines, heavy rail and metros, on complex projects and in difficult ground conditions. The design of bridges for existing railways benefits from our specialist experience of box jacking, sliding and heavy-lift operations.

For new track layouts our survey, planning, investigation and engineering services yield fully optimised, cost-effective permanent way schemes with low cost maintenance. On existing routes we carry out full route assessment and structure gauging to optimise line capability using swept-path techniques, including kinematic envelope checks and the application of tilting-train technology. Line speed improvement assessment is always to the fore – together with journey time analysis it can limit the need for track realignment and expensive reconstruction.

When planning and designing major stations, terminals and depots, we can oversee a single discipline or provide full design and specification services for structural, building, mechanical and electrical design. Conceptual cost estimates, feasibility studies and cost modelling and planning are provided by our in-house construction economists Franklin + Andrews.

Our innovative solution on the most complex contract of the USA's \$15 billion Boston Central Artery project helped to reduce costs by several hundred million dollars. The project involved jacking three interstate highway tunnel structures beneath a live mainline railway without disrupting services. It was the biggest tunnel jacking project of its kind in the world and winner of 10 global industry awards.





Systems

If the key physical elements are well engineered and integrated, the railway service will run smoothly. Systems integration is central to our approach to project development, from requirements management to fully operating systems.

Mott MacDonald brings huge operations knowledge to signalling and train control. Our process-based approach to feasibility studies uses value engineering and whole life cost studies to produce the optimum solution – whether it is for a new scheme or undertaking audits and condition assessments of existing railway assets.

For mechanical and electrical systems our experience covers every applicable discipline in tunnels, stations, depots, electrical substations and plant rooms. These services are carried out both for new-build projects and for the upgrading and modernisation of existing schemes.

Our varied and extensive experience in telecommunications and control systems includes SCADA and telemetry, CCTV and security systems, customer information systems, trackside telephones, public address and ticketing and gating systems. Importantly, we also specialise in the ergonomic design of control centres.

We provide project services for every aspect of traction supply and distribution – AC/DC, high and low voltage, overhead line and conductor rail – providing advice on regenerative braking. Our in-house simulation programmes for the optimisation of traction system design can match supply to load and take many other factors into account. We manage all the potential impacts of electrical supply and distribution networks, including noise and contamination, protection systems, stray current control, electromagnetic compatibility and harmonic analysis.

Mott MacDonald is working on eight out of 24 design contracts on Europe's largest infrastructure project, Crossrail. We are bringing state-of-the-art skills to the design of tunnels, stations, signalling, traction power and rolling stock, delivering time and cost savings and improving safety.



Mott MacDonald was technical advisor for the 'transformational' first section of London Overground's £1 billion East London Line extension project and is providing technical services on the next phases of the extension – phase 1a and phase 2 – which will complete the London orbital rail network. Our construction economists also provided commercial advice including estimating and procurement support for the infrastructure and rolling stock, project control and post-contract commercial advice.



Rolling stock

Mott MacDonald has a dedicated team of rolling stock professionals and provides comprehensive technical and specialist engineering capability covering all stages of the procurement process from project identification and scoping, design and specification through to operation and maintenance. We fully understand the requirements for design and build projects.

Drawing upon many years of experience from manufacturing, maintenance and operational backgrounds, our team undertakes commissions for heavy rail, metro and light rail applications, and also monorail and people-mover projects. Strategic advice is provided to clients worldwide.

Mott MacDonald provided technical advice and project management to the Strategic Rail Authority and the Department for Transport in all aspects of the procurement process through the lifecycle of a seven year project to deliver a £250 million fleet of Class 395 'Javelin' high speed trains. The fleet successfully entered passenger service on time and to budget.

The development of the client's specification is undertaken to incorporate all performance and maintenance requirements, with particular attention to whole life costs and the preparation of the safety case. Mott MacDonald is accredited as a vehicle acceptance body by the Rail Safety and Standards Board and a notified body by the Department for Transport.

We provide independent advice for each client's unique set of requirements

Operation and maintenance

Mott MacDonald provides a stand-alone operational service or can form a key part of a major project team undertaking specialised tasks and service start-up alongside the client's operational staff.

Engineers with specialist operational experience work at the front end of a scheme, providing the most appropriate solution for the client in terms of running the service as efficiently and economically as possible. We provide independent advice for each client's unique set of requirements for cost-effective maintenance programmes, including Six Sigma and PAS 55 methods.

We always work closely with our clients in order to realise the full potential and maximise capacity of their station and depot assets. Freight terminal management – a particular area of expertise for Mott MacDonald – is increasingly in demand from industry, ports and local government in the drive to increase the proportion of freight carried by rail.



We are part of the joint venture for the review of operational and maintenance practices and rolling stock requirements on the 861km iron-ore rail line in South Africa.



A strong culture of safety underpins all of our project work from inception to operation

Mott MacDonald has been involved with the £1 billion East London Line project since 2005 developing the preliminary design, acting as technical advisor and providing independent certification of works for client London Overground.

The £700 million upgrade of Victoria Underground station involves the creation of a new ticket hall, escalators, lifts and walkways. Mott MacDonald has been appointed lead consultant for the detailed design.



Systems engineering and assurance



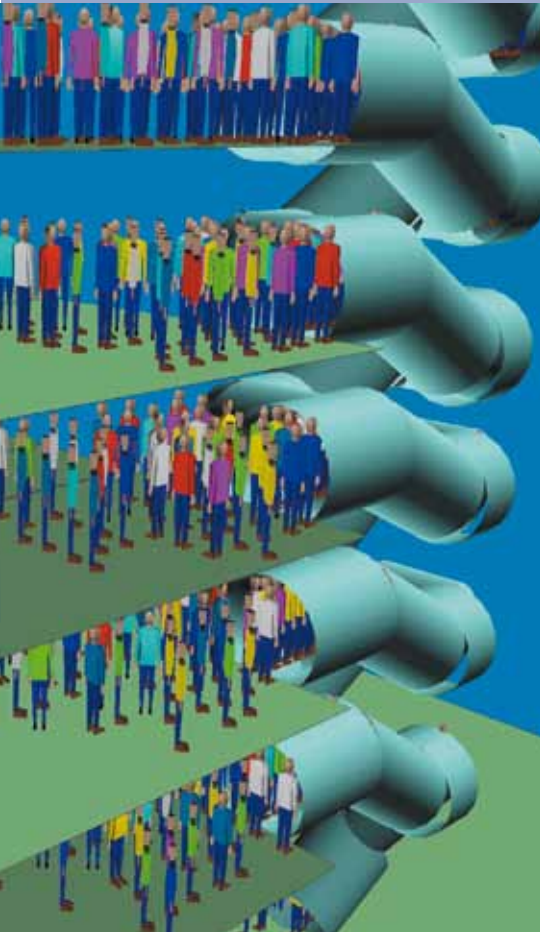
The £15.9 billion Crossrail project is a major new transport scheme for London and Mott MacDonald is involved in working on a full range of systems engineering and assurance services.

At Mott MacDonald a strong culture of safety underpins all of our project work from inception to operation. We help clients to fulfil their safety obligations, creating robust processes, reviews and audits during the life of the project. Our professional safety and systems engineers undertake requirements capture, configuration management, hazard identification and system integration using tested techniques.

Reliability, availability, maintainability and safety (RAMS) are fundamental to dependable operation, so we establish criteria with the operator at the start of each project and set agreed targets for all phases of the project life. The results of initial assessments are incorporated into the specifications for the supply of goods and systems. Targets are assigned to suppliers and subcontractors as appropriate so that the overall requirements of the client can be monitored and met. A strong methodology of checking and control facilitates certainty during testing and commissioning.

Mott MacDonald's human factors team are all qualified ergonomists and provide an essential service in the assessment of safety-critical systems to assess the impact of human errors and to provide safeguards.

CFD modelling was used to assess the build-up of heat around locomotives travelling through tunnels for the New York cross-harbour movement project.



Simulation and visualisation

Mott MacDonald uses specialist simulation and visualisation techniques to support the development of our engineering design solutions.

We apply sophisticated computational fluid dynamics (CFD) techniques to simulate the environment within tunnels, stations and buildings, predicting air velocities, pressures and temperatures under normal conditions and smoke spread during fire incidents. We also use CFD modelling to investigate the effect of wind on and around rolling stock, buildings and structures.

Our own advanced in-house tunnel simulation software is used to predict the aerodynamic and thermodynamic behaviour of rail tunnels and underground metro systems under different operational scenarios. This allows us to develop optimised design solutions for ventilation and cooling, and for mitigation of adverse transient pressures and velocities as trains travel through tunnel systems.

The STEPS (Simulation of Transient Evacuation and Pedestrian movementS) software, developed by Mott MacDonald, is used to simulate pedestrian movement under both normal and emergency conditions in transport facilities. This allows us to develop designs both for effective normal operation and safe egress in case of emergency.

Our visualisation specialists create photomontages, animations and virtual reality models which help project stakeholders gain a clear appreciation of visual impacts, construction processes and operational details at an early stage in the design.

Our in-house designed STEPS program enables us to model passenger flow in real time. These 3D simulations show the complex movements in intermodal terminals taking into consideration factors such as fire safety.

Mott MacDonald created visualisation images for safe rail tunnels for the EU trans-European conventional rail system.



Since 1999, Mott MacDonald has served as multifunctional consultant for all rail disciplines on the £8.6 billion West Coast Route Modernisation programme from London to Glasgow.



We can manage the full delivery process from inception through to commissioning and beyond

Management

As programme managers, we can manage the full delivery process from inception through to commissioning and beyond, entrusted with essential elements of the owner's rail services and working as an integral part of the client's organisation. Our scope of services covers all studies and engineering and construction packages depending on the overall needs of the client.

We carry out traditional project management and procurement management. This involves clear definition of the scope of the project, key programme dates, deliverables and cost budgets. We use computerised systems to track financial monitoring, engineering assurance status, programme and schedule management, safety, cost management and project performance appraisal. We advise on the most suitable methods of procurement.

For major projects, a dynamic risk management plan is developed from a practical risk register with specific plans for mitigation and allocation. This is done in conjunction with the client. Our managers report on the status and evolution of risks at programme, project and contract levels as well as for individual blockades, possessions or track operations such as heavy lifts.

We are part of the engineering, procurement, construction and management (EPCM) joint venture responsible for the major upgrading of the freight rail network in South Africa.



Mott MacDonald – multisector, multiskilled, multinational

Buildings

Communications

Construction economics

Education

Water

Environment

Health

Industry

Management consultancy

Planning

Project finance

Project management

Transport

Urban regeneration

Power

Oil and gas

For details see www.mottmac.com

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