Company profile

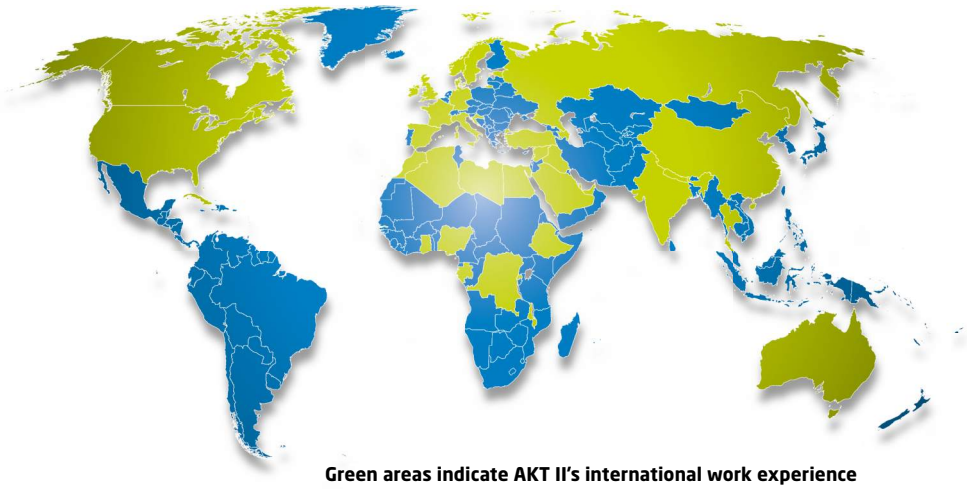
AKT II is a progressive, design-led structural and civil engineering firm with current and complete projects in 44 countries worldwide. The practice operates from its central London headquarters of over 300 people, with its organic growth lending support to the Copenhagen office.

Our experience is extensive, covering the commercial, residential, retail, leisure, educational, health and transportation sectors of the market. Projects range from large new build developments to complicated refurbishments of listed buildings, with contract values ranging from £100,000 to over £750 million. We are thus confident in working with a wide range of methods and materials including structural steel and other metals, concrete, structural timber, alloys, masonry, plastics, glass, composites and tensile fabrics.

The shareholding of the company is divided between the AKT II senior directors and Swedish engineering group Tyréns.

Innovation and high-quality design

We have a reputation for innovative and high quality design. Since formation in 1995, our projects have won over 350 design awards including the prestigious Stirling Prize for Peckham Library, designed with Will Alsop, the Sainsbury Laboratory, designed with Stanton Williams, and for Bloomberg's European HQ with Foster + Partners. We have also received many Structural Steel Design and Concrete Society Awards, countless Civic Trust Awards, BREEAM Award, BCO Award, BCI Award, RIBA Award, Building's Housing Project of the Year, and the Building Award for the Most Sustainable Building of the Year.



Green areas indicate AKT II's international work experience

Resources

In addition to their involvement in individual projects, Hanif Kara, Albert Williamson-Taylor, Gerry O'Brien monitor the overall design quality, alongside other design directors, while Robin Adams and Paul Scott are responsible for the day-to-day management of the practice, supported by fellow management directors.

We have a policy of employing only well-qualified, professional staff of high calibre, recognising that this is essential to maintaining the quality of the engineering delivered.

Our current staffing levels, across the whole company, are as follows (all permanently employed):

Principals	5
Directors and Associate Directors	43
Associates	24
Senior and Design Engineers	139
CAD Technicians	42
Specialist teams (Envelopes, Geotechnical and Computational Research)	22
Business support	32
Total	**307**

We invest heavily in technology, including IT systems, advanced analysis and design software, plus advanced 3D CAD modelling systems from which 2D drawings are automatically produced.

Integrated Management

The directors firmly believe in Quality, Occupational Health and Safety, and Environmental Management, and have in place an Integrated Management System (IMS) which is continually maintained and improved. Strict reviewing and auditing processes are an inherent part of our culture.

AKT II operates an IMS that is compliant with and externally certified to:

- ISO 9001 Quality Management Systems
- OHSAS 18001 Occupational Health and Safety Management Systems
- ISO 14001 Environmental Management Systems

Insurances

AKT II operates with the following levels of insurance cover:

Professional Indemnity	£10 million
Public Liability	£10 million
Employers Liability	£10 million

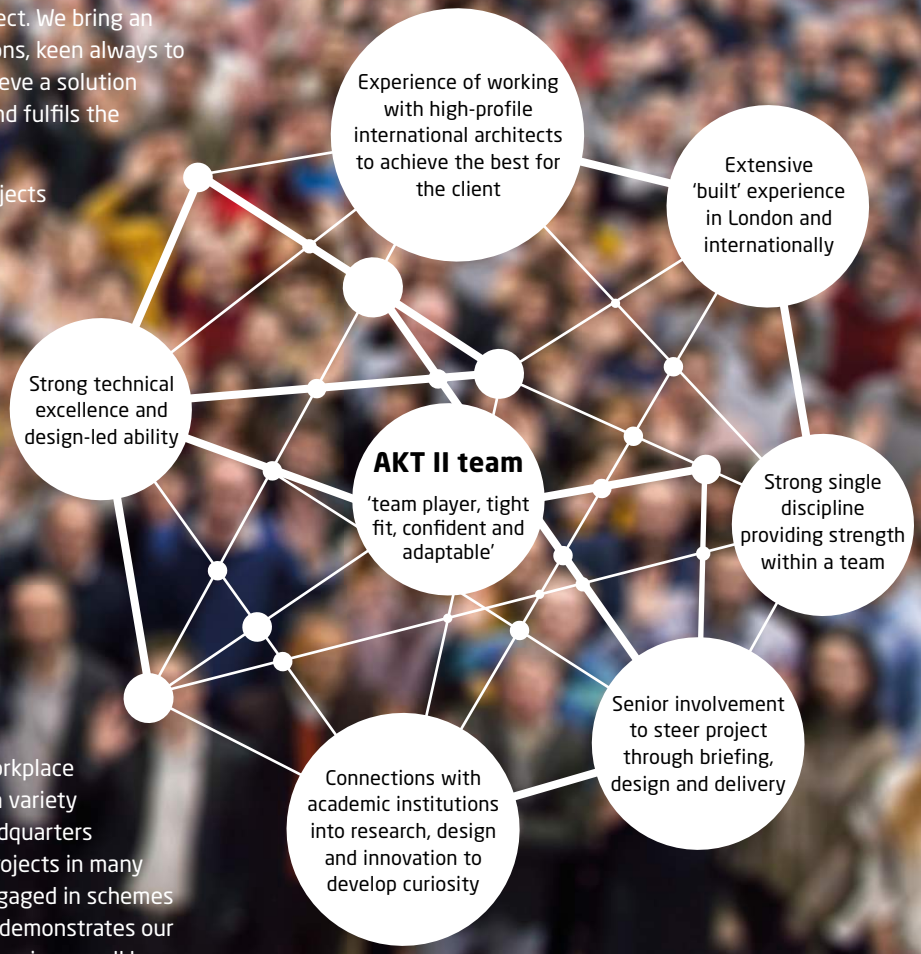
Our culture

We believe in providing a high-quality model which draws on a wealth of experience and is enriched by an inherent curiosity. Through this we ensure that value is embedded from concept through to the successful delivery of a project. We bring an innovative thought process to all commissions, keen always to produce well-engineered buildings and achieve a solution which is appropriate to the client's needs and fulfils the requirements of the design brief.

AKT II has the ability to deliver complex projects within budget and programme. This has been proven on many past projects and is monitored vigorously during all stages of the project. We believe in the benefits of an open and collaborative approach and our willingness to work with and for contractors underscores this.

We have been recognised as a practice with a skill set that reaches beyond our own discipline through our collaborations with (and appointments to) industry bodies and academic institutions.

Diversity is encouraged within the office, and at the last count we had people of over 20 different nationalities, and the ability to communicate in over 30 languages. This diversity not only culturally enriches our workplace but also provides an openness to embrace a variety of approaches. Working from our single headquarters in London we have delivered high quality projects in many areas throughout the UK and have been engaged in schemes in 44 countries worldwide. Our track record demonstrates our ability to listen, understand, learn and apply science – all key components of effective engineering.



Commercial offices

A primary value driver for commercial office developments is balancing the requirements of the building with the needs of its users; early understanding of key design drivers and must-have items is essential.

The office offer and local market

For the office design and its offer to the market, aspects such as structural grid, floor-to-ceiling height, ceilings (or not), toilet provision, tenancy split, interconnecting stairs, etc., must all be discussed with the aim of drawing out these fundamental briefing questions early on. Along with the energy strategy, environmental and building services discussions, these will help to shape the appropriate structural frame strategies and grids. Steel versus concrete will be debated and it will be interesting to see if the current trend of RC or PT flat slab continues over the potential current market advantages of steel. These debates have been tested at length over many previous projects, and we can bring our views and experience to the table for future projects.

Chosen specification

The potential for consideration of a variety of structural grids is driven by the various functionalities within an office building brief and its emerging massing. For example, the office may have a requirement for longer spans to facilitate flexibility in use. Whether the grid is around the 9 m mark, or something longer that could provide greater flexibility, is often a matter of great debate. This has been the case in many recent developments in which we have been involved, where achieving the correct floor sandwich was considered absolutely key to unlocking value.

Occupants' needs

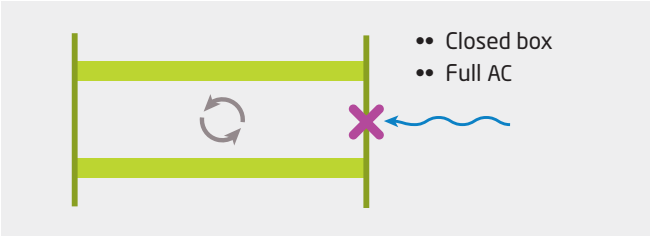
Successful solutions must be in keeping with the needs of the likely occupiers of the office space. Historically there has been a clear understanding that West End offices have different needs to mid-city offices, and those aimed at the TMT market or in emerging destinations are different again. There is now a train of thought that these typologies may be converging in areas as employers battle to attract the best staff and as the potential occupiers of the city now includes creative and tech companies, or even tech start-ups. Movable desks, collaborative working, overlap zones, town hall spaces and outdoor amenity may now all be considered key components of a successful office. Wellbeing and mindfulness are an emerging concern for all reputable employers and one that must influence what we design and bring to the market.

Consideration for the potential provision for terraces / balconies is paramount. We have seen terraces add significant value to projects. Should they be adopted, careful consideration will be necessary in these areas to test the need to increase the floor zones. With potentially differing build-ups externally and internally, as well as a desire for flush thresholds, this must be another area of early focus in the office development design process.

Environmental design and structural integration

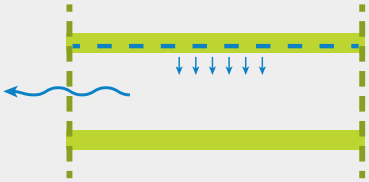
There are many aspects of the structural design that can be beneficial to the environmental approach, which often adopts the thermal mass of floors to aid the passive and active cooling systems. If the structure is not forming an integral part of the environmental design, then the options available are wider, and the optimal 'floor sandwich' needs to be considered, looking at either integrated or non-integrated floor and services zones.

We are experiencing more and more speculative and end-user-specified office space having environmental systems that take advantage of either natural ventilation, thermal mass in structure, or both to improve their environmental credentials and wellbeing of the

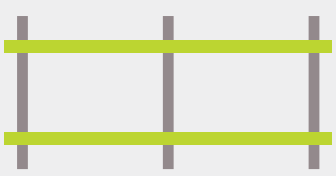


- Closed box
- Full AC

- Long span
- Deep (steel) structure
- Integrated services zones



- Permeable façade
- Natural ventilation
- Integrated cooling / heating



- Shorter spans
- Concrete as option
- Services either above / below or integrated

occupants, whilst offering a different or even unique aesthetic offer. Our office at the White Collar Factory is a key case in point, and we genuinely believe it has enhanced our working productivity and staff wellbeing (we are undertaking post-occupancy observations to test this).

Similarly, there is a trend to make workplace design more flexible and adaptable with varying tenancy splits or wider flexibility within the base-build scheme, including atria and interlinking stairs (base-build provision) and an emphasis to use the back-of-house stairs by upgrading their finish.

We have a wealth of experience in differing office / environmental / structural approaches. Taking our work at Pancras Square as an example, of the six buildings completed and in construction, there are five differing structural / environmental approaches, ranging from long-span steel with 4PFCUs to partially naturally ventilated, using the thermal mass of exposed concrete, to high-quality exposed concrete with chilled beams. We are also familiar with schemes that adopt integrated structure / M&E systems, such as the actively cooled and heated slabs at the White Collar Factory.

Key design considerations:

- Value, cost and structural efficiency balance
- Sustainability focus
- Set-backs to office massing – position where transfers can be avoided
- Roof terraces detailing and opportunities to create flush thresholds
- Acoustic and vibration considerations from the rail below – early survey to de-risk
- Connectivity to the wider area – making a place with all elevations facing outwards
- Services integration into structural design
- Look at passive or integrated solutions – natural ventilation for office opportunity
- Focus on detailing to achieve quality, buildability, tolerances and reduce the number and complexity of interfaces
- Design life – longer than 60 years at low cost?
- Rooftop gardens and amenity space integration into the office floor stack
- Façade cleaning and maintenance – integrated BMU / mobile equipment / integration with roof amenity and setbacks
- CFD wind modelling to give early direction to massing and structural loading
- 3D coordination and intelligent modelling using advanced BIM techniques

1 **White Collar Factory:** Exposed RC soffit and services
2 **Bloomberg European HQ**
3 **King's Cross R7:** Roof terraces
4 **Four Pancras Square**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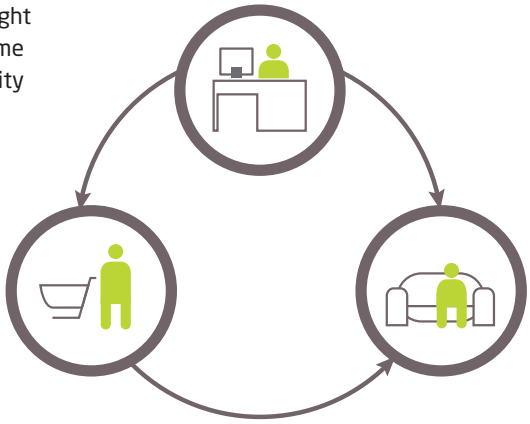
Adaptable spaces

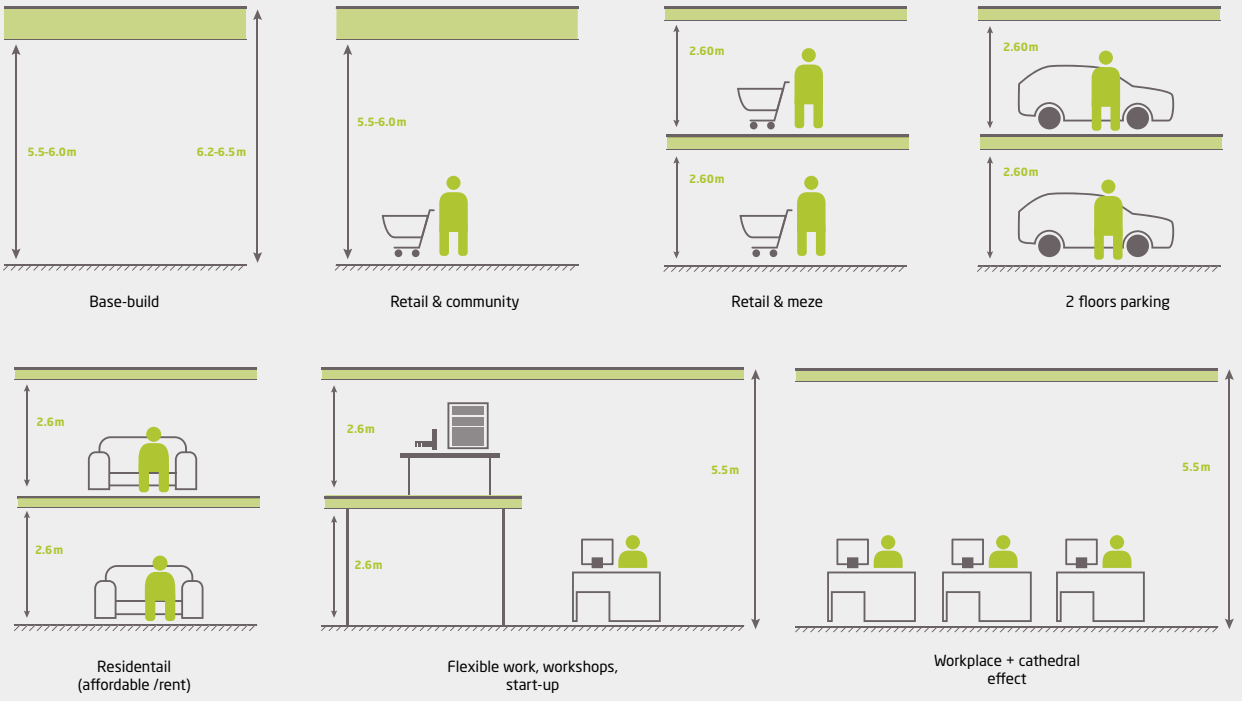
Creating spaces that are adaptable and flexible is critical in creating a new place that is capable of responding to the changing needs of retail, ensuring the investment made has longevity in its returns.

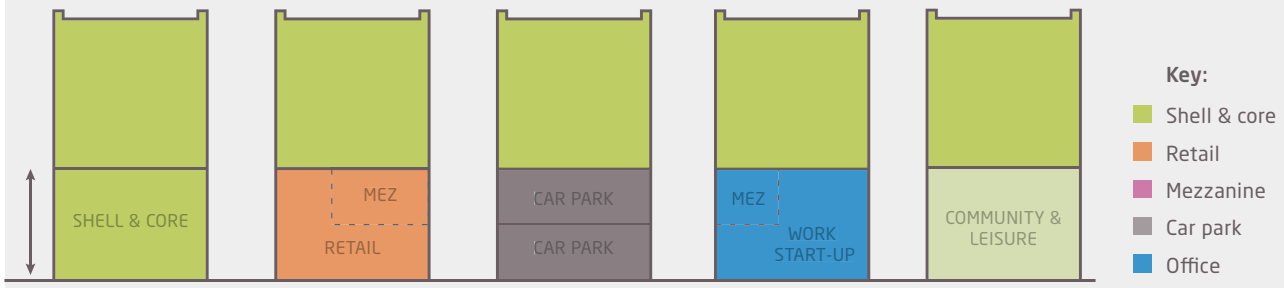
We completed high-level studies, testing the extra investment in space and structural fabric with the aim of adding enhanced adaptability to the lower floors of developments. These studies demonstrated that a relatively small increase in height at the lower floor can add significant future flexibility into the basic fabric created at day one.

We have also looked into the added investment that would be needed within the fundamental structural fabric, providing scope to further extend the assets in a point in the future where, for example, the planning and height restrictions for the plot may become less onerous, giving the opportunity to further expand. These questions are significant, as they go beyond just structure (lift and stair provision, servicing etc. all need considering), yet could be a sound investment should the client choose to invest further for the future.



Options for retail alternative use with a higher floor height in the base-build





Efficiencies of residential design

We understand the importance of extracting the greatest efficiency from a scheme balanced with achieving a quality model for the chosen residential mix. Key drivers on efficient housing developments include optimal core location / sizing, pushing floor-to-ceiling heights, cycle and car provision, maximising unit density, provision of amenity space, and connectivity to the wider masterplan and community.

From a structural perspective, this necessitates a careful and early integration of structural systems with unit mix, to achieve a balance between structural efficiency and value. Alignment of vertical structure is key to unlocking this efficiency, so limiting transfers is always our starting point. Where this cannot be achieved we endeavour to find smart ways of minimising them or, if necessary, to integrate them into the building fabric. Minimising structural floor zones, provision of flat soffits and the integration of services, are also important considerations that need to be evaluated across disciplines with other influences such as flexibility, acoustics, fire, etc.

As an example, we have taken the first phase of St James' White City development to planning with Patel Taylor, the success of which relied on the strength of the architectural / structural / MEP relationship. The result was a framing system of concrete flat slab and blade columns coordinated with the unit mix such that columns were aligned and integrated into the internal layouts and façade. Across the wider masterplan we also developed a structural concept for all primary elements of the build and, through careful evaluation with trade, rationalised the design of each into a limited set of defined structural components.

On the Athletes' Village in the London Olympic Park different layers of grids were necessary given the change of function vertically from car parking to town houses to apartments at the top. Combined with a change of use from Olympic to legacy mode, this produced a complex set of planning constraints for the frame design, which could have potentially resulted in a dense network of bespoke transfer beam elements. We carried out a full rationalisation process to align / overlap structural walls and columns where possible, maximising repetition and keeping structure to dedicated zones.

Conversely on Highpoint, a 45-storey building in Elephant & Castle, stacking of units was achieved with a very compact central core, which resulted in the need for additional stability systems other than the cantilevering core. We integrated the internal unit stacking arrangement and the external architectural expression with the structural stability system. This was achieved by utilising internal and external RC blade walls as part of an outrigger system, which used every floor slab as a bending element to transfer axial loads to the walls – unlike more 'traditional' systems where whole floors are taken up with outrigger trusses. This means that structurally there is very little redundancy and that all elements are working as part of a lateral stability system as well as vertically, producing an efficient design in terms of engineering, cost, programme and sustainability.

1 **White City:** Columns aligned and integrated into the façades and internal layouts
2 **Highpoint:** Blade wall system provides stability to stacked units
3 **Athletes' Village:** Different grid layers respond to shift from Olympic to legacy mode
4 **Renaissance:** Rationalisation of the structure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Foundation / basement

Utilising volume below ground is a key driver on many London sites, and very early strategic decision making is key to balancing the value of excavation with the associated risks – cost, programme, third parties, etc. We make a point of evaluating this aspect with our clients during the briefing period and will push the button on the workstreams of analysis that are necessary to inform a decision.

At the Bloomberg European HQ in London, four basement levels of top-down construction connected to a new LUL station box are surrounded by third party assets on all sides, and the agreed construction methodology was a direct product of evaluating cost, programme and risk profile, as well as close and early liaison with the asset owners.

Basement construction methodology is also key, and this is assessed early in the process and then implemented into design, as opposed to waiting until the contractor makes his choice. We have vast experience in analysis of the options available; on each and every job we apply rigour to this process, engaging with the rest of the design team, including external trade, to conclude the optimum solution for the project and the site. The resulting solution appropriate for each site can take many forms, from open battered excavation (White City) to top-down construction (The Glebe in Chelsea).

Foundation design is also an area we try to optimise, as often we believe it is here where over-design is common. We carry out in-house geotechnical design and modelling to assess the appropriate options and impact on third party assets, often going against the grain of 'piling every site' by designing shallow rafts (Park House), reusing existing retaining walls (White Collar Factory), and reusing existing piles to provide additional stiffness to the ground (Bloomberg European HQ); our aim being to add value through speeding up construction.

With Barratt Homes, we were commissioned to design Dalston Lane South, a series of mixed-use low- and high-rise residential developments. Each block had different planning grids due to cost / programme drivers, and Crossrail was located directly below the site. Rigorous ground modelling was carried out to establish the optimal foundation system, and it was concluded to design the entire development on raft foundations to ensure that loads across the blocks did not induce differential settlements and were kept within the limits defined by Crossrail.

1 **Park House:** Open cut
2 **One Nine Elms:** Pinning down Thames Water sewer
3 **Bloomberg European HQ**: Hybrid construction
4 **The Glebe:** Top-down construction


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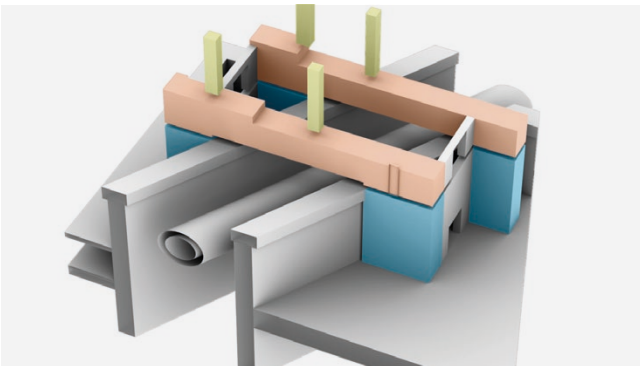
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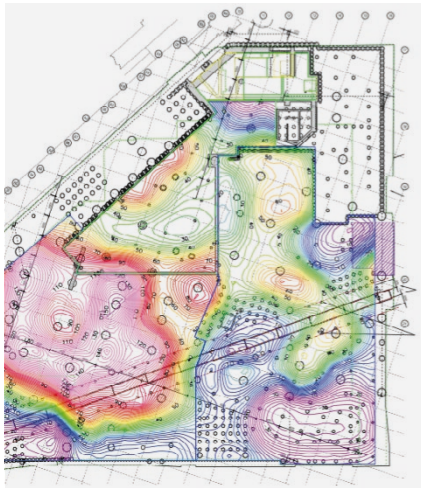

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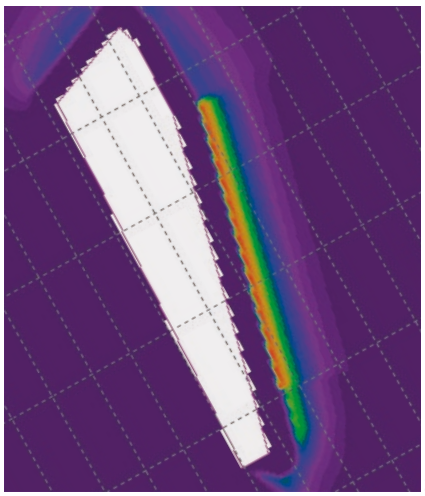

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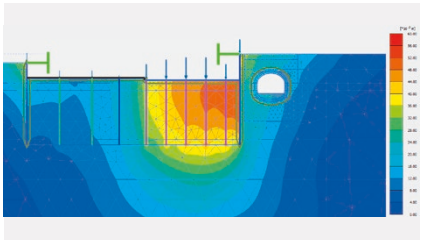

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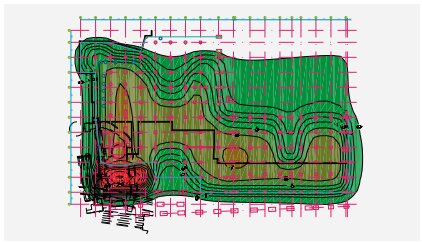

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1 **Bloomberg European HQ**
2 **Google London**
3 **Canada Water Plot A1**
4 **100 Liverpool Street**

Complex ground modelling

Through the growing complexity of our projects and the importance of asset protection of third parties, we have developed a wealth of experience in soil-structure interaction and ground movement modelling. This knowledge is integrated into the wider office by sitting within both the structural engineering teams, where the experience has developed over the life of the practice, and in a more focused and specialised manner within our geotechnical team.

This team has a breadth of knowledge and understanding of soil behaviour and analysis that, when complemented with and supported by our structural engineering teams, is able to tackle the most complex challenges of asset protection and soil-structure interaction.

At the Google London project, our team has developed an efficient substructure solution by utilising load balance over the site; we were able to propose a 'settlement reducing raft', whereby pile sizes and depths are significantly reduced in comparison to the pile-only solution.

At Canada Water, our 42-storey project is situated directly adjacent to a subterranean section of the London Overground line south of Canada Water station. Originally constructed in 1868, this portion of tunnel is a sensitive piece of infrastructure, and our ground movement analysis to date has had to reflect this by considering longitudinal effects in addition to vertical and horizontal movements and strains.

Some examples of our bespoke ground modelling work are described here.

Building higher on existing foundations

At 100 Liverpool Street the work of the geotechnical team has made it possible to add 4 storeys on top of an existing 8-storey building without strengthening the existing foundations. Following extensive review of the archive information, axisymmetric pile models were combined with 2D plane strain and 3D halfspace analyses to justify the additional loads while ensuring that displacements were controlled. It was necessary to consider the full history of site development within this work in order to secure the relevant third party approvals.

Optimising foundations

For the 45-storey Highpoint tower in Elephant & Castle, we specified the use of advanced site investigation techniques that ultimately allowed shorter, more cost-effective CFA piles to be used. We were able to use the results of self-boring pressure meter tests to define advanced soil models, demonstrating that the stiffness of the ground was higher than would have been expected based on more traditional techniques. On current projects, we are utilising similar innovative techniques to combine new mini-pile groups with existing under-reamed piles, reducing cost and programme time in comparison to traditional solutions.

Getting more out of difficult ground conditions

At One Nine Elms it has been necessary to undertake complex 3D FEM analysis to develop a foundation solution capable of supporting the 58-storey tower on complex ground conditions. The site incorporates a highly variable gravel hollow, and the work undertaken has allowed the full capacity of the piles to be realised, where the length through the hollow may have otherwise been ignored. Similar techniques were used at Bloomberg European HQ to take account of the beneficial effects of the existing piles that were cut down but left in the ground.

Third party interfaces

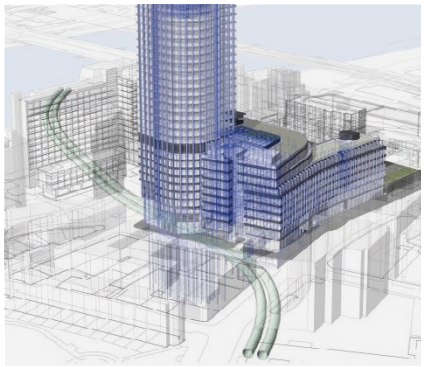
Many of our London projects have significant interfaces with buried rail or other key assets. Managing and controlling these interfaces has to be won on two fronts. Not only does a high level of technical competence and experience need to be brought to these projects, but just as important is the ability to communicate and interface at the human level with the asset owner and their asset protection team.

In all of our projects where such an interface is key, we strive to meet and liaise with the asset owner at the earliest opportunity, starting an open dialogue and generating relationships that often become critically important through the journey of the project. Many of our current and recent projects interface with assets such as Network Rail, London Overground and Thames Water, to name just a few.

We approach projects with these third party interfaces as we do any other – where extracting maximum value from the site for our client is the ultimate goal – however this 'value' is measured. Projects with these complex third party interfaces are where 'value extraction' expertise becomes increasingly influential, and it can literally make or break a project. The realisation of this value is borne from both engineering and development acumen, in parallel with a detailed appreciation of the third party assets, their guardians, and the extent of intervention they can accommodate.

For example, a conservative or overly guarded approach would not have allowed us to redevelop the Cadogan Mansions site, where we exposed the crown of the Circle line tunnel below the building; or to have added 11 storeys to the existing 31-storey South Bank Tower, which sits upon the Waterloo & City line. It is this insistence on pushing boundaries and taking the hard route that adds the extra edge to our clients and their development opportunities.

1 **South Bank Tower:** Interface with the Waterloo & City line
2 **Cadogan Mansions:** Transfer over the Circle line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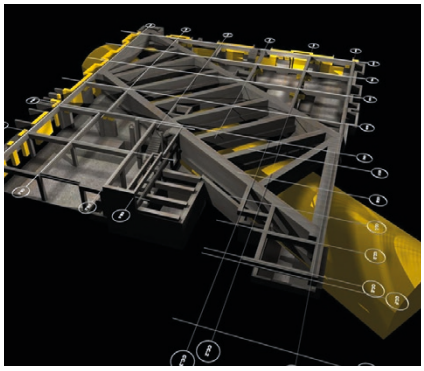
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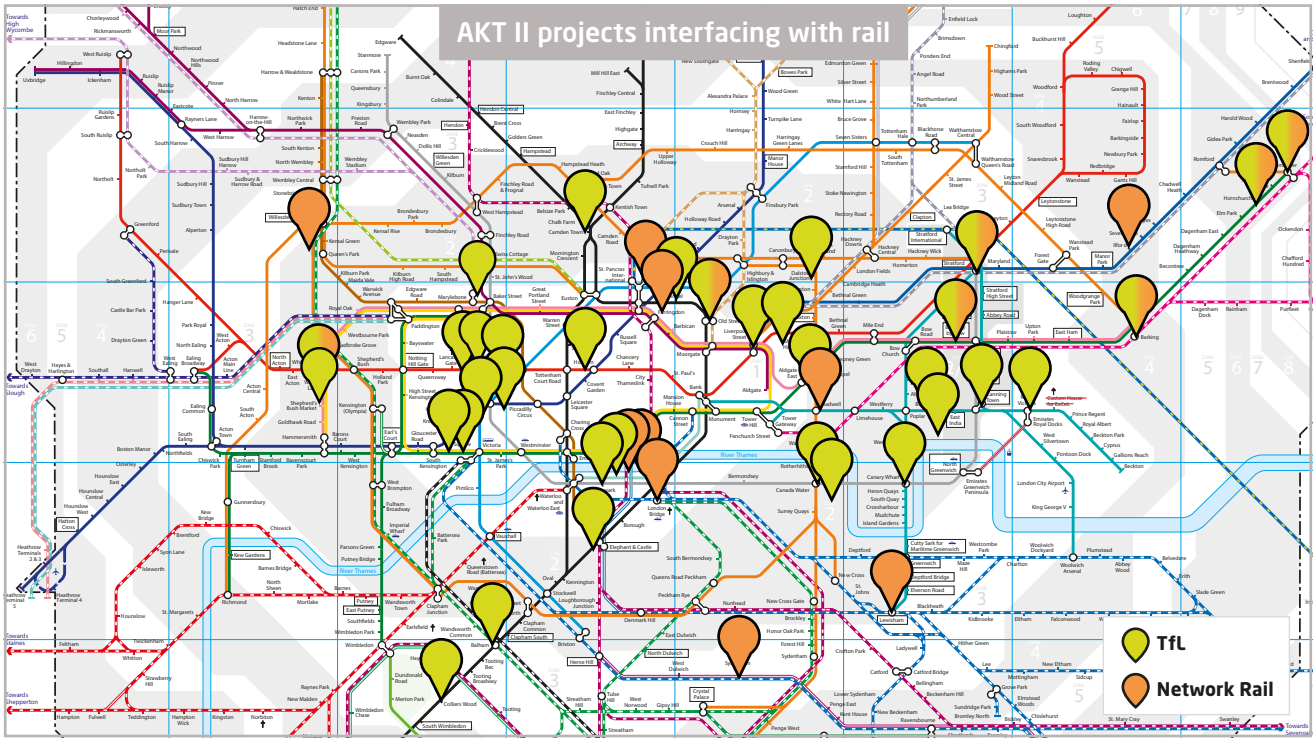

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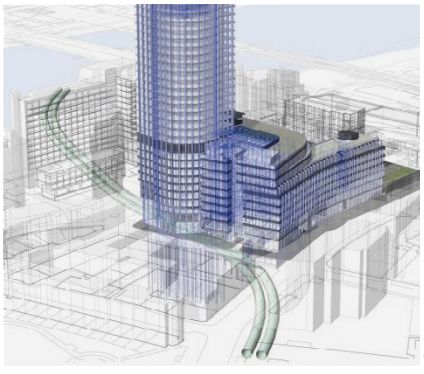
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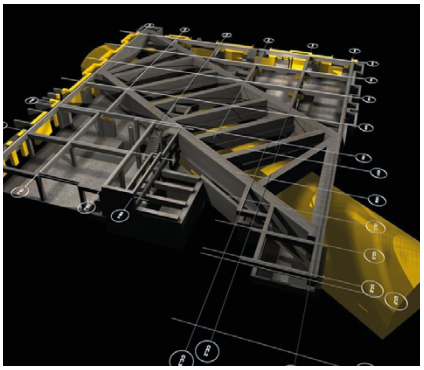
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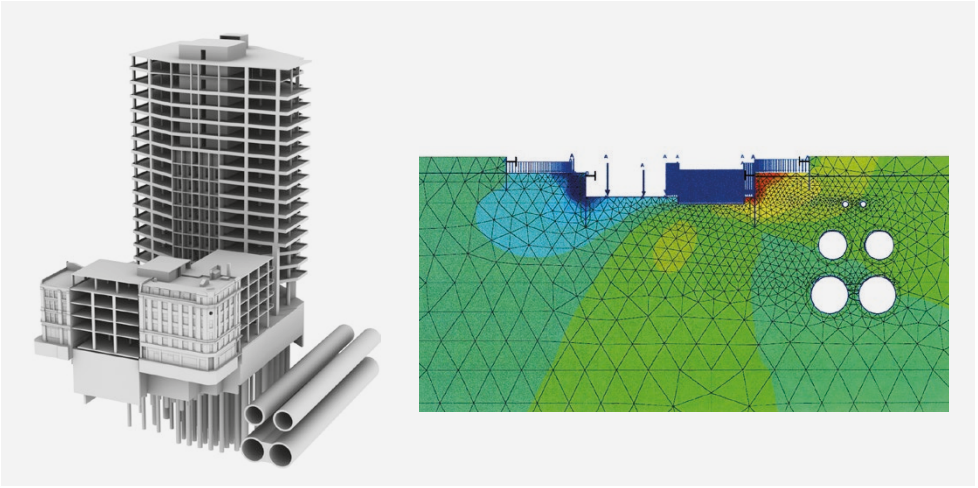
3 **White Collar Factory:** Models (3D and analytical) showing both the LUL and Network Rail subterranean tunnels running below and adjacent to the building



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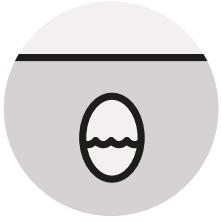
Overground

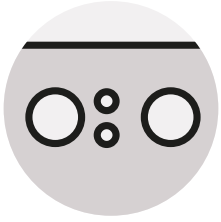
We have interfaced with Network Rail assets, as well as working on their behalf, such as at Birmingham New Street station; similarly with Treno Alta Velocità SpA, our client for the Napoli Afragola High Speed Rail Station project.

In the UK, and London in particular, much of the Network Rail infrastructure is ageing and potentially very sensitive to movements induced by development. An appreciation of the likely sensitivity of these assets is key in optimising structural and construction solutions to allow the best result for our clients.

Underground

London Underground infrastructure is commonly encountered on our projects; LUL operates a network that is 249 miles long, with 112 miles of this being subterranean. The age of the LUL infrastructure varies considerably: the Metropolitan line opened in 1863, and parts of the Northern line were the first deep tunnels, opening in 1890, whereas the newest stretches of the Jubilee line are a mere 20 years old. This leads to variation in the assets' sensitivity and how we treat each site, depending on the line involved. Other subterranean operators include Network Rail, Crossrail, London Overground, the DLR and the Post Office Tunnels.





Buried services

Buried services have a significant range in size, depth and sensitivity. Everyday services include flexible and relatively accommodating services such as power cables, but relatively small services can be highly sensitive, like the Victorian cast-iron gas mains we encountered at the Francis Crick Institute.

Many of our projects have key interfaces with Thames Water assets, and their sewer network is the most significant in this regard, with historical Victorian brick sewers being large, at depth, and, due to their age, highly sensitive to load changes and ground movements. At even greater depth is the relatively new high-pressure Thames Water Ring Main that was completed in the early 1990s using tunnelling technology, and runs east to west over a length of 50 miles.

Rathbone Square

This commercial and residential development has been built on the site of a former Post Office sorting office with a railway tunnel below and is situated the Crossrail 2 route. The Post Office tunnels are strategic assets and, as such, still operational. The new basement and foundations had to be developed on and around the station box within the site, whilst also maintaining the Crossrail 2 alignment.

Bloomberg European HQ

A new basement straddles the strategic City of London trunk sewer, a sensitive Victorian asset running through the centre of the site. A new entrance to the Waterloo & City line at Bank station was incorporated into the scheme, and entailed the formation of a 21 m-deep basement box down to the platform level to double-end the platforms.

Dalston Square

This residential-led mixed-use scheme of 553 homes is positioned directly over Dalston Junction station in Hackney. Formed on an existing OSD, the residential structure has been designed to work with the constraints of the pre-existing transfers, where our revised appraisal of this structure found spare capacity, allowing additional units to be developed. Acoustics and vibration became a key design consideration, and to meet the requirements the new structure was formed on neoprene isolation bearings.

Birmingham New Street Station

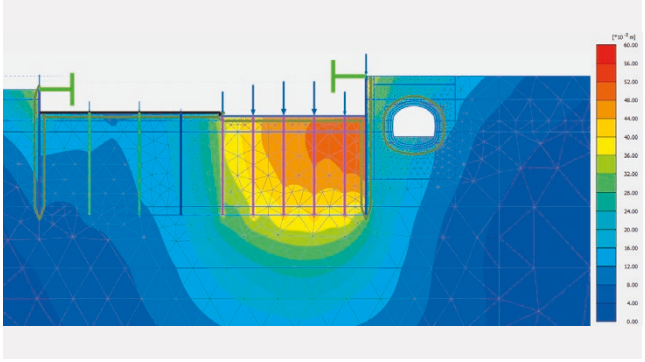
Working with AZPML and Atkins, we developed the design and delivery for a new atrium, its roof and the exterior over-cladding. Appraisal of the existing 1960s structure was a critical aspect of the project's success, and our approach allowed Network Rail to significantly reduce the amount of strengthening works. The whole project was completed within an existing major hub station and above the rails. Not one train was cancelled during the site works, demonstrating excellence in the planning and construction of the design.

100 Liverpool Street

Adding 44 % NIA to the building where Network Rail are tenants in the entire basement required intense re-engineering of the existing building frame and foundations. The extended building interfaces with the Central line below and the newly formed Crossrail box directly adjacent, requiring further complex ground modelling to ensure these assets are protected.

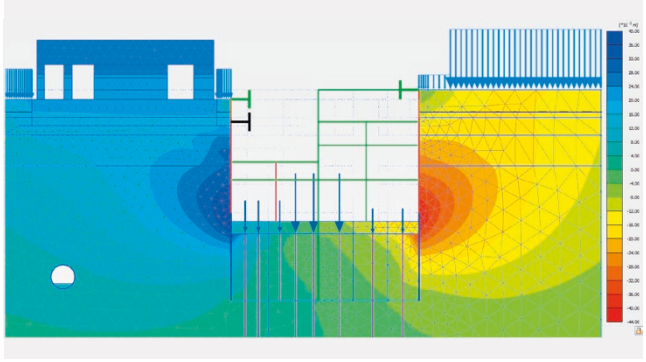
White Collar Factory

Next to Old Street station, interfaces with buried rail were inevitable, in addition to the sewers. These three assets (Thames Water / LUL / National Rail) are stacked below the street. In order to control ground movements, at concept stage the strategic move to offset building load through transfer walls within the double-depth basement was made, which unlocked early conversations with asset owners in parallel.



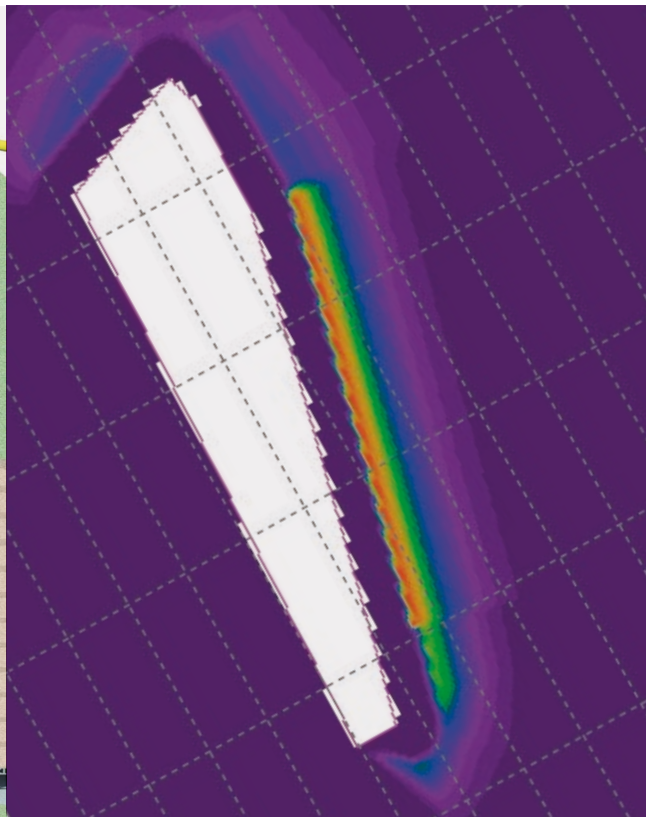
Canada Water Plot A1

Total soil displacement (vertical and horizontal) caused by the excavation of a shallow basement located 3 m away from an Overground masonry tunnel. The results allowed us to check whether the tunnel was within or outside the mobilised soil zone.



Bankside Yards PLAXIS GMA

Horizontal movements in the soil surrounding a deep excavation car park (c. 20 m deep). The main purpose of this was to investigate the short- and long-term ground movement impact induced by the excavation of the Network Rail viaduct.



Google London

Horizontal displacement contours caused by basement excavation using Oasys Xdisp. This ground movement contour was generated by scaling 2D Plane Strain FEM results in key excavation sections and by applying corner stiffness effects. It allowed us to estimate potential Network Rail track movements caused by excavation of a nearby deep basement.