



Basements and excavation support

Complete solutions covering all ground engineering technologies and monitoring systems

Geotechnical solutions for the construction industry





Overview

The unique character of each project and the underlying site conditions mean that customised solutions in the planning and construction of excavation support are essential. As a full-service provider, Keller is able to offer solutions perfectly tailored to the requirements of any project.

Keller can provide suitable solutions for many soil conditions and technical requirements in connection with excavation support. Our extensive geotechnical expertise accumulated over the years enables us to provide cost-efficient solutions, especially on complex shoring systems.

The variety of systems we are able to offer allows us to respond flexibly to a variety of boundary conditions. We are committed to maintaining the highest quality and environmental standards, which are deeply rooted in our company philosophy.

Our engineers are constantly pushing the boundaries of our high-performance products, and we make extensive use of the most advanced software to ensure our designs are the best they can be to suit your project.

Health and safety

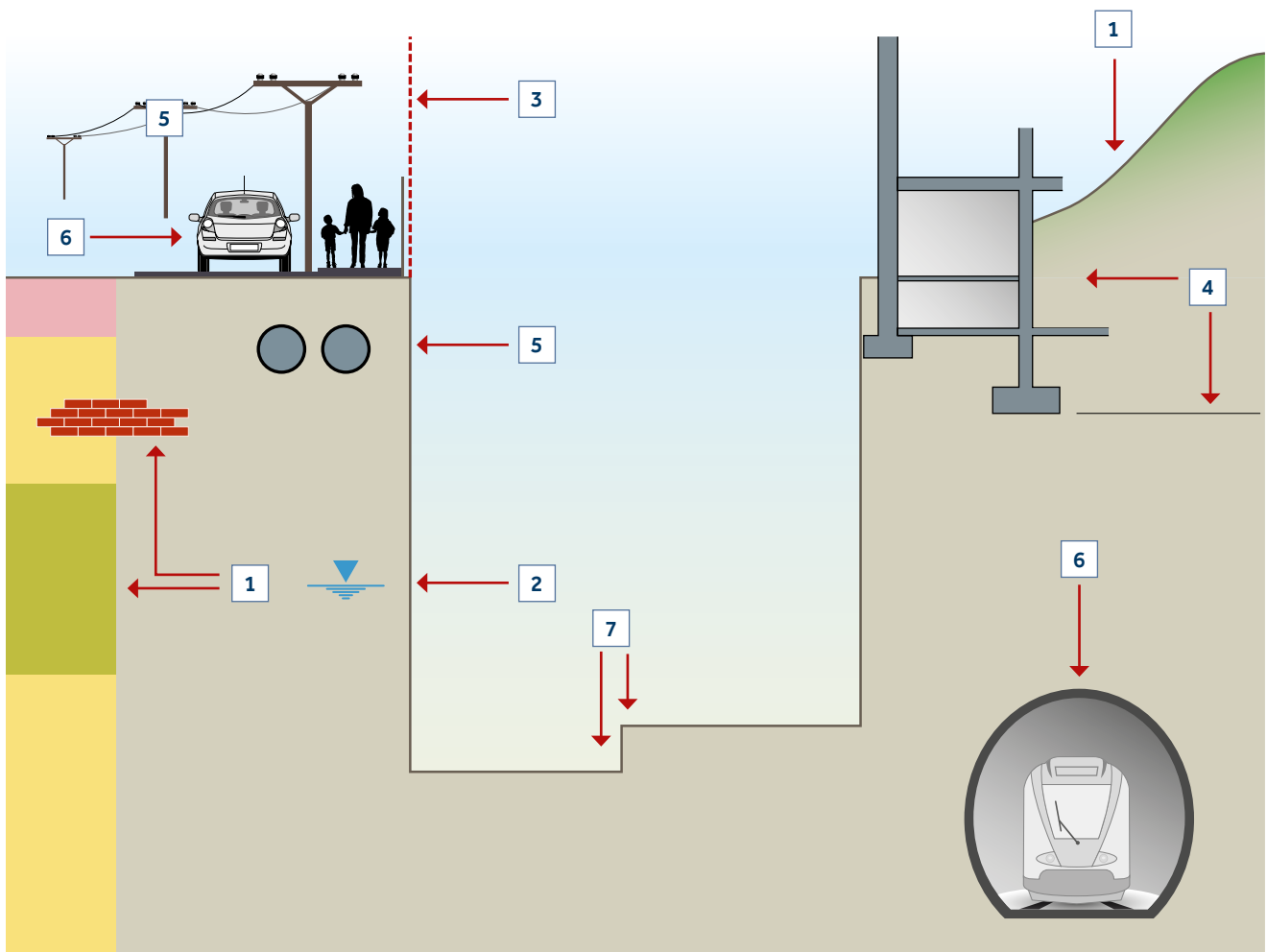
Health and safety is a priority for Keller and we have a proven track record of one of the lowest accident frequency rates in our industry. The commitment of leaders and employees to our Think Safe programme has earned us awards and recognition from industry bodies as well as our clients.

We believe no one should be harmed as a result of any work we do and our ultimate goal is zero incidents.





When designing and constructing excavation support, we work to complex boundary conditions and performance requirements, whilst considering how to make the best use of the land available.



Requirements

- Minimum impact on existing building structures
- No disturbance to day-to-day operations
- Optimum use of plot space and facilities
- Integration of foundation system into the overall structure
- Minimum deflection even for deep excavation support
- Compliance with environmental standards, noise, dust- and vibration regulations
- Efficient use of natural resources
- Extensive monitoring and verification through measurement, with detailed records
- Close cooperation between owner, designer and foundation specialist

1. Soil conditions

Difficult soil conditions (stratigraphy, obstructions, existing slopes etc) require careful design and planning to select an appropriate solution.

2. Groundwater

Protection of groundwater against pollution and prevention of water ingress into the excavation pits.

3. Plot boundaries

Plots and existing rights of way require particular care when planning the building site and during construction.

4. Existing buildings

Damage to adjacent buildings as a result of the work being conducted must be avoided. In particular, the serviceability of the existing building foundations must not be compromised. This often requires additional support and underpinning to secure them.

5. Underground services

Underground services such as sewage and water pipes, power lines and communication cables must remain in service, especially in densely populated areas such as city centres.

6. Traffic

Traffic flow should be impeded as little as possible and existing traffic infrastructure needs to be protected against damage.

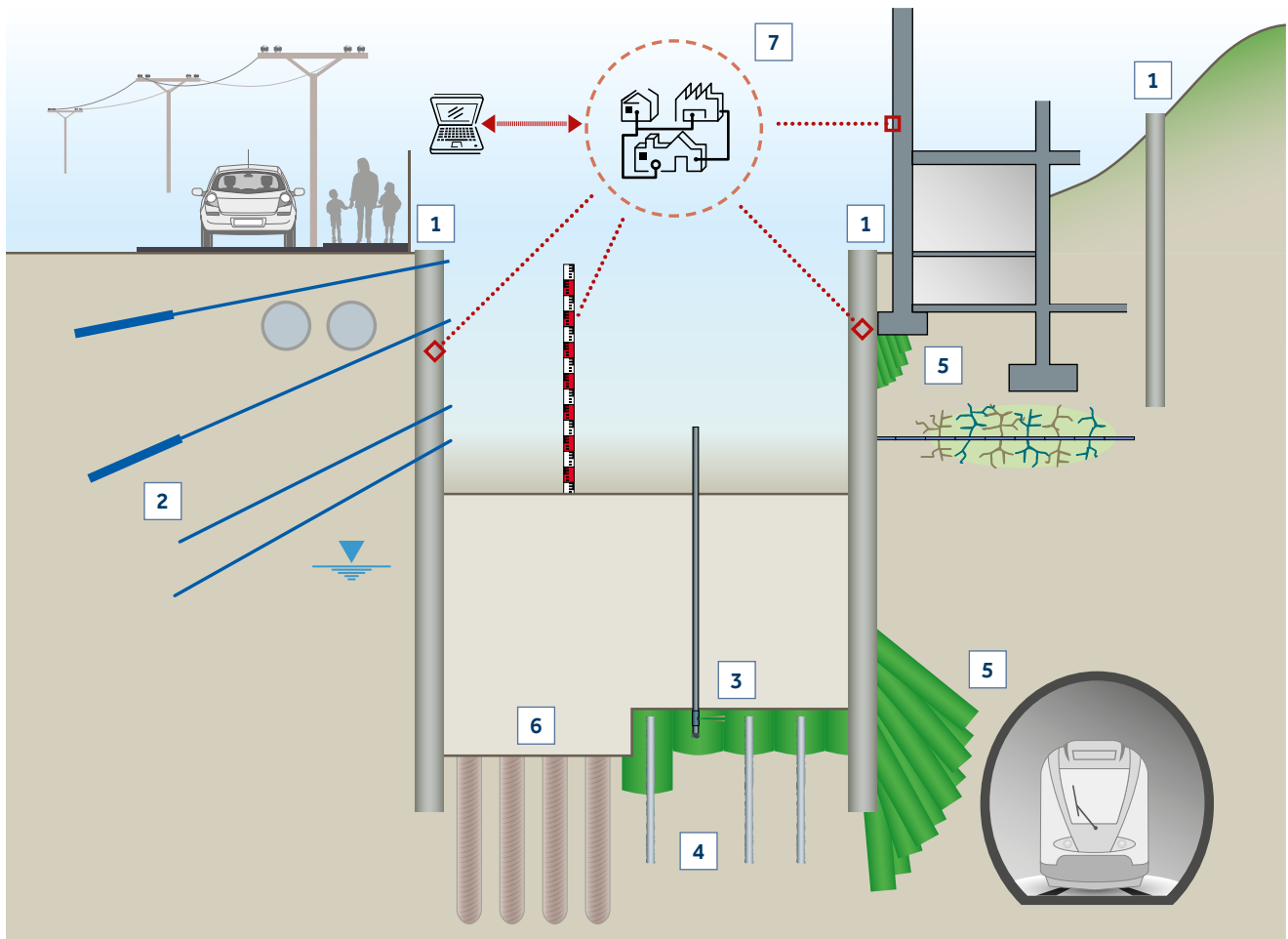
7. Varying excavation depths

Some projects require excavation depths to vary across the site, for which a range of tailored solutions may be required.





Keller offers flexible solutions and specialist techniques to solve even highly complex excavation support problems. Working to industry leading quality and environmental standards is an integral part of our philosophy.



Solutions

- Complete package: A full range of methods for the construction of excavation support to suit your job
- Custom-made solutions designed in our in-house Engineering Centre
- Low-vibration and ecologically sustainable construction
- Use of environmentally compatible materials
- Continuous monitoring
- Flexible response to unexpected problems
- Direct communication between client and Keller
- Extensive knowledge from more than 150 years' experience in ground engineering

1. Pit walls

- [Bored pile walls](#)
- Diaphragm walls
- Sheet pile walls
- Berlin type pit lining
- Shotcrete
- [Soil mixing method \(DSM\)](#)
- [Jet grouting method](#) (including Soilcrete® wall/underpinning)
- Combined solutions (eg bored piles and Soilcrete®)

2. Groundwater

- [Anchors](#)
- [Soil nails](#)
- Steel and concrete reinforcements

3. Base slabs

- [Jet grouting method](#) (Soilcrete®)
- Soft-gel chemical grout
- Underwater concrete

4. Uplift control

- [Micropiles](#)
- [Pail radice piles](#)

5. Base slabs

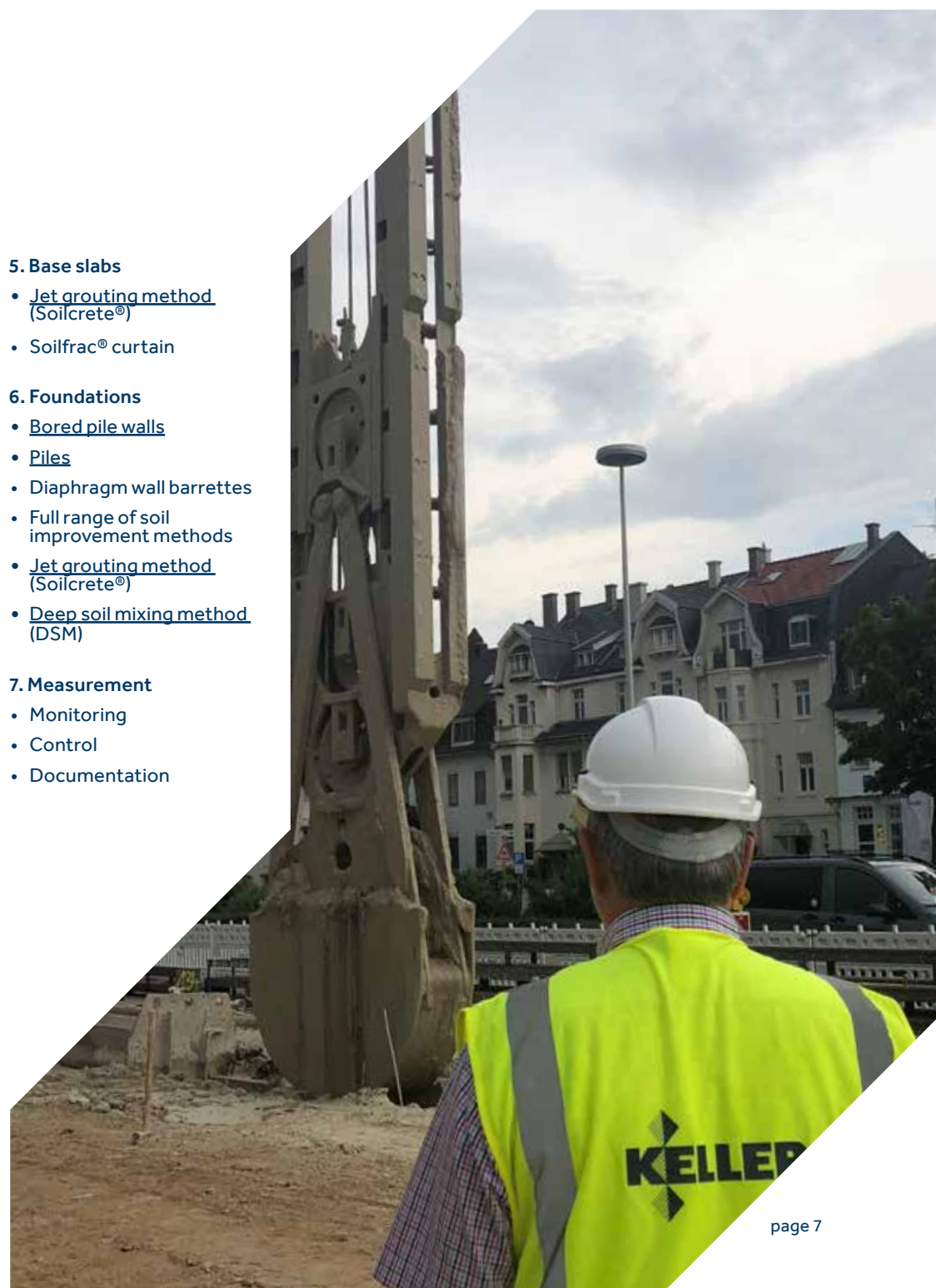
- [Jet grouting method](#) (Soilcrete®)
- Soilfrac® curtain

6. Foundations

- [Bored pile walls](#)
- [Piles](#)
- Diaphragm wall barrettes
- Full range of soil improvement methods
- [Jet grouting method](#) (Soilcrete®)
- [Deep soil mixing method](#) (DSM)

7. Measurement

- Monitoring
- Control
- Documentation



Monitoring solutions

GEO-Instruments, Keller's instrumentation and monitoring business, can monitor excavations and basement construction to provide data and alerts to understand ground movements, wall deformation and effects on structures adjoining the site works.

We use a wide range of manual and automated monitoring solutions that allow data acquisition from all excavation works.



- Inclinometers and ShapeArrays (SAA) for detailed monitoring of deformation in excavation walls.
- Strain gauges can be installed on props to measure changes in stress.
- ATS networks for 24 hour, high-frequency monitoring of movements of neighbouring structures.
- Levelling surveys to monitor effects on neighbouring infrastructure and utilities.
- Extensometers to monitor ground movement around the excavation.
- Crack monitoring for measuring impacts on structures.
- Levelling Cell and Tiltmeter systems to measure settlement and tilt in nearby buildings.
- Piezometers for monitoring pore pressure in the soil.

Project examples

Four Ashes manufacturing facility Wolverhampton, United Kingdom

Keller UK installed more than half a kilometre of CFA piled wall to allow the construction of three Press Pits for a new manufacturing facility at Four Ashes near Wolverhampton.

More than 900 No 600mm diameter hard and soft piles were installed to depths of 12m and reinforced full length to provide a high retention capacity.

Keller's CFA pile technology was the preferred solution due to the unstable glacial and glaciofluvial soil deposits present. Using two state-of-the-art rigs, the conditions were easily overcome producing high quality piles and impressive rates of production. This ensured the project was successfully delivered within the tight 10-week programme.



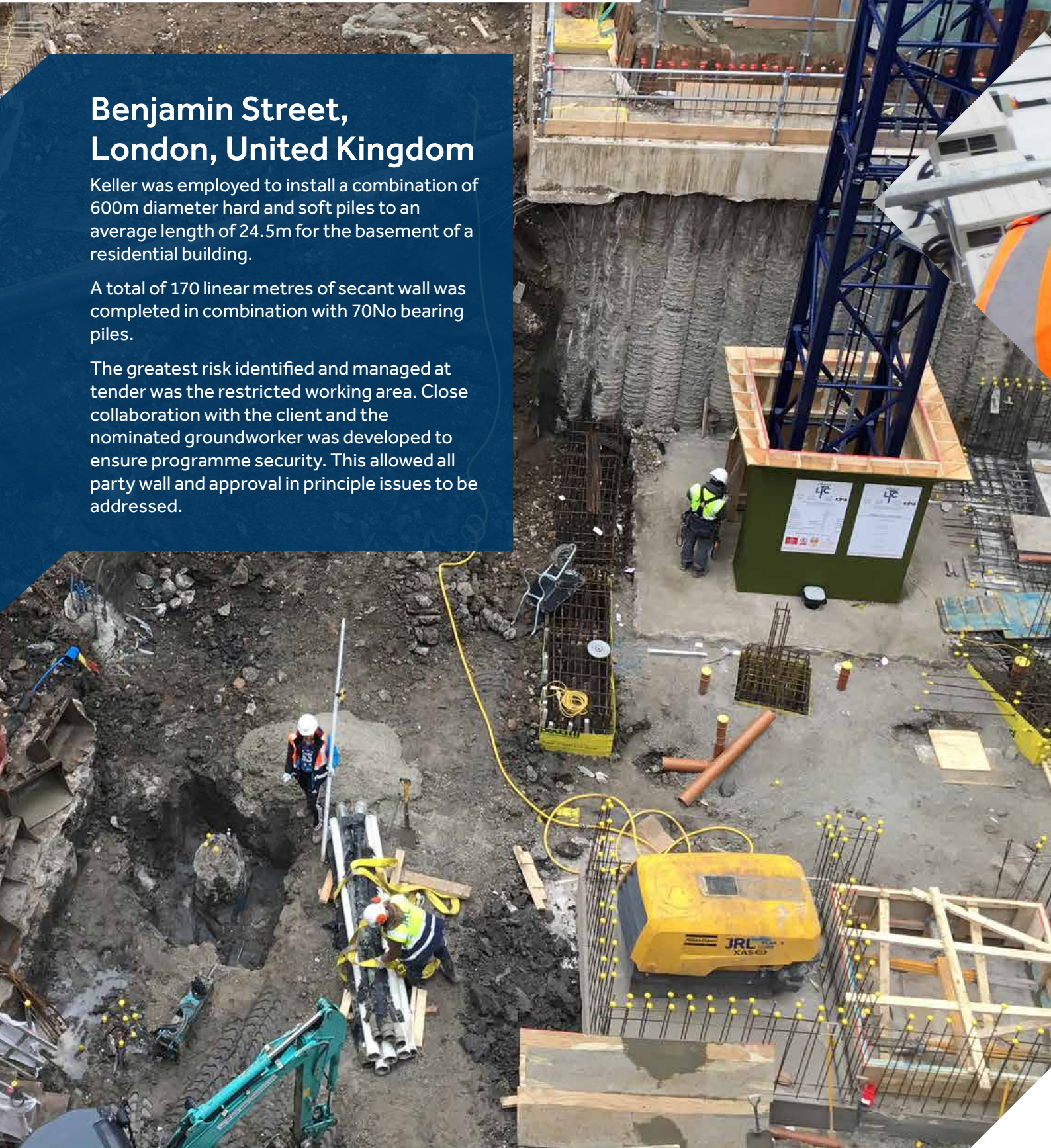
Project examples

Benjamin Street, London, United Kingdom

Keller was employed to install a combination of 600mm diameter hard and soft piles to an average length of 24.5m for the basement of a residential building.

A total of 170 linear metres of secant wall was completed in combination with 70 No bearing piles.

The greatest risk identified and managed at tender was the restricted working area. Close collaboration with the client and the nominated groundworker was developed to ensure programme security. This allowed all party wall and approval in principle issues to be addressed.





University College Hospitals, London

University College London Hospitals were building a new proton beam therapy cancer treatment centre in central London.

GEO-Instruments deployed a comprehensive structural and environmental monitoring solution from the start throughout the whole job duration. Monitoring was required during demolition and the excavation of a 4000m², 20m deep basement. The basement was constructed using diaphragm walls with a perimeter of 310m and a 30m depth.

The specification was demanding with data processing such as noise hourly and daily averaging required, but also calculating horizontal tensile strain, deflection ratio and slopes of adjacent structures. Noisy works and potential movements of the existing structures and roads required alarm thresholds to be flagged up by email immediately to allow the works to be modified accordingly. Comprehensive noise and air quality monitoring was also required due to the surrounding residential buildings.

GEO-Instruments' own Quickview web viewer was provided for viewing the data from different sources for the project.



Southbank Place, London

GEO-Instruments provided monitoring of live London Underground tunnels during the demolition of the old Shell building and the construction of eight new commercial retail and residential buildings in Southbank Place, which included a site-wide two-storey basement.

The monitoring system was required to establish

if any movement or damage might occur to the Northern Line and Bakerloo line tunnels or tracks while the main contractor undertook construction works directly above the tunnels.

No cabling or instrumentation could protrude beyond the existing tunnel flanges, so a robust wireless system was used to provide accurate near live data on any movement that might occur throughout the five-year project.

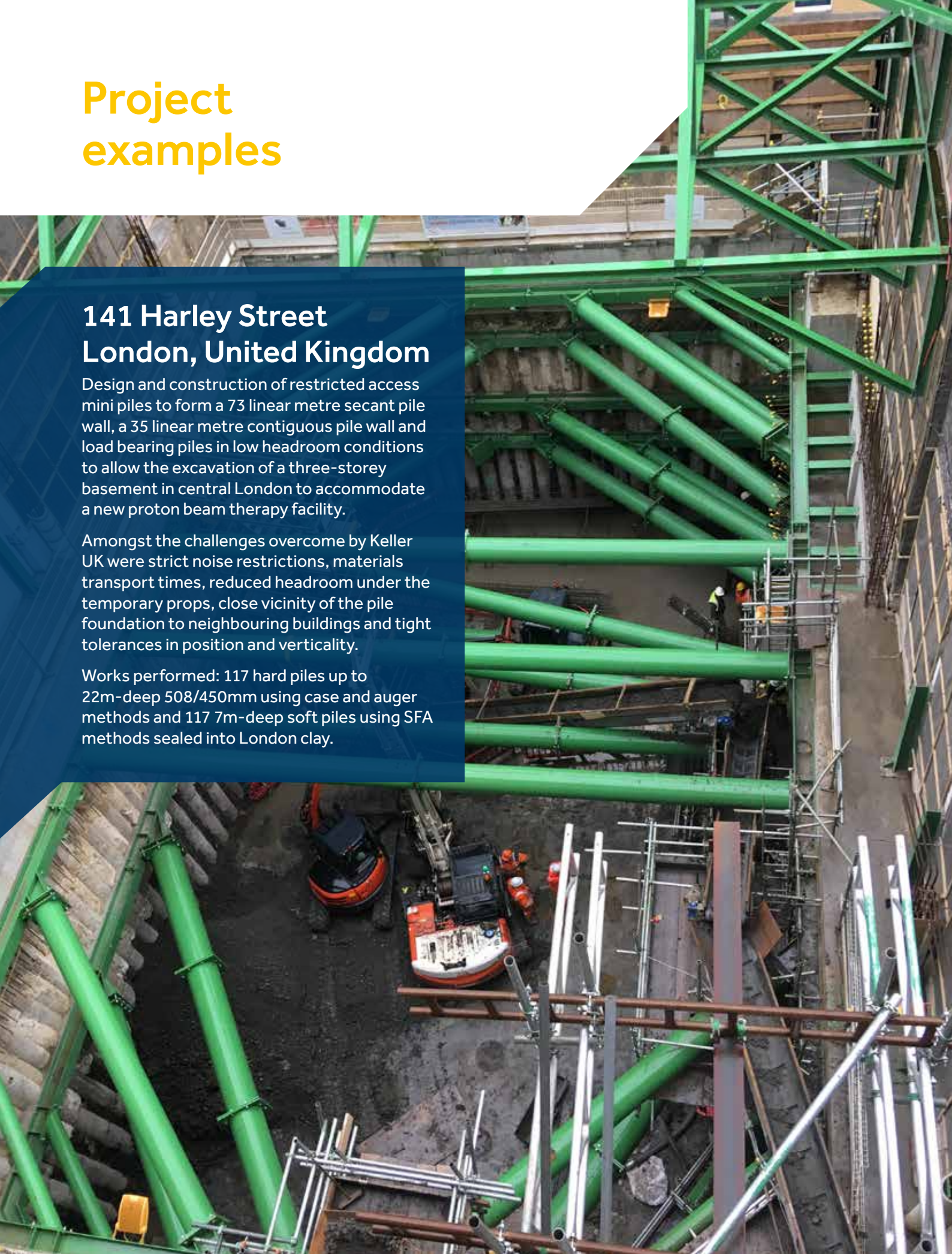
Project examples

141 Harley Street London, United Kingdom

Design and construction of restricted access mini piles to form a 73 linear metre secant pile wall, a 35 linear metre contiguous pile wall and load bearing piles in low headroom conditions to allow the excavation of a three-storey basement in central London to accommodate a new proton beam therapy facility.

Amongst the challenges overcome by Keller UK were strict noise restrictions, materials transport times, reduced headroom under the temporary props, close vicinity of the pile foundation to neighbouring buildings and tight tolerances in position and verticality.

Works performed: 117 hard piles up to 22m-deep 508/450mm using case and auger methods and 117 7m-deep soft piles using SFA methods sealed into London clay.



Project examples

Secant Box Test Pit Montrose, United Kingdom

During the construction of a Centre of Excellence for Baker Hughes Gas and Oil, there was a need to construct foundations to support a new shed facility and its underground testing pit.

The secant box methodology was a new technique to Keller UK but one which has been successfully utilised in other business units across the world. Due to the challenging ground conditions of dense, saturated sandy strata, a hybrid solution was devised.

The 900mm diameter CFA piles were installed first with jet grouted columns being sized to seal between the piles and construct the watertight wall. A further 88No plug columns were then installed, up to a diameter of 2.2m to create the base of the box. There were two levels of grouting, the 2m deep plug 12m below ground level to resist hydrostatic uplift and another at 7.5m below ground level to act as a dry working platform to construct the permanent slab.



Keller Group plc - Who we are

Every day, people around the world live, work and play on ground prepared by Keller, the number one geotechnical specialist contractor worldwide.



North America

North-East
 South-East
 Florida
 Mid-West
 Central
 West
 Canada
 Specialty Services
 Moretrench Industrial
 RECON
 Suncoast

Europe

Central Europe
 North-East Europe
 South-East Europe and Nordics
 South-West Europe
 UK

AMEA

(Asia-Pacific, Middle East and Africa)

ASEAN
 Austral
 India
 Keller Australia
 Middle East and Africa

Solutions specialist

Used alone or in combination, our techniques solve a wide range of geotechnical challenges across the entire construction sector – from industrial, commercial and housing projects to infrastructure construction for dams, tunnels, transportation and water treatment, as well as projects to address environmental challenges.

Global strength and local focus

We are unique in that we combine global strength and knowledge with our local presence and focus. Our knowledge of local markets and ground conditions means we're ideally placed to understand and respond to a particular local

engineering challenge. Our global knowledge base then allows us to tap into a wealth of experience, and the brightest minds in the industry, to find the optimum solution. With 9,000 employees and operations across five continents, we have the people, expertise, experience and financial stability to respond quickly, get the job done and see it through safely.

By connecting global resources and local knowledge, we can tackle some of the largest and most demanding projects around the world but the everyday work we do is just as important and, in total, we handle an unrivalled 6,000 projects every year.



Keller at a glance

 Established in 1860	 6k contracts executed a year
 40 countries	 9,000 employees

Building the foundations for a sustainable future

-  Ground improvement
-  Grouting
-  Heavy foundations
-  Earth retention
-  Instrumentation and monitoring



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