MOBILISING PUBLIC TRANSPORT

RAIL ENGINEERING AND CONSULTANCY SERVICES

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Creating Sustainable Connections

Mobility and transport is essential for the development of any modern society. With people and goods crossing borders every day, globalisation has increased the importance of an efficient and sustainable transport system.

It is expected that in near future the number of people living in cities globally will exceed the number of people living in the countryside. This means that everywhere, more and more cities will be crammed with people. In order to avoid congestion and a complete standstill of traffic, a functional and attractive public transport system is needed. All over the world, the big cities will have to adapt to this new reality. Balanced solutions are needed to improve city infrastructure while not isolating the countryside.

Increased urbanisation and road congestion, and a focus on the environment and energy consumption make railways a strong alternative to road transport for people and freight. Because of this, construction and upgrading of railways is rapidly increasing all over the world.
Who we are
We provide professional consultancy services within railways and other public transport – including a complete range of rail-based systems, from high-speed railways to urban transport systems, such as metro and light rail. We combine our expertise within rail consultancy with all of Ramboll’s other service areas – allowing us to deliver fully integrated transport solutions.

What we do
Our technical expertise within rail consultancy comprises permanent way, traction power, and overhead catenary systems, interlocking systems, signalling, traffic management, telecoms and rolling stock. With extensive expertise within railway and urban transport services, we offer planning, design, approval, operational and commissioning services.

In this brochure we feature the following key services:
• Capacity analysis
• ERTMS
• High speed rail
• Light rail
• Upgrades and renewals
• Rail safety

A partner to the global community
We render services to both public and private sector companies, and our customers cover all major stakeholders in the railway market. By having such diverse customers, we have acquired a unique understanding of the different stakeholder needs. It also gives us a valuable background for finding solutions suitable for all parties involved.

Ramboll covers the whole project cycle from inception to ex-post evaluation. We also have experience with investor-grade assessment of markets and service propositions. We maintain a strong focus on the customer’s needs and expectations through all stages of our projects. Our approach is based on a close dialogue and cooperation with all customers and stakeholders.

Wide-ranging expertise
Our rail experts have diverse backgrounds, including infrastructure and business management, finance, traffic and project management, engineering, safety and risk management. Their expertise, combined with the experience we have gained over more than 30 years as consultants in the railway business, provides us with a deep technical knowledge, as well as strong networks in the market.

Our multidisciplinary approach
We differentiate ourselves by providing expertise at all project stages, a truly multidisciplinary approach, and global knowledge coupled with an understanding of the local context.

We adopt the latest technological innovations from around the world, integrate them into the local transport infrastructure and make sure they meet all local regulations and standards.

We have a consistent approach to quality and safety. This means that we are as keen on getting the small details right, as we are on developing the best overall concept.

At the forefront of industry innovation
Our assignments often require that we combine our railway know-how with our expertise in other fields, such as management, construction, and ground engineering.

We have experience working with international and national codes and standards (EN and UAC), and we actively participate in workshops and group forums to help set new standards and drive innovation in the rail industry.
CAPACITY ANALYSIS

In many countries, ageing rail systems accommodate increasing volumes of trains. The optimisation of network capacity is therefore a prerequisite for well functioning and punctual train services.

Holistic and expert services

Our competencies within capacity analysis include:

- Scheduling and comparison of different timetable structures
- Analysis of passenger service levels
- Optimisation of platform and station track usage
- Simulation of railway networks, marshaling yards and station areas
- Capacity consumption calculations using the UIC 406 method
- Capacity and bottleneck analysis
- Optimisation of traffic control operations
- Running time calculations
- Analysis of capacity consumption and evaluation of operator's annual capacity requests

Railway capacity analyses play an integral role in planning and optimising railway services as well as enabling significant bottlenecks to be identified and rail capacity to be allocated effectively.

Within this area, Ramboll assists rail operators and infrastructure managers with disturbance management and has helped create new operation models and premade plans for different disturbance scenarios.

Drawing on advanced tools and technical expertise

Ramboll also specialises in scheduling and railway simulation studies. We employ state-of-the-art tools for these studies and can provide detailed information and insights into the quality of current or planned timetables.

We approach every project with a view to delivering our customers with versatile, innovative and professional expertise that is tailored to individual project demands. In addition, we draw on a variety of advanced methods, from simulation to sophisticated analytical models, which we combine as appropriate to meet the specific challenges of each project and yield the most value for our customers.

Solutions built on quality, reliability and successful partnerships

Our solutions stand out not only for the range of analytical methods at our disposal but also for their quality and reliability. The outcome is results that are both detailed and relevant.

Ramboll works closely with other leading players in the rail industry and we have forged strong partnerships with other consultants, universities, research institutes and railway operators. We draw on this pool of talent to create maximum value for our customers.

Ramboll’s market-leading traffic simulation capabilities enabled a thorough understanding of customer’s needs and the delivery of results in a short timeframe.

Ramboll’s capacity evaluations combined detailed knowledge of the Finnish rail network and use of specialised analytical tools with wide-ranging capacity experience.

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Over the next 10-15 years, all European countries will need to install signalling systems based on the European standard, ERTMS, which will enable seamless rail travel across national borders.

Ramboll’s market leading expertise in this area includes the design of the world’s first and largest nationwide ERTMS system. Through many signalling and ERTMS projects, Ramboll has established extensive experience with ERTMS, ETCS and GSM-R radio.

Improving capacity, punctuality and safety
ERTMS will create significant benefits for passengers and freight companies. In many cases this includes improved capacity, better punctuality and improved safety. It will also help ensure that rail becomes more competitive and a sustainable alternative to road traffic.

Many countries have still to decide their strategy for incorporating ERTMS, and face significant challenges such as obsolete and unreliable signalling systems. Ramboll can assist infrastructure managers in defining strategies, investigating business cases, developing technical solutions and facilitating migration from old to new signalling systems. We are also able to simulate and analyse scenarios and provide models to improve the capacity of existing lines.

Adding value throughout the project life cycle
Ramboll can help customers manage projects and the associated risks throughout the project life cycle - to successfully meet agreed milestones, budgets and quality standards. This applies to both small ERTMS projects and large programmes comprising several schemes.

Our holistic approach encompasses financial considerations, technical strategies and solutions, procurement strategy, project planning, and safety and interoperability certification. The result is well founded business cases for making informed decisions and successful implementation.

Achieving the best results
We work closely with our customers to establish the most appropriate setup for ERTMS studies, ERTMS projects or conventional signalling projects. By drawing on specialist expertise from across our disciplines and international office network, we are able to effectively meet the individual requirements of each project.

Our methods are based on the recognised Prince2 project model and we combine this with advanced technical knowledge of different signalling and traffic management systems to achieve the best results.
There is no precedence for upgrading an entire country’s railway signalling infrastructure. This is the task facing a consortium led by Ramboll and comprising Atkins, Emch+Berger and Parsons that is designing and planning Denmark’s new signalling system.

Shorter travel times and less delays

With 60 percent of all Danish signalling sites reaching the end of their technical service lifespan within the next 15 years, the Danish Parliament decided to fund a EUR 3.2 billion programme to renew all railway signalling. The consultancy tender for this programme is the largest call for tender ever in Denmark.

The re-signalling scheme will ensure shorter travel times and less delays, and is the first step towards a total reorganisation of the trans-European train operation.

Replacing analogue with digital

The programme covers 2,100 km of lines and 3,200 km of tracks and encompasses all signalling equipment – from basic train detection and point machines to the overall traffic management system and on-board systems.

By implementing the common European ERTMS level 2 system on intercity and regional lines, all existing analogue radio systems will be replaced by digital GSM-R technology for data communication between the trains and the signal control systems. In addition, all signalling on the Copenhagen S-train network will be replaced by a CBTC metro/urban railway signalling system that is customised for driverless operation. To accomplish the task, the consortium has created a team of more than 100 experts from Denmark, Switzerland, UK and USA, to combine local knowledge of the existing system with international railway expertise.

Technology migration by 2021

The new signalling system is scheduled to be fully implemented by 2021, and Denmark will by then be the only country to have carried out a total migration to the new signalling technologies.

Throughout the roll-out of the re-signalling scheme, the entire train operation will be maintained.

Designing the tender

Ramboll drew up tender documents – within the scheduled time frame and to a standard that enabled an international competition between the world’s leading suppliers of signalling equipment – which led to contracts being awarded that comply with the requirements and budget specifications for the project in every aspect.

Reorganisation of trans-European train operation starts with Denmark.
HOLISTIC AND EXPERT SERVICES
Ramboll draws on the combined expertise of many different disciplines for HSR projects, and we cooperate with experienced companies within planning and construction of high speed rail lines. We provide holistic consultancy services from the very early phase studies to the detailed design projects and within all kinds of services related to HSR.

Our competences within HSR include:
- Market evaluations
- Corridor surveys
- Operational concepts
- Route design
- Earthworks, bridge and tunnel design
- Construction work
- Risk management
- Cost estimates
- Socio-economic studies
- Feasibility studies
- Cost-benefit analysis

For societies with continuously growing populations, especially in and around large cities, effective transport systems are absolutely essential. In the future, travel times with high speed rail must be competitive compared to air traffic. In addition, the demand for sustainable transport solutions is growing, which is driving the search for attractive alternatives that are less dependent on fossil fuels in the future.

An alternative to air traffic
High speed rail lines serve as a good alternative to air traffic, and successful operations in many countries such as China, Japan, Germany, Spain and France are proof of this. Several countries are now in the initial phase of planning high speed rail (HSR) projects. The early phase planning of HSR projects includes surveys and reports that can lead to more detailed plans as well as discussions regarding construction and different financing models. Ramboll can help decision makers and infrastructure administrators with the insights needed for choosing the right strategies for future HSR lines.

Ramboll has extensive experience with evaluating opportunities for new and faster rail options. We assess the future market and the necessary travel times to compete with other modes of transport. For high speed rail lines, the main focus is to convert air traffic into train traffic.

Safe and fast lines in challenging terrains
At Ramboll, we conduct comprehensive mapping of environmental conditions and technical feasibility in corridors. The lines are then constructed to meet the necessary design speed. A firm curvature often demands several constructions and tunnels, especially in mountainous landscapes. Our experts possess long-term experience within bridge-building and tunnel engineering and can calculate all parameters in order to construct safe and fast rail lines that are also operational and simple to maintain.

We are also well-versed in calculations of costs and the use of optimised construction methods.

We deliver reports on the potential benefits of constructing high speed lines for society and users and we provide our customers with overviews of potential environmental consequences, time schedules and cost estimates. Our visualisation-led approach to projects is tailored to each customer’s requirements and employs overview maps showing where the lines will pass through the terrain as well as additional drawings of, for example, constructions and stations.

HIGH SPEED RAIL

New and faster rail options are demanded in many countries in order to offer sustainable transport solutions that serve as good alternatives to air traffic.
Light rail is a popular transportation solution for urban areas. The urban environment and rapidly growing cities call for public transportation solutions that are cost-effective, reliable and sustainable.

Light rail is becoming increasingly popular, particularly in mid-sized cities in the Nordic countries. Several Norwegian and Swedish cities have adopted light rail transportation, and cities such as Stockholm, Gothenburg, Norrköping, Helsinki, Bergen, Trondheim and Oslo are studying and conducting network extensions.

Light rail as part of urban revitalization projects
Light rail provides an optimal solution, not just for infrastructure purposes alone, but also as part of urban revitalisation and design projects. For this reason, mid-sized Nordic cities such as Malmö, Lund, Helsingborg, Tampere, Turku, Odense and Aarhus are developing or considering light rail as part of urban development plans.

Ramboll is involved in several light rail projects across Northern Europe. Our expertise within rail engineering, traffic planning and urbanism covers all disciplines of light rail projects. We take a holistic approach and provide multidisciplinary consultancy from regional and comprehensive planning to design and construction.

Traffic safety is a primary focus area in all infrastructure projects. The street layout and road planning must be carefully designed in a balanced way to improve traffic safety for all road users as many light rail projects will be constructed in areas with heavy existing road traffic.

Rail safety is principally focused on preventing incidents from happening. This can be achieved by controlling processes through the regulation of technological devices.

Multidisciplinary solutions
Ramboll has many years of experience and advanced technical knowledge regarding tram-specific technology and, at a system level, we understand how the specific sub-systems work together. Our focus is to integrate technological studies and investigations with planning processes in order to deliver optimal functionality cost-effectively. This enables us to deliver holistic and multidisciplinary consultancy solutions for our customers. Our experts also have experience with simulation in Open Track (railway) with input from Vissim (micro simulation).

HOLISTIC AND EXPERT SERVICES
- Studies, strategies, analysis (cost/benefit – traffic), functional aspects
- Planning
- Detailed design
- Project management, building management, inspection, on site validation
- Maintenance and operation
ENRICHING THE URBAN ENVIRONMENT
FEATURE PROJECT

WORLD CLASS TRAIN STATIONS

Train stations in large cities are nodes for millions of passengers each day. The security of passengers is of prime concern when designing new train stations.

Langdon Park, Docklands Light Railway (DLR)
Langdon Park is an award-winning, modern, transparent landmark station built to aid regeneration and in consultation with local residents. Central to the regeneration plans for the area, the three-car DLR station is built on-line around the existing Stratford link between All Saints and Devon’s Road station in London.

Innovation is present in many aspects of the design. Ramboll specified platform units that were precast in 6m lengths by manufacturer Hering Bau in Germany. These were craned into place during one of three planned possessions, and sit on simple reinforced trench foundations, designed for construction behind fencing during normal operating hours. The footbridge design was modified whilst bidding in order to remove two of the intermediate foundations and to eliminate the proposed piling.

Substantially funded by region development monies, the quality of the Langdon Park station’s architecture is high, including ETFE coverings to the platform canopies, a new curved DDA-compliant steel footbridge, striking aluminium fins around the lift shafts and monocoque GRP canopy 32m long to shelter pedestrians.

Crossrail – Paddington station
As the first of seven major new underground stations in central London, Paddington Station forms part of the £15bn Crossrail project that will restructure London’s transport challenges. The new Paddington Station will take the form of an underground box 260m long, 25m wide and 23m deep, located directly under Departures Road and Eastbourne Terrace.

Msheireb Station, Doha
The Msheireb Station will become the largest metro station in Qatar and it is part of a new world-class metro system installed ready for the 2022 Football World Cup. The station will be located in central Doha beneath a proposed five-storey basement and high-rise residential and commercial towers.

The station is designed to accommodate 4,500 passengers an hour. It will feature high ceilings and premium retail space with a total net floor area of 18,000 m2.

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UPGRADES AND RENEWALS

Demands for operational reliability and lower maintenance costs give rise to many upgrade and renewal projects.

A major focus area for railway infrastructure owners is determining how to optimise their infrastructure in order to fulfil the demands for operational reliability whilst at the same time keeping maintenance costs down.

As a result, very large sums are invested in renewing existing railways. At the same time, many lines are upgraded for higher speed or axle load.

Over more than 10 years, Ramboll has participated in a large number of renewal and upgrade projects. We have participated in the improvement of concepts for procurement and competition to secure the best use of allocated funds.

Cost-effective project planning

With strong coordination between Ramboll’s different disciplines and external stakeholders, the projects are carefully planned to minimise changes in the execution phase.

This ensures that the time schedule and budget of the project are met. Our many years experience on a range of different projects combined with the fact that we can provide all the required technical disciplines also play a decisive role in achieving this.

Close interaction with the relevant authorities and approval of projects prior to completion is essential. Ramboll has experts that are specialised within these areas. Drawing on their know-how, we ensure that the projects are not stopped or interrupted due to missing approvals.

We also provide consultancy regarding calculations for financial optimisation and investments for the decision-making process.
The large-scale Fehmarn Belt Tunnel will be the world’s longest combined rail and road tunnel with a length of 17.6 km. As an important part of the project to link Denmark and Germany via the Fehmarn Belt, the Danish hinterland railway lines will be upgraded to accommodate the increase in train traffic.

The entire line from Ringsted to Rødby (except Storstrøm) will be upgraded to two tracks, some tracks will be straightened and more than 50 bridges will be reconstructed or replaced. New passing stations will be established and the whole line will have a catenary system.

Ramboll is working on the Danish section from Ringsted to Orehoved (including the Storstrøm bridge) – a total of around 60 km.

Complete design services

The project comprises preparation of an outline proposal and project proposal for new tracks, passing loops, investigations regarding potential speed increases and the establishment of traction power and the catenary system.

Together with our partners, we provide the complete design for all aspects of the project:

- Route planning, including alternative proposals
- Conceptual design for preferred alternative
- Investigations regarding speed increases
- Track technology
- Traction power
- Catenary system
- Design related to adjacent roads, bridges and investigations
- Land use
- Geotechnical investigations
- Investigations regarding planning and environment
- Background information and input to EIA-report
- Building (station) and landscape architecture
- Estimation of construction cost

Project outline for catenary systems

With regard to electrification, Ramboll is identifying the supply needs and optimisation of the location of the catenary supply system (distribution substations), considering the needs of the railway as well as the connection possibilities on the local high-voltage network. Our services include requirements specification for the catenary system, taking into account that this is a TEN-section as well as considering the implications for bridge heights. We prepare project outline for the catenary system, including electrification of the Storstrøm bridge.

For the preferred alternative, Ramboll provides the conceptual design for all technical areas as preparation for detailed design and elaboration of tender documents.
RAIL SAFETY

During recent years, there has been a proliferation in requirements from rail authorities regarding common methods for documenting railway safety.

National and EU requirements based on the Common Safety Method (CSM) regulation now forms the basis for railway safety documentation. Due to these relatively new developments, there is a significant demand from customers seeking assistance in aligning the project to the process and in helping the customer to drive the process.

Tailored project delivery employing advanced tools

Ramboll assists in arranging the safety process to ensure that it fits each individual project and takes into account all associated safety requirements.

We have developed a large number of advanced tools that have been specifically adapted for the safety approval process. These tools comprise an integral part of our service during project delivery.

Our safety considerations in projects are integrated into the Reliability, Availability, Maintainability and Safety (RAMS) framework, which is an underlying mindset of our consultants in all rail-related work processes.

A partnership approach

Our customers receive all the necessary safety documentation – delivered in timely manner and taking into account all time-consuming approval activities.

We draw on experience from a large number of projects and have a full understanding of the approval processes facing our customers.

Ramboll’s partnership approach ensures that work is carried out in close cooperation with authorities, assessors, operators and railway undertakers.

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“Ramboll has played a proactive, flexible and responsive role in the project.”

Iben Marcus-Møller, Project Manager of Fehmarn Hinterland Project, Banedanmark