

# LRT Rolling Stock Capability

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## 1. Introduction

Mott Macdonald has a proven track record in tram and light rail planning, design and procurement gained over many years involvement with the development of light rail systems. We are able to provide advice on all aspects of the development of schemes from conceptual planning and Application for Powers, through to contract preparation, design, construction and commissioning.

We are acting as technical advisor for the procurement of new vehicles and operations for a number of UK systems and promoters. In addition to this, Mott MacDonald can provide an unrivalled level of knowledge of the light rail vehicle market, testing and commissioning of light rail vehicles and a thorough understanding of the UK approvals process including interfacing with ORR, Network Rail and other third parties.

Mott MacDonald is accredited as a Vehicle Acceptance Body (VAB) by the Rail Safety and Standards Board and a Notified Body (NoBo) by the Department of Transport. We also have many engineers experienced in the ROTS and ROGS approvals processes applicable to rail vehicles and the application of any associated regulations and guidance, i.e. RVAR and RSP2

Mott MacDonald is closely involved in the work of the Light Rapid Transit Forum and UK Tram and in this role has been liaising with ORR regarding the introduction of ROGS to tramways and the establishment of a British Tramways Safety Board. We are also assisting clients to follow the recommendations of the NAO and House of Commons Select Committees and to achieve the benefits of standardisation of vehicle specifications in line with the advice coming from the EU Libertin project.



We have extensive experience in the production of vehicle specifications for light rail systems and in the subsequent procurement of rolling stock to satisfy Client aspirations, we similarly act as technical advisors to funding agencies.

### A Selection of our LRT Rolling Stock Projects:

Refer to section 4 of this document for more details

- Manchester Metrolink Ph 1 to 3 (GMPTE)
- Nottingham Express Transit (NET)
- Midland Metro (Centro)
- Blackpool Tramway (Blackpool Council)
- Skoda (TfL and BBC)
- Alstom Transportation UK
- London Tramlink (Croydon) Ops (TOL)
- London Tramlink (Croydon) (TfL)

We have also been involved in the design and procurement of a number of overseas light rail systems, including most recently the LUAS LRT system in Dublin, Skytrain LRT in Vancouver, Ottawa Light Rail and Estram Eskishehir in Turkey. Mott MacDonald is also involved in the Kuala Lumpur and Jakarta monorails. Current staff members were actively involved in the generation of the UITP 'Guidelines' for light rail systems, including rolling stock.

We are currently supporting clients in the procurement of light rail vehicles for various UK schemes, including Manchester Metrolink (GMPTE), Midland Metro (Centro), London Tramlink (TfL), Blackpool Tramway (BBC) and Sheffield (SYPTTE). We have a clear understanding and up

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to date appreciation of the rolling stock types that are currently available from the leading manufacturers and are able to use this experience and our contacts with the manufacturers' to identify suitable vehicle types for a particular system, their budget costs, and the manufacturers' build schedules. This knowledge enables us to reduce the risks involved in rolling stock procurement.

## 2. Rolling Stock Capability

### General

Mott MacDonald's rolling stock team brings together many years of light and heavy rail experience from across the UK, and the world, encompassing specification, procurement, manufacture, commissioning, maintenance and operation of rolling stock. The team undertakes commissions for light rail, metro and heavy rail applications in addition to monorail and people mover projects.

Core skills include system and sub-system specification, concept design, design review and formal scrutiny, supplier assessment and surveillance and vehicle system component technical expertise, (e.g. Bodysells, Bogies, Traction power supply etc.).

A whole system approach is encouraged to ensure that key rolling stock issues such as gauging, wheel/rail interface, and the platform to tram interface, as well as passenger perception and environmental issues including noise, vibration and ride comfort are considered as an integral part of the wider transport system.

### Interfaces and System Integration

It is important that the interfaces between the rolling stock and the other elements of any scheme are identified at an early stage and that all of these interfaces are satisfactorily managed during the specification, design and procurement phases of the scheme. Mott MacDonald's extensive experience has enabled us to identify interface risks and to manage them. The principal rolling stock interfaces include, but are not necessarily limited to, the following:

- the wheel/rail interface
- the tram/fixed infrastructure interface
- the pantograph/overhead line interface
- the signalling/control interface
- the tram/communications interface
- power consumption requirements
- depot facility & equipment requirements

### Maintenance

Mott MacDonald's rolling stock team have a wealth of experience in the practical, technical and operational aspects of both light and heavy rail maintenance. Key components of our services include:

- maintenance strategies and specifications
- maintenance methodology
- reliability centred maintenance (RCM)
- condition monitoring
- fault trend analysis (system and component failure)
- depot layout specification, design and asset evaluations
- asset condition assessments

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### 3. Signalling Capability

Mott MacDonald's breadth of experience includes full heavy rail systems, metro style signalling through to line of sight tram signalling including road traffic signals as appropriate. Mott MacDonald's signalling team has wide experience in the railway signalling discipline and has additionally undertaken work associated with light rail systems, including a recent review of the signalling infrastructure of the Manchester Metrolink system.

It is recognised that the eventual solution for any project requires the development of innovative solutions. Any proposals need to take into account existing rail and highway signalling systems and level crossings in the immediate area when producing a final solution. Utilising our experience our approach is to analyse any identified options and develop an appropriate signalling/control philosophy to suit the application, taking into account interfaces with other networks and any requirements for inter-operability of differing systems.

In addition to commissions for projects on heavy rail networks worldwide Mott MacDonald engineers have been involved in the highly successful Manchester Metrolink Light Rail system since its inception and have also worked on the light rail systems in Birmingham, Nottingham and Croydon with their varied solutions to the issues of signalling and control philosophies.

We are engaged as Design Consultant for the Nottingham Express Transit NET2 Extensions Project. In addition we have experience in the field of light rail signalling work on LUL, LUAS and Dublin Interconnector (DART).



*LRT Signalling Manchester*

We have teams of trained IRSE Licensed Signalling Engineers with design skills and Signal Sighting competencies. These teams are currently working on large scale projects including Cross Rail and for Network Rail on the West Coast Mainline and also on the Lea Valley Line. Working in combination with our light rail engineers these teams possess the necessary skills to assess any identified options and recommend an effective scheme.

Our overall philosophy is to provide advice on signalling systems which offers cost effective solutions that meet client requirements for whichever option is eventually assessed as providing the most effective solution to the transport needs of that project. We can ensure that the design conforms fully to contemporary RSPG/RSP2 Standards and where appropriate Railway Group Standards and appropriate European standards.

Mott MacDonald also has experience in the management of interface issues where light rail systems are proposed to be constructed in close proximity to existing heavy rail infrastructure. Issues surrounding matters such as compatibility between light rail vehicles and existing signalling equipment on heavy rail can become contentious if not managed correctly and identified at an early stage. We are currently involved in assisting GMPTE with such issues associated with the procurement of new LRVs for Manchester Metrolink. These LRVs are required to operate adjacent to Network Rail infrastructure and also over Network Rail controlled lines. In this context consideration of signalling equipment for both heavy and light rail is vital.

### 4. Previous Experience

Mott MacDonald has undertaken numerous projects which demonstrate our ability to deliver a high quality solution on time and within budget. We are able to provide a multi-disciplinary design and management service, including specialist skills, to meet and exceed the Client's expectations.

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As a large multi-disciplined engineering design consultancy we are able to draw on the expertise from throughout the Group and details of our specialists, their capabilities and previously completed projects can be supplied upon request.

A selection of Mott MacDonald's portfolio of Light Rail projects are summarised below:

### [Manchester Metrolink](#)

As part of its services to GMPTE Mott MacDonald has an ongoing role as technical advisor for the procurement of new trams to ensure compatibility with the existing fleet and fixed systems. Initially this involved providing technical input and also evaluating bid documents from vehicle suppliers. Deliverables to GMPTE included an Interface Specification and Briefing for Bidders documents, which the vehicle manufacturers were required to bid against.

As a result of the value added to the commission our role has recently been extended as GMPTE's advisor during the supply phase for the new Bombardier built M5000 trams.

In addition to our work on tram procurement we assisted GMPTE with the bid evaluations for the new Metrolink operator contract, dubbed "OPCO", this involved evaluation of incoming bids against a pre-determined scheme. Our work on the OPCO contract, to appoint a new operator for the system, included an LRV asset condition survey on the entire Metrolink fleet.



As part of the expansion of Metrolink we have provided a Depot Strategy Study to ensure a smooth transition between the existing system and the planned expansions of it.

### [Nottingham LRT, UK \(NET\)](#)

Mott MacDonald carried out a vehicle design risk study for Nottingham Express Transit (NET) to provide a preliminary assessment including a tram suitability comparison for Lines 2 & 3 and to provide an appraisal of the existing Line 1 Bombardier Flexity 'Outlook' (previously known as 'Incentro' Type AT6/5) Light Rail Vehicle (LRV). This comparison also summarised potential risks and opportunities of the current fleet and alternative vehicles.



Mott MacDonald is involved in the NET Phase Two requirements definition phase and Advance Design in relation to rolling stock, ride quality, wheel/rail, noise & vibration and depot as well as design/maintenance. We will also be writing the ITT documents and evaluating the tenders received.

### [Blackpool Transport](#)

Mott MacDonald is assisting the client with the procurement of modern low floor trams to run on the historic Blackpool system. We have recently provided the Tram Requirements Specification for the suppliers to bid against and are assisting the client with evaluation of the suppliers' proposals.



As part of the same commission Mott MacDonald are producing concept designs for the development of the depot so that modern trams can be accommodated and maintained alongside the heritage fleet. The ITT specification for the depot has recently been provided for the contractors to bid against and we are assisting the client with evaluation of contractors' proposals as well as giving the client support with planning applications.

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### [London Tramlink formerly Croydon Tramlink \(Transport for London\)](#)

Mott MacDonald is assisting Transport for London, the owners of London Tramlink, with the procurement of additional trams to supplement the existing fleet and provide increased passenger capacity. We are currently producing a Tram Functional Specification and an Interface Guidance document for the suppliers to bid against.



### [London Tramlink formerly Croydon Tramlink \(TOL\)](#)

We are currently acting as technical advisor to the Operator of the London Tramlink Light Rail system. The main part of this work is providing technical assistance with regard to the vehicle maintenance and modifications.

### [Midland Metro \(Centro\)](#)

We have provided the client with a study into alternative rolling stock that would be suitable for both the existing and proposed Midland Metro alignments. Mott MacDonald was previously involved in looking at alternative depot locations and production of depot layout designs.



The client is now moving forward with extensions to the system and procurement of new trams and Mott MacDonald are providing technical support to this process.

### [Docklands LRT](#)

We were responsible for carrying out a bench-marking study of the Docklands Light Railway rolling stock against appropriate industry benchmarks. This included reviews and recommendations of vehicle/sub-systems reliability and maintenance arrangements. As a result of this study we were also commissioned to advise and assist in developing a new maintenance regime to maximise vehicle availability.

### [Tyne & Wear Metro LRT \(Nexus\)](#)

Responsible for producing a benchmarking study for Nexus to support their proposals, under 'Project Orpheus' to look at incorporating street running Light Rail Vehicles into the existing Metro system. One of the many aspects of this study included looking at the current rolling stock market and contacting manufacturers for suitable vehicles that could carry out the combined role of 'Street, Metro and joint Heavy Rail Running.'

### [Design Scrutiny for Tyne & Wear extension to Sunderland:](#)

As part of the engineering acceptance process for the vehicles owned and operated by NEXUS for use on the Sunderland extension of the Tyne & Wear Metro system Mott MacDonald undertook the Vehicle design elements of this process. This extension had shared use with the Network Rail controlled infrastructure and the vehicles were therefore subject to mandatory requirements. The design scrutiny was carried out in accordance with relevant group standards and required a review of all Mandatory Requirements (new and emerging) to assess which were applicable to the Metro Cars.

### [Skoda \(TfL & BCC\)](#)

On behalf of UK promoters we conducted a study of the Skoda vehicle range. Within this study we also compared the Skoda vehicle to UK current legislation and the UK approvals process. This study looked at the entire Skoda vehicle range including part and full low floor vehicles. A wide range of vehicle configurations, lengths and widths were covered.

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### *Alstom (Alstom Transportation UK)*

We carried out a study for Alstom Transportation to determine the level of vehicle compliance with regard to RVAR and RSP2 to assist Alstom with UK acceptance of their Citadis tram design.

### *Merseytram*

We were the lead technical advisor, to the Promoter, on all aspects of rolling stock. This included reviewing the Light Rail Market on new technologies; current vehicle designs e.g. Ultra Low Floor, 100% low floor, 70% low floor and high floor vehicles, vehicle procurement, technical advice, maintenance and operational matters. This role also included being a key member of the review panel for the evaluation and selection of the preferred bidder for the procurement of rolling stock for the proposed Merseytram Network. In achieving this role we became actively involved in detailed discussion with a number of leading LRV manufacturers and as such have an excellent and fully up to date understanding of prices and rolling stock procurement issues.

In addition, we also supported the Client in the design, technical advice and procurement of the depot equipment and stabling facilities for the Merseytram Network.