SCIENCE AND LABORATORIES
CAPABILITY STATEMENT
WWW.RAMBOLL.CO.UK
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.

Designing hundreds of buildings every year, Ramboll has a rich heritage in realising many landmark schemes.

Our passion for design and creativity has led us to work with an array of world leading architects and clients to realise the ambitions for their projects. As a result we are a leading global engineering and consultancy company.

Our unwavering commitment to design is married with a deep appreciation of a building’s function, buildability and adaptability. Whether it’s designing and engineering world class residential developments, sensitively modernising A grade commercial premises, or restoring priceless heritage assets, we have a great imagination for the future and a deep rooted sense of responsibility for the past.

Our Nordic heritage and founding principles underpin how we operate; we strive to create sustainable solutions where people and nature flourish. Our deeply ethical standpoint ensures we consider the impact on the local environment, in a societal, cultural and sustainable context. Furthermore our Liveable Cities Lab in Copenhagen is spearheading research into improving liveability, providing further insight for our progressive solutions.

We pride ourselves in understanding a brief, so that what gets designed and built achieves a client’s aims. We believe the best outcomes are achieved when we challenge and are challenged, the winner is always the project, and is why we champion open and collaborative dialogue.
ABOUT RAMBOLL
Ramboll is a leading engineering, design and consultancy company founded in Denmark in 1945.

The company employs 13,000 across 300 offices in 35 countries with experts in the Nordics, North America, the UK, Continental Europe, Middle East and India, supplemented by a significant representation in Asia, Australia, South America and Sub-Saharan Africa.


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We have a team of specialists with extensive experience of designing of science and research facilities to achieve a range of complex technical requirements. Our experience and expertise ranges from designing ultra-low vibration spaces for the most demanding imaging equipment to developing highly efficient general lab spaces.

We can add most value by being involved from the very start of a project. For the most demanding facilities this often includes being involved in selecting the best site, before the project process starts in earnest.

**01 National Graphene Institute, UK**
In addition to high-grade cleanrooms, the National Graphene Institute provides flexible laboratory space for ground-breaking research in the field of graphene. Image: Daniel Shearing.

**02 Mountbatten Cleanrooms, UK**
An extensive complex of cleanrooms for the University of Southampton. Image: Ben Grubb.

**03 Materials Science & Metallurgy, UK**

**04 Defining the Brief**
Our involvement in the briefing process is critical to understanding the project requirements.

**05 Capitalising Our BIM Experience**
BIM plays a vital part in co-ordinating complex laboratory services with other aspects of the design.
OUR APPROACH FOCUSES ON:

» Establishing a robust well-documented design brief through our involvement in the briefing process, talking directly to users, equipment suppliers and studying existing benchmark facilities.

» Understanding the site characteristics and adapting our design to provide an efficient design solution.

» Establishing key design principles in close collaboration with the rest of the team to develop a holistic design that achieves all of the technical requirements.

» Adopting a proactive approach and engaging across the whole project scope, sharing experience and lessons learnt.

» Using our BIM model to develop and co-ordinate the design, particularly important for heavily-serviced science buildings.

» Detailed analysis to test the developing design followed by further refinement to provide the most efficient solution.

» Using proof of concept testing to reduce project risk where the technical requirements demand innovative and untested design solutions.

» Frequent peer reviews to capitalise on the experience of senior directors.
SPECIALIST SERVICES

We offer specialist expertise across a wide range of disciplines

VIBRATION ENGINEERING

We offer a full vibration engineering service, from undertaking surveys for site selection to designing ultra-low vibration facilities.

We have in-house capability to conduct a range of vibration surveys with our own high-specification, regularly calibrated equipment that allows us to measure extremely low levels of vibration.

Our experience in ultra-low vibration design allows us to provide early input to the design process, ensuring that the vibration brief is achieved in the most efficient way. We work collaboratively with the whole team to ensure that the vibration strategy is considered holistically within the design, to achieve the full range of complex technical criteria.

ACOUSTICS

Using our expertise in acoustic design, we design quiet laboratories to achieve the optimum conditions for extremely noise-sensitive equipment, providing spaces quieter than a recording studio.

In addition, we have extensive experience of acoustic design to achieve a balance between quiet write-up space and opportunities for interaction and collaboration between researchers.

We are pioneers in acoustic modelling and encourage clients to listen to aural demonstrations to experience their project during the design process.

DRAINAGE DESIGN

We understand the high performance that a science facility demands from its drainage systems and have experience in designing a wide range of different below-ground systems including chemical-resistant drainage, high-temperature drainage and radioactive drainage.

We also have detailed knowledge of trade effluent licence requirements and provide comprehensive advice to our clients as they liaise with the statutory authority to obtain consent to discharge.

ADVANCED ENGINEERING

Our Advanced Engineering team is at the forefront of computer modelling and simulation which enables us to refine our designs.

Applications include modelling propagation of vibration through the ground and CFD modelling to simulate wind loading in complex built environments.

We have also pioneered the use of laser scanning to quickly create detailed models of existing site features, integrating this information into the BIM environment.

01 Vibration Modelling
Detailed vibration modelling allows us to accurately predict the vibration performance of our buildings.

02 Survey Capability
Our in-house survey capability allows us to undertake noise and vibration surveys at an early stage to inform the design.

03 Chemical-Resistant Drainage
Fusion-welded chemical-resistant drainage provides a robust solution for laboratory drainage systems.

04 Vibration Propagation Analysis
Using our advanced modelling techniques we are able to accurately predict propagation of vibration through the ground.

05 Engineered Fire Design
We apply an engineered approach to fire design, using simulations to go beyond standard design codes and achieve a more economic design solution.

06 Site Investigation
We provide a full site investigation service.
FIRE ENGINEERING

Our team of fire engineering experts provides wide range of services from strategic fire engineering work to fire system design.

We take a scientific approach that uses the statistics of real fires, calculation tools and studies of human behaviour. Our designs provide value by applying an engineered approach to eliminate over-specification caused by conservative codes, allowing the fire protection to be deployed in the most critical locations.

Our team stays with the project throughout construction to ensure the strategy remains appropriate and is implemented correctly, and to provide on-going specification and construction advice.

ENVIRONMENTAL ENGINEERING

We deliver site-specific environmental solutions that address all aspects of the remediation process—from site investigation and feasibility studies to risk assessment, remedy selection, remedial design and construction management to site reuse.

We develop cost-effective, risk-based approaches to the evaluation, remediation and redevelopment of landfills and former industrial or hazardous waste facilities to return the land to productive use.

At the forefront of green and sustainable remediation, our innovative thinking and turnkey solutions have been applied successfully to thousands of industrial, mining, development and hazardous waste sites around the world. We have established an unsurpassed reputation with both public- and private-sector clients and regulators around the world for achieving cost-effective site closure.
FEATURE PROJECT

MATERIALS SCIENCE & METALLURGY

A new £34m laboratory building for University of Cambridge requiring ultra-low vibration and EMI sensitive facilities

This new development brings together this prestigious research department from their existing dispersed accommodation in the city centre into a single building within the University’s West Cambridge site. The facility includes teaching laboratories, seminar rooms and student study space, as well as ultra-sensitive specialist research laboratories and offices.

A key aim of the structural design is to provide a world-class building that can accommodate equipment that is highly sensitive to vibration, acoustics, temperature and electro-magnetic interference. Of particular note is the Electron Microscopy Suite housing state-of-the-art Transmission Electron Microscopes with exceptionally stringent design criteria.

Using our finite element analysis capability, we modelled the floor slabs to predict how they will vibrate and thus refine the design to meet the vibration requirements of sensitive equipment.

Described by the University’s Estate Management department as “one of the most complex projects the University of Cambridge has ever constructed”, the building was completed in July 2013. The project was short-listed for a British Construction Industry Award and has won ICE and RICS awards.

PROJECT DETAILS

Customer
University of Cambridge

Architect
NBBJ

Location
Cambridge

Value
£34m

Project Countries
United Kingdom

Period
2009 to 2013

Services Provided
Civil, structural and vibration engineering.
New state-of-the-art cleanroom and laboratory building for the University of Manchester. Awarded British Construction Industry Major Project of the Year, 2015.

This new building will allow the continued research and commercial development of graphene, the new material discovered at the University in 2004. The cleanrooms achieve ISO 5 (Class 100) and ISO 6 (Class 1000) classification areas, with VC-D vibration criteria.

Situated in the heart of Manchester achieving the vibration design criteria was identified as a key challenge at the start of the project. In fact the feasibility study had established the ambient vibration performance on site was considerably higher than VC-D.

Ramboll vibration specialists were involved in the design from the outset and quickly established the best form of construction to optimise the vibration performance was the use of a basement to reach bedrock. Our in-house vibration survey capability enabled the vibration performance at depth to be established in detail and the design optimised to achieve the requirements.

We developed a structurally separate utilities and services block to house the extensive services required to operate the clean rooms without degrading the vibration performance achieved.

Completion vibration surveys have shown the building achieves surpasses the vibration performance achieving VC-E on average.
Ramboll was originally appointed to establish the brief for the Civil, Structural and Vibration Engineering aspects of this highly complex project. We were subsequently selected by the University to provide design services for the whole project, through our experience of large laboratory projects including previous work for the University.

Research carried out by the department ranges from high-speed impact testing to sensitive low-temperature measurements. The aspiration is to construct a world-leading ultra-low vibration facility to enable the department to continue their pioneering research, whilst promoting close collaboration between the research groups.

The building will also contain teaching laboratories and write-up space for academic staff as well as shared social spaces to encourage interaction between students and researchers in different fields.

The criteria for each space were defined through a series of user briefings and workshops, revealing a multitude of complex requirements specific to each laboratory. These include different levels of vibration sensitivity, special drainage requirements, varying levels of cleanliness and specialist areas such as a plate impact facility.

The project will be partly funded by an £85m donation from the Dolby family which represents the largest philanthropic donation ever made to UK science.

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**PROJECT DETAILS**

**Customer**
University of Cambridge

**Architect**
Jestico + Whiles

**Location**
Cambridge

**Value**
£200m

**Project Countries**
United Kingdom

**Period**
2014 to 2021

**Services Provided**
Civil, structural, acoustic, fire and vibration engineering.

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**CAVENDISH III**

A new £200m world-class facility for the Department of Physics at the University of Cambridge
The most complex technical challenges relate to the specialist research laboratories within the building, which include clean rooms, optics labs and high-resolution microscopes. Much of the user equipment is sensitive to vibration and electro-magnetic interference, aspects which were particularly challenging on this city centre site.

Ramboll designed an isolated 1.5m thick basement slab which will provide 2200m² of exceptionally quiet laboratory space, with vibration levels attenuated to meet the NIST-A criterion.

Some of this space will also be magnetically shielded, to reduce the impact of electro-magnetic interference from sources within the building as well as the new metro line which is being constructed just 900m away.

The Niels Bohr Building will provide state-of-the-art teaching and research facilities for the Faculty of Science at the University of Copenhagen, including the internationally recognized Niels Bohr Institute. The project consists of two separate buildings located either side of a major road, linked together by a tunnel and a high-level skywalk.

The new facility will bring together research groups from the fields of Physics, Chemistry, Computer Science, Nanotechnology and Mathematics, promoting interdisciplinary working.
Mountbatten Cleanroom Complex
The original Mountbatten cleanrooms were destroyed by fire in November 2005. This, however, gave the University of Southampton the opportunity to build a world-leading research facility designed to meet its needs and aspirations for the next 10 years.

The new building has cleanrooms and technical laboratories, which are highly vibration sensitive, together with offices and support spaces. Ramboll provided structural, geotechnical and environmental engineering as well as vibration analysis, and demolition advice on fire-damaged property.

British Museum World Conservation Centre
We were the civil and structural engineers for the British Museum World Conservation building which was completed in 2014.

This £110m project included a four-storey deep basement and houses specialist laboratory space which is highly sensitive to vibration.

University of Cambridge, Electrical Engineering Building Annexe
We provided specialist vibration expertise on this project to construct a new £9m cleanroom and laboratory facility adjacent to the department’s existing building. The building houses highly sensitive e-beam lithography and scanning electron microscopes.

We carried out brief definition, detailed vibration surveys, structural modelling and vibration source control specification. Completion testing showed the vibration performance surpassed the brief requirements.

Papworth Heart and Lung Research Institute
This new research facility is a collaboration between the University of Cambridge and Papworth Hospital NHS Trust. We are providing civil and structural engineering services.

The building will provide space for a variety of cardio-pulmonary research activities, including Phase 1 first-in-human trials in a specialist unit accredited by the Medicines and Healthcare Regulatory Authority (MHRA).

Pirbright Institute, Surrey
We provided specialist vibration expertise on this £12m project to construct a new CL2 biological research facility on this site in Surrey. The building houses highly sensitive microscopes and demanded a low vibration environment for imaging.

We also provided specialist expertise to define construction vibration limits to safeguard proximate high containment buildings and infrastructure.

University of Birmingham and Molecular Sciences Building
This new building will be part of a phased development to house a range of research departments in a way that enhances their ability to collaborate across traditional boundaries. Phase 1 will incorporate significant areas of dedicated chemistry space, low vibration laboratories and offices.

Ramboll is providing civil, structural and vibration engineering services. At the early stages of the project phasing considerations were a key issue with focus on planning for future access, deliveries during construction and identifying opportunities across the site including the optimum locations for low vibration.
01 British Museum World Conservation Centre
02 Mountbatten Cleanrooms
03 University of Cambridge, Electrical Engineering Building Annexe
04 Papworth Heart and Lung Research Institute
05 Pirbright Institute, Surrey
06 Molecular Sciences Building
The laboratories include the provision of a CL3 suite, NMR, MRI and an AFM suite as well as the largest NHS endoscopy facility in the UK. The vibration requirements of the building were developed through close interaction with the users and include the VC-D criterion for the most sensitive areas.

The building form is a reinforced concrete frame with an atrium space separating the laboratories from the office space. The foundation solution required extensive investigation to reduce the risk of ground cavities which are prevalent in the chalk close to the ground surface on the site.

The Quadram Institute brings together the Institute for Food Research (IFR), Norwich and Norfolk University Hospitals (NNUH) and researchers from the University of East Anglia (UEA) into one building which will be the first on the South Norwich Research Park. It will house endoscopy, lecture theatre/exhibition space, write up and laboratory space as well as cafe areas and terraces.

The building will enable ground-breaking research in a broad range of disciplines and considerable planning was required to bring the unique collection of users together into one facility. Detailed user briefings were essential to identify the requirements of each research group and overall brief for the building.

FEATURE PROJECT
THE QUADRAM INSTITUTE
Facilitating world class research by bringing together a unique collection of users into a flexible and adaptable building

PROJECT DETAILS
Customer
Institute of Food Research / BBSRC

Architect
NBBJ

Location
Norwich

Value
£60m

Project Countries
United Kingdom

Period
2014 to 2018

Services Provided
Civil, structural and vibration engineering.
Support facilities such as the main plant room and cycle parking are located at the base of the tower, whilst the low-level wings around the tower house a lecture theatre, kitchen, canteen and teaching spaces.

Our flexible design for the tower will enable offices to be converted to laboratories in future and vice versa, allowing the facility to adapt to future changes with minimal disruption.

The Mærsk Building is an extension of the existing Panum Complex, located in the centre of Copenhagen. The new facility will house 42,700m² of teaching and research space for a collection of institutes that form part of the Faculty of Health and Medical Sciences at the University of Copenhagen.

We provided all engineering services on the project as sub-consultants to architects C. F. Møller, who were appointed as turnkey consultants.

The 75m tall, 15 storey tower at the centre of the building will provide 12 storeys of office and vibration-sensitive laboratory space for state-of-the-art research in the areas of cancer, heart disease, diabetes and allergies.

**PROJECT DETAILS**

- **Customer**: University of Copenhagen
- **Architect**: C F Møller
- **Location**: Copenhagen
- **Value**: Confidential
- **Project Countries**: Denmark
- **Period**: 2010 to 2016
- **Services Provided**: Structural, mechanical, electrical, fire & safety, lighting design and facade engineering

**Biological laboratories for vibration-sensitive research at the University of Copenhagen**
FEATURE PROJECT

ABCAM HQ

Commercial laboratory and office accommodation for Abcam, a biotechnology company with expertise in the development of specialist life science products

Abcam is a Cambridge success story, having grown from a small start-up founded in 1998 to an international company operating in 130 countries today. With 1000+ employees globally, they made the decision to locate their new headquarters on the Cambridge Biomedical Campus life sciences cluster.

Ramboll was appointed by Cambridge Medipark Ltd as the developer and Abcam as tenant to provide civil, structural and vibration engineering services for the building and internal fit-out.

As the first plot on Phase 2 of the CBC masterplan the building set the design principles for the rest of the development.

This includes building in future flexibility for upgrading to heavily-serviced labs to suit a range of tenants, and provision for additional vibration-sensitive equipment.

The building is split into two blocks, one for laboratories and the other office accommodation. The blocks are linked by a central feature staircase to encourage collaboration. The separation of the functional spaces enabled different slab thickness's and floor-to-floor height for each. The result is that four storeys of office and three storeys of laboratory have been provided with similar roof heights across both blocks generating an efficient use of space and external envelope.

Initial recommendations from the site investigation suggested that a piled solution would be most likely. Through Ramboll’s experience on the CBC site we were able to engineer a ground level raft solution which provided significant cost and programme savings as well as an inherently excellent vibration performance at no extra cost.
 FEATURE PROJECT
ROYCE INSTITUTE

A world-class materials science research facility forming the national hub of the Royce Institute in the centre of Manchester

Located at the heart of the University of Manchester’s Engineering Campus, the 16,000sqm Royce Institute will house world-leading materials scientists, state-of-the-art equipment and collaborative space for industrial engagement. It will enable the UK to grow its world-leading research and innovation base in advanced materials science and technology.

The building's location in the centre of Manchester, along with the heavy duty spaces within the building, led to challenges for the vibration design. The building is to house extremely demanding characterisation and imaging equipment that requires extremely low vibration levels.

Ramboll led the civil, structural, vibration, fire and acoustics design taking account of the wide range of challenges. In particular we championed the use of a typology approach where research within the building is arranged in terms of types of space as opposed to individual research groups. This has led to a highly rational, flexible and affordable building.

Ramboll’s vibration expertise was fundamental to a robust design concept. This was critical in defining the brief, carrying out surveys on site and developing the building design to achieve the requirements.

Early in the design we identified the structure as being ideal for pre-fabrication. We have developed this concept through to construction enabling a high quality structure that is fast to construct.

PROJECT DETAILS

Customer
University of Manchester / Arcadis

Architect
NBBJ

Location
Cambridge

Value
£70m

Project Countries
United Kingdom

Period
2015-2019

Services Provided
Civil, structural, acoustic, fire and vibration engineering
Royce Discovery Centre
The new Royce Discovery Centre (RDC) at the University of Sheffield will form part of the Henry Royce Institute for Advanced Materials, a collaboration between nine research partners with a central hub at the Royce Institute in Manchester.

The RDC will focus on early-stage research on materials discovery and processing, working alongside the existing Translational Centre to bridge the gap between research and industrial applications. The new building will house a series of specialist laboratories, including some that are sensitive to vibration, together with office and meeting space.

Ramboll are providing MEP and vibration engineering services for the project.

Novo Nordisk Måløv Site, Copenhagen
We have a long history of providing a multi-disciplinary design service for pharmaceutical research and production facilities for Novo Nordisk, including extensive new development and refurbishment at their site in Måløv, Copenhagen.

Chemical Engineering and Biotechnology
Construction of new office and teaching space at the University of Cambridge.

We provided civil and structural engineering services for this new £42m laboratory, office and teaching building which brings together the University of Cambridge’s departments of Chemical Engineering and Biotechnology. Specialist laboratory spaces include highly vibration-sensitive laser imaging suites, microscopy labs, NMR imaging facilities, a class 10,000 cleanroom and a BSL3 suite.

Graphene Engineering Innovation Centre, University of Manchester
New state of the art pilot production facilities.

We are providing specialist vibration design services for this £35m building in the heart of Manchester. As the follow-on building to the National Graphene Institute this building will house highly sensitive imaging and characterisation equipment.

We have been involved throughout the project to develop a highly efficient design that achieves the onerous technical requirements.

Addenbrooke’s Clinical Research Facility
World leading clinical research facility
The Addenbrooke’s Clinical Research Centre (ACRC) Expansion comprises five storeys of clinical research space including day rooms, in-patient accommodation and facilities, behaviour observation units and two procedure suites, one of which is dedicated to endoscopy.

A basement provides an MRI facility as well as storage, waste-handling and plant room space.

Maxwell Centre, University of Cambridge
Furthering collaboration between industry and academic research in the Physics department.

We provided civil and structural engineering and specialist vibration services on this building for the Department of Physics. The building achieves highly flexible spaces, general laboratories and specialist spaces with demanding requirements for low vibration and magnetic performance.

Our detailed vibration survey at the start of the project allowed us to define the key vibration sources on site. Our design to improve the performance through adjustments to the road infrastructure on the site avoided the need for costly isolation systems.
01 Royce Discovery Centre
02 Novo Nordisk Måløv Site, Copenhagen
03 Chemical Engineering and Biotechnology
04 Graphene Engineering Innovation Centre, University of Manchester
05 Addenbrooke’s Clinical Research Facility
06 Maxwell Centre, University of Cambridge