rail systems
passenger & freight rail
water & water resources
wastewater
tunnels
highways & bridges
environment
municipal engineering
aviation
ports & harbors
architectural services
pipeline services
life-safety & security
information management
operating services
Areas of Expertise

Signaling Systems
- At Grade/Level Crossing Active Warning Systems
- Advanced Train Control Systems (ATCS)
- Automatic Block Signaling (ABS)
- Block Design, Signal Plans & Simulations
- Centralized Traffic Control Systems (CTC)
- Communication Based Train Control (CBTC)
- Automatic Train Operation (ATO)
- Automatic Train Supervision (ATS)
- Automatic Train Protection (ATP)
- Dark Territory Control Systems
- Vital Control Systems (Microprocessor, Relay, Electro-Mechanical, Mechanical)
- Yard Control Systems

Wayside Systems
- Dragging Equipment Detectors
- Hot Box Detectors
- Slide Fences
- Snow Clearing Devices
- Solar Powered Systems
- Switch Machines (Conventional & In-Tie)
- LED & Conventional Signals

Communications Systems
- LAEI/RFID Readers
- Intrusion Alarm & Detection Systems
- Closed Circuit TV
- Fiber Optic Networks
- IT Networks
- Operation Control Centers
- Passenger Information Systems
- Fare Collection
- Public Address, Intercom
- Radio Systems (VHF, UHF, Microwave, GPS)
- Supervisory Control & Data Acquisition (SCADA)
- Telephone Systems

Positive Train Control
- Dispatching Systems
- Vital Onboard Equipment
- GPS Tracking Technology

Traction Power Systems
- AC & DC Substations
- Corrosion Control & Stray Current Mitigation
- EMI & RFI Analyses
- Load Flow Analyses & Simulations
- Overhead Contact Systems
- Third Rail Systems

Systems Engineering, Integration & Management
- Systems & Requirements Engineering
- Safety & Security Compliance Certification
- Safety Management & Certification
- Interface/Integration Control
- Testing & Commissioning
- Systems Assurance
- Independent Safety Assessment

Life–Safety & Security
- Ventilation, Aerodynamics & Cooling
- Smoke Modeling, Prediction & Removal
- Computational Fluid Dynamics
- Emergency Response Plans & Evacuation Procedures
- Environmental Monitoring & Control Systems

Design & Development
- Feasibility Studies
- Specifications & Tender/RFP Management
- Preliminary Design
- Technology Evaluation & Migration Planning
- Operations Planning
- Maintenance Auditing

Project Implementation
- Detailed Design
- Installation Planning & Support
- Testing & Commissioning
- Construction Management & Site Supervision
- Green Field & Existing Operational Environments
- Project Execution to CROR, Transport Canada, FRA, FTA, NORA, AREMA, CENELEC, & IEC Rail Systems Standards

Contract Management
- Project Management
- Project Scheduling & Cost Control
- Contract Administration
- Engineering Approvals (Owner's Representative)

Cover: John Street Interlocking, Toronto, ON
This page: Union Station, Toronto, ON
Hatch Mott MacDonald

Hatch Mott MacDonald’s team of professionals provides cost-effective and innovative engineering solutions for North American Passenger and Freight Rail industries with unprecedented success. We have earned an outstanding reputation for meeting, and often exceeding, client expectations. Our portfolio speaks for itself:

- Program and Project Management Consultant for Toronto Transit Commission’s Sheppard Subway
- Systems Design and Construction Support for Seattle Sound Transit
- Signal Design, Installation Support, and Test and Commissioning for Calgary LRT Extensions
- Program and Construction Management for VTA’s San Jose multi-corridor Light Rail Expansion Program
- Owner’s Representative for GO Transit’s Union Station Rail Corridor Signals, Electrical, and Communications Contract
- Project Management for Toronto Transit Commission’s Spadina Subway
- Program Management Services for the Toronto Transit City Light Rail Program
- Systems Design for SVRT, California High Speed Rail, and the Transbay Terminal Development in San Francisco
- Program Management Services for GO Transit’s Union Station Rail Corridor Infrastructure Improvement Program
- Owner’s Engineer for Calgary West LRT
- Program Management, Signal Design Services, Test Plans, Installation and Commissioning Support for Canadian Pacific Rail’s Western Capacity Expansion Program

Through our founders’ involvement in the development of London’s underground over a century ago, and their work on Toronto’s subway system more than 50 years ago, Hatch Mott MacDonald has an established history of rail design and engineering. Our association with these clients continues today—a testimony to the quality of our work and to the trust and professional relationships we build with our clients.

With over 50 offices throughout North America, Hatch Mott MacDonald offers a full-range of services to handle any size project—from a small improvement initiative to a major multi-billion-dollar program. We understand the challenges of a new start rail program, an enhancement or rehabilitation effort under operating conditions, or a major expansion. Our goal is to help clients deliver successful projects in an environmentally responsible manner, through value-added design and construction methods.
Hatch Mott MacDonald offers an unrivalled expertise in railway systems. Our signaling team has extensive experience with all types of systems, offering services at all stages of design, testing, and commissioning. This expertise encompasses all aspects of vital microprocessor, relay, and mechanical interlocking systems. HMM’s signaling designers have decades of experience in design from mainline Centralized Traffic Control (CTC) to some of the most complex interlockings in North America. In addition to this conventional signaling expertise, HMM offers the same set of services for Communication-Based Train Control (CBTC), Advanced Train Control System (ATCS), and Positive Train Control (PTC).

HMM’s designers also have extensive experience with level crossing and dark territory control systems in addition to other areas of the rail system spectrum, ensuring that the requisite domain expertise is always available, regardless of the challenges presented.

In addition to signaling expertise, HMM offers a range of railway capacity planning services. Effective planning is key to maximizing the effects of infrastructure expenditure, and HMM has the capability to undertake capacity studies at varying levels of detail, for trunk corridors as well as complex terminal areas. Our team offers both manual and computer analysis, using such tools as Train Performance Calculation (TPC), Time Distance analysis, Signal Wake analysis, and full blown computer simulations using Berkeley Simulation's Rail Traffic Controller (RTC). HMM’s experts also have extensive block design experience, as well as the ability to develop and verify signal plans over corridors and terminal areas.

Many of our designers and experts use their experience to become licensed under the Institution of Railway Signal Engineers (IRSE), providing a means to certify our competence in undertaking safety-critical work.

Top: Canadian Pacific Rail Murdoch Interlocking, Calgary, AB
Right: Union Station, Toronto, ON
Wayside systems

Hatch Mott MacDonald strives to provide our clients with safe and reliable wayside systems. With expertise in the operation of both light and freight rail, our professionals have the capability to engineer innovative solutions tailored to each client’s specific needs. This capability allows us to take on a wide-range of projects—whether an upgrade to an existing system or a design from the ground up.

Our wayside system designs have been successfully implemented throughout North America. Hatch Mott MacDonald’s proven track record is a testament to the innovation and attention to detail that goes into every design. From in-tie switch machines to Train-to-Wayside Control (TWC) systems, Hatch Mott MacDonald has the necessary expertise in technology aimed at minimizing the safety hazards and costly delays caused by equipment failure.

In addition, our substantial experience with rail and transit operations throughout North America allows us to engineer solutions that will operate reliably in the harshest environmental conditions. With the need to advance beyond dark territory rail systems, the application of HMM’s expertise in the use of solar and hybrid powered wayside solutions can provide cost-effective alternatives to utility powered systems.

Hatch Mott MacDonald’s commitment to on-going training ensures that our professionals are using the latest wayside system technologies. This allows us to provide safe, durable, and reliable designs that balance functionality with cost and time restrictions—ensuring that clients get the most from their wayside systems design.

Top: South LRT, Calgary, AB
Below: Milton Station, Milton, ON
HMM’s extensive experience in communications and control for rail systems operations and real-time customer information systems covers all aspects, from the design of the control center and yard control, to technical audits for public address and information display systems. Our team has the necessary expertise to meet our clients’ requirements for all rail and transit communications systems covering voice, video, and data.

**fiber optics & radio systems**

HMM provides leading edge solutions in the design of new control systems utilizing radio and fiber optic communications media as well as traditional telephone leased lines. We have the experience and resources to not only provide new, complete systems but also to integrate new facilities into your existing system. HMM can also evaluate and recommend communications upgrades that result in significant cost savings and short capital recovery periods.

Our services include design of fiber optic and copper communications links; radio (VHF, UHF, Microwave, GPS) media to transmit/receive information for closed circuit television (CCTV); security access control, alarm, and detection systems; public address, intercom, telephone systems; fare collection; and LANs, WANs, and network management systems.

**passenger information systems**

HMM provides public transportation agencies with state-of-the-art solutions for passenger data and communication systems and visual message boards. Our designs offer full communications and control solutions for light and heavy rail, rapid transit, trams, and guided bus routes.

**fare collection systems**

We deliver design, integration, and maintenance of Ticket Vending Machine (TVM) systems including electronic fare gates, ticket and token vending machines, smartcards, security elements, barriers, and electronic validating fare boxes. Our world-class systems can be fully integrated with new or existing rail central control and communication systems.

**operations control/monitoring facilities**

HMM has a broad range of expertise in designing central control, yard control, and monitoring facilities for rail and transit projects—including electrification, support facilities, and multi-purpose channels and terminals to monitor and control train operation. We also provide upgrades of control/communication systems, ensuring safe, secure, reliable, and efficient rail transit operations.

**supervisory control and data acquisition (SCADA) systems**

Our SCADA designs provide monitoring and control of equipment throughout the rail and transit operation including subsystem interfaces with traction power, closed circuit television, elevators, fire alarms, sump pump stations, ventilation, and wayside devices.
Hatch Mott MacDonald has extensive experience in the design and management of Traction Electrification Systems in light, heavy, commuter, and high speed rail applications. We have a wide-range of design capabilities, including computerized load flow simulations, substation design and procurement, overhead contact systems, 3rd-rail systems, and ground grid systems.

Using software (TRAIN), developed by one of our parent companies, Mott MacDonald, our professional engineering staff analyzes and creates simulations of loads and capacities required to operate a safe and reliable system in the most efficient manner. Whether it is high speed rail utilizing an AC electrification system or a DC system for a light rail or streetcar project, this software proves to be a critical tool in the design of traction electrification systems.

HMM designs overhead catenary systems for your most challenging alignments and adverse conditions. Our experience in overhead contact systems and 3rd-rail systems ranges from simple catenary, employing auto-tensioning devices for high speed applications, to single wire fixed systems for streetcar systems.

Along with our design expertise, HMM is a leader in on-site services including training, testing and commissioning, and construction management. We have provided effective and efficient field testing/commissioning services for the start-up of initial and expansion rail lines, and supported the training of maintenance personnel throughout North America.

In the field or in the office, HMM has a multi-faceted group of individuals that will cater to your project objectives.
As systems integration specialists, HMM ensures that all system elements interface properly and efficiently with each other, as well as with associated facilities. This is an integral part of our project involvement, from the earliest conceptual design through construction and testing. It involves contractual and physical interfaces, construction phasing, and implementation.

Major systems integration exercises are treated with a unique approach. A Systems Engineering process is applied to large scale integration projects, beginning with the customer needs. Applying the standard ‘V’ model, a requirements-based design approach is implemented with verification and validation activities throughout the lifecycle process to ensure issues are rectified early, schedules are met, and costs to the client are minimized.

HMM’s systems engineers have conducted numerous systems testing and safety certification programs for clients throughout North America, including the cross-acceptance of internationally developed and certified products to the North American domain. These programs are critical to the successful start-up and commissioning of a project. HMM customizes each of these programs to our clients’ drawings, specifications, procedures, operations, and maintenance requirements. When complete, the documents reference, record, and document pertinent aspects for certification by the governing authorities in accordance with regulations and requirements.

HMM also provides Systems Assurance and System Safety services to the transit and mainline industry. We develop specifications, plans, analyses; and certification of signals, traction power, communications, emergency ventilation, and rolling stock. Our expertise includes:

- System Safety & Safety Certification
- Reliability Requirements
- Maintainability Requirements
- Availability Requirements
- Human Factors
life-safety & security
HMM is a world leader in tunnel ventilation. Our group has extensive skills in the design, development, and approval of modern fire safety systems. Microprocessor-based automated control systems are used to alarm, alert, and suppress upon detection of smoke or fire. Cutting edge computer smoke modeling provides invaluable information to clients, allowing for the development of comprehensive emergency response plans and evacuation procedures.

design, development, & implementation
Our experience in the railway industry allows us to provide valuable design and development support to our clients. Project involvement begins early with feasibility studies, followed by detailed design specifications, and tender documents. Detailed designs of trackwork, signal circuits, electrical, and other rail systems are developed systematically, with independent reviews to ensure quality. Our staff can help plan and support the installation of these designs, interfacing on site with contractors and supervising their efforts.

Additionally, we perform testing and commissioning of rail systems in brand new environments and existing live railway. Further, we have worked within a complete range of application environments from project execution to Canadian Rail Operating Rules (CROR), Transport Canada, Federal Railroad Administration (FRA), Federal Transit Administration (FTA), Northeast Operating Rules Advisory Committee (NORAC), American Railway Engineering and Maintenance-of-Way Association (AREMA), European Committee for Electrotechnical Standardization (CENELEC), and International Electrotechnical Commission (IEC) rail systems standards and rules. Our experienced staff ensures plans are followed in a safe and efficient manner.

contract management
HMM has developed a “no-surprises” project management approach that delivers sound, simple, and practical solutions for the projects we undertake. We employ high-level coordination, design, and construction management practices, and sensitivity to all-important issues through effective utilization of materials and resources. Our proactive approach to planning, value engineering, and risk management includes coordinating numerous interfaces, anticipating potential “road blocks,” and finding cost-effective, flexible, and timely solutions from programming, planning, and costing, through system start-up and commissioning.

We tailor our established internal control systems to meet each client’s needs, and effectively manage and control project costs, maintain schedules, efficiently produce high-quality deliverables, maintain readily accessible documents and data files, and produce concise reports. We provide timely and effective communications structured through face-to-face dialogue, meetings, regular reporting, and most importantly — listening to the client.

sustainability
Although sustainability has received increased focus in recent years, the Rail Systems group at HMM has been promoting sustainability concepts and designs for many years. The rail industry plays a large role in the reduction of carbon-based emissions by taking cars and trucks off the roads. Railway transportation requires less land to be developed and less fuel to be consumed, while carrying more passengers to their destinations. From paperless designs to electrified railways, HMM is capable of helping you reach your sustainability goals.
how Hatch Mott MacDonald makes the difference

Hatch Mott MacDonald meets the challenges of increasingly complex rail and transit projects. Our staff includes many career railway professionals who fully understand design, operations, planning, regulatory, and infrastructure requirements. They work closely with our expert project and program managers to deliver the highest quality of service to our clients.

In addition to our technical expertise, we understand the challenges presented by community, environment, regulators, and government agencies, as well as other stakeholders. Our commitment and ongoing client care activities ensure that we listen and respond to your needs. These activities have enabled us to build strong, lasting relationships with clients who recognize our superior engineering and management capabilities.

Our clients benefit from our corporate commitment to innovation and continuous improvement. Hatch Mott MacDonald’s ongoing support and participation in industry forums, including AREMA, the American Public Transportation Association (APTA), and IRSE, directly impact the professional development of our staff, and our industry, making us a preferred employer in the industry.

We put our clients’ needs above all else by bringing the necessary technical expertise, relevant experience, leading edge technology, and commitment. We continue to implement projects in the most innovative and cost-efficient manner, meeting, and often exceeding, client expectations. That’s how Hatch Mott MacDonald makes the difference.
For Current Office Locations Click Here.