ARCADIS TUNNELS
Solutions built on experience
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SOLUTIONS BUILT ON EXPERIENCE

Pascal Guédon
Global Leader
Tunnels
Arcadis is the leading global natural and built asset design and consultancy firm, covering the whole asset lifecycle. For over a 125 years we have been working in partnership with clients around the world to deliver exceptional and sustainable outcomes.

Our reputation is built on a deep understanding of client needs, combined with our knowledge and experience worldwide. With 28,000 people and €3 billion in revenues, we have built a global network that enables us to serve our local clients on a global basis.

The megatrends of the 21st century place increasing demands on clients worldwide. Rapidly increasing urbanization, shrinking budgets and environmental sensitivity require innovative approaches to deliver advanced infrastructure for the Megacentury.

With our multidisciplinary approach we create tunnels and underground spaces that respect the environment and connect communities more efficiently around the world.

We look forward to working with you.
ABOUT ARCADIS

Arcadis provides consultancy, design, engineering and management services in infrastructure, water, environment and buildings. Established in the Netherlands in 1888, Arcadis now operates with 28,000 staff in over 40 countries worldwide.

We provide services throughout the entire value chain – from strategic advice, planning, design and implementation, through to maintenance and total lifecycle operation. We offer our clients solutions that are robust in the long-term, viewed within the context of their business needs.

Our experience shows that the challenges faced by our clients are rarely met through simply providing traditional professional services. It is our ability to understand the specific needs of clients, in their local context, and our innovative application of services that are new to the industry combined with traditional skills that deliver real results.

Arcadis has a substantial global footprint. Our network enables us to bring our knowledge and experience of projects worldwide and apply that expertise to specific local situations and needs.

Our mission is to improve the quality of life worldwide by creating assets of distinction and sustainable solutions that enhance the built environment. Sustainability is central to everything we do: in our work with clients, in the way our company is organized and in our approach to social responsibility. Arcadis supports UN-HABITAT with knowledge and expertise to improve the quality of life in rapidly growing cities around the world.

FACTS

<table>
<thead>
<tr>
<th>Gross revenue by activity:</th>
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<tbody>
<tr>
<td>Infrastructure</td>
<td>24%</td>
</tr>
<tr>
<td>Water</td>
<td>15%</td>
</tr>
<tr>
<td>Environment</td>
<td>33%</td>
</tr>
<tr>
<td>Buildings</td>
<td>28%</td>
</tr>
<tr>
<td>Gross revenue</td>
<td>€3 billion</td>
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The mega trends of the 21st century will bring rapidly increasing levels of urbanization as the global population is set to reach nearly 10 billion by 2050. This demands advanced infrastructure across roads, railways, ports and waterways, airports, energy resources and communication networks. There is increasing urgency for sustainable solutions to resolve the issues of climate change, fragile environments and the scarcity of natural resources.
INFRASTRUCTURE FOR THE MEGACENTURY

THE TOTAL MOBILITY CHALLENGES
In mature markets, limited government ability to commit to new infrastructure and challenged budgets, as well as limited natural resources, means that more innovative ways are needed to manage existing infrastructure assets through to refurbishment and optimization programs. Emerging markets must also rise to the challenge by building new infrastructure in order to compete. Both require transformational thinking on mobility, connectivity, safety, durability, aesthetics and sustainable solutions. This is infrastructure beyond the technical: this is Total Mobility.

FULFILLING THE POTENTIAL, MEETING THE DEMAND
Tunnels are increasingly important structures in the evolution of 21st century infrastructure, whether on a grand scale cutting through mountains or reducing congestion in densely populated urban settings. With our multidisciplinary approach, Arcadis has the expertise and experience to plan, design, build and manage even the most challenging of tunnel projects. With our global presence we have developed a deep understanding of all kinds of environments that enables us to bring fresh perspectives, innovative thinking and solutions to complex problems. In doing so, we deliver Total Mobility to billions of people worldwide.

CONNECTING COMMUNITIES NOW AND INTO THE FUTURE
Arcadis responds to these challenges by working in partnership with the public and private sectors to deliver the infrastructure that will connect communities now and into the Megacentury. All our activities embody the highest levels of safety, quality and effectiveness. Our designs are engineered to meet the world’s most rigorous safety standards; when developing land we ensure there is balance with the natural habitat and we measure success in long-term outcomes. Clients around the world look to us to build tunnels and underground spaces that will be assets for their communities for generations to come.
Arcadis combines strategic advice with multi-disciplinary technical knowledge to design and build tunnels that are safe, functional and sustainable. We have been at the forefront of this expertise for more than 60 years, ensuring reliable and efficient tunnel systems worldwide.

**OUR OFFERING IN TUNNELS**

**FACTS**

**World’s top tunnels**

- Longest land rail tunnel: The Lötschberg Base tunnel in Switzerland is currently the longest land rail tunnel, with a total of 34.5km.
- Longest and deepest rail tunnel: Seikan tunnel in Japan, 53km long and 140m below sea level.
- Longest undersea section: The Channel tunnel, connecting the UK and France - 37.9km under the sea, overall length 50km.

*Perthus tunnel – northern portal, Perpignan to Figueras*
TUNNELLING INTO THE FUTURE

Tunnels are one of the most efficient means to connect two points – and often they are the only viable solution. Today, with the development of urban areas and wider regions, communities require a vast range of tunnels, to carry road and rail traffic across mountains, transport water and other utilities, to reduce congestion and environmental pollution, to protect urban spaces and – above all – to convey people and freight safely and sustainably.

The Arcadis approach is to ensure engagement of the stakeholders and project team right from the start. Particularly for major projects in environmentally sensitive settings, tunnels require close cooperation between all the parties involved, from concept through to commissioning. Only then is it possible to develop the solution that leads naturally to efficiently managed projects with successful outcomes. The tunnels built by Arcadis around the world are testament to this approach.

Our track record of delivering complex tunnelling projects is exemplary, from tunnels through complex geology and hydrogeology to complete underground infrastructure networks. We have contributed to the development of many innovative technologies, such as Tunnel Boring Machines (TBM), which protect our construction workforce more effectively, and immersed tube tunnels for waterbody crossings. Sustainability is a key component of all our designs, which incorporate low carbon footprints, low maintenance and high durability.

As tunnel designers we are faced with sites of all kinds – with historical importance, urban density or environmental sensitivity – and endless geographical and geological variation. Almost every situation is a unique challenge that demands a carefully tailored solution. Arcadis has extensive experience of designing, adapting and building all major forms of contemporary tunnels. We are also expert in creating underground spaces and caverns, such as metro stations, storage chambers, car parks and shopping malls.

Our attention to both the desired end results and the detail means that right from the start of the planning phase we identify, mitigate and even avoid issues that could affect the construction and safe operation of our tunnels. With forward thinking and excellence integrated into every phase of the project from planning to maintenance, clients trust us to deliver safety, aesthetic quality, durability and sustainability across every project.

LOCAL, GLOBAL AND INDEPENDENT

Our local presence helps us to maintain lasting relationships with our clients and to build in-depth understanding of local communities and environmental conditions. Our global network enables us to use our vast expertise to provide the best added value services and technologies to multinational, regional and local clients.

By combining global expertise with local presence, the projects we deliver incorporate the highest levels of strategic consulting with the full range of technical services and solutions for designing, building and maintaining tunnels and underground spaces.

As an independent company with no links to government, suppliers or tunnel owners and operators, Arcadis is best placed to advise clients objectively on the most appropriate solutions and suppliers.
FACTS

The Deepest under-sea section of immersed road tunnel, Busan-Geoje Fixed Link in South Korea, connecting the city of Busan to the island of Geoje. It is 3.4km long and 48m below sea level.

The Gotthard Base tunnel and Lyon to Turin base tunnel, will be the longest rail tunnels in the world beneath mountains at more than 50km.

East Side Access for Grand Central Station, New York City, United States
OUR EXPERTISE

Clients need reliable design and engineering expertise that guarantees tunnels of lasting value to their communities; safe, sustainable and efficient to operate. With experience in the design and construction of tunnels and underground spaces across Asia, Europe, the Middle East and the Americas, Arcadis has the proven ability to meet this need.

FACTS

Types of tunnel construction
Cut-and-cover; for shallow tunnels, where a trench is excavated and then covered over with material to carry the required load.
Bored tunnels; for tunnels that must run deep and/or where it is impossible to remove the material above.
Immersed tube tunnels; for some underwater tunnels, typically crossings under rivers, estuaries and sea channels. Made up of prefabricated segments that are floated into position.

(such as a city or a mountain). Usually constructed today with TBM's.)
INCREASING METRO NETWORK CAPACITY
Underground metro networks are very effective for transporting large numbers of passengers, many more than surface systems such as trams and buses could accommodate. But improving networks can be a major challenge, with intersections between lines and stations. Arcadis has extensive capabilities in managing this complexity, taking an integrated approach that includes environmental procedures, technical expertise in tunnels, underground stations, mobility and managing the interfaces with other parts of the existing transportation system.

ENSURING EFFICIENT OPERATION OF TRANSPORT HUBS
Asset owners require safe and efficient crossings in multi-modal transport hubs, with minimum disruption when needing expansion or updating. We are leaders in the specialized, integrated and innovative disciplines that guarantee these outcomes. With proven experience of phasing – managing and completing complex reconstruction works while transport systems remain in operation – Arcadis is able to offer all-round support in building and improving tunnels serving transport hubs.

PLACEMAKING FOR LOCAL COMMUNITIES, KEEPING TRAFFIC MOVING UNDERGROUND
Local authorities are frequently faced with conflicting demands for improving the quality of life for their communities – creating safe and pleasant green spaces – while providing optimum traffic flow on motorways through the city.

The solution is to take the major roads underground, with a development of green areas above them. Arcadis advises on all aspects of these projects, including environmental impact reports, zoning plans, focused expertise relating to soil, water, archaeology, noise and air pollution, tunnel and road design.

MAXIMIZING LIMITED SPACE IN HISTORIC CITY CENTERS
In urban heritage sites, space is almost always a challenge; the only solution to limit the impact on them may be to tunnel downwards to build subway stations, shopping centers and car parking facilities. Arcadis has extensive experience of creating underground spaces sensitively, respecting the historic references.

MOVING FREIGHT TRAFFIC FROM ROAD TO RAIL TO REDUCE ENVIRONMENTAL IMPACTS
In mountainous regions the numbers of heavy goods lorries are increasing, causing bottlenecks and pollution in these environmentally sensitive areas. Tunnelling under the mountain passes to create high speed rail routes for freight is the most attractive solution. Arcadis can support clients at every stage of these major projects, from early stakeholder engagement through to operational use. This includes strategic advice on aspects such as environmental issues, and technical expertise in geotechnics, safety, system design, construction, operation and maintenance of rail tunnels.
CASE STUDY

TOP SAFETY FOR NEW RAIL TUNNELS

Project: Lyon to Turin, France and Italy
Date won/completed: 2005 / 2012
Client: Lyon – Turin Ferroviaire (LTF)

OUR CLIENT’S CHALLENGE

This 53km rail tunnel between Italy and France is used for the transport of freight, including dangerous goods, as well as high speed passenger trains. The challenge was to make the tunnel safe, with no compromise in making it compliant with international standards and Arcadis’s own safety policy.

OUR APPROACH

Arcadis provided investigation and analysis of all safety provisions and installations for the tunnels on this international railway line. This included:

- Analysis of the possible impact of accidents in the tunnel involving hazardous substances, such as flammable or toxic gases and fluids
- Our cutting-edge smoke and fire development plus explosion modelling which enabled us to take measures to reduce the risks associated with goods transportation and optimize passenger safety
- Our role in analyzing the required safety provisions and installations in and around the tunnels to minimize the impact of possible accidents.

The result of this study was a functional requirement specification covering all safety aspects, including all necessary safety measures for safe transport of (dangerous) freight at the same time as passenger trains.

THE OUTCOMES FOR THE CLIENT

We enabled the client to establish an exploitation model for high frequency train traffic (freight and passenger) which was safe and complied to international legislation and standards.
MAXIMIZING THE BENEFITS OF INFRASTRUCTURE ASSETS

Tunnel owners and operators want to maximize their returns on investments in tunnel infrastructure while ensuring they comply with legal requirements for safety, health and the environment. Arcadis advises clients on all aspects of strategic, tactical and operational asset management, combining technical, engineering and management expertise to offer a full range of asset management services avoiding spiralling maintenance costs.

PUBLIC PRIVATE PARTNERSHIPS

Limited public funding means that public tunnel owners and operators around the world are looking towards private sector funding to meet their investment goals. At the same time, investors are increasingly interested in assets that deliver a long-term guaranteed return.

Arcadis identifies and scopes the possibilities for Public Private Partnerships (PPP), assesses the value of assets and structures the outsourcing of operations to private parties. We can also contribute to the formation of PPP and Build Operate Transfer (BOT) projects, bringing our engineering expertise into consortia or support investors.
CASE STUDY

IMPROVING THE WATER QUALITY OF THE VICTORIA HARBOUR

Project: Harbour Area Treatment Scheme (HATS) Stage 2A, Hong Kong Island, China
Date won/completed: 2009 / 2015
Client: Gammon Construction Limited

OUR CLIENT’S CHALLENGE
The client needed to construct a sewer tunnel to improve the water quality of the Victoria Harbour. As the largest tunnel contract of the Harbour Area Treatment Scheme Stage 2A, this contract involved the construction of a 12km long trunk sewer tunnel system at up to 160m depth below sea level along the northern coast of Hong Kong Island and across the Victoria Harbour, serving to collect and transfer primary treated sewage from the northern areas of Hong Kong Island to Stonecutters Island for further treatment.

OUR APPROACH
Arcadis was the contractor designer, responsible for designing the permanent lining of the shafts and the tunnels and temporary support for the tunnels constructed by drill-and-blast method. We were also responsible for assessing the effect of tunnel excavation and blasting for the tunnels on existing buildings and structures.

The key design challenge was that all tunnels and shafts in rock had to be constructed of unreinforced concrete, including their intersections. This was further complicated for the tunnel section along the coast of Hong Kong Island, where the conduits are in dual oval shape, with a thin partition between the two conduits, able to take the stress when either of the conduits is empty while the other is under an internal water head of 160m.

THE OUTCOMES FOR THE CLIENT
Our cost effective design through innovative design methodology has allowed our client to win the construction contract and complete the subsequent successful delivery of it. Our blasting assessment also ensured safety of the public and the construction personnel during construction.

CASE STUDY

ENABLING NATM CONSTRUCTION OF MAJOR URBAN TUNNEL

Project: Geotechnical monitoring for Lochkov Tunnel, Prague, Czech Republic
Date won/completed: 2006 / 2010
Client: The Czech Republic’s Directorate of Roads and Motorways

OUR CLIENT’S CHALLENGE
Lochkov Tunnel is an essential part of Prague’s city ring road, linking two main motorway routes. The client, the Czech Republic’s Directorate of Roads and Motorways, needed geotechnical monitoring to enable construction of the tunnel to NATM (New Austrian Tunneling Method) principles – expertise that is critically important for the success of this type of project.

OUR APPROACH
Arcadis in a consortium with PUDIS, jointly provided comprehensive geotechnical monitoring. Arcadis was responsible for managing the monitoring office. One of the most important goals during the course of the tunnel excavation was continuous verifying of the construction design assumptions with the geotechnical reality on the ground and obtaining justification for categorizing the excavation into NATM support classes.

The required optimum was to achieve the categorization assumed by the design – or even improve it, if possible. Arcadis provided reliable information about the geotechnical properties of the rock mass, its deformational behaviour on the primary lining being built and the impacts of the construction on the ground surface, using our online information system.

THE OUTCOMES FOR THE CLIENT
Our team ensured a significant improvement in the NATM classification of the excavation part against the design prediction, which contributed to the project achieving maximum quality, a good economic outcome and minimum negative impacts on the environment and existing buildings.
OUR CLIENT’S CHALLENGE
The East Side Access Project is a $9.3 billion program to expand the Long Island Rail Road (LIRR) commuter rail service into historic Grand Central Terminal (GCT), the largest train station in the world. The client required a new route via a combination of newly constructed tunnel and an existing bi-level tunnel under the East River, leading to a new passenger terminal beneath the existing GCT.

The client needed a company with significant expertise in managing complex railroad construction projects, as this project connected the two largest commuter rail systems in North America with the busiest railroad interlocking in the US.

OUR APPROACH
Arcadis provided program and construction management services as a member of the construction management team for the entire Manhattan section of the East Side Access (ESA) program. This included the excavation and finishing of tunnels and caverns, structures construction and rehabilitation, station and platform construction and finishes, as well as track, communications, signals and traction power systems. Key challenges included:

• Complex structural construction methods affecting an existing historic structure and adjacent properties
• Staging and phasing activities to control and protect train operations, passenger movements, and street-level vehicular and passenger traffic around traveling public – with over 800 train movements per day.

THE OUTCOMES FOR THE CLIENT
• All work managed by Arcadis was completed without disruption or delay to scheduled MNR service operations. The construction contracts managed by Arcadis were all on or better than planned for budget and schedule.
• This system improvement will allow the ESA service to provide 25 trains per hour in the peak period during initial operations scheduled for 2021. The MTA forecasts that the ESA project will handle approximately 162,000 daily commuters to and from the GCT.
This is the biggest project in Metro de Santiago’s 50-year history. Line 3 will introduce 18 new stations to the network across 22km from the northern district of Quilicura, to La Reina in the east. Line 6 will connect the metropolitan districts of Providencia in the centre of the city, with Cerrillos in the southwest.

OUR APPROACH
Arcadis is working as part of a consortium to provide engineering consultancy on both lines, and is also responsible for supervising construction on Line 3:
• Almost all of the new Metro is underground, crossing the historic downtown of the city. There are additional geophysical challenges: this is one of the most active seismic areas in the world
• Conventional excavation techniques (not TBMs) are used with the support of experts in tunnel design to overcome the technical issues – Arcadis has performed detailed 3D modelling analysis on the potential of disturbance during construction. Arcadis is recognized by Metro de Santiago as a leading service provider in this field.

• Tunnel design represents a particular challenge on both lines as they intersect several existing lines and stations

THE OUTCOMES FOR THE CLIENT
• Arcadis’s long experience of working with Metro de Santiago has enabled us to bring in-depth local knowledge to the project, combined with access to our global network of experts.
• Major expansion of the Metro network has contributed to reducing urban congestion and pollution (serious problems for this rapidly growing city) and improved the quality of life for the people who live in Santiago.

CASE STUDY
NEW METRO LINES: IMPROVING THE QUALITY OF LIFE FOR SANTIAGO’S RESIDENTS

Project: Metro de Santiago, Santiago, Chile
Date won/completed: 2013 / 2015
Client: Metro de Santiago

OUR CLIENT’S CHALLENGE
For over 15 years, Arcadis has worked with the state-owned Metro de Santiago to expand the city’s ambitious and state-of-the-art transport system. With more than 2.5 million passengers per day, the Metro infrastructure in Santiago, Chile is already one of the largest in South America. Arcadis is currently participating in constructing two new lines — Line 3 and Line 6 — that will increase network capacity by 35% and benefit one million people.
interconnected with many existing stations. It will be connected to the high-speed rail network and Paris’ airports. 200km of new automatic metro lines will be built.

One of these new lines is the Red Line (75km length), surrounding the Paris area and connecting the suburbs together. It will be built in the next 16 years, which corresponds to the duration of the Arcadis contract.

OUR APPROACH
• Arcadis will be involved in all project management services (contract, cost, risk, time management), in the environmental procedures, in the technical advisory (tunnels, underground stations, mobility) and in the interfaces with the transportation system.
• Arcadis is part of a group of firms providing program management services to support SGP since September 2013 on the Red Line, including program management, project management, contract and procurement management, technical advisory and many web-based program control systems and coordination with all projects interfacing GPE.

THE OUTCOMES FOR THE CLIENT
It is too early in this project to determine the final outcomes. At this stage:
• With our global presence and local knowledge, Arcadis has been able to mobilize key experts in every field immediately, to quickly resolve critical issues allowing fast decision making and in a flexible relationship to adapt profiles and roles with the client’s needs and organization
• The new metro will play an important part in realizing the Grand Paris scheme, enabling France’s capital city and surrounding area to achieve economic, social and environmental development.

“Arcadis, together with its partners (ARTELIA and BG) has demonstrated its ability to grow an organization with personal and collective skills that brings value to the program and to each project of the Grand Paris Express Metro. The professional services that its team delivers are very wide from risk, cost, time and contract management to project management tools and processes setup. We are glad we chose Arcadis who demonstrates leadership, agility and trust in the partnership it is building with the Société du Grand Paris along the years.”

Gérard Chérel, Société du Grand Paris, Program Director
one, refurbish the existing tunnel and enhance the A10 ring road to support the new infrastructure.

OUR APPROACH
Arcadis is a shareholder in Coentunnel Construction B.V.(CCY), which was awarded the project in 2007. Coentunnel Construction VOF (CCN) is the construction joint venture set up for the project, with partners Besix, CFE, Dredging, TBI and Vinci. Arcadis was the design consultant, lead engineer and partner for all construction engineering relating to the tunnel elements, including the ramps and feeders. Arcadis was also involved in the bid design, risk management and systems engineering design, which included:

• Geotechnical design
• Assessment of the existing tunnel
• The Second Coentunnel (immersed tube tunnel). Tunnel elements were constructed in the Barendrecht Dockyard and transported over the North Sea to the immersion location in Amsterdam
• Renovation of the existing Coentunnel
• Design of 8km highway
• 10km sound barrier.

With the design and construction completed within a five-year period (2007-2013), Arcadis as shareholder of concessionaire Coentunnel Company B.V. will now operate and maintain the highway system under the terms of a 30-year concession.

THE OUTCOMES FOR THE CLIENT
Our expertise in immersed tunnel design and construction was valuable for the client. The design allowed for construction of the Second Coentunnel without major interruptions to traffic on the A10 ring road. Now, under the conditions of a DBDM agreement, operations and maintenance will be optimized for maximum availability of the new crossing, which will ease congestion and ensure free traffic flow during rush hour on this busy road.
The plan focuses on the point where currently the A2 National Highway divides the city in two, with the aims of improving traffic flow on the A2 and access to Maastricht – as well as promoting quality of life and road safety for local people, resolving bottlenecks, limiting air and noise pollution, and creating opportunities for urban development to revitalize the A2 corridor.

**OUR APPROACH**

Arcadis, as partner and Lead Designer for Avenue2 Joint Venture (consisting of Ballast-Nedam and Strukton, with other partners) developed a unique plan as part of a European Tender. Avenue2 was awarded the project in 2009. The plan includes:

- The “Green Carpet”, a recreational strip of 2000 trees, winding through the city from north to south
- The Parklaan, a tree-lined avenue above the dual-layered tunnel – the connecting element between the adjacent city-districts on the location that was once the A2 Highway
- A 2300m double-layer tunnel, one tunnel above the other, separating local traffic from through-traffic, improving the traffic flow in Maastricht and on the A2 highway
- Property development on the Parklaan, in keeping with the contemporary street scene
- Property development on the Europaplein and Geusselt junctions: offices and a residential tower block at each junction.

Arcadis was able to provide support on all aspects involved in the project including local know-how. This included landscaping, infrastructure design, MEP, Tunnel Safety, EIS and geotechnical and geo-hydrological expertise. This combined expertise enabled Avenue2 Joint Venture to develop and propose the unique concept of the plan.

**THE OUTCOMES FOR THE CLIENT**

As evaluated by the client during the tender, the plan offers the highest added value for the fixed amount of budget available. The developed plan will improve the traffic flow in Maastricht considerably, the air and noise conditions will meet European legislation and the urban development in the A2 corridor will enhance living conditions for future generations to come.
the 26km Hong Kong section of
Guangzhou-Shenzhen-Hong Kong
cross-boundary Express Rail Link
project that will provide high speed
rail services between Hong Kong
and Guangzhou and a connection to
the national high-speed passenger
rail network serving major mainland
cities of China. The works under the
contract comprises the construction
of a 2.35km twin bore single track
TBM tunnels of 8.15m internal
diameter with cross-passages at
250m intervals running between
Mai Po and Ngau Tam Mei and an
110mx36mx35m deep launching
shaft and ventilation building at Mai
Po area.

OUR APPROACH
Arcadis was the designer to the
contractor, responsible for design
of precast segmental lining of
the tunnels bored by TBMs, the
cross-passages and the diaphragm-
walled excavation for the launching
shaft. We were also responsible for
designing the face support pressure
to be adopted by the earth pressure
balance TBM and assessment
of effect of the tunnel boring on
existing building structures along the
tunnel alignment.

At tender stage, Arcadis achieved
cost savings by reducing the lining
thickness in comparison with the
reference design. The tunnels were
to be driven underneath an existing
footbridge. Through detailed 3D
numerical modelling, Arcadis were
able to justify eliminating signature
grouting works for protection of the
footbridge by adopting stringent face
pressure control instead.

THE OUTCOMES FOR THE CLIENT
• Through close collaboration with
the contractor’s construction
team, Arcadis delivered cost
effective engineering solutions to
facilitate the safe completion of
the tunnelling works within a tight
program.
• The tunnels will help to connect up
high-speed rail services between
Hong Kong and China’s major
mainland cities.

CASE STUDY
HELPING TO
CONNECT HONG
KONG AND
MAINLAND CHINA
VIA HIGH SPEED
RAIL

Project: MTR Express Rail
Link Contract 825 Mai Po to
Ngau Tam Mei tunnels, Hong
Kong, China

Date won/completed: 2009 – ongoing
Client: Penta-Ocean
Construction Company
Limited

OUR CLIENT’S CHALLENGE
The contract forms part of

the 26km Hong Kong section of
Guangzhou-Shenzhen-Hong Kong
cross-boundary Express Rail Link
project that will provide high speed
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We have people and offices around the world. Our global network enables us to bring our knowledge and experience of projects worldwide and apply that expertise to specific local needs and situations. We are based in:

- Australia
- Bahrain
- Belgium
- Brazil
- Brunei
- Canada
- Chile
- China
- Czech Republic
- Dubai
- France
- Germany
- Hong Kong
- India
- Indonesia
- Italy
- Jordan
- Kazakhstan
- Korea
- Macau
- Malaysia
- Mexico
- Mozambique
- Netherlands
- Oman
- Peru
- Philippines
- Poland
- Qatar
- Romania
- Russia
- Saudi Arabia
- Serbia
- Singapore
- Slovakia
- Spain
- Switzerland
- Taiwan
- Thailand
- Turkey
- United Arab Emirates
- United Kingdom
- United States
- Vietnam
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