Inspiring Bridge Solutions

www.ramboll.com/bridges

RAMBØLL

Bright ideas.
Sustainable change.

About Ramboll

Ramboll is a global architecture, engineering and consultancy company founded in Denmark in 1945. Our more than 18,000 experts create sustainable solutions across Buildings, Transport, Energy, Environment & Health, Water, Management Consulting and Architecture & Landscape.

Across the world, Ramboll combines local experience with a global knowledge base to create sustainable cities and societies. We combine insights with the power to drive positive change for our clients, in the form of ideas that can be realised and implemented. We call it: Bright ideas. Sustainable change.

www.ramboll.com

18,000 People
300 Offices
35 Countries

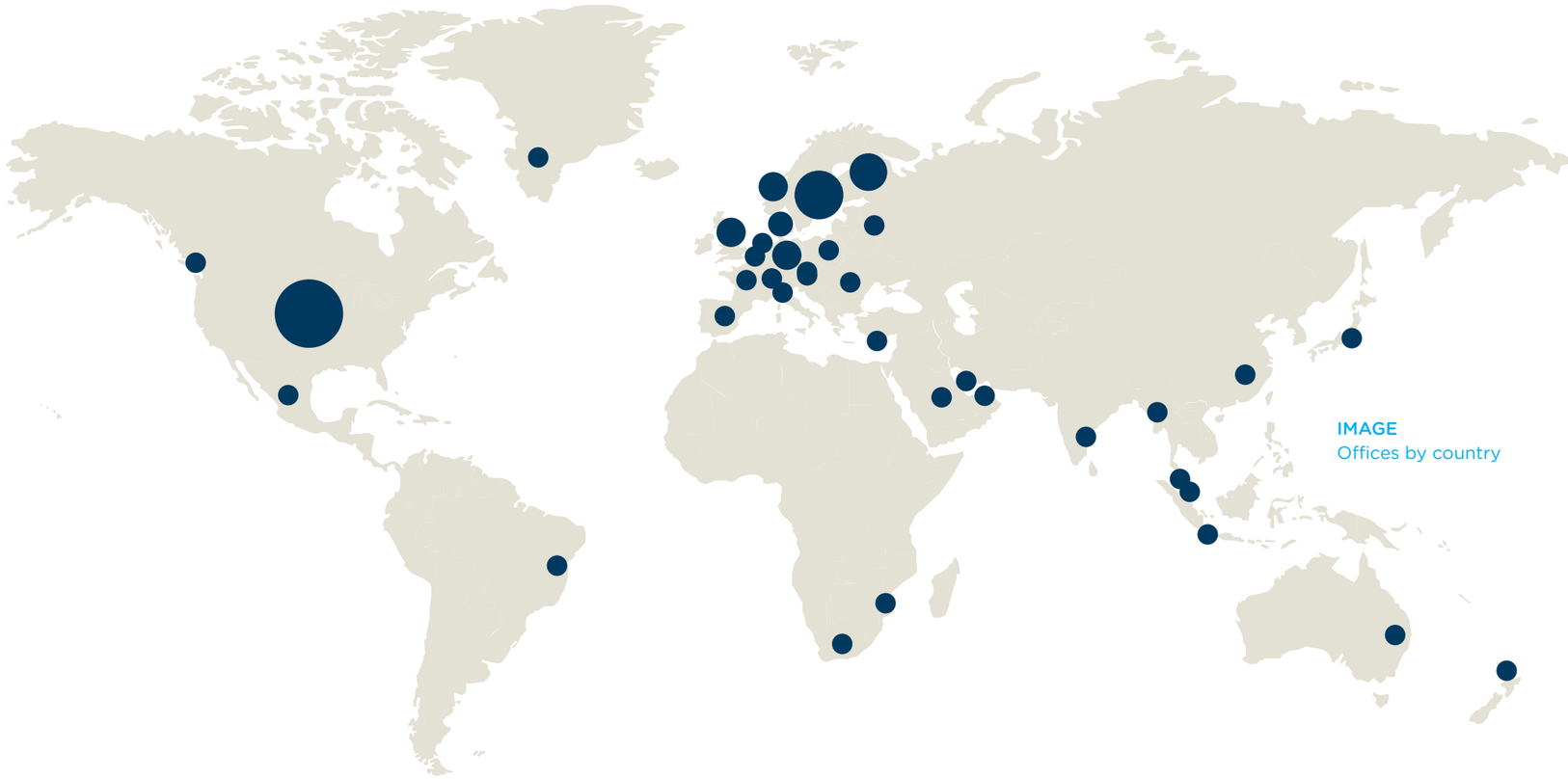


IMAGE
Offices by country

Buildings
Buildings form a fundamental part of our lives by shaping our communities and daily activities. For these reasons, Ramboll's design philosophy is to always make room for the human experience. As one of Europe's top 3 buildings designers with decades' of experience in the global market, we create visionary, sustainable, and award-winning buildings that improve life for users and enhance the surrounding landscape.

Read more at:
www.ramboll.com/building

Energy
Security of power supplies, climate change, energy efficiency and resource scarcity are top priorities on the global agenda.Ramboll is at the forefront of addressing these issues as the global market leader in offshore wind, waste-to-energy and district heating consulting and the leader in Scandinavia for large-scale thermal power consulting. We also have a specialist competence in designing power transmission masts and offshore wind met masts.

Read more at:
www.ramboll.com/energy
urbanisation, the extraction

Environment
Industrial development, of natural resources and extreme weather events all call for sustainable and responsible environmental solutions.As the leading environmental consultancy in Northern Europe and one of the top-20 globally, Ramboll's environment experts help customers across the mining, water, buildings, transport, energy, and oil & gas markets to address these issues. We take a comprehensive view of each project to optimise every step of the process and deliver solutions that are technically resilient, environmentally sustainable, and valuable to society.

Read more at:
www.ramboll.com/
environment-and-health

Water
Water is essential to life and one of our most precious resources. Working with municipalities, utilities, and industrial clients Ramboll draws on proven multidisciplinary expertise to manage the most challenging water resources, wastewater, and storm water issues. We integrate treatment process selection and engineering, operational services, and regulatory management and planning to deliver innovative solutions that benefit both industries and society.

Read more at:
www.ramboll.com/water

Planning & Urban Design
Ramboll's holistic approach to urban development encompasses strategy, planning, and world class technical design services and is based on an integrated multidisciplinary skills base. We have an extensive track record working with a number of the world's largest cities to create liveable, sustainable, and implementable urban development solutions that are fully adapted to the local context.

Read more at:www.ramboll.com/planning-and-urban-design

Management Consulting
National, regional and local authorities are responsible for issues that affect us all; from health care, education and day care to strategic planning of infrastructure and climate initiatives. Drawing on 500 management experts, Ramboll acts as a trusted partner to public administrations, creating the insights needed to make informed strategic decisions that promote stronger societies. With unprecedented levels of competition in the global economy, Ramboll focuses on empowering private sector customers with expertise and powerful management tools.

Read more at:
www.ramboll.com/
management-consulting

Transport
Mobility fuels economic and social development and with 50% of the world's population now living in urban areas, efficient and reliable transport systems are essential. To meet this need, Ramboll has been working on some of the world's largest, most innovative infrastructure projects and is the leading consultancy in the Nordic market. We create value for transport authorities, contractors and local authorities by providing multidisciplinary technical excellence and minimising resource usage.

Read more at:
www.ramboll.com/transport

Bridge Services
Ramboll's multi award winning bridge team is at the forefront of bridge design. Our experience spans small pedestrian bridges through to major crossings, with many of our designs becoming landmark structures. We provide all the design, engineering, environmental, sustainability, and project and cost management skills needed across the entire bridge lifecycle.

Bridges about us

Our team
We have more than 18,000 people in 300 offices across 35 countries

Other consultants
Other consultants include bridge operators and owners, contractors, developers, local authorities and government bodies.

We are renowned for our world class bridge portfolio. Our passion for design and clever engineering drives creative, efficient, safe and sustainable construction.

As a leading sustainable society consultant, we ensure our solutions successfully serve and connect societies, now and in the future.

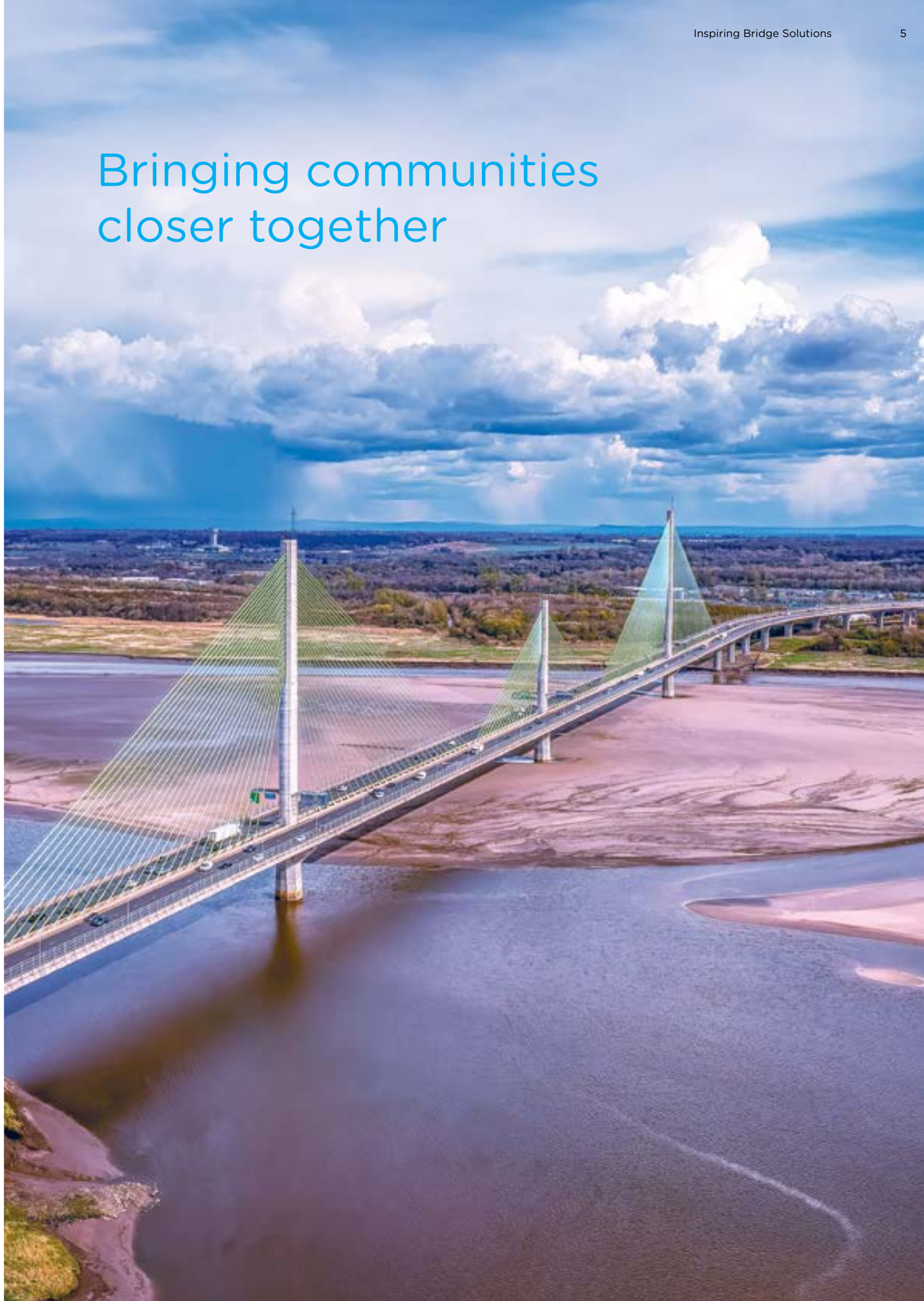
Our expertise and portfolio
We provide the full range of multidisciplinary design, engineering and consultancy needed for any bridge type. We deliver feasibility studies and concept design, foundation design, hydraulic analysis and construction management. We are essential partners, from project beginning to project end, and beyond.

Our impressive repertoire of bridge projects over the course of 60 years is a testament to our team's imagination and ambition to deliver inspiring structures that not only deliver functionally but also create a sense of place. Our portfolio ranges from major crossings to small pedestrian bridges, and from designing brand new bridges to strengthening those that already exist.

We have been involved in the three of the UK's most iconic estuary crossings; as part of a design joint venture for the Queensferry Crossing, lead technical consultant for the Mersey Gateway and independent checker for the New Wear Crossing.

Mersey gateway
The Mersey Gateway, a 6 lane cable-stayed toll bridge, is a visually stunning solution to strategic transport needs in the north west, acting as a powerful statement of region-al pride and ambition. Images: Mersey Gateway Crossings Board.

Bringing communities closer together



Our approach

Practical, efficient and creative designs

Essential components

The essential components of all our work involve three elements to deliver well-designed structures:

- Structural Integrity – delivering sound and well-designed structures
- Practical Design – ensuring all functionalneeds are met
- Elegance – producing aesthetically pleasing designs

Twin sails bridge
This visually stunning bridge inPoole Harbour resembles the sailsof a yacht when the two spansare lifted, providing a clear 19mchannel for boats to pass. Image:Dave Morris Photography.

Design excellence
The variety of our designsreveal our imaginative approach and robust process. Every bridge design is a meticulous response to the context: location, material and usage. Aesthetic demands, function and appearance come together in the final design.

While we are responsible for many iconic bridges around the world, we are equally proud of our simpler and smaller scale bridge designs.

Innovative culture
Our rich heritage in innovation has advanced best practice in bridge design throughout the industry. We designed the world's first tilting bridge, the Millennium Gateshead Bridge, and the dramatic and unique 'Twin Sails' bridge in Poole. We have pioneered the development of Design for Manufacture and Assembly paving the way for rapid and cost-effective high-quality construction. We have leading experts in concrete and steel technologies as well as in dynamic analysis and response suppression of cable supported structures. We apply this expertise to some of the world's most challenging bridge structures, such as the spectacular proposed Sulafjorden Bridge on the E39 in Norway.

Forming close relationships
We have strong ties with leading architects, planning authorities and statutory bodies, and we've proved we know what it takes to work successfully in integrated teams. You'll find us collaborative, communicative and completely engaged.

Sustainable outcomes
Ramboll is committed to creating solutions that deliver a sustainable future, enabling people and nature to flourish. We measure success not only by how well our clients are served, but also by how well bridge users and surrounding communities are served. We deliver progressive solutions that bring both commercial advantage and sustainable outcomes.

The decarbonisation gap - Scaling existing solutions to decarbonise our world for net zero

In the built environment, an essential step to decarbonization is minimising the amount of embodied carbon in new bridges and reducing the carbon emissions associated with maintaining them. By using sustainably sourced and recycled materials, increasing asset life spans, and optimising maintenance and design processes, we can dramatically reduce levels of embodied carbon.

The resilient societies gap - Enabling conditions for life to thrive

By actively planning and designing to overcome the challenges faced by the movement of urban and rural populations, we will be able to help transition our societies into resilient and liveable communities. By adopting a human-centred approach, based on evidence and insights, we can design our bridges to be natural, adaptive, caring, harmonious and generous. This includes the provision of seamless transportation systems & infrastructure, attractive green spaces, inclusive social spaces, and integrated management systems.

The circularity gap - Creating a new era of circularity and resource management

To ensure that current and future generations can live on a planet that has not been completely depleted of its resources, there is a need to fundamentally rethink how we produce, consume, process and re-use our resources. Taking a circular approach to the design and operation of our bridges will not only help address pollution, biodiversity loss, and resource scarcity, but also create new economic opportunities and benefits. By ramping up the market for recycled building materials and repurposing/extending the life of existing structures, we can reverse the unsustainable resource consumption associated with infrastructure development. Other ways to sustainably handle materials and resources include designing structures with end-of-life in mind.

The biodiversity gap - Integrating nature-positive solutions into our infrastructure

To halt the decline in nature and biodiversity and reverse the harmful consequences for humans and nature, there is a global need to restore and expand ecosystems. In doing so, we shift away from damage limitation and mitigation, and, instead, create a positive impact and 'net gain' that enhances biodiversity. Nature-based solutions, such as the development of bridges attuned to their location, are a cost-effective way of building resilience against extreme weather and creating attractive and inclusive green spaces. By actively integrating nature-based solutions and innovative technologies into how we plan, design, and build our infrastructure, we can leave nature in a better state than before.

Saving infrastructure - strengthening the Hammersmith Flyover

The ambitious and innovative phase 2 strengthening works, led by Ramboll, were completed in 2015 and saved 75,000 tonnes of carbon. The project extended the life of the Hammersmith Flyover by 70 years with no requirement for major maintenance work.

Hammersmith Flyover,
the first major segmental precast post-tensioned high-way structure in the UK, was strengthened by Ramboll, extenndig its life to 70 years without maintenance.

Learn more

#LetsCloseTheGap

Improving liveability through mobility

Mobility is key to liveability in the 21st century. The creation of new bridges and the safeguarding of existing ones is critical for the improved flow and freedom of vehicles, people and goods. They can act as catalysts for economic regeneration and improved quality of life. We understand the broader role bridges can play and are skilled in creating integrated, sustainable transport solutions that are sensitive to their settings.

Queensferry crossing

The Queensferry Crossing is one of the most striking engineering icons of the twenty-first century. It is the UK's tallest bridge and the world's longest three-tower, cable-stayed bridge. Linking Edinburgh with the county of Fife it sits alongside its illustrious neighbours, the Forth Bridge and Forth Road Bridge.

Our services

Integrated multidisciplinary design, engineering and consultancy

OUR SERVICES

- Planning
- Feasibility studies
- Outline proposals
- Preliminary design
- Detailed design
- Tender
- Construction engineering
- Operation and maintenance
- Repair
- Strengthening
- Demolition or replacement

Ramboll was the full-service consultant for the detailed Cirkelbroen moveable bridge in Copenhagen's inner harbour.

Through the Project lifecycle

Our team of bridge engineers and designers bring expertise in safety, design, construction and operation gained from more than 60 years working on international bridge projects.

Work ranges from concept design of new bridges through to design of repair and strengthening solutions for existing bridges, including design of temporary works for bridge maintenance and replacement.

With world class transport and infrastructure expertise spread across the globe, we combine local knowledge with international teamwork. Ramboll provides design, analysis, and project and cost management services, helping our clients imagine and realise sustainable solutions.

Understanding performance to minimise disruption

Bridges are critical pinch points in any transport network. Working closely with clients, we design major bridge works that can be carried out with minimal impact on trains or road traffic, easing disruption to bridge users, local communities and businesses.

With skills in assessing, strengthening and managing aging infrastructure, coupled with experience of specialist design and construction techniques, we design lasting solutions to critical transport needs.

Our services

A fresh approach to bridge safety
Assessment of bridge safety is a complex process. Sometimes, bridges with apparent problems can be shown to be safe. In contrast, bridges with hidden defects might be unsafe and yet may have historically been assessed as ‘adequate’.

To properly assess bridge safety we use a combination of advanced analytical techniques and thorough structural behaviour investigations. In recognition of this approach, Ramboll was awarded the Historic Bridges Award for not (sic) strengthening Winston Bridge.

Ramboll has increased the assessed capacity of well over 100 bridges, many from zero live-load to full assessment loading. Supporting Network Rail with the management of their bridge stock, we delivered many refurbishment, strengthening and renewal projects and have overseen the assessment of 2,000 bridges in the past 20 years.

We use innovative techniques to assess buckling, yielding and concrete behaviour, ensuring interventions are appropriate. Our development of advanced discrete element analysis of masonry arches earned Ramboll the Queen’s Award for Enterprise: Innovation. We assessed the influence of the construction of the Shard on the extensive masonry vaults below London Bridge Station. And we preserved the world’s first iron bridge using our innovative process that links laser surveys with analysis. We can also offer non-destructive testing techniques on road networks to assess stability and structural integrity.

Sustainable solutions to meet regional needs
We deliver designs for iconic new infrastructure, such as Gateshead Millennium Bridge and Twin Sails in Poole, as well as designs that re-use existing bridge infrastructure such as Bermondsey Dive Under and Northern Hub. These help to boost regional economic competitiveness by connecting communities with reliable and sustainable transport solutions.

Iron bridge
Ramboll conducted modelling, analysis and assessment of Iron Bridge, the world’s first iron bridge, together with a desk study of the development of structural defects.
Image: Roger Davies.

Champlain bridge
The New Champlain Bridge Corridor is one of the largest and most strategic corridor-wide projects in North America.
Image: Signature on the Saint Lawrence.

Major bridges

Today's major bridges are becoming ever more sophisticated. Ramboll has been closely involved in modern developments of major bridges which have seen cable-stayed structures grow from modest scale footbridges to much larger crossings, previously only the domain of suspension bridges.

Major bridge projects

01 Storebælt east bridge
As a leading expert in major bridge inspections, Ramboll carried out inspections and rehabilitation works on the Storebælt East Bridge, also known as the “Great Belt Bridge” in Denmark. Designed by Ramboll and built in 1998, the bridge has a main span of 1.6km and side spans of 535m giving an overall length between the two anchor blocks of 2.7km. The bridge is connected to 23 approach spans with the pylons

02 New champlain bridge corridor
As the Independent Engineer for the New Champlain Bridge Corridor, one of the largest and most strategic corridor-wide projects in North America, Ramboll’s role is to review the bridge designs, including the crown-jewel of the project, the New Champlain Bridge. The 3.4km crossing over the main channel of the St. Lawrence River includes a cable stay section over the St. Lawrence Seaway, and is a replacement for the decaying Champlain Bridge.

03 Mersey gateway
Mersey Gateway is a six lane cable-stayed toll bridge and the second largest estuary crossing under construction in the UK. It will reduce journey times for millions of people and attract massive inward investment and regeneration in the region. Supporting Mersey Gateway since 2001, Ramboll’s initial role as lead technical consultant helped secure funding approval. Then in 2014 our work continued as part of a technical advisory team, to support the Mersey Gateway Crossings Board with the technical and contractual administration of the project.

04 Pelješac Bridge
Pelješac Bridge is a 2,4 km extradosed bridge that forms the fixed link between north and south Croatia across the Mali Ston Bay over the Adriatic Sea. The 13 span extradosed bridge includes 5 main spans of 285m, providing 4 traffic lanes, in a region of high seismicity. Ramboll provided Independent Proof Check, on behalf of Hrvatske Ceste (Croatian Road Authority), for the detailed design and construction phases, ensuring that the design and construction was conducted in compliance with project requirements and international design standards. Construction involved heavy civil works for deep foundations based on piles up to 124 m in length. Superstructure erection involved handling of large orthotropic steel deck box segments using deck launching operations and balanced cantilever construction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05 Queensferry Crossing
This new UK cable-stayed road bridge linking Edinburgh with the county of Fife sits alongside its illustrious neighbours, the Forth Bridge and Forth Road Bridge and is the UK’s tallest bridge. We are proud to have led the Design Joint Venture on this Transport Scotland project. Ramboll has brought many innovations to the project, one example being a significant change to the design of the foundations which helped to de-risk the construction programme and deliver material cost savings. Image: Graeme Peacock, Courtesy of Transport Scotland.

06 Ile d’Orleans Bridge
The new 2km iconic bridge that will span the St Lawrence River, connecting the Ile d’Orleans with Quebec City in Quebec in Canada. The new bridge comprises a 430m main span cable stayed bridge with a further 17 approach spans. The superstructure comprises a 22m wide steel composite trapezoidal box girder deck providing a single carriageway for vehicles with segregated cycleways and walkways for pedestrians. The pylons are inclined outwards to reduce risk of ice falling from stays onto the carriageway below. The bridge is subject to extreme environmental loads including earthquakes, wind, and extreme snow and ice loads. Ramboll, in partnership with Stantec, were responsible for the concept and preliminary design, of the main bridge superstructure and geotechnical design and are appointed as Independent Engineer for the duration of the construction contract.

07 Storstrom Bridge
The new bridge replaces an outdated, existing connection across Storstrøm, linking Zealand and Falster in Denmark. The bridge will be Denmark’s third largest after the Oresund Bridge and the Great Belt Bridge, which Ramboll also helped deliver. The new Storstrøm Bridge is a 4km cable stayed bridge with 160m main spans and multiple 80m approach spans. The new bridge comprises a 27m wide post tensioned concrete box construction provides a replacement transport corridor for electrified double rail tracks accommodating speeds up to 200 km/h, a two-lane road plus pedestrian and bicycle paths.

08 Kruunuvuori Bridge
Ramboll were appointed as construction designer for this 1.2km long cable stayed bridge. The bridge will shorten the distance from the islands of Laajasalo to the centre of Helsinki, thereby making it easier to travel the distance by bike or even on foot. The completed Kruunuvuori Bridge will be special in many ways. It will be the only bridge in the world of this size that caters only for light rail, pedestrians, and cyclists. The bridge will be the longest and tallest in Finland, and the central pylon of the cable stayed bridge will be 135 metres tall and built on a rock at the point where the rock rises close to sea level. Ramboll completed detailed design and erection analysis and fabrication drawings using innovative computational design techniques, including fully automated FE modelling and BIM from a single point of truth database.

0ww Farris Bridge
E18 Bridge and motorway was the largest and most prestigious project in Norway. It replaced 6.4km motorway that no longer met the needs of up to 17,000 daily road users. The new four-lane motorway and bridge stretches alongside Farris reservoir - a source of drinking water for 200,000 inhabitants. In addition to designing the bridge Ramboll, in collaboration with L2 Architects, drew on the multidisciplinary team of experts in wastewater, environment, geology, geotechnics, landscape architecture, construction monitoring, zoning, ventilation, noise pollution and impact analysis to ensure successful delivery of the project and minimal environmental impact.


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Moving bridges

Moving bridges present many design and engineering challenges. As compact electromechanical structures with short spans that open to river traffic when required, moveable bridges are appropriate for locations where there is limited land available. Our team of experts have the engineering experience and knowledge to fully understand the challenges associated with moving structures.

Gateshead millennium bridge
Gateshead Millennium Bridge was the world's first tilting bridge. Our competition winning design, in collaboration with Wilkinson Eyre, provided an iconic structure over the River Tyne to celebrate a new era. Image: Ramboll.

Moving bridge projects

02 Gateshead millennium bridge

Gateshead Millennium Bridge is the world's first tilting bridge. Our competition winning design, in collaboration with Wilkinson Eyre, provided a new crossing over the River Tyne and an iconic structure for the new millennium. Using its inventive pivoted solution, the architecturally stunning structure overcame constraints with its geometric simplicity and was a catalyst for regeneration. The Royal Mint chose the bridge for a commemorative one pound coin, sitting alongside bridges designed by Telford and Brunel. Image: Ramboll.

01 Twin sails bridge

This visually stunning bridge in Poole Harbour resembles the sails of a yacht when the two spans are lifted, providing a clear 19m channel for boats to pass. The 'Twin Sails' Second Opening Bridge spans the navigation channel of the Backwater Channel. It comprises a 10.8m wide carriageway incorporating two vehicular lanes segregated from two cycle lanes, with two 2.5m wide footpaths that cantilever from the bridge. The 139m long bridge has five spans that lay flat when closed.

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03 Media city footbridge

This footbridge forms a part of the Salford Quays regeneration that links the Media City development with Trafford Wharf. Together with our partners we created a bridge that met the dual 20m headroom requirements for ships and achieved "landmark" designation. The design detail extended to every element of the bridge; from the cable-stay anchorages featuring cantilevered seating benches and the visually deceptive angle of the bridge edge soffit; to the discrete stainless steel gate 'pods' and precise selection of lighting. Image: Inside Out.

04 Pont y ddraig – rhyl harbour

The landmark Pont y Ddraig also known as the Rhyl Harbour Bridge is an important access point for the National Cycle Route 5 for all types of sustainable transport, tourism and leisure users. Pont y Ddraig is a twin bascule style opening bridge, allowing the passage of boats and yachts. Twin 32m glass and carbon fibre composite decks lift through a cable system located within a 50m high stainless steel mast resulting in a dramatic lifting sequence. Image: Ramboll.

05 Cirkelbroen – the circle bridge

Ramboll was the full-service consultant for the detailed Cirkelbroen moveable bridge in Copenhagen's inner harbour. The pedestrian and cycle bridge can open for larger boats sailing through and consists of five differently sized circular platforms, each with its own mast. The moveable part consists of three circles, with only the largest circle in the centre of the bridge resting on the seabed. When the bridge opens, the middle platform will rotate on its axis.

06 Cathedral green bridge

Designing the pedestrian and cycle swing bridge over the River Derwent in Derby gave our team the opportunity to extend bridge technology. The bridge has an iconic needle-shaped mast to echo the heritage of the nearby Silk Mill. A 38m main span and 18m kinked back span is supported by three pre-stressed cables. The bridge rotates on a central pivot bearing under the mast while the tail end bearing is continuously supported on a concealed track. Image: Lightworks Photography.

07 Swing Bridge Replacement – Bermud

The new bascule bridge will replace the existing swing bridge that has reached the end of its serviceable life and are beyond viable repair all will maintain the lifeline connection between the airport and the west of the islands. Ramboll carried out options study, feasibility study and completed detailed design of the bridge, taking due consideration of the isolation and remoteness of the Bermuda islands, together with the extreme environmental factors and exposed marine climate in the middle of the Atlantic Ocean. The replacement bridge is a 130m long, multi-spanned bascule bridge. With a main span of 30m and comprising a distinctive curved steel box, it will provide a clear navigation channel for shipping access to St George's harbour. The bridge has a curvaceous and flowing appearance; this curved aesthetic also serves to improve durability of the structures in such a harsh marine climate. The bridge will be finished in soft tones of pink to accentuate its form and to have synergy with the distinctive colour palette typical of buildings throughout Bermuda.

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Pedestrian Bridges

Pedestrian bridges have an inherent significance and symbolism as connectors and conduits, gateways and meeting places, landmarks and icons. We design safe and aesthetically pleasing crossings. Many become landmark structures in their own right, whilst others serve their purpose simply and honestly.

Jarrold bridge
The Jarrold Bridge is an award-winning double cantilever footbridge linking St James Place to the historic city centre of Norwich in the UK. Image: Jaap Oepkes.

Pedestrian bridge projects

01 Jarrold bridge
The award-winning Jarrold Bridge is a double cantilever footbridge. Spanning the river Wensum it improves pedestrian and cycle access to Norwich city centre and the railway station, whilst maintaining passage for river traffic. The primary design concept was for a bridge that traced a smooth uninterrupted arc over the water. The result is this unique bridge form that appears to float over the site with little visible means of support. Designed for fabrication offsite, the deck was craned into position, minimising disruption to the river banks and traffic. As well as providing engineering services, Ramboll undertook a full ecological programme to protect the local indigenous wildlife. Image: Jaap Oepkes.

02 Spinningfields footbridge
The Spinningfields footbridge provides a safe, car-free crossing linking the Manchester and Salford banks of the River Irwell. It was designed with particular attention to the needs of cyclists and disabled users, and is an exceptional piece of contemporary engineering. The bridge consists of an underslung cable catenary supporting a structural steel deck with lightweight aluminium decking. At the centre of the main span the deck is a generous 4.5m wide and includes an 8m long bench. Image: Jaap Oepkes.

03 Forthside pedestrian footbridge
Binding together two disparate places, the aprovides pedestrians with a link between Stirling's city centre and a new development area on the banks of the River Forth. It acts as a visual signal contrasting the modern with the old. The dramatic, visually 'light' design uses inverted trusses to support the deck from above. This asymmetrical arrangement creates an organic twisting form, spanning seven rail tracks, a service road and a car park. Ramboll provided the structural, lighting and mechanical design for the bridge.Image: Paul McMullin.


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04 Golden jubilee bridges
We designed the Golden Jubilee footbridges that sit aside the Hungerford Railway Bridge, providing safe walkways across the River Thames, linking the South Bank with Charing Cross and the West End. Each footbridge comprises a seven-span cable-stayed structure hung away from the railway bridge on tapered tubular steel pylons. At 4m in width the decks cater for the heavy pedestrian traffic across the river. The competition-winning design includes ship impact protection for the historic rail bridge caissons from Brunel's suspension bridge of 1845.

05 Cykelslangen
Copenhagen's new, elevated cycle lane known as 'Cykelslangen' connects the Vesterbro and Islands Brygge districts providing an alternative route for the cyclists using Bryggebroen as a gateway to the island of Amager. The bridge, previously a missing link for cyclists, is suspended 5m above pedestrian walkways and up to 7m above sea level. Constructed out of steel, the 190m long and 4m wide bridge has a 30m ramp creating a shortcut for cyclists crossing the Port of Copenhagen.

06 Akrobaten
We are proud to have designed the Akrobaten bridge, the 206m long pedestrian and cycle bridge in Norway, that runs across the tracks of Oslo Central Station connecting Bjørvika to the city centre. Cutting-edge in design, the bridge is made of steel and glass and has become a popular subject for photography and films. The backbone of the bridge is a triangle truss weighing 180 tonnes. The steel and concrete gangway is supported in the truss by 72 hangers.

07 Folke Bernadotte's bridge
A pedestrian bridge that connects Rosendahl and Museiparken (Sweden). The purpose of the bridge is to increase accessibility for visitors and at the same time be a beautiful structure that fits well into the surroundings. The footbridge is a stainless-steel structure that is 97 meters long and 3.5 meters wide. The project also won the City of Stockholm's competition Stockholm Building of the Year (2022).


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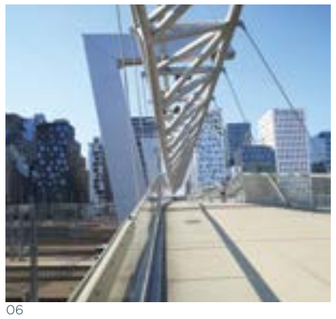
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Strengthening, refurbishment and management

Ramboll is an internationally recognised expert in assessing and strengthening aging infrastructure. Our renowned non-standard design and assessment approaches have facilitated challenging strengthening projects instead of conventional replacement of structures, saving our clients millions of pounds.

We provide world class expertise in areas such as post-tensioning, the realistic assessment of structures, failure modes effect and criticality analysis, finite/discrete-element method, engineering simulation and 3D computational design. This means we can safely maximise the capacity of existing structures.

Hammersmith flyover
As part of our work on the TfL Structures and Tunnels Investment Portfolio (STIP), our innovative strengthening solutions have extended the life of the Hammersmith Flyover by installing the first ever full new pre-stressing system where it was not possible to remove the original without significantly disrupting the traffic on this critical route. Image: Daniel Shearing.

Saving bridge projects

01 Post-tensioned concrete bridges

Over 40 years Ramboll has carried out more than 120 special investigations of post-tensioned concrete bridges. Our design of the new post-tensioning system for Versova Creek Bridge in Mumbai and Hammersmith Flyover in London are the latest major strengthening projects in a portfolio that includes the Braidley Road Bridge tendon replacement, and the M8 Kingston Bridge strengthening (illustrated) with the largest diameter post-tensioning cables ever used in an existing bridge at the time. We tailor solutions to address specific challenges and constraints with 'progressive strengthening' that ensures the integrity and safety of a structure is improved at each successive stage of the works. Image: Ramboll.

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02 Historic metal bridges

We have assessed and strengthened more than 40 historic metal bridges in the UK, gaining a thorough understanding of their behaviour. Intelligent and sensitive blending of historic and modern standards, and techniques, has allowed us to develop solutions that are sympathetic to the fabric and appearance of these structures. Our award winning approach to refurbishing the complicated structure of Coalport Bridge (illustrated) resulted from months of complex analysis. Our calibrated 3D model identified strengthening works needed. Image: Daniel Shearing.

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03 Global highways infrastructure

Globally there is an increasing sense of urgency regarding the management and care of aging infrastructure: optimising safety, improving reliability and reducing lifetime costs. Our projects have enabled increased capacity, transportation sustainability and regional economic competitiveness. Examples include the widening of UK motorway bridges on the M1 and M9, developing standards for the management of 11,000 post-tensioned concrete bridges in Japan for NEXCO (illustrated), and strengthening design and investigation of the Varsova Bridge in India. Image: Polfoto.

04 Cost saving from novel approaches

Using advanced analysis we have assessed as 'adequate' many half through girder bridges, saving unnecessary strengthening or replacement. On the DLR 3-car enhancement (illustrated) we substantially reduced the scope of fatigue strengthening works by monitoring actual stresses. Image: Daniel Shearing.

05 Masonry arch bridges

We developed advanced discrete element analysis of masonry arches (illustrated) which led to 350 'ARCHTEC' strengthening projects from 1998 to 2016 and won a Queen's Award for Enterprise: Innovation. Discrete element analysis enables much more rigorous assessment of the real behaviour of masonry structures, justifying increased strengths and facilitating more novel and efficient strengthening solutions. In 2007 we created a structural model with 13,500,000 degrees of freedom to assess the impact of the construction of the Shard on the extensive masonry vaults below. Image: Ramboll.

06 PT rail bridges

We have supported Network Rail in managing their bridge stock for over 20 years, assessing thousands of bridges, developing standards and guidance, and delivering numerous refurbishment, strengthening and renewal projects. For Northern Hub we are assessing the capacity of masonry arch viaducts and other bridges, designing strengthening where required. At the Bermondsey Dive Under (illustrated), a key junction, developed designs for new viaducts using the existing foundations, reflecting the form of the remaining structures, while optimising the use of precast offsite manufacture. Image: Skanska.

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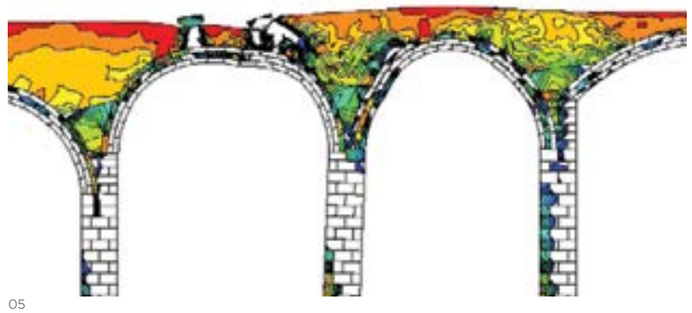

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06

Regenerating Urban Landscapes

Cykelslangen bridge
Copenhagen's new, elevated cycle lane known as 'Cykelslangen' connects the Vesterbro and Islands Brygge districts providing an alternative route for cyclists using Bryggebroen as a gateway to the island of Amager. Image: dissing+weitling.

Major Bridge projects

Queensferry Crossing

Length	2700 m (8,858 ft)
Main Span	650 m (2,132 ft)
Width	40 metres (130 ft)
Bridge Type	Cable-Stayed Bridge road traffic
Height	210 m (689 ft)
Country	United Kingdom
Period of service	2011-2018
Year of completion	2017

Client FCBC Forth Crossing Bridge Contractors (consortium of Hochtief, Dragados, American Bridge Morrison Construction)

Services
led the Design Joint Venture (DJV)

Tender Design

Detailed Design

Construction Supervision
Bridge engineering,
ground engineering,
highway engineering,
environmental monitoring and appraisal, MEP, ITS, transport planning, traffic engineering, traffic safety

New champlain bridge corridor

Length	3400 m (11,155 ft)
Main Span	240 m (790 ft)
Width	60 m (196 ft)
Bridge Type	Cable-Stayed Bridge road and rail traffic
Height	170 m (558 ft)
Country	Canada
Period of service	2014-2018
Year of completion	2019
Client	Infrastructure Canada

Services
Bridge engineering, construction, contract management, Tender Design
"Independent Engineer
Site supervision, inspection and testing"

Ile d'Orleans

Length	2050 m (6,725 ft)
Main Span	430 m (1,410 ft)
Width	22 m (72 ft)
Bridge Type	Cable-Stayed Bridge road traffic
Height	121 m (397 ft)
Country	Canada
Period of service	2020-Ongoing
Year of completion	Ongoing

Client Ministry of Transport Quebec

Services
Concept and preliminary design Bridge engineering, seismic engineering, wind engineering, geotechnical engineering.
"Independent Engineer
Site supervision, inspection and testing"

Peljesac Bridge

Length	2404 m (7,887 ft)
Main Span	285 m (935 ft)
Width	22.5 m (74 ft)
Bridge Type	Extradosed Bridge road traffic
Height	98 m (322 ft)
Country	Croatia
Period of service	2018-2022
Year of completion	2022
Client	"Hrvatske Ceste Croatia Roads

Services
Detail design Independent Proof Check: Bridge engineering within area of the concrete, composite and steel structures, foundation engineering

New Storström bridge

Length	3 840 m (12 598 ft)
Main Span	160 m (525 ft)
Width	24 m (79 ft)
Bridge Type	Cable-Stayed Bridge road, rail, pedestrian and cyclist traffic
Height	100 m
Country	Denmark
Period of service	2020-2022
Year of completion	Ongoing
Client	Danish Road Directorate / Storström Bridge Joint Venture

Services
Ramboll was the main structural designer of the New Storstrøm Bridge, with responsibility for 45 out of 47 spans and piers, including the two 160m navigational spans with pylon and stay cables. Ramboll was also responsible for the gotechnical design of 31 out of 44 underwater pad foundations.

Crown bridge

Length	1200 m (3937 ft)
Main Span	260 m (853 ft)
Width	18 m (59 ft)
Bridge Type	Cable-Stayed Bridge light rail, pedestrian and cyclist traffic
Height	135 m
Country	Finland
Period of service	2021 – 2022
Year of completion	2023 – 2026 Ongoing
Client	Kreate and YIT Joint Venture

Services
In detail Ramboll delivers for the contractor the detailed design of the main spans and stay cables, erection desing of the deck, complete steel workshop model and workshop drawings, design of inspection gantry support structure, the design of temporary piers, main designer services, and various smaller tasks throughout the construction.

Moving bridges

Twin sails bridge

Length	139 metres (456 ft)
Main Span	23.4 metres (77 ft)
Width	10,8 m (35 ft)
Bridge Type	Bascule bridge
Country	United Kingdom
Period of service	2003-2012
Year of completion	2012
Client	Borough of Poole

Services
Competition concept design
Scheme Design through planning process
Environmental Impact Assessment
Stakeholder engagement consultation and Client support through Pubic Inquiry
Planning approvals including Transport and Works Act

Awards
2012 ISE Highway or Railway Bridge Structure Award – Commendation
2013 ICE SW Major Projects Highly Commended
2013 RICS SW Infrastructure Winner
2013 SSDA – Winner
2014 Civic Trust Awards – Winner
2014 RIBA SW Awards – Winner
2014 RIBA National Awards - Winner

Gateshead millennium bridge

Length	126 m (413 ft)
Main Span	105 m (344 ft)
Width	8 m (26 ft)
Bridge Type	Tilt Bridge Cyclists, Pedestrians
Country	United Kingdom
Period of service	1997-2000
Year of completion	2001
Client	Gateshead Metropolitan Borough Council

Services
Conceptual and detailed structural design
Co-ordination of hydraulic, mechanical and electrical works
Commissioning of aerodynamic investigation
Design co-ordination of structural glass
Preparation of works information.
On-site supervision and contract management (ECC target contract)

Awards
2002 RIBA Stirling Prize - Structural Excellence
2003 Supreme Award - Structural Excellence

Media city footbridge

Length	83 metres (272 ft)
Main Span	65 metres (213 ft)
Width	6–19 metres (20–62 ft)
Bridge Type	Cable-stay swing bridge, Pedestrians
Country	United Kingdom
Period of service	2008-2012
Year of completion	2011
Client	Peel Media Ltd

Services
Concept design and planning approvals.
Environmental assessment and stakeholder consultation.
Detailed design of opening (swing) bridge including sub-structure pile and caisson design; M&E opening mechanism; lighting; electrical and architectural quality finishes.
Site design support including geometric control and stay stressing.

Pont y Ddraig – rhyl harbour

Length	68 m (223 ft)
Main Span	32 m (105 ft)
Width	4.3 - 2x3.4 m (14 - 2x11 ft)
Bridge Type	Twin bascule style opening bridge, Cyclists, Pedestrians
Country	United Kingdom
Period of service	2009-2013
Year of completion	2013
Client	Denbighshire County Council

Services
conceptual and arcitectural design of the structure including liaison with third parties and preparation of documentation for planning consents
marine license
flood risk assessment and Highways Act Section 106 Agreement.
Working closely with the contractor to develop a design to match the proposed construction sequence and took advantage of the contractors experience to develop safer and more cost effective forms of construction

Cirkelbroen – the circle bridge

Length	35 m (115 ft)
Main Span	25 m (82 ft)
Width	9 - 13 m (30 - 43 ft)
Bridge Type	Swing bridge with a swing span
Country	Denmark
Period of service	2009-2015
Year of completion	2015
Client	Nordea-fonden

Services
full-service consultant on the detailed project

Cathedral Green bridge

Length	59 m (194 ft)
Main Span	39 m (128 ft)
Width	4 m (13 ft)
Bridge Type	Cable-stayed swing bridge, Cyclists, Pedestrians
Country	United Kingdom
Period of service	2007
Year of completion	2009
Client	Derby City Council

Services
Bridge engineering, geotechnical, environmental impact assessment, water resources, environmental planning, water management, ground engineering"

Pedestrian bridge projects

Jarrold bridge

Length	80 m (262 ft)
Main Span	41 m (135 ft)
Width	3.6 m (12ft)
Bridge Type	Curved double cantilever footbridge
Country	United Kingdom
Period of service	2010-2012
Year of completion	2012
Client	Jarrold & Sons Ltd, St James Ltd

Services
Bridge engineering, geotechnical, ground engineering, environmental impact assessmentct

Awards
"ICE East of England Awards 2012 – Exceptional Merit for 'Technical Excellence and Innovation'.
The Structural Steel Design Awards 2012 – commendation for the high standard of design achieved.
British Construction Industry Awards 2012 – short-listed in the Civil Engineering Project.
Civic Trust Award 2013 – these prestigious awards honour projects that make an outstanding contribution to the quality of the built environment.
Norwich Society Design Award 2013 – in the Civic category.
EDP Business Award 2013 – for Design and Development.
Footbridge Awards 2014 – winner medium span"

Forthside pedestrian footbridge

Length	113 m (371 ft)
Main Span	88 m (289 ft)
Width	5.5 m (18 ft)
Bridge Type	Inverted fink truss footbridge
Country	United Kingdom
Period of service	2005-2008
Year of completion	2009
Client	Stirling Council

Services
Concept design at competition stage plus detailed design of bridge, car park extension, M&E and pile design, Network Rail Approvals – Form A and Form B procedures, geometric control for construction and stay stressing sequence, site design support

Awards
2010 The Saltire Society Awards for Civil Engineering 2010; Commendation
2010 IStructE Structural Awards, Pedestrian Bridges category; commendation

Golden Jubilee bridges

Length	2 x 310m (2 x 1,017 ft)
Main Span	64.7 m (212 ft)
Width	4.7 m (16 ft
Bridge Type	2 No. cable stayed footbridge
Country	United Kingdom
Period of service	1999-2003
Year of completion	2003
Client	Westminster City Council

Services
Tender design for contractor.
Design review during post-tender negotiations.
Detailed design of substructures and foundations.
Design adoption, construction stage design and detailing of superstructure.
Independent design checking of temporary works.
Design adoption and detailing of stairs, lifts and finishes.

Awards
Civic Trust Award 2004
IStructE Award 2004 - Structural Achievement - Commendation
Royal Fine Art Commission Trust 2003 - Building of the Year and Specialist Winner

Cykelslangen

Length	190m (623 ft)
Main Span	17 m (55.8)
Width	4 m (13 ft)
Bridge Type	Cycle bridge
Country	Denmark
Period of service	2010-2013
Year of completion	2014
Client	Dissing + Weitling Arkitektfirma A/S

Services
Preliminary and detailed design including tender documents.

Akrobaten

Length	206m (676 ft)
Main Span	67 m (219ft)
Width	Up to 6m (19.7 ft)
Bridge Type	Truss with suspended walkway
Country	Sweden
Period of service	2007-2009
Year of completion	2009
Client	Bjørvika Infrastruktur AS

Services
Bridge, glass (Rambøll DK), wastewater, road heating, geo-technical engineering and government permits.

www.ramboll.com

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Sustainable change.