

GROUND ENGINEERING

We provide innovative designs tailored for individual projects within all aspects of Ground Engineering.

Proper ground engineering is a prerequisite for improving the performance of designed structures – including roads, railways, bridges, and tunnels – and can significantly reduce life-cycle costs by making use of the latest technology and methods.

Ramboll's competence within ground engineering comprises a comprehensive range of investigations and design services related to the subsurface. We have extensive experience from working in more than 70 countries, and we are able to handle any soil condition anywhere in the world providing the technology and methods needed.

Our services cover all project phases from site investigations, laboratory and in-situ testing to advanced numerical modelling, project implementation, inspection, and supervision.

SELECTED REFERENCES

SOLIDIFICATION OF CONTAMINATED SEDIMENTS, VUOSAARI HARBOUR, FINLAND, 2006-2007
Various methods of stabilisation were implemented in Vuosaari Harbour, including the restoration of 500,000m³ of TBT-contaminated sediments by dredging and mass stabilisation with cement in the lagoons.

FEHMARNBELT FIXED LINK, DENMARK AND GERMANY, 2008-2014
Geotechnical and geophysical investigations for the Fehmarnbelt Fixed Link between Germany and Denmark. The investigations included marine geophysical investigations, a comprehensive geotechnical boring campaign, laboratory tests, geophysical borehole logging and offshore large scale testing.

BBC W1 PROJECT, LANGHAM PLACE, LONDON, UK, 2001-2010
Planning and design of basements over 14m deep in central London, next to a Grade I Listed church and within the exclusion zones of London Underground's Victoria Line tunnels.

PRE-DESIGN FOR TRAFIKPLATS SPILLEPENGEN, MALMÖ, SWEDEN, 2011
Geotechnical and environmental investigation and design for Spillepengen junction, in the northern part of Malmö. The area is mainly reclaimed land which involves geotechnical and environmental challenges.

HUMBER GATEWAY OFFSHORE WIND FARM, UK, 2011-2012
Geotechnical investigation, interpretation and detailed design of monopile foundations for offshore wind turbines at Humber Gateway Offshore Wind Farm.



Marine and offshore



Transport



Buildings and urban geotechnics



Rock engineering and engineering geology



Field investigations



Geophysics and groundwater

FROM LEFT: Marine and offshore – Kentish Flats Offshore Wind Farm, UK, Transport – Forth Replacement Crossing, Scotland, Buildings and urban geotechnics – Triangeln Railway Station, Sweden, Rock engineering and engineering geology – Sweden, Field Investigations – Norrland, Sweden, Geophysics and groundwater – Malmö Citytunnel, Sweden.



GROUND ENGINEERING SERVICES

RAMBOLL

Ramboll is a leading engineering, design and consultancy company employing close to 10,000 experts and with a significant presence in Northern Europe, Russia, India and the Middle East. We constantly strive to achieve inspiring and exacting solutions that make a genuine difference to our customers, the end-users and society as a whole.

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RAMBOLL

MARKET SEGMENTS

Ramboll provides ground engineering services to a broad range of market segments.

Marine and offshore

Ramboll provides the full range of offshore services within ground engineering for offshore wind, marine structures, ports and harbours. We provide specifications for supervision and interpretation of site investigations as well as preparation of ground models for all design stages. Our specialists within geology, geophysics and geotechnics integrate all available knowledge using advanced 3D modelling, GIS and databases.

Infrastructure

Ramboll provides ground engineering expertise for all aspects of infrastructure development for roads, railways, bridges, tunnels, and dams in all geologies. Our geotechnical services include: planning and interpretation of geotechnical investigations; foundation design; pile foundations; slope engineering; earthquake engineering; soil-structure interaction; advanced modelling; earthworks design and specification; contract administration; anchor and soil nail design; reinforced soil; and soft ground engineering.

Buildings and urban geotechnics

Ramboll provides geotechnical engineering for buildings and structures of all scales, notably for complex, high rise and large scale projects, in all types of locations — from inner-city confined sites to greenfields.

In urban locations, we have successfully found solutions for projects that involve not only extensive foundation re-use, but also complex piling grids and building close to existing structures, major waterways as well as urban and transport infrastructure. We also have an extensive track record of successful projects located on ground with complex sub-surface conditions, including the presence of other structures, sensitive archaeology and transport infrastructure. Consideration of seismic factors is also increasingly part of our international work.

Environmental geotechnics

Ramboll's knowledge and technological innovation within the soil and groundwater area is based on our experience from investigation, risk assessment and remediation of thousands of impacted sites. Ramboll has all the

necessary technical equipment to investigate and record soil and groundwater contamination, including a field laboratory for measuring chemical concentrations in water, soil, and pore air samples. All available data is integrated in order to predict the strength and dispersal of contamination in soils and groundwater.

Areal geotechnics

The design of new residential areas and large shopping centres usually requires the ability to master large entities. In geotechnics this culminates in the successful collection and evaluation of the information related to sub-soil conditions and soil layers as well as possible foundation alternatives.

KEY SERVICES

The range of services provided by Ramboll on a highly specialised level is widespread.

Rock engineering and engineering geology

Ramboll has broad experience in designing underground facilities in sensitive natural environments as well as in urban settings. We perform field investigations, numerical analyses, engineering geology investigations, dam safety evaluations, rock mass classifications, as well as planning and design of excavation methods, rock support and grouting.

Field investigations

Soil investigations are made by drilling, sampling and mapping, and the knowledge from these various methods of field investigations is compiled from the geotechnical units across Ramboll. Thus, we have a large amount of sampling devices for the production of soil samples from disturbed to undisturbed samples. We are able to determine soil parameters either by carrying out field measurements or through laboratory tests.

Geophysics and groundwater

Geophysical investigation techniques help us identify geological, geotechnical and hydrogeological parameters from the surface to more than 2,000

metres below the ground based on measurements in boreholes, along profiles and on surfaces. Linking the physical conditions of the earth or seabed in 2D or 3D models with, for example, drillings and cone penetration test data enables us to establish a consistent geological model.

GIS, databases and 3D models

We make extensive use of GIS, databases and digital 3D models in all project stages in order to make use of all available information. This enables us to identify and reduce risks for the benefit of the projects and our customers.

FE modeling and advanced calculations

Finite element modeling offers Ramboll the opportunity to simulate the behaviour of foundations when soil/structure interaction is important. PLAXIS 2D/3D has recently become one of the most common tools in geotechnical design. We also have experience with FE software such as Geostudio and Phase 2, and we furthermore use specialised software such as Geosuite, D-Sheet and Frew.

Laboratory services

Ramboll has highly qualified laboratory personnel with extensive experience in carrying out as well as providing advice to our customers concerning the use of state-of-the-art testing of ground conditions. The quality of the investigations of the strength and deformation properties of soil and rocks is crucial in order to plan and design, *inter alia*, foundation solutions.

Special competencies

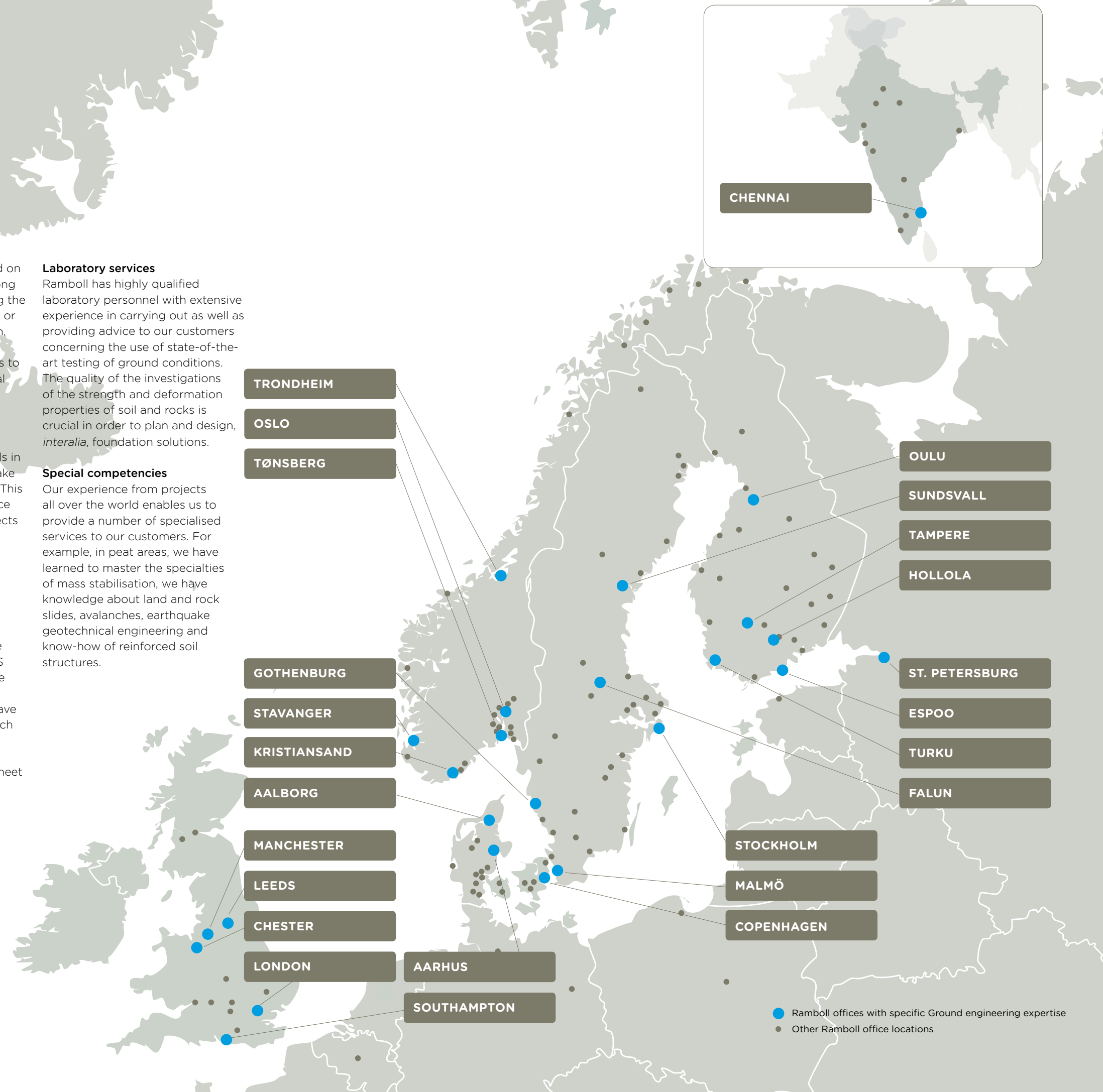
Our experience from projects all over the world enables us to provide a number of specialised services to our customers. For example, in peat areas, we have learned to master the specialties of mass stabilisation, we have knowledge about land and rock slides, avalanches, earthquake geotechnical engineering and know-how of reinforced soil structures.



01 BBC Broadcasting House phase II excavation in central London, UK.

02 Drilling rig at Beamers Rock, Forth Replacement Crossing, Scotland.

03 Geotechnical soil samples from the investigations for the Fehmarnbelt Fixed Link, Germany and Denmark.



● Ramboll offices with specific Ground engineering expertise
● Other Ramboll office locations