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Buildings

10 Million M²
Area of building Ramboll designs for 10,000 projects annually

We are engineers, scientists and consultants who believe in the power of design to create a better future.

Our design philosophy is to always make room for the human experience. Ultimately, we measure our success by how well people and communities are served by what we have done.

At its best, good design can regenerate communities, protect natural environments, and connect people across vast distances; it can provide new energy solutions and create buildings that people are happy to be in. Good design is also robust and long-lasting.

We share this design approach with the world’s leading architects and developers - with whom we regularly collaborate, often as a preferred partner.

01. National Graphene Institute, UK
The new state-of-the-art cleanroom and laboratory building for the University of Manchester. The National Graphene Institute was awarded Major Buildings Project of the Year (over £50m) for 2015 and the BIM Application Award for 2015. Image: Daniel Shearing.

02. Panum University, Denmark
The 42,000 m² landmark extension to Copenhagen University’s Panum complex will serve as a modern, vibrant, and flexible centre for science and education accommodating world-leading specialists in cancer, ageing, and lifestyle-related diseases. Ramboll is providing all engineering services. Image: C. F. Møller Arkitekter and SLA Urbanity

03. Tate Modern, UK
This landmark extension will increase Tate Modern’s display area by 60% to cater for the increasing number of visitors. Ramboll developed the engineering design to accommodate the building’s structural specifications and realise the architect’s visions. Image: Daniel Shearing.

Our Clients
In Buildings, our goal is to create client partnerships on every project we undertake.

Our clients want innovative design solutions, and we strive to put the best of ourselves into every single project. This requires specialised competencies and unique skill sets. We foster these by facilitating multiple strong professional environments.

How We Work
We take a fully integrated multidisciplinary approach to our work. Specialised teams are assembled from across the entire Ramboll group on a project-by-project basis.

We have a genuine passion for engineering, and we apply the same rigour and enthusiasm to every project no matter the size.
Ramboll is a leading engineering, design and consultancy company employing 13,000 experts. Our presence is global with a strong representation in the Nordics, UK, North America, Middle East and Asia-Pacific. We constantly strive to achieve inspiring and exacting solutions that make a genuine difference to our customers, end-users and society as a whole.

www.ramboll.com
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

OIL & GAS
To make it in today’s fast paced and competitive oil and gas market, companies depend on advanced technical solutions that combine economic efficiency with stringent health, safety and environmental (HSE) safeguards during the production and distribution processes.

These elements form an integral part of Ramboll’s independent and multidisciplinary consultancy service, which covers the entire project cycle. We excel in onshore consultancy and have designed offshore structures for industry giants such as Maersk Oil, DONG Energy and Statoil since the 1970s. Read more at: www.ramboll.com/oil-gas

A UNIQUE COMBINATION
A powerful end-to-end consultancy service combining a suite of advanced digital design tools with industry leading offsite construction. Together they revolutionise the way we design, plan and build. They allow us to model and analyse multiple design options faster and earlier, solving real life engineering and construction challenges for our clients.

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

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
Our Values

Our vision is to create inspirational, long-standing solutions that allow people and nature to flourish.

Ramboll is a company with a wider sense of purpose. Our staff live our values in every aspect of their work and they form a central part of our performance reviews, and training. We aim to make a positive impact in the communities where we work by contributing our knowledge and resources to relevant initiatives and charities.

Ramboll and its engineers are involved in a number of projects around the world designed to help communities in need — often focused on post-conflict reconstruction and disaster relief. In addition, our engineers regularly take part in charitable fundraising events and volunteer projects.

Each year, the Ramboll Foundation grants financial support for:

Research, studies and education;
Current and former employees and their families in difficult situations;
Humanitarian aid.

Over the past five years, the Ramboll Foundation has donated an average of $525,000 a year. In 2014, the donations amounted to $1,030,000. Every member of UK staff is allocated one day a year for a corporate social responsibility project of their choice (CSR Day). We often use our CSR days together to build team spirit. Some of the CSR days used in 2015 are illustrated on this page.

“We being decent and proper does not only concern whether your tie is in place when doing business. It is about treating other people and society right in a long-time perspective”

Our Values
- B.J. Rambøll

01 School Engineering CSR Day, UK
Barry Williams and Dev Rajan used their CSR days to teach kids about engineering and build a bridge that they could walk on!

02 Tacloban, Philippines
Ramboll graduate engineers, Alice Bond and Philippe Ayache, headed to the Philippines in October 2015 to help the Streetlight project rebuild community facilities that were destroyed during Typhoon Haiyan.

03 Nepal Relief Project, Nepal
Four of our structural experts were deployed across Nepal to assess the damage at nine hospitals hit by the twin earthquakes of April and May 2015.

04 ATD Fourth World Charity, Peru
Linnea Engemann and Nishma Agarwal worked with ATD Fourth World Charity in 2015 to design and construct a new community centre in Peru, which will provide an education base to children from 50-60 families.

05 Gambia Community Projects, Gambia
During a trip to The Gambia, Jackie Heath spent her CSR day leading an expedition of 34 teenaged Scouts to undertake community projects, including repainting the town mosque.

06 Charity Duck Race, Chester
Our Chester office were involved in a local charity duck race which raised money for the Baby Grow Appeal hoping to build a Neonatal Unit in the countess of Chester Hospital.

07 Marine Conservation Society Event
In September 2015, Russ Butcher, Tom Hough, Caroline Lai, Andy Neillings, Josie Ratter-Evison and Richard Smith used their csr days to participate in a marine conservation society beachwatch clean event.
“We do more than carry through an engineering process, we are engaged with the architect’s ideas to meet the client’s brief.”

Collaboration with architects
- Martin Burden, Arts & Culture Lead

Many of our projects have had a significant public dimension, often contributing to successful regeneration strategies. Whatever the vision for a development may be, we are skilled at delivering value for our clients, end users and the wider community.

We understand how crucial it is to foster effective collaboration with others in the design team, to achieve overall project ambitions.

Our contribution is deeper than just providing a simple engineering process to underpin a design. We grasp the unique opportunities and constraints involved in arts and culture schemes, and are widely recognised for unlocking project value with inventive solutions that serve the overall vision.

Often conceived as artworks in themselves, arts buildings are frequently expressed as unusual geometric forms, posing a unique challenge to the structural engineering design. At the same time, other design drivers must be met, including appropriate servicing, meeting strict loading and vibration criteria, sustainability issues, and delivering ultra-flexible performance and public space.

We take a holistic approach to resolving these complex challenges, and we excel at designing integrated solutions that ensure the whole adds up to more than the sum of the parts.

ARTS & CULTURE

our engineers deliver the buildings, spaces and conditions to satisfy clients and users alike. At a time of straightened budgets, we deliver exceptional value.

01 Tate Modern, London
Inside the new extension to the Tate Modern Museum - Image: Daniel Shearing
PROVIDING A SEAMLESS EXPERIENCE FOR THE END USER
Ramboll prides itself on working on some of the most innovative museum projects of modern day. From the British Museum and World Conservation Centre to the worldclass and iconic addition to London’s skyline, The Tate Modern extension. We understand the responsibility that our clients hold when committing to major capital expenditure and we bring all of our skills to bear to help identify and manage both cost and risk whilst still designing iconic structures.

More than just a structural engineering consultant, Ramboll in the UK are a partner for our museum clients, providing hands on senior leadership to all of our projects and with the ability to mobilise the expertise of 13,000 engineers and specialists within the wider Ramboll Group.

The way museums operate has changed dramatically over the last 20 years and will continue to evolve, balancing conservation of artefacts and exhibits with increasingly dramatic displays that capture the imagination of visitors. Imparting knowledge and learning to current and future generations, museums are now also places of entertainment and public gathering - becoming cultural destinations that provide the backdrop to the cities and locations they inhabit.

Modern museums embrace advances in technology and the way people experience their content demands a flexible approach to structural engineering. First and foremost Ramboll engage, collaborate and understand our clients and their stakeholders - empathy is one of our core values.

We do more than carry through an engineering process, we are engaged with the architect’s ideas to meet the client’s brief.”

Collaboration with architects
- Martin Burden, Arts & Culture Lead

From the British Museum World Conservation Centre to the iconic Tate Modern Switch House, the Mary Rose Museum to the Hepworth Gallery, Ramboll’s engineers are behind many of the UK’s most celebrated museum projects.

“Tate Modern, London
We engineered this geometrically complex structure, designed to link well with the original Tate Modern, providing a seamless experience for the end-user - Image: Daniel Shearing

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EXHIBITION SPACES

Whether driven by celebration or necessity, temporary structures are increasingly used to transform and inspire

As major cultural events grow in scale and spectacle, exhibitions and creative installations need to add real impact, creating a sense of drama for the occasion.

We enjoy working at different scales and bring to the table the experience of designing large flexible museum spaces as well as providing engineering input into the exhibitions and installations themselves. We have a passion for designing innovative and unusual temporary creative exhibits from Athens Olympic opening ceremony to Turbine Hall installations at Tate Modern.

Such smaller bespoke projects often require more detailed design and imaginative input, a hands-on crafted approach is needed. Balancing the inventive with the pragmatic, our strong record for temporary installations and exhibition design, pushes the boundaries of what materials can achieve.

As engineers, we work closely with a diverse range of collaborators to help them realise their ambitions - curators, artists, sculptors, stage and show designers to name just a few. We enjoy contributing to the local community, which drives a number of our projects and feel great pride when we see the public enjoy interacting with the installations.

Creative installations and exhibition design give us the chance to explore ground-breaking concepts, express creativity and challenge the rules of convention. These projects frequently test our research and inform future ideas.

We enjoy the creative process and relish the opportunity to realise aspirations.

01 KREOD, London
Image. Jaap Oepkes

02 Nissan Halo 2014 Expo
Image. Kathryn Rapier
Our passion and expertise has contributed significantly to the successful conservation, protection and adaptation of internationally important structures and landscapes. Working closely with stakeholders such as Historic England, Society for Protection of Ancient Buildings and the Victorian Society we are able to conserve the past while ensuring a regenerated future.

Our lead engineering team includes experts who are conservation accredited (CARE), IHBC registered and active in recognised national and international heritage bodies such as ICOMOS and the Association for Studies in the Conservation of Historic buildings.

Ramboll’s heritage specialists are a unique multi-disciplinary team of engineers, archaeologists and materials analysts who provide all the services that enable the successful protection and regeneration of historic environments.

Leaders in their field, our specialists work alongside bodies such as Historic England to advance the principles of conservation best practice that are essential for the successful repair, alteration and adaptation of historic buildings and infrastructure. Our conservation experts tackle projects holistically, often integrating expertise from various other in-house specialists such as advanced geomatics and computational modelling.

Working with historic buildings and environments requires detailed knowledge and a sensitive approach. Understanding the value of the fabric of historic assets is a fundamental requirement for engineers dedicated to this field. Ramboll places huge value on the integrity upon which those who care for heritage structures and places depend.

"Gone are the days when listed buildings were put in a glass case. Our heritage must be accessible. People have to smell and touch it to understand and connect."

Ramboll has more conservation accredited engineers (CARES) than any other practice.

LEADING HERITAGE ENGINEERS

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Tate Modern, London

Officially opened on the 17th June 2016, the new Tate Modern extension is an iconic world-class addition to London’s skyline. This groundbreaking Tate Modern extension pushes the boundaries of modern design and engineering. From its one-of-a-kind geometric structure to its striking brick façade, every aspect of the building has been planned and engineered with staggering accuracy.

OUR PORTFOLIO
FEATURE PROJECT

TATE MODERN

We engineered this geometrically complex structure, designed to link well with the original Tate Modern, providing a seamless experience for the end-user.

About the project

Officially opened on the 17th June 2016 the new Tate Modern extension is an iconic world-class addition to London’s skyline. The groundbreaking Tate Modern extension pushes the boundaries of modern design and engineering. From its one-of-a-kind geometric structure to its striking brick façade, every facet of this building has been planned and engineered with staggering accuracy.

Tate Modern is the world’s most visited museum of modern art. The extension has enabled an increased display space of 60%, which is hugely welcome as visitor numbers since its opening in 2000 exceeded all expectations, averaging five million annually.

Appointed by the Trustees of Tate, Ramboll’s role in the Tate Modern extension began in 2008. Our work included structural, geotechnical, civil, and façade engineering and environmental consultancy.

The Tate Modern extension has been built on top of its three awe-inspiring disused oil tanks. Positioned in a clover leaf shape, each one spans approximately 30m and are located 9m below ground. Two of the three oil tanks create new unique gallery spaces for large-scale artists’ installations, performances and film. Additionally the re-building of part of the existing Switch House and relocation of its switchgear has also freed up three 18m span floors of gallery space.

Tate Modern is an excellent example of our ability to work around existing constraints, including UKPI mains, sub-stations, below ground oil tanks to prepare a complex drainage scheme involving a hybrid of SuDS which minimised the requirement for existing utility diversions creating significant savings to the project. The drainage strategy included a bespoke slot drainage channel system to protect the buildings unique façade.

Ramboll infrastructure team led the landscape design of all external roads surrounding the site including intensive consultation with Southwark to achieve Section 278 agreements.

PROJECT DETAILS

Customer
The Trustees of the Tate Gallery

Architect
Herzog & De Meuron

Location
Bankside, London

Value
£260m

Project Countries
United Kingdom

Period
2008 to 2016

Services Provided
Structural engineering, bridge engineering, façades, infrastructure, geotechnical, transport, soil/groundwater
FEATURE PROJECT
MARY ROSE MUSEUM

An imaginative and highly technical museum building for the display of the Tudor warship, Mary Rose, raised from the sea bed in 1982

About the project
Famously raised from the sea bed before a worldwide television audience of 60 million in 1982, the Tudor warship Mary Rose has undergone an heroic conservation process in a temporary museum in Portsmouth Historic Dockyard. With the help of a £21m Heritage Lottery Fund grant, a purpose-built museum is was constructed in a Dockyard dry dock, itself a scheduled ancient monument.

Our engineers worked on the detailed design of the M&E aspects of the hull’s conservation, and our ongoing involvement includes structural, building services and civil engineering for the new museum.

The Mary Rose is the only sixteenth century warship on display anywhere in the world. Her construction was ordered by Henry VIII and she sank in the Solent in 1545. In the temporary museum, it was only possible to display 6% of the 19,000-odd artefacts found with the hull.

The new museum, which is elliptical in plan, with the hull at the centre, has artefact galleries running the length of the ship. A ‘virtual’ hull — a mirror image of the real one — provides a viewing platform for the conserved section and artefact display spaces.

PROJECT DETAILS

Customer
The Mary Rose Trust

Architect
Wilkinson Eyre

Location
Portsmouth

Value
£35m

Project Countries
United Kingdom

Period
2009 to 2016

Services Provided
Structural, building services, civil and geo-environmental engineering, archaeological and heritage services, environmental, flooding and transport input into the planning process and building regulation consents
The Whitworth Gallery
Through its impressive £15m reinvention, The Whitworth Art Gallery has cemented its place at the centre of the cultural national stage - winning the prestigious 2015 ArtFund Museum of the Year Award and reaching the finals of the RIBA Stirling Prize Award 2015.

“Winning the prestigious 2015 ArtFund Museum of the Year Award and reaching the finals of the RIBA Prize Award 2015.”

As part of the University of Manchester, the Grade II listed Whitworth Art Gallery reopened its doors on 14 February 2015 following a £15 million major refurbishment and extension, designed by architects MUMA. Prior to the most recent renovations, the gallery had been designed for 100,000 visitors annually but visitor numbers had nearly doubled reaching 190,000, making some parts of the gallery unpleasantly congested.

Suspended ceilings covering vaults and roof lights made for large dark galleries, the blank gable ends were attracting graffiti and storage problems had become acute making the refurbishment and extension vital to the future success of the gallery.

“Extension vital to the future success of the gallery.”

Ramboll carried out full structural and civil engineering services for the Whitworth renovation that included refurbishment to the existing Grade II building as well as an extension. Renovation of the existing building included opening up the existing exhibition spaces to create more light and space; this was achieved partly by the restoration of three barrel-vaulted ceilings that had been hidden by suspended ceilings since previous renovations in 1960’s.

The Hepworth Gallery
The new Hepworth Wakefield gallery is the focal point of regeneration on the River Calder waterfront, formerly the site of a huddle of low mill buildings. It houses a collection of sculpture by local-born artist Barbara Hepworth alongside the works of other prominent artists, and is one of the largest art galleries yet built outside London.

“One of the largest galleries yet built outside London.”

As a response to its environment, the building was conceived as a group of ten linked blocks of varying sizes, and is expressed in pigmented self-compacting concrete. The addition of pigment was untried in this country and required the development of dedicated pour techniques to get the meticulous mirror finish specified. This route to achieving the design proved highly cost effective compared with precast options, as well as advancing UK industry knowledge in aesthetic concrete techniques.

The two-storey building houses a learning suite, cafe, lecture theatre and ancillary facilities on the ground floor, with ten gallery spaces above. The various skew roofs of the airy gallery spaces, up to 13m high, enable generous clerestory glazing as part of the natural lighting strategy.

“Enable generous clerestory glazing as part of the natural lighting strategy.”

Gagosian Galleries
Gagosian Galleries are known for the quality and scale of their exhibitions. The engineering design of the building has been focused on high quality gallery spaces uninterrupted by columns, with concealed services integrated into the fabric of the spaces.

The environmental design provides close control of the internal environment, while allowing flexibility in the usage of the gallery spaces. The structural engineering design incorporates extensive analysis allowing the creation of large span spaces, capable of supporting very heavy art works.
01 The Whitworth Gallery, Manchester
Image: Alan Williams, MUMA

02 The Hepworth Gallery, Wakefield
Image: Jaap Oepkes

03 The Whitworth Gallery, Manchester
Image: Alan Williams, MUMA

04 Gagosian Galleries, London

05 The Hepworth Gallery, Wakefield
Image: Jaap Oepkes
The British Museum

The world's first public national museum, the British Museum, was established in 1753 in Bloomsbury, London. Over time, its buildings were developed to accommodate the museum's growing collections. Inadequate exhibition space and scattered conservation facilities recently prompted the redevelopment of buildings in the north east corner of the site to provide a new gallery, conservation and science centre, collections management hub and storage.

“The world’s first public national museum, the British Museum, was established in 1753 in Bloomsbury.”

Working directly with Rogers Stirk Harbour + Partners, we helped co-ordinate the brief and design for the 18,000 sq m purpose-built facility.

To minimise impact, a significant proportion (about 60%) of the new building is located underground and its structural line steps back from adjacent properties. Surcharge loads were verified and stringent criteria employed in the sequencing of works to minimise vibration and avoid damage to the fabric, foundations or contents of neighbouring structures.

The 10,000 sq m substructure is arranged over four storeys with only one access point to maximise space on the restricted site. Secant pile walls have been installed up to a 15m excavated depth over the full area of the site using temporary props. The reinforced concrete structure was formed sequentially from basement to ground floor and movements monitored.

The concrete-frame ground floor includes 1,100 sq m of column-free exhibition space with links with the museum’s Great Court. Access points and links to other listed buildings are placed to minimise intervention. Four three-storey steel frame pavilions with precast plank floors sit atop the ground floor. The steel frame is exposed internally throughout the height of the superstructure and integrates with the architect-designed cast glass façade.

Ayelsbury Waterside Theatre

The architect’s design for Aylesbury Theatre was an interpretation of the surrounding countryside, with its woods and rolling hills. In plan, the building describes a curved shape similar to a pond, resulting in undulating forms for both the façade and roof. The extensively glazed façade is supported by external timber fins. These taper outwards from base to crown, also supporting the stainless steel clad roof overhang. The theatre houses a 1,200 seated auditorium and a second space for 200 people.

“Complex building form to a buildable and cost effective programme.”

Our key achievement was engineering an irregular and complex building form to a buildable and cost effective programme, while introducing design innovations that maximised the flexible use of the space. We proposed a double-skin envelope to ensure acoustic performance, and also maximised functional value-adds of this design by incorporating circulation space at each floor level within the framing interstices.

“Use of 3D modelling facilitated smooth integration of structures and services.”

Our use of 3D modelling facilitated smooth integration of structures and services, and also aided clear communication amongst the design team and stakeholders throughout, so that each subtle design iteration was thoroughly understood by all.

Sea City Museum

The Southampton Civic Centre had been renovated and redeveloped as an integral part of the creation of the city’s new cultural quarter, which includes the existing Guildhall, library and art gallery.

“Transformation of the Grade II* listed former magistrates courts and police headquarters building.”

We worked on the transformation of the Grade II* listed former magistrates courts and police headquarters building — and its new extension pavilion — to accommodate the Sea City Museum, which focuses on the maritime history of Southampton. The museum opened on the centenary of the sinking of the Titanic, which began its ill-fated journey from the city’s port.

Working with architect Wilkinson Eyre, we provided structural, infrastructure and building services engineering for the refurbishment, conservation and new-building works. We also contributed public realm design services and took on the role of CDM co-ordinator.

The existing building is a 1930’s stone-clad steel frame structure. Its interior has undergone a significant opening-up works to create the open plan spaces required for the museum. The steel frame was found to have considerable corrosion, and extensive repairs to it, and to the stonework, have been undertaken. All alterations were approved by English Heritage.
01 Ayelsbury Waterside Theatre
Image: Jaap Oepkes

02 Sea City Museum, Southampton
Image: Monika Kubala

03 British Museum, London
Image: RHSP
Vanke Pavilion
One of the core challenges faced by Ramboll’s Computational Design (RCD) team was to deliver a structural solution that simplified the construction process without compromising the design of the uniquely shaped building. With an almost cork-screw like shape and a façade composed of hundreds of ceramic tiles, the project had the potential to be both high-cost and lengthy.

In order to rationalise construction of the steel frame structure, the team developed an approach which used parametric modelling and coding techniques to digitally slice and analyse the pavilion’s structural design. Taking their inspiration from ship-building techniques, the RCD experts identified 25 unique structural shapes required to construct the building, allowing them to deliver a rational material response to an irregular structure.

“25 unique structural shapes required to construct the building.”

The complex tile pattern was thus optimised to achieve a 95% uniformity in the tile shape and returned to Ramboll’s team in Italy to complete the remaining codes, details and structural design.

The corporate pavilion will be three to four storeys tall, containing a bamboo structure and Chinese artworks that explore the Milan Expo theme of ‘Feeding the Planet, Energy for Life’. Post Expo the pavilion will be dismantled and rebuilt in China, again echoing the sustainability theme of the Italian exposition.

William Morris Gallery
The William Morris Gallery, containing an internationally important collection of items relating to the Victorian designer, occupies the 18th century Water House in north-east London. Plans to refurbish and enlarge it were made possible by a National Heritage Memorial Fund grant.

“Containing an internationally important collection of items relating to the Victorian designer ”

We provided structural and building services engineering for an East Wing extension accommodating additional exhibition space and a new café at ground level, with archive storage below.

The new structure is founded on a 400mm deep concrete raft that also serves as the basement floor slab. A 300mm concrete perimeter retaining wall, with a corbel arrangement, supports the façades, and a suspended slab is used for the ground floor.

Above ground, load-bearing handmade-brick piers support the vertical loads from overhead ring beams and the roof. To contain the thrust arising from the arches, we designed a special stainless steel rod that has been inserted along the line of them, tying them together to provide stability. The roof is a hybrid construction of steel beams and timber joists, and is flat over the exhibition areas and glazed duo-pitched over the café.

The extension is connected to the existing gallery by new openings at ground and basement levels, and to the second and third floors via a lift in a steel frame shaft. Movement joints enable differential settlement between the new and existing structures.

The House of Music, Aalborg
The House of Music holds pride of place (along with the nearby Utzon Centre, another Ramboll project) in a broader masterplan to transform the Aalborg harbour into a vibrant cultural hub. The building’s brief was unusual: to create a world-class concert venue that was at the same time a centre for educational excellence.

“A world-class concert venue that was at the same time a centre for educational excellence ”

Long-span structures, 3-storey deep basements adjacent to the harbour, a façade featuring non-repeatable elements – this project presented numerous challenges. We worked closely with architect Coop Himmelb(l)au, underpinning their complex architectural vision with value-driven engineering, ensuring no aspect of the architectural brief was compromised.

Within the U sits the concert building proper: a 1,300 seat world class symphonic venue.

“A 1,300 seat world-class symphonic venue ”

Educational facilities (set to house several higher education establishments), as well as rehearsal and performance spaces, are housed in a three-storey U-shaped building.
01 Vanke Pavilion, Milan
Image: Libeskind

02 The House of Music, Aalborg

03 William Morris Gallery, London
Copenhagen Opera House
Ramboll provided a wide range of engineering services on this iconic building, helping to deliver a complex job to a very tight timeframe. With horizontal dimensions of 158m by 90m (roughly the size of three football fields), the canopy roof is one of the largest of its kind in the world.

“An engineering insight from the design of steel bridges helped realise the architect’s vision for a cantilever roof, giving the opera house an iconic profile.”

Our structural engineers designed the roof as a closed steel box to ensure the necessary stiffness, while also delivering the super-slim depth desired by the architect. This innovative approach helped secure an IABSE Outstanding Structure Award, 2008.

Reykjavik Concert Hall and Conference Centre
Situated on the waterfront, the concert hall was conceived by the architect to ‘stand out as a radiant sculpture reflecting the sky and harbour.’

The multi-award winning building features a 1,800 seat concert hall, a 750-seat rehearsal room for Iceland’s Philharmonics, a conference hall, as well as various exhibition spaces, restaurants, backstage and administrative facilities. The spectacular façade was designed in collaboration between Henning Larsen Architects, the Danish-Icelandic artist Olafur Eliasson, and Ramboll.

“The multi-award winning building features a 1,800 seat concert hall, and a 750-seat rehearsal room for Iceland’s Philharmonics.”

The challenge for us as engineers was to marry the aesthetic ambition – which envisioned the glass and steel façade as an expressive sculptural form – with the need to deliver a high performance envelope, meeting strict requirements for structural capacity, acoustics, moisture management, and cleaning access. Close dialogue between architect, artist, engineer and contractor helped deliver a result that satisfied all requirements.

In order to achieve a fully coordinated design and ensure all geometric interfaces were well managed, all disciplines were designed in one 3D model, which resulted in what was, at the time, arguably the largest 3D model ever developed for a building.

Nissan Halo
The Nissan booth offers tiered seating/standing space around a focal stage, beneath and within the Halo. The rings are formed from lightweight long-span faceted aluminium structural elements, clad with curved dibond panels and finished with tensioned white fabric sleeves. A steel structural frame provides stability and support to carry the wraparound LED video wall and frame the central stage.

For the purposes of practicality and sustainability, the Halo can be erected quickly, is constructed from standardised components, and can be fully dismantled and re-assembled without generating waste or scrap material.

Three separate structures of varying dimensions were fabricated for use at different shows around the world, with the Asian Halo being the largest at 38m long and 24m wide with a 30m cantilever. Detroit was the first destination for the Halo concept, which began its journey across North America, Europe and Asia in early 2013.

We accurately determined the final deflection of the rings before installation and designed a structure flexible enough to form the curved final shape but strong enough to carry its loads. By test fitting parts of the structure, we iteratively updated our digital models to reflect actual material behaviour.

“An engineering insight from the design of steel bridges helped realise the architect’s vision for a cantilever roof, giving the opera house an iconic profile.”
01 Reykjavik Concert Hall and Conference Centre
Image: Nic Lehoux

02 Reykjavik Concert Hall and Conference Centre
Image: Nic Lehoux

03 Nissan Halo
Image: Kathryn Rapier

04 Reykjavik Concert Hall and Conference Centre
Image: Nic Lehoux

05 Copenhagen Opera House
**Kreon Pavilion**
The KREOD Pavilion is made up of three timber gridshells that implement a number of geometrical optimisation and fabrication algorithms that have not been previously applied to a real structure. The first three pavilions were built in the Greenwich Peninsular site and have been widely publicised.

The structure pushed digital fabricators and materials suppliers to new limits and required a highly creative approach to structural design, as well as the application of novel digital modelling techniques.

“Hexagonal mesh generated by applying a ball-packing algorithm to the surface.”

Pavilion Architecture’s proposal was for a hexagonal mesh generated by applying a ball-packing algorithm to the surface. From our experience of similar complex three dimensional structures, we felt from the outset that the design of the connection would be key to unlocking the efficiency of the structure as a whole.

**Miroslaw Balka Installation**
Tate Modern, London’s home of international modern art, is located in a converted power station. Its cavernous former Turbine Hall is 152m x 24m and 30m high, and is the venue for a series of large-scale installations. Miroslaw Balka is the tenth artist to contribute to The Unilever Series, creating a house-sized, light-tight walk-in box on stilts — a sensory deprivation experience.

“Miroslaw Balka is the 10th artist to contribute to The Unilever Series.”

We worked closely with Balka to finalise the structural design, taking into account a number of constraints, including the floor loading capacity and structural limits of the Turbine Hall. Balka requested that the temporary structure be minimal in detail and portable — the Tate remains open during most art construction works. Balka wanted visitors to be able to walk around the box as well as underneath it.

**Tetashed**
Taking the form of a truncated tetrahedron, Tetra Shed® is a visually striking yet comfortable space that can be adapted internally to suit a range of requirements within the same structural shell without planning permission.

Each pod has a power supply and an integral sound system. The pod is approximately 3.5m tall and with a footprint of 2.5m by 2.5m. Designed to stand alone, it can be joined with others into a single-storey tessellation or a vertical honeycomb structure. Constructed of plywood and softwood timber with a minimal number of steel connections, the interior is lined with birch ply and the exterior waterproofed with matte black rubber.

“We used 3D modelling and CNC programming to enable accurate cutting of pod components.”

Drawing on previous experience of fabricating and jointing thin plywood sections into structural frames, we used 3D modelling and CNC programming to enable accurate cutting of pod components.

**Fitzrovia Chalkboard**
The Fitzrovia Chalkboard created a collective display point for community messages — its multi-coloured exterior writing surface inviting contributions, reflecting the continuing use of traditional chalkboards by local businesses. Inspired by the Trada Pavilion, the Chalkboard had a shell of 47 discrete birch plywood panels joined by steel hinges which can fit inside a 4m-diameter hemisphere. Each unique panel is numbered sequentially, fitting together with standard hinges for rapid accurate assembly.

The structural form was expressed by computational algorithms, using the tangent plane intersection methods developed by Ramboll Computational Design to break down any double curved form into planar elements. Exact cutting patterns for digital fabrication were generated automatically from the algorithms.
01 Fitzrovia Chalkboard

02 KREOD Pavilion, London
Image. Jaap Oepkes

03 KREOD Pavilion, London
Image. Jaap Oepkes

04 Fitzrovia Chalkboard

05 Miroslaw Balka Installation, Tate Modern
Image. Jaap Oepkes
John Rylands Library
The John Rylands Library opened its doors to readers on 1st January 1900, over the previous 12 years the library’s founder Enriqueta Rylands had spared no expense to create one of the world’s great libraries in a spectacular neo gothic building.

“The building was one of the first in Manchester to be lit by electricity.”

The building was one of the first in Manchester to be lit by electricity, and the heating and ventilation system involved an intricate filter arrangement to minimize the level of soot and industrial pollutants coming into the library.

For a number of years the library had been addressing the issues of access and building conservation. This had involved assessing every aspect of the building for its aesthetic and architectural qualities. English Heritage had provided much appreciated guidance and advice. The result is the scheme ‘Unlocking the Rylands’, which involved four principal elements, a new entrance building, permanent exhibitions and displays, a new roof for the reading room, and improved security on fire protection systems.

Somerset House East Wing
Somerset House is one of London’s most important eighteenth century buildings. Over the last fifteen years it has been transformed from an unloved records office to a major centre for arts, culture and education, operated through a number of stakeholders. Ramboll has been an integral part of this change.

In the late 1990’s Ramboll undertook archaeological investigations and engineered the changes to the east and south wings, creating the Courtauld Galleries, housing the Gilbert Collection, strengthening floors to take exhibition space and re-servicing to replace the defunct building systems.

Through the 2000’s the company helped create the Joint Education Centre and re-landscape the Great Courtyard with its celebrated fountains. In the 2010’s it undertook the sensitive refurbishment of the east wing to provide flexible, modern education space fit for a new generation of students.

At every stage circulation has been improved and impedances to disability overcome: elegant ramps cross the light wells, stone cantilever stairs were load-tested to prove escape routes. The company even designed the base for the courtyard’s Christmas tree and the fixings for the Film 4 open air film screenings.

Temperate House Kew Gardens
Last restored in the late 1970’s, the paint systems had failed widely, window mechanisms broken and the glass itself was etched with dirt and deposits. The Temperate House was built between 1860 & 1897. It is listed Grade I and is located within the UNESCO World Heritage site at Kew. Built of cast and wrought iron and early steel, it is a case study in the development of Victorian engineering structures.

“Built of cast and wrought iron and early steel, it is a case study in the development of Victorian engineering structures.”

Ramboll was appointed late in the project, in June 2013, taking on the work from at RIBA Stage C after the main team had been engaged for some time. The company has taken the role of both lead consultant and structural engineer. At Ramboll’s instigation, a major survey of ironwork was immediately undertaken to identify the extent of corrosion and decay, using one of the largest access platforms available in the UK, which itemized the defects and achieved a detailed diagnosis for repair. The survey reports were turned into an extensive series of drawings that defined the contract works.

The project includes provision of an education Centre with flexible class areas. This is designed to help school numbers to increase by a remarkable 90,000 per year over the next 4 years, consolidating Kew’s role as a world class educational establishment. The Centre is provided outside the main Temperate House.
01 John Rylands Library, Manchester
Image: Daniel Shearing

02 Somerset House East Wing, London
Image: Jaap Oepkes

03 Temperate House Kew Gardens
Image: Paulina Sobczak

04 John Rylands Library, Manchester
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05 Somerset House East Wing, London
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06 Temperate House Kew Gardens
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