

Buildings
Yearbook
2020-21

ARUP

Introduction ——— 03

Creating sustainable cities ——— 04

Cityringen Metro | Soho Place | *A Sustainability Revolution* | Axel Springer Campus | One Bank Street | ATRIO | Property Insight | London Data Centre 7 | Wheelabrator Kemsley Waste-to-Energy facility

Renovating our built environment ——— 26

1 Triton Square | 388-396 Oxford Street | Museum of London | *Embodying Refurbishment* | Grosvenor House | St Martin's Digital Fusion | British Airways Maintenance Cardiff

Nurturing future generations ——— 44

Whittle School and Studios | Space Explorer | *Unlocking the Power of Smart* | CERN Science Gateway | UCL Marshgate I | Heartspace

Shaping people-centred spaces ——— 60

Chelsea Barracks Stage 3A | Ebury Bridge Renewal | *Wellness – An Essential in Placemaking Design* | Victory Plaza | Springfield University Hospital | Lush Spa – Lushroom Pi | Grange University Hospital | Royal National ENT and Eastman Dental Hospitals | Brentford Community Stadium | Crystal Palace Dinosaurs Bridge

CERN SCIENCE GATEWAY
Geneva, Switzerland

Creating beautiful, sustainable and connected places

We believe buildings should respond to the social, environmental and economic needs of the city whilst complementing the infrastructure that supports our communities.

As designers, engineers and advisors, we have a responsibility to build back better by developing more resilient, regenerative and responsible solutions for our clients. Our approach has to be as multifaceted as the challenges we face and it is our responsibility to create very low energy, net zero whole life carbon, high-functioning smart buildings that promote wellness and have a low environmental impact.

At Arup we are building on 75 years of excellence, drawing on our experiences of the past but remaining unbound by convention. Through our collaborative relationships we contribute to the built environment in elegant and innovative ways.

We hope you enjoy our highlights from a year none of us are likely to forget.

NIGEL TONKS AND JIM BURRIDGE
Buildings London and Buildings UK Regions Leaders

Creating sustainable cities



Cities around the world face many common challenges: regenerating neighbourhoods, managing critical resources, facilitating inclusive growth and building stronger communities.

Our work reflects all of these, with a clear focus on sustainable development as a constant and vital thread.

CITYRINGEN METRO
Copenhagen, Denmark

Cityringen Metro
Copenhagen, Denmark

Cityringen is a major part of the city's strategy to be carbon neutral by 2025

We led the design of Denmark's largest infrastructure project for 400 years, creating a new underground line to encourage people out of their cars and onto a low carbon network.

MOVING TOWARDS CARBON NEUTRALITY

The completion of Cityringen or 'city circle line' is a major part of the city's strategy to be carbon neutral by 2025. With 17 new underground stations, most of Copenhagen's residents are now within 600 metres of a train or metro station.

Arup led the architectural design, taking a user-centric ethos every step of the way. Inspired by Scandinavian design tradition, we created spacious, light-filled stations with bespoke identities that echo the areas they serve.

FUNCTIONAL AND THOUGHTFUL DESIGN

Intuitive wayfinding makes the metro easy to navigate, even for children. This includes natural daylighting, clear sightlines and local station designs that connect to the neighbourhood above ground, from the glazed tile roofs of Vibenshus Runddel to the sand-coloured limestone of Marmorkirken. The skylights that allow natural light to flood the stations double up as air vents and enhance the cityscape above ground.

Each station is designed as a kit of parts, allowing both modularity and originality. As many elements as possible are 5.5m wide and tall, from wall cladding to platforms. This means if anything needs fixing, it can be swapped out without significant cost or disruption.

EMBEDDING NEW STATIONS IN A BUSY CITYSCAPE

Constructing 16 kilometres of twin bore tunnels and 17 stations beneath residential and commercial neighbourhoods in a historic city was a delicate task. We carried out a spectrum of early technical studies to minimise risks.

Stations are situated beneath existing parks and squares wherever possible to minimise impact on daily lives. In Marmorkirken, for example, the station is 40m underground to work around the 19th century marble church's foundations. In Gammel Strand, where the station is partly under a canal, this was kept open for tourist boats, passing through a tunnel under the worksite.

Client: Metroselskabet

Architect: Arup

Services: Architecture | Civil engineering | Structural engineering |

Building services (MEP) engineering | Fire engineering |

Rail engineering | Acoustics | Bridge design | Façade design |

Geotechnical engineering | Infrastructure design | Lighting |

Materials consultancy | Product design | Quantity surveying | Tunnel design



Soho Place
London, UK

A vibrant regeneration programme of offices, retail, public realm and a new theatre

Arup has helped Derwent London regenerate the eastern end of Oxford Street, above a new Crossrail station. Once completed, Soho Place will offer a vibrant mix of offices, retail and public realm.

COLLABORATING TO REDUCE RISKS AND ADD VALUE

The opportunity to redevelop Soho Place arose through the construction of the new Crossrail station at Tottenham Court Road. We engaged closely with Crossrail and London Underground on this complex project over a period of years. To optimise the design and delivery of this development Arup drew together its deep expertise in metro, property and music venues, steering modifications to station design which created an extra 2,600m² of lettable area above ground. Uniting our structural MEP and technical specialists enabled us to optimise the integration of the auditorium directly above the underground rail, significantly reducing the construction programme.

INNOVATING TO OVERCOME CHALLENGES

Locating a music venue above the new Crossrail station, controlling noise from the tunnel vent shaft was a major concern. We undertook background noise tests from the outset and made extensive use of the Arup Soundlab virtual environment, allowing stakeholders to experience what the space would sound like. Our acousticians provided a holistic solution to meet stringent auditorium standards, working closely with the client, architects, theatre operator, specialists and consultants.

Arup designed pre-compressed springs to limit noise transfer, control movement during construction and ensure that floor levels inside and outside the auditorium are always aligned. The team also developed a demountable system that folds the main auditorium balconies into the walls, increasing seating flexibility in any of the seven theatre formats.

DESIGNING FOR THE FUTURE

Despite being designed in 2007, our forward-looking design approach aimed to future-proof the building by accounting for future building regulations, occupier trends and sustainability standards. Interventions for a low carbon future include ground source heat pumps, high performance passive façade systems and efficient mechanical systems, including mixed mode ventilation. Modularisation and prefabrication reduced waste and embodied carbon. There are also extensive cycle storage facilities to encourage green travel and active lifestyles.

285,000 sq ft

mixed-use development

Client: Derwent London
Architect: AHMM | Haworth Tompkins auditorium designers
Services: Civil engineering | Structural engineering | Building services (MEP) engineering | Façade design | Fire engineering | Geotechnical engineering | Acoustics | BIM | Sustainability consultancy | Vertical transportation



A sustainability revolution

We are in the midst of a sustainable development revolution. Alarmed by the natural disasters, fires, floods and heatwaves in recent times and prompted by the global climate protest movement, the environmental discourse has changed radically over the last one to two years. The 'climate emergency' has finally hit home and suddenly everyone is talking about net zero carbon. This was easily the biggest and fastest change to hit the property sector in decades.

Then came the global pandemic – a tragedy, and a fundamental change to our way of life. Office buildings have stood largely empty for months and working from home became the new normal overnight. While the way ahead is far from clear, there is a strong sense that this will change our long-term approach to health and wellbeing quite substantially, as well as to the way we work, and our workplaces are unlikely to go back to the way they were.

Out of tragedy comes opportunity: to take a leap forward in our application of sustainable development to the built environment. It is no coincidence that the new Arup Strategy (launched June 2020) defines our purpose as “Sustainable Development is Everything”.



STEPHEN HILL
Associate



80 CHARLOTTE STREET
London, UK



▲ **SPRINGFIELD UNIVERSITY HOSPITAL**
London, UK

THE BIRTH OF NET ZERO

Looking back, COP21 was a tipping point in the global discourse on climate change. The acknowledgement that to avoid the worst impacts of climate change we need to limit global temperature rise to 1.5°C, and the scale of that challenge finally caused the penny to drop. Since then, we have seen global climate protests, including in the UK. In June last year, the UK Government signed a legally binding target to achieve net zero carbon emissions by 2050.

The concept of net zero carbon in the property sector has caught on astonishingly quickly. In October last year, 23 leading property organisations and members of the Better Buildings Partnership signed a Climate Change Commitment, agreeing to set out, by the end of 2020, their own pathways to achieve net zero carbon¹.

The UKGBC defined what net zero means for UK property in Net Zero Carbon Buildings: A Framework Definition². This was published in April 2019, supported

by a group of stakeholders including Arup. Together, we agreed the important principle that achieving net zero is about reducing demand (for both energy and materials), not just offsetting. UKGBC also set a target for commercial property to reduce energy intensity by more than 60% to achieve net zero carbon by 2050³.

While the details of the calculation may change over time, the scale of the task is clear. We continue our dialogue with UKGBC and other stakeholders to continue progress together.

We are working with clients across the sector, developing building designs that respond to this challenge. But what is still missing is a clear, robust definition of net zero carbon for property assets. There is a strong desire from the market to achieve net zero carbon, but no common understanding of what it means. Importantly, there is not yet a common understanding that net zero has to mean whole life net zero, including embodied emissions.

There is still a tendency in the market to focus exclusively on operational emissions, which is only between one third and half of the total whole life carbon impact of a building.

As shown in the diagram below, achieving operational net zero carbon is not just about design and construction; it is a journey that involves a combination of the right client brief, design, facility management and tenant behaviours, and will take time.

We believe that the emerging concept of ‘net zero enabled’ – buildings designed and constructed with the potential to achieve net zero – will be an important step on this journey. This will give owners and developers an incentive to invest and will give the market a means of differentiating net zero assets at an earlier stage. Importantly, though, this needs to be seen as a step on the journey, rather than an end in itself.

Our assessment of net zero, both ‘enabled’ and achieved, needs to be backed by a robust methodology. In terms of embodied emissions, the 2017 RICS guidance⁴ provides a robust framework for measuring whole life carbon impact

and is starting to be used much more widely. So we are starting to get a feel as an industry as to what ‘good’ looks like in embodied carbon terms.

The launch of UK NABERS in November 2020 was a huge step forward in terms of controlling operational carbon emissions. It sets a clear measurement framework for estimating and measuring energy efficiency and, importantly, will provide a recognisable performance benchmark that will allow real energy performance to start to influence property values. Arup has been involved in the evolution of the UK NABERS scheme since 2016 and are currently working with Stanhope and Derwent London to deliver pilot UK NABERS projects.

There is a lot of talk about net zero in the market. Now is the time to grab the opportunity to turn that talk into action and dramatically advance progress towards net zero.

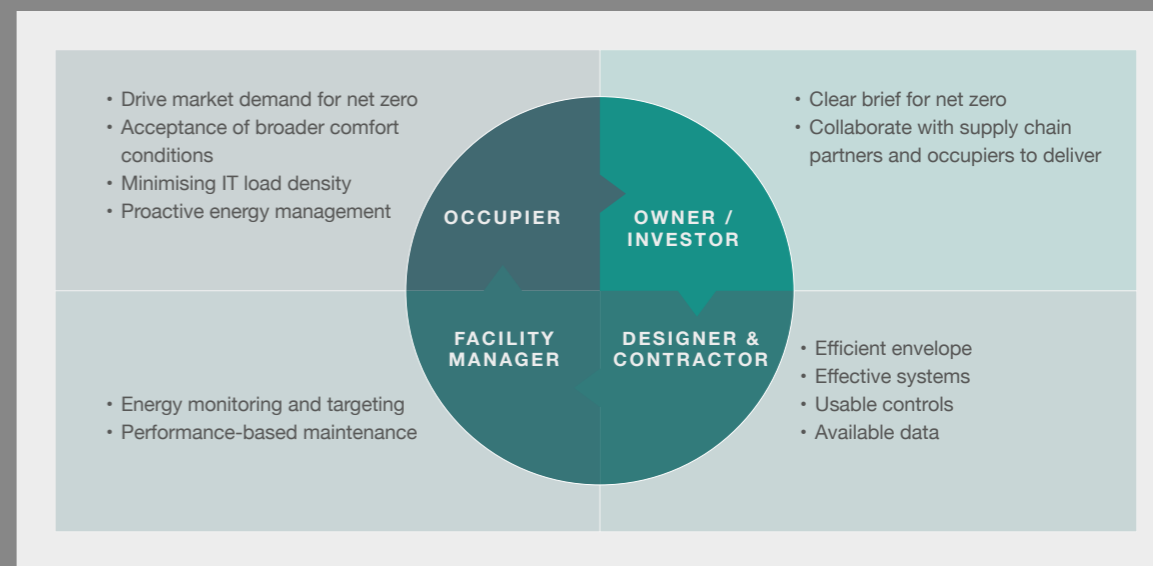
1) <https://www.betterbuildingspartnership.co.uk/member-climate-change-commitment>

2) <https://www.ukgbc.org/ukgbc-work/net-zero-carbon-buildings-a-framework-definition/>

3) <https://www.ukgbc.org/ukgbc-work/net-zero-carbon-energy-performance-targets-for-offices/>

4) RICS Professional Statement: “Whole Life Carbon Assessment for the Built Environment”

▼ NET ZERO CARBON RESPONSIBILITIES



Axel Springer Campus
Berlin, Germany

Iconic city centre HQ for one of Europe's largest media corporations

We partnered with OMA and won an international design competition to create iconic new headquarters for the digital future of one of Europe's largest media corporations, Axel Springer Group.

WORKING AS A TRUSTED ADVISOR FOR OUR CLIENT

During the competition, we helped define the concept with OMA and demonstrated how it could be constructed. We went on to develop the structural design for the building and the supporting frame for the atrium's glazed façade. Described by the client as a 'structural masterpiece', the upper floors partly hang from the roof level transfer structure.

This new headquarters brings together the brand's digital subsidiaries in around 52,000m² of traditional and collaborative workspaces. Our challenge was to develop a bespoke structure that efficiently enables the creation of extremely flexible workspaces at the heart of the building. In the move from physical print to digital media, our client prioritised creating a physical, informal stage at the centre of the building, a space that facilitates collective intelligence necessary for true innovation and where users can broadcast ideas to other parts of the company.

Arup used advanced 3D modelling and analysis to simulate and optimise the complex construction. Diagonal struts in the transfer level increase the effective span of the transfer beams and we reduced the number of columns in the atrium, doubling the typical structural span to 16m. The atrium glass façade is based on a folded plate structure that floods the atrium with natural light.

ENHANCING CONNECTIVITY AND COLLABORATION

The light-flooded building features a landscape of ten terraced floors around a 45m high glass atrium – a visually connected working environment for up to 3,500 employees. 13 bridges create connections between the sections and increase the opportunities for chance physical encounters. Rising to its responsibilities to the city, the public can experience the inside of the building on three levels – the event and exhibition spaces at street level, the meeting bridge viewing platform where visitors can observe the daily activities of the company and the rooftop bar with its city panorama.

This is the latest project in a series of successful collaborations between OMA and Arup, including CCTV in Beijing and BLOX in Copenhagen.

“We wanted the new building to be a symbol and an accelerator of our own transformation... Open, multifunction spaces that enable maximum flexibility of use. Avant-garde architecture as a magnet for encounters and communication. The building as a powerhouse of creativity.”

MATHIAS DÖPFNER

CEO of Axel Springer SE

Client: Axel Springer

Architect: Office for Metropolitan Architecture

Services: Structural engineering



One Bank Street
London, UK

Engineering a BREEAM Outstanding commercial building on a complex site

Arup provided multidisciplinary services at One Bank Street, developing creative solutions to site challenges and collaborating to achieve the first BREEAM Outstanding rated building at Canary Wharf.

WORKING AS A TRUSTED ADVISOR

One Bank Street is a 28-storey commercial building, providing 60,400m² of Grade A office space. As a trusted advisor to Canary Wharf Contractors Ltd since the early 1980s, Arup provided structural, geotechnical and fire engineering, accessible environments, maritime and flood risk management services. The building is engineered to provide a range of floor plate sizes, including three large trading floors over 4,000m² each.

CONTRIBUTING TO OUR LOW CARBON FUTURE

Through efficient and resilient design and responsible materials sourcing, our structural designs contributed to the first BREEAM Outstanding development at Canary Wharf. Along with embodied carbon savings on steel through our continuous truss, we developed unusual perimeter steel framing details to eliminate secondary steel, which also improved construction safety. We further reduced embodied carbon by using 70% cement replacement in the substructure concrete and selecting strength grades to minimise cement use. The substructure is designed to be durable over a 100-year life, including foreseeable climate change impacts.

INNOVATING TO OVERCOME CHALLENGES

With a building footprint partly within a reclaimed dock and the requirement for a triple basement, our structural and geotechnical experts worked closely together to overcome site challenges and achieve the aspirations of the client and architect around space, appearance, sustainability, cost and programme.

To enable a safe design and construction sequence, we engineered a secant pile wall to the north and west and a double skin cofferdam to the south and east. We replaced steel columns with a truss system that hangs off the core, saving around 1,150 tonnes of embodied carbon and eliminating vertical tension in the core. This bespoke hanging 'soft core' allowed the construction of the concrete core to progress ahead of final services coordination in risers. We also developed a fast-track design for the slip-formed core and its foundation pile cap, allowing their construction to progress ahead of the rest of the structure.

“This is CWCL’s first project to achieve this level, an acknowledgement of our project and consultant teams’ diligent work, and reflects our commitment to sustainability. I’m very pleased that we managed to exceed our set target and achieve BREEAM Outstanding.”

BIANCA STENDTKE

Project Executive at Canary Wharf Contractors Ltd

Client: Canary Wharf Contractors Ltd

Architect: Kohn Pedersen Fox Associates | Adamson Associates

Services: Structural and geotechnical engineering | Fire engineering |

Accessible environments | Flood risk management



ATRIO

Bogotá, Colombia

Engineering two of the tallest buildings in Colombia for global and local businesses

Working collaboratively with Rogers Stirk Harbour + Partners, Arup engineered two of the tallest buildings in Colombia to withstand extreme earthquakes, while meeting the needs of global and local businesses.

REGENERATING A DOWNTOWN DISTRICT

One of the first skyscraper developments in Bogotá since the 1970s, ATRIO marks a major step in the modernisation of the downtown area. It will bring new business, tourism, public transport and culture to the city's former business district.

Comprising two towers – Torre Norte and Torre Sur – ATRIO will be home to over 250,000m² of commercial offices, residential apartments, a luxury hotel, public observation deck and retail space, with 10,000m² of open public space at ground level. The 43-storey Torre Norte completed in 2019, while the 58-storey Torre Sur will be the second tallest tower in South America.

OVERCOMING ENGINEERING CHALLENGES

Together with Rogers Stirk Harbour + Partners, Arup worked closely with the client and local contractors to develop a new approach to building services, responding to the differing demands of local and multinational firms. We designed-in a large degree of flexibility, including on-floor equipment rooms, to allow for changes and simplify fit-out. High efficiency services contributed to Torre Norte's LEED Gold certification.

Building on the success of our tall buildings in Mexico City and around the world, Arup engineers played a vital

role in designing ATRIO to withstand even the most extreme earthquakes. A perimeter megabrace system, flamboyantly coloured, works with the central concrete core to ensure safety and comfort for occupiers during extreme events.

With local construction tending to favour concrete over steel, we engaged with local engineers to create an engineering design that combines the efficiency and seismic performance of steel, with the familiarity and economy of local concrete practice, delivering a 20% saving in embodied carbon. The design represents a compelling benchmark for materially efficient tower design, minimising building weight and embodied carbon, being heavily influenced by a need to achieve fast construction cycle times. The result is flexible floorplates with enhanced connectivity, generous daylight and 20m x 20m column-free office space, unprecedented in the Bogotá commercial market.

“ATRIO is a place for all where people are encouraged to meet, interact and socialise (...) we hope ATRIO will change perceptions of architecture and public space in Colombia.”

NAYIB NEME

President of Grupo, ATRIO lead investor

Client: QBO Constructores S.A.S.

Architect: Rogers Stirk Harbour + Partners

Services: Building services (MEP) engineering | Structural engineering | Fire engineering | Wind engineering | Façade design | Sustainability consulting | Building envelope design | Seismic design | Vertical transportation



Connecting data to transform how buildings are run for people and planet

To empower clients to manage their portfolios as effectively and efficiently as possible, Arup has developed an open, standardised method for surfacing real-world building data. Our digital toolkit brings together disparate datasets at scale, so property owners and managers can make the best decisions in real time, optimising asset performance.

UNLOCKING THE POWER OF SMART BUILDINGS

Working with the Open Data Institute, we created a Building Device Naming Standard – Universal Device Management Interface (BDNS-UDMI) open-source industry standard. We used tools such as Docker to create containerised architecture, simplifying operations and providing flexibility. We also worked with BIM and Esri to digitally map buildings for overlaying data. Our modular software collects data from different sources, with the potential to add new features based on client need. Data is stored and processed via open-source technologies such as TICK stack and Grafana.

DESIGNING FOR SIMPLICITY AND PERFORMANCE

Building data is complex and ever changing. This often results in huge inefficiencies in how they are run. Arup carried out extensive research across our client base to understand the challenges they face. Drawing on these insights, we developed a platform that pre-solves their problems.

Our cloud-based system brings together data from disparate sources, including building management systems (BMS),

metering, HVAC and lighting systems. It is not bound to a specific cloud provider and, critically, is able to connect and integrate other building operations software.

Property Insight can pull data from any building, new or existing. It allows thousands of data points to be harvested, processed and stored in seconds, providing a holistic view of asset performance. Users can then access this data to explore anomalies and areas of interest quickly. Arup is supporting clients to identify the best course of action using this tool.

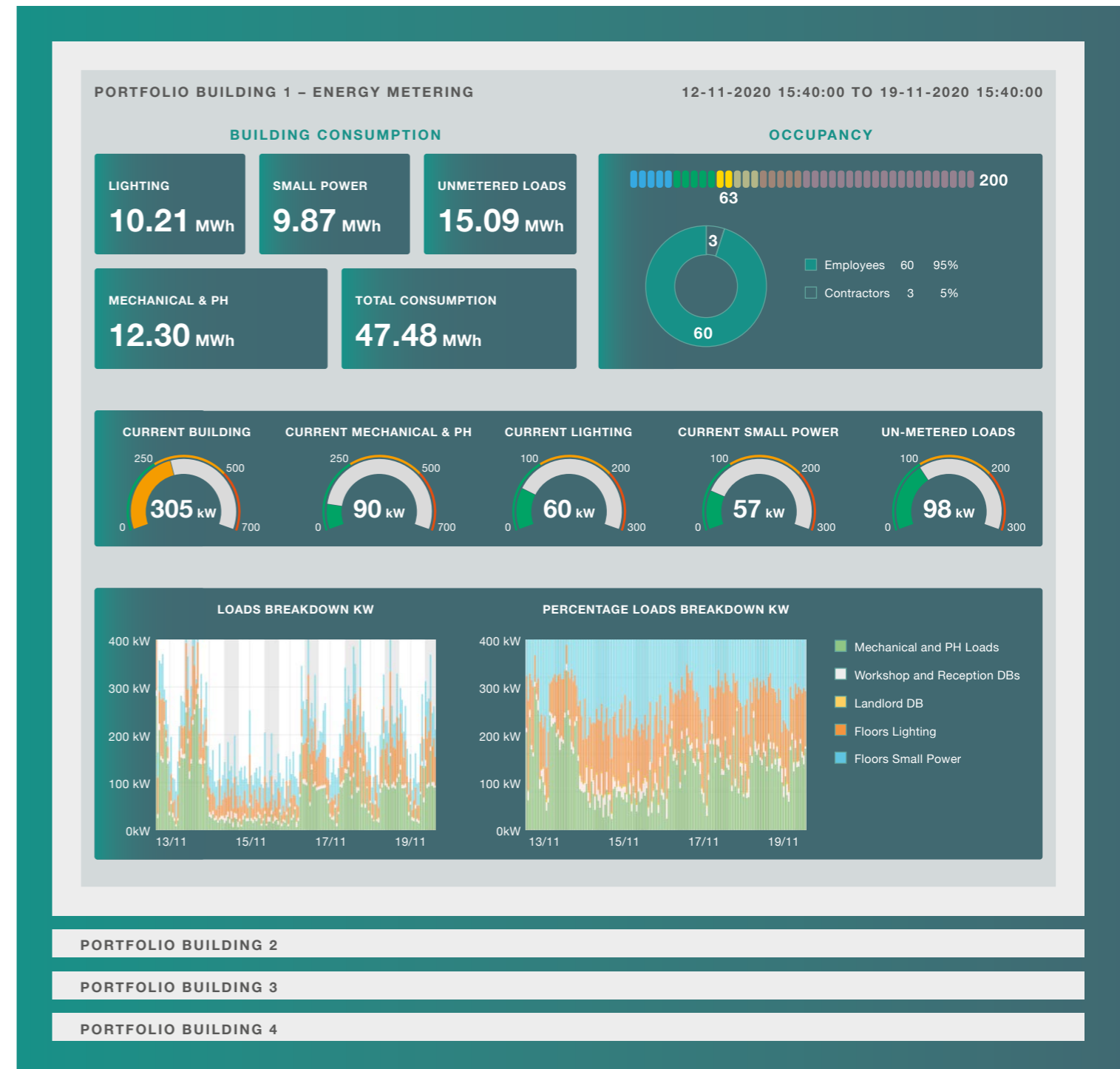
CONTRIBUTING TO OUR LOW CARBON FUTURE

Property Insight can draw on real-time data to highlight opportunities in performance between a building's design potential and how it actually operates. There is often a huge disparity across a range of areas, including energy efficiency, air quality and thermal comfort. By closing the performance gap, clients improve sustainability, driving energy savings and reducing carbon emissions across their portfolio.

The platform can also link data with Building Information Modelling (BIM), connecting the digital twin of a building to real world coordinates, for visualisation and easy location of devices at every stage of the property lifecycle. Our London head office at 8 Fitzroy Street has provided a successful test bed for this new technology, as we explore the future of smart buildings globally.

Client: Multiple

Services: BIM | Consulting engineering | Facilities management | Smart buildings



London Data Centre 7
London, UK

Engineering one of the world's most advanced data centres

We partnered with Equinix to deliver one of the most technologically advanced data centres in the world, increasing Equinix's presence in a key international location. This £90m International Business Exchange data centre is Arup's fourth generation design for Equinix and our most advanced solution yet.

CONTRIBUTING TO LONDON'S CONTINUED POSITION AS A GLOBAL HUB

Part of Equinix's wider investment into the UK's digital infrastructure, LD7 offers space for 1,750 server cabinets, expanding to up to 2,650 cabinets at full build. It is based on flexible data centre design principles to accommodate Equinix's evolving customer needs, allowing the white space to be deployed in modules of 2MW or 3MW IT capacity, supported by DfMA power and cooling modules. Located on Equinix's London Slough campus, LD7 is the first of three buildings on the LD7 site, and the fifth building that Equinix have built with Arup in Slough. It adds 6,600m² of prime co-location space for IT equipment ('white space') and 12MW of customer power. We also designed a substation on site to power the Equinix Slough campus.

WORKING AS A TRUSTED ADVISOR

Using building information modelling (BIM) and engaging early with the contractor, we increased the use of prefabricated and preassembled elements, saving cost and time. Through computational fluid dynamics analysis, we gained insights into the interaction of exhausts with the external environment and intakes, enabling us to build greater resilience into the mechanical system design.

We have been delivering data centres for Equinix in Slough for around 20 years. We worked closely with Equinix and their framework partners at every stage of LD7 to create a centre that is both highly resilient and energy efficient. The site uses a chilled water system, with most of the heat rejection achieved by adiabatic pre-cooling, resulting in annualised Power Usage Effectiveness of 1.2. This contributes to the facility's LEED Gold rating.

“As one of the most technologically advanced data centres in the world, LD7 is also set to raise the bar for sustainability in the data centre industry, which is very important to us.”

RUSSELL POOLE

Managing Director UK, Equinix

Client: Equinix

Architect: Reid Brewin Architects (UK)

Services: Civil engineering | Structural engineering |

Building services (MEP) engineering | Fire engineering | Acoustics |

BIM | Building physics | ICT infrastructure design | Project management



Wheelabrator Kemsley Waste-to-Energy facility
Kent, UK

Transforming waste into low carbon energy to power homes and businesses

Arup collaboratively created the building design for one of the largest energy-from-waste plants in the UK, treating non-recyclable waste as a valuable resource.

CONTRIBUTING TO OUR LOW CARBON FUTURE

The Wheelabrator Kemsley energy-from-waste facility entered full commercial operation in 2020, following a successful commissioning phase. The £340m facility will now displace 550,000 tonnes of non-recyclable waste from landfill each year, generating up to 50 MW (gross) of low carbon energy to the National Grid, sufficient to power 140,000 UK homes. It will play a major role in reducing waste sent to landfill or European export, saving carbon emissions and making better use of non-recyclable materials through energy recovery.

Creatively, the facility also provides steam heat – up to 70 tonnes per hour – to DS Smith’s adjacent paper mill. This is helping diversify the energy mix for the largest mill for recycled paper in the UK, supplying a third of the steam required to run the mill. In addition, any bottom ash residue from the facility is collected and used as aggregate in road construction, reducing resource extraction and putting circular economy principles into practice.

WORKING AS A TRUSTED ADVISOR FOR OUR CLIENT

Arup provided a range of services, including civil, structural, geotechnical, mechanical, electrical and public health engineering, working collaboratively throughout with Clugston Construction Ltd and CNIM Group.

The design of energy-to-waste plants is technically complex, with large structures demanding high load and performance requirements. We provided cost-effective designs for a huge underground bunker within which fuel is stored to meet project goals. We also completed construction-issue design within six weeks of the project start date, enabling the fast-track construction programme to be achieved.

“To be able to complete construction, hot commissioning, grid synchronization and steam export to DS Smith during the Covid-19 pandemic is a fantastic accomplishment and a testament to the commitment of our team and our partners to work safely and make a difference.”

ROBERT BOUCHER

President and CEO at Wheelabrator Technologies

Client: Clugston Construction Ltd | CNIM Group | WTI Energy

Architect: UMC Architects

Services: Civil engineering | Building services (MEP) engineering | Structural and geotechnical engineering | Fire engineering



Renovating our built environment

Refurbishing buildings is crucial to meet the goal of decarbonisation by 2050. Reinvigorating existing assets allows us to create new places and new value, from both an environmental and a financial perspective.

More importantly, it refreshes characterful places to live and work in, whilst preserving heritage value for communities.

MUSEUM OF LONDON
London, UK

1 Triton Square
London, UK

Transforming 1990s offices into one of the UK's most sustainable HQs

We partnered with British Land to transform a 1990s office building for today's workstyles. Together, we reused as much of the existing building as possible, while adding three extra floors and doubling the lettable area.

TRANSFORMING AN EXISTING BUILDING

As architects and engineers on the project, we were entrusted by British Land to deliver a truly groundbreaking approach to the decarbonisation and optimisation of this 1990s office building refurbishment. Adapting the building for today's workstyles, we co-located our multidisciplinary team to encourage innovation, seating architects next to engineers, supply chain experts and acoustic specialists. Designed entirely by Arup, the reimaged building challenges the status quo.

We pioneered a circular façade that cut carbon and cost 66% less than a new equivalent. 3,500m² of panels were removed and refurbished at a pop-up factory, before being reinstalled. We also pioneered British Land's first carbon fibre wraps to support the three new floors where possible. At only 4mm thick, these saved floor space and reduced visual impact versus the usual twin column solution.

CUTTING WHOLE LIFE CARBON

By not defaulting to demolition, we saved 35,000 tonnes of concrete and nearly 2,000 tonnes of steel, along with 6,000 lorry journeys. We also specified new low carbon materials and high efficiency equipment, and positioned the corner stairs outside the building's thermal line to improve air tightness.

Overall, our development and operational efficiencies will save an estimated 62,000 tonnes of carbon over 20 years, with 56% less embodied carbon than a typical new build and 43% greater operational efficiency than a typical commercial building. We doubled the floor area with no increase in plant.

DESIGNING FOR WELLBEING

Floor to ceiling windows, 2.7m tall, fill offices and stairwells with natural daylight. Nearly 500m² of green roofs promote biodiversity and increase opportunities for people to enjoy nature. Over 530 cycle spaces, along with lockers and showers, support active lifestyles and green travel. Five panoramic terraces provide space for socialising, working, exercising and relaxing. All these features contributed to the project's BREEAM Outstanding sustainability rating at design stage.

Future Projects Award

Commercial category at the 2019 World Architecture News Awards

Client: British Land

Architect: Arup

Services: Architecture | Civil engineering | Structural engineering |

Building services (MEP) engineering | Façade design |

Fire engineering | Wind engineering | Acoustics | Building physics |

Controls and commissioning | Geotechnical engineering | Lighting |

Materials consultancy | Sustainability consultancy |

Transport planning | Vertical transportation



388-396 Oxford Street
London, UK

Reinvigorating a poorly performing 1950s building with a new, classically proportioned masonry façade

Located next to the flagship Selfridges & Co. department store on London's Oxford Street, the redevelopment of 388-396 Oxford Street involved completely replacing poorly performing frontages, adding an extra storey and renewing office and retail accommodation.

TRANSFORMING AN EXISTING BUILDING

The refurbishment of 388-396 Oxford Street creates a sympathetic relationship to the adjacent Selfridges store, aligning with the Grade II listed building in both materials and proportions. The existing concrete frame was retained, reducing embodied carbon and costs, while a new façade and single storey extension at roof level updated the building for the latest workstyles and performance standards.

To maximise the floor area for the new offices, the replacement façade projects beyond the existing structure. Arup reduced the façade load versus the proposed designs and coordinated with the structural engineer to develop the structural support strategy. We also explored which stones would work best aesthetically, sustainably and practically for the office façades and boutique shopfronts, and we designed façade detailing to avoid staining as the building weathered.

SHAPING A SUSTAINABLE WORLD

To help achieve the BREEAM Excellent sustainability target, we reviewed the thermal performance criteria and developed alternative details for areas that present challenges, such as the shopfronts where façade zones were minimal. Our façade designs also incorporated fire

compartmentation of the building.

The stone was selected through a rigorous process, including a sustainable sourcing review by Arup, looking at quarry conditions and practices, along with the architectural intent. The project team visited our Material Things library, where they viewed a range of stone and high-performance glazing samples. This resulted in the choice of Portland Whitbed limestone for the handset stone piers, with Sardinian Grey granite bases. For the double-height shopfronts, Pierre Bleue limestone provides a contrast to the lighter stone above.

ENGINEERING SOLUTIONS TO DESIGN CHALLENGES

The original façade design featured stone-faced precast concrete piers with large lintels dividing the glazing. We developed an alternative system for the overhanging and double-height piers, instead using handset stone on lightweight steel supports. This reduced the weight of the façade and worked better structurally, by using the lintels to support and restrain the stone and transferring the load away from the piers.

We calculated initial façade weights and support locations, coordinating with the structural team to develop tailored brackets that would fix the piers back to the primary structure. We also standardised the façade design to accommodate the differing dimensions of each floor.

Client: Selfridges Group
Architect: Grafton Architects
Services: Façade design | Materials consultancy



Museum of London
London, UK

Creating a new cultural destination in heritage buildings

The Museum of London is to move to West Smithfield from its current home on London Wall. This will secure the future of three neglected historic buildings in need of significant repair and renewal, while creating a world-class, 24-hour cultural destination.

COLLABORATING TO FIND DESIGN SOLUTIONS

Arup is working closely with the Museum of London and the design team on this complex site to create a new future for the 19th century market buildings, the Grade II listed Poultry Market and the vast basement level storage areas beneath them. Revealing the historic building fabric and adapting these spaces to create museum-quality environments for exhibitions and visitors is one of the major challenges the team has been working through.

CREATING A TOP 10 LONDON ATTRACTION

Once relocated, the Museum of London will have the capacity to welcome two million people every year and fulfil its ambition to reach every London schoolchild and enhance their learning experience. It will also expand its night-time offer to reflect the 24-hour Farringdon location.

With more space to create blockbuster exhibitions with a broader appeal, the museum will secure its place as a Top 10 London attraction. It will be an integral part of the City's Culture Mile. The £332m project is backed by the City of London Corporation and the Mayor of London. Opening is expected in 2024.

A CLEAR PATH TO A NET ZERO FUTURE

We set out a clear trajectory to net zero operational carbon from the outset, achieving a 58% reduction in on-site carbon emissions and a further 40% reduction in embodied carbon. We rationalised the space distribution to maximise daylight in and views out, and optimised the thermal properties of the envelope whilst taking advantage of the architectural character of the existing building. The larger public spaces will be stripped back to their original condition whilst a passive heating and cooling approach will minimise both contemporary interventions and energy performance.

Targetting BREEAM Outstanding, this project is a prime example of what is possible in transforming and reusing heritage sites. Also leading the way in smart enablement, the building's operational data will be measured and monitored to improve energy performance.

“This spectacular new home for the Museum of London is a landmark project that will reveal the fascinating history of our city to millions of Londoners and visitors to the capital every year.”

SADIQ KHAN
Mayor of London

Client: Museum of London
Architect: Stanton Williams | Julian Harrap | Asif Khan
Services: Building services (MEP) engineering | Civil Engineering | Sustainability consultancy | Security | Vertical transportation



Embodying refurbishment

Energy efficiency has been part of the language of building design for many decades now, and we have a high level of confidence around the impacts of specific design parameters on operational performance over the life of the building. There is still much work to do in getting to a place where all buildings perform as they were designed to, but we know what to focus on when we want to reduce a building's demand for energy.

This helps us on a path to reducing operational carbon emissions – a lower energy demand moves us in the right direction for lower carbon emissions. We can amplify the improvement by switching to lower carbon fuels – and with the progressive decarbonisation of the UK's electricity grid, that typically means switching our heating fuel from gas to electricity.

But this focus on operational energy – the part that we pay for in our gas and electricity bills – represents only part of the picture and in many ways the simplest, most visible part.



MEL ALLWOOD
Associate Director



Grosvenor House
Sheffield, UK

Transforming disused assets to kickstart city centre regeneration

Arup, T&T and Leonard Design worked with Sheffield City Council to secure the transformational relocation of HSBC to this flagship mixed-use building, kickstarting a £500m regeneration project at the heart of the city centre.

KICKSTARTING CITY CENTRE REGENERATION

Our collaboration enabled the creative repurposing of a disused concrete hotel and transformed it into a vibrant building comprising of offices, retail units, a rooftop terrace and refreshed new public realm. Grosvenor House forms the first part of Sheffield's Heart of the City II masterplan, accommodating around 2,000 people.

With just two weeks to submit initial proposals, collaboration and innovation was key. We hosted the team's ideas in Arup's digital city model as a design tool and for visual context.

CONTRIBUTING TO OUR LOW CARBON FUTURE

To cut embodied carbon, we used a high proportion of cement substitute (GGBS) in the concrete mixes and minimised concrete per floor with a trapezoidal metal deck. Energy comes from Sheffield's Energy from Waste district heating system, reducing operational emissions. Along with high levels of natural daylight to promote wellbeing, this positively contributed to the project's ambition to achieve LEED Gold certification, a first for the city.

ENGINEERING SOLUTIONS TO DESIGN CHALLENGES

Working as a trusted advisor, we carried out detailed studies and BIM at every stage, as well as 3D modelling, which informed decision making and reduced risks.

Challenges included a 6m level change on the steeply sloping city centre site. Two sides of the structure are also close to existing buildings and city streets. We used a freestanding contiguous pile wall along one length with a capping beam, so excavation and construction could go ahead without temporary propping or excavation outside the site boundary.

The project timeframe was tight. We made structural alterations that helped achieve completion in only 24 months, from ground breaking to occupiers moving in. These included changing the concrete core walls from in-situ construction to precast, and reducing their thickness to minimise the weight of each crane lift.

Working in close collaboration with the developer and HSBC's client team, the building delivers on the client's ambitions for a vibrant and exciting workplace which meets the business needs for flexible spaces.

Client: Sheffield City Council
Architect: Leonard Design Architects
Services: Civil engineering | Structural engineering | Building services (MEP) engineering | Fire engineering | Geotechnical engineering | Acoustics | Façade design | Lighting | Master planning | Security | Sustainability consultancy | Transport planning



St Martin's Digital Fusion
Brighton, UK

Reimagining a historic church as a community data centre

Arup's award-winning Digital Fusion scheme, initially created in response to an ideas competition to rethink the future of the Grade II* listed St Martin's Church in Brighton, has been selected by the Lord Lieutenant of Sussex as the preferred scheme for further development. Drawing together our technology expertise and our business advisory services, Arup have provided the client with a business plan demonstrating a broad range of opportunities that will facilitate taking Digital Fusion to market.

ADDING NEW LIFE TO A HERITAGE LANDMARK

Our vision reimagined the church as a multifaceted centre for the community. We envisaged modular data centres integrated into this historic structure, along with a digital education environment and flexible social spaces. Our concept balanced the continuing need for a place of worship, with new uses and economic sustainability to benefit the community for generations to come. The project won Bronze at the International Design Awards 2019.

FUSING THE FUTURE WITH THE PAST

Phased digital interventions within the church include a network of data servers, set back in deep, cool recesses along the side aisle. Operated by a specialist provider, more could be added and leased, to generate valuable revenue for the church. The flexible central space will continue to be a social meeting place, bringing together people and communities.

The data servers would be shielded by translucent, light-refracting membranes that are themselves new pictorial windows. These could be programmed to respond to the varying needs of the space, adapting to a soft white glow for prayer or full-coloured refracted light to celebrate community life. An experiential screen will provide additional light and colour for worship and education.

CONTRIBUTING TO OUR LOW CARBON FUTURE

The inherent thermal mass of the church structure contributes to the new environment, while waste heat from the servers will be redistributed into the community spaces, much like a district heating system. This will reduce energy demand, cut carbon emissions and save on running costs.

“We felt the practical solutions submitted by Arup, if combined with the uplifting arts suggestions put forward by Emil Eve, would ensure the life of a beautiful heritage building such as St Martin's church for generations to come.”

PETER FIELD

Lord Lieutenant of East Sussex and Chair of the Jury Panel

Client: Diocese of Chichester

Services: Architecture | Structural engineering | Building services (MEP) engineering



British Airways Maintenance Cardiff
Cardiff Airport, Wales, UK

Repurposing an old aircraft hangar for today's fleet

Continuing our 26-year relationship with the British Airways Maintenance team in Cardiff, we repurposed an existing maintenance bay for modern aircraft.

GROWING OUR LASTING PARTNERSHIP

Arup designed the original British Airways Maintenance Cardiff facility, which opened in 1994, and we have been involved in all major modifications ever since, adapting facilities as the fleet evolves. It comprises three hangar bays, along with workshops, stores and offices.

With the retirement of Boeing 747 aircraft and the transformation of the British Airways fleet, the facilities needed to be updated. Arup led the feasibility study that identified Bay 2 for modification, providing a fully flexible hangar bay capable of servicing the future British Airways fleet and extending the life of the facility.

We replaced the fixed aircraft access equipment in Bay 2 with modern, lightweight, mobile versions. We also extended the workshops to cope with more composite materials in new aircrafts. This included the clean room, where composite repairs are completed under strict criteria for temperature, humidity and airborne particles.

ADDING VALUE AND DELIVERING COST SAVINGS

Arup delivered this complex and technically challenging project to programme and under budget, maintaining high standards. Together with British Airways, we achieved £630,000 savings on the £8.7m project, despite additional works being instructed.

We achieved significant savings by avoiding the need for a temporary screen to be erected between Bay 2 and Bay 3, where aircraft maintenance was ongoing. Working closely with the contractor and the British Airways Maintenance Cardiff team, we found alternative ways to mitigate dust and noise. We optimised the composite materials and paint booth requirements in the workshop areas, which reduced the amount of new build required, achieving further savings.

We also cut costs and carbon by reusing existing elements, including mezzanine steel beams, staircases, balustrading and 400Hz cables. We repurposed existing plant for the new, larger workshop space, supplementing rather than replacing.

We created a digital version of the bay through a 3D LIDAR scan, which reduced the number of site visits needed, supporting health and safety in a sensitive working environment, and reducing the impact on the live hangar bays. Through the scan, we traced existing services and confirmed structural record information with a high degree of accuracy, feeding this into the complex MEP design. We are adopting this technique as part of our new and efficient ways of safe working in a post-COVID environment.

Client: British Airways Plc

Architect: Arup

Services: Architecture | Civil engineering | Structural engineering | Building services (MEP) engineering | Aircraft access systems | Aircraft services | Fire engineering | Geotechnical engineering | Commissioning | ICT and audio visual | Project management | Contract administration | Quantity surveying – AECOM



Nurturing future generations

The best facilities open up horizons and feed the imagination. Our expertise in education and technology allows us to respond to the expectations of learning environments and solve complex, technical challenges to give as many people as possible new, inspiring experiences.

WHITTLE SCHOOL AND STUDIOS
Shenzhen, China

Whittle School and Studios
Shenzhen, China

Opening the first of 36 campuses for students to learn and grow

Arup is the strategic engineering partner for Whittle School and Studios, a global programme aiming to establish 36 campuses in the world's major cities, all designed by Renzo Piano Building Workshop. Shenzhen is the first of the campuses to complete.

DESIGNING FOR LEARNING AND WELLBEING

The Whittle School and Studios Shenzhen campus is designed to be a place for 2,200 students to learn and grow. The 58,000m² school is made up of two buildings, each level a 'school within a school', so pupils can get to know all the children in their 'school'.

Natural daylight is a priority, and all classrooms are within 9m of the façade, so pupils have views outdoors. Adding to this transparency and connecting pupils, all the classroom walls are glass. A feature staircase with a suspended design further increases visual connection and allows light to flow from a lightwell above.

High performance building fabric and automated solar control blinds prevent rooms overheating and minimise glare. We also introduced active chilled beams, which quietly deliver low velocity cool air, with local controls in each classroom. Air quality is designed to outperform US standard fresh air rates by 30% and rooms are acoustically designed to the highest educational standards.

CREATING FLEXIBLE, HEALTHY SPACES

Flexibility is integral to the best learning environments, so all furniture is movable. Transparent panels allow pupils and teachers to write directly on classroom walls. Materials are also selected for mental wellbeing, using warm colours and natural materials such as wood. Outside, the roof provides a sports and recreational space. Nature is key to the design, with trees planted at ground level and on level 6.

WORKING AS A TRUSTED ADVISOR

Our global design team shares best practice from continent to continent. We contributed to the global technology strategy for Whittle School and Studios, enabling all the campuses to be virtually connected. We also helped form a vision for their buildings to become a learning resource for sustainability, contributing to the Shenzhen campus China Green Star Sustainability Certification two-star rating.

1st of 36

campuses planned

Client: Whittle School & Studios

Architect: Renzo Piano Building Workshop

Services: Civil engineering | Building services (MEP) engineering |

Acoustics | Façade design | Sustainability consultancy



Reshaping workplaces for health and productivity in a changing world

Space planning has always been important – for health and wellbeing, flexible working and productivity. With Covid-19 increasing focus on how we use space, Arup Space Explorer is helping multinational organisations find the right solutions for their teams – from airports and offices to laboratories and retail centres.

SHAPING THE WORKPLACES OF THE FUTURE

Space Explorer combines the power of our MassMotion crowd simulation software with data and spatial analysis tools. Our data team visualises and documents the best options for safety and productivity, modelling people's movements and identifying interventions to minimise risk and safely maximise occupation, giving employers and employees confidence in the safety of their workplace.

In a changing world, Space Explorer provides fast, reliable answers to questions such as: What is the optimum number of people for our space? How close together can people work? What are the best routes from A to B? How far apart should equipment be? How can we expand occupancy safely as guidance and knowledge change?

Space Explorer is a cost-effective, digital approach to workplace safety and performance. It draws on the power of our MassMotion software, which draws on pioneering research into the science of human movement, to model the flow of people through physical spaces.

It also gives organisations valuable insights into how their people interact, to help shape the workplaces of the future, including airports, offices, laboratories, retail centres, museums, hospitals and any venue where people gather.

We have now updated it to include experimental behavioural modes that test physical distancing scenarios in dynamic conditions. The client can input different parameters, from the frequency of trips to washrooms, to background rates of inter-floor travel and stair usage.

UNLOCKING THE POWER OF DIGITAL FOR SAFETY AND PERFORMANCE

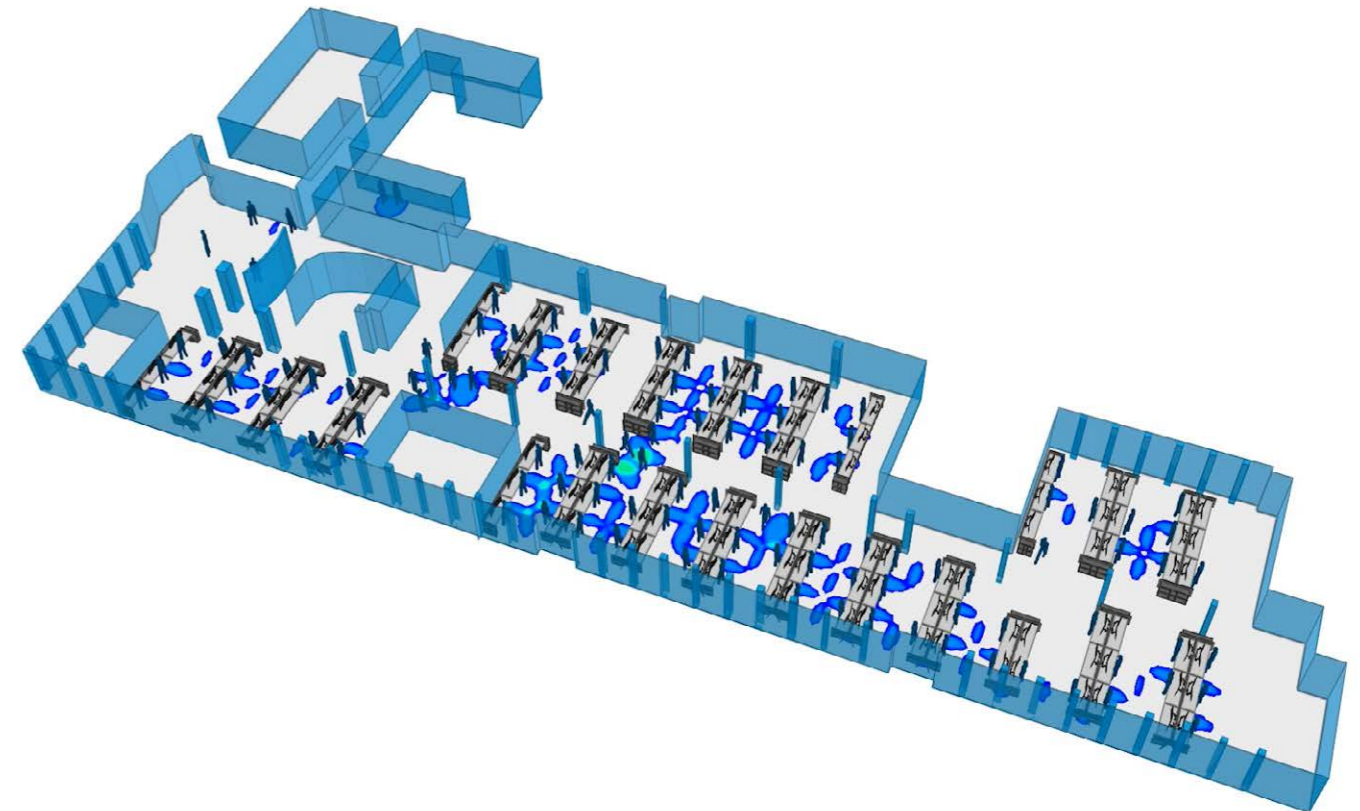
With reduced numbers of people in many workplaces during 2020, in-house FM teams adopted pragmatic approaches to physical distancing, such as closing off workstations and removing furniture. However, as guidance evolves and organisations look to optimise the number of people in their space, more advanced solutions are needed. This is where digital data-driven tools are proving vital.

Through Space Explorer, we can replicate an existing layout at speed and test it against several scenarios, trying out multiple interventions, from reconfiguring furniture and relocating business teams to introducing one-way systems and staggering start times. Importantly, these simulations highlight hotspots that would often otherwise be difficult to identify. It then reveals which interventions make the greatest improvements, empowering organisations to achieve optimal occupancy levels.

Combined with physical interventions, Space Explorer analysis is helping senior managers engage with their colleagues on actions taken to make workplaces as safe as possible, rebuilding confidence.

“Space Explorer is helping multinational organisations around the world explore what’s possible, safe, optimal and practical, rebuilding confidence and productivity. It provides enduring value, giving new insights into how people interact, to help shape the workplaces and visitor destinations of the future.”

JAMES WARD
Associate Director of Architecture at Arup



Unlocking the power of Smart

If we were to design buildings to harness the power of modern technology, rather than accepting legacy approaches, how would these smart buildings look and what benefits would they bring to the people who use them? Perhaps more importantly, given that up to 87% of today's buildings will still be occupied in 2050¹, how can we deliver similar benefits in existing buildings?

Here, we explore how technological disruption is creating environments that enhance human experience and asset performance.

THE BENEFITS OF SMART

Smart buildings bring together real-time data and system controls to optimise asset performance, improving resource efficiency, moving towards predictive maintenance and responding to the climate emergency.

Building users can access enhanced services, from amenity bookings to on-demand services such as catering and parcel deliveries. Employees can easily find suitable work areas via their personal devices, be it a collaborative space for team activities or a quiet desk for individual focus. The visitor experience is also easier, quicker and more enjoyable.

For occupiers, smart enhancements support commercial performance. Research shows that people's productivity increases when they are more comfortable and have greater control over their work environment.

For property owners, smart buildings stand out in a crowded marketplace, providing a premium that boosts lettable in a similar way to wellness certifications. Proactive diagnostics allow facilities teams to detect and fix maintenance issues before occupiers are affected, improving relationships. In addition, live occupancy data opens opportunities for new pricing models such as space-as-a-service or demand-driven pricing. Owners can also draw on real-time data about how spaces and services are being used, to adapt their portfolios to the changing needs of occupiers.



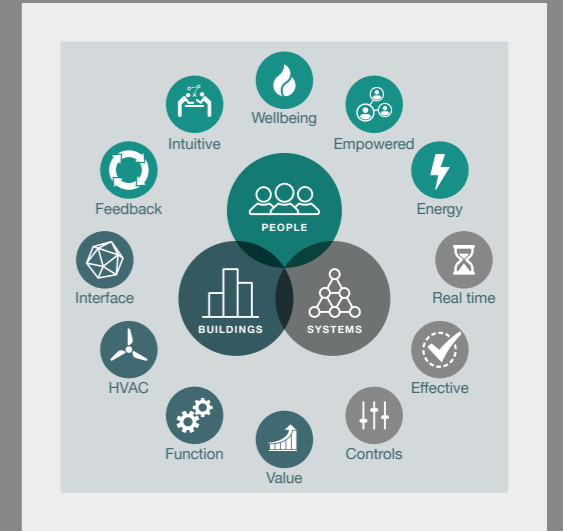
FRANCESCO ANSELMO
Associate Director

SMART BUILDINGS

In recent decades, 'smart' has been increasingly used to describe almost any new piece of technology. But smart buildings are more than isolated items of kit or software. They have a profound and positive impact on the people and businesses who use them.

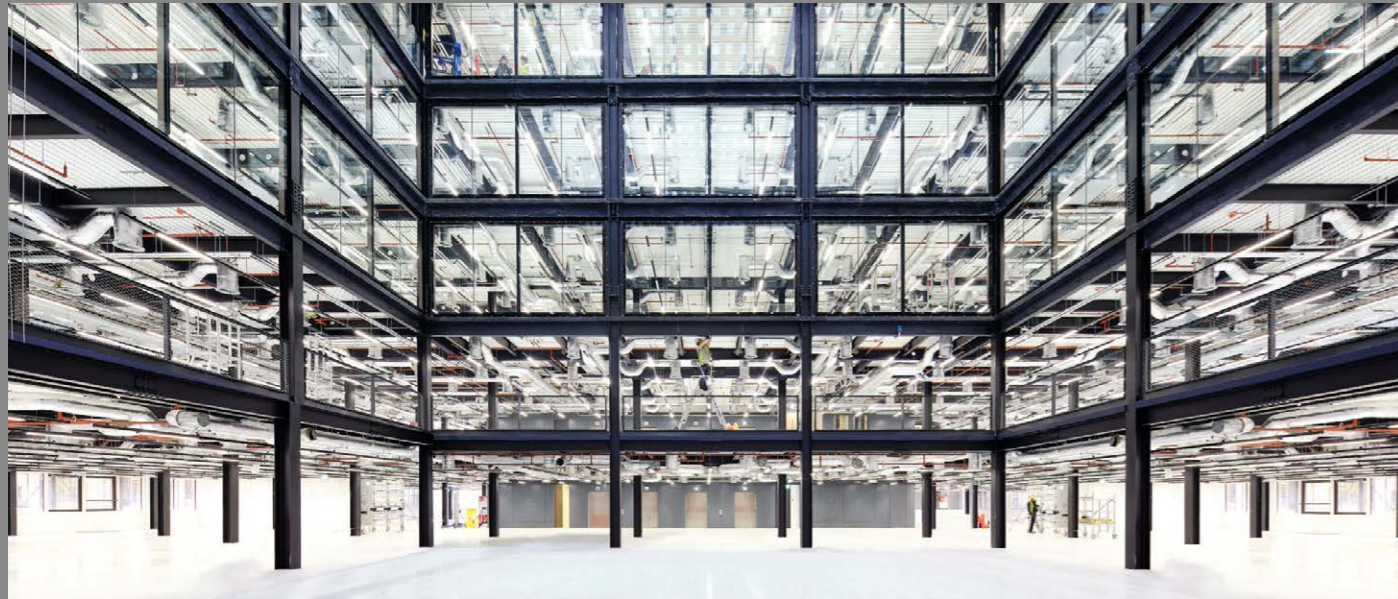
A smart building should deliver on three key criteria:

- Enabling connectivity between diverse building service systems, business systems, control interfaces and personal devices.
- Automatically identifying issues and using machine learning to operate buildings more efficiently and effectively, including resources such as energy and space.
- Supporting the health and happiness of occupants through environments that are productive and comfortable.



▼
100 LIVERPOOL STREET
London, UK





▲
1 FINSBURY AVENUE
London, UK

ENABLING BUILDINGS FOR DIVERSE FUTURES

With new technologies rapidly emerging and work practices evolving, how can we prepare the first generation of smart buildings for futures that might not even have been imagined yet? For a start, it is not dependent on significant capital expenditure during the base build. Through good design, procurement and testing, any new and many existing buildings can be smart-enabled.

Smart enablement involves standardising the naming of building devices, open internet standard communication protocols, common networking and data validation. These are the first steps towards commercially viable smart buildings, enabling many of the benefits, without having to immediately introduce costly features that could become redundant or not suit future occupier requirements.

At British Land's 1 Finsbury Avenue, a major refurbishment project engineered by Arup with AHMM architects, Arup enabled smart at a relatively late design stage, working with both the existing base build and new fit-out systems. Through understanding the data requirements and communication protocols, we added specifications to existing systems and designs, introducing digital functionalities without significant changes and with minimal cost implications.

We worked with British Land in facilitated workshops to develop use cases and associated user journeys across several projects in their portfolio. Through use case mapping, we ensured our fit-out guidelines cover all the necessary read/write points that need to be exposed from building systems, sensors and other technologies, future-proofing any building within the portfolio.

UNLOCKING THE POWER OF NEW TECHNOLOGY

Building data is currently structured in many ways. The lack of standardised naming for connected devices in the built environment has been a huge barrier to collecting, analysing and capturing data insights from buildings.

Arup is collaborating with industry partners to pioneer new standards for the automation and retrieval of real-time data from building systems and sensor networks. Partnering with the Open Data Institute, British Land and Google, we have developed a Building Device Naming Standard – an open source standard already implemented across multiple projects. This will be a catalyst for optimising building efficiency and occupant productivity.

To further realise the potential of smart buildings, we are researching, developing and working hands-on with Internet of Things (IoT) and maker technologies, both with our clients and within our own organisation. We have invested in a global IoT skills community, which has also yielded a smart desk project, new technical specifications and lab and maker spaces.

Leading by example, we are deploying our open, secure IoT approach in our existing London head office at 8 Fitzroy Street and our new home at 80 Charlotte Street. Both buildings are connected to our Property Insight platform, which is transforming how we use our space, providing our operational teams with actionable insights to create a better experience for our people and achieve our sustainability objectives.

Other digital tools we have developed include Arup Carbon, which automates embodied carbon calculations from complex geometric models, and Space Explorer, which is helping clients shape their workplaces for productivity and wellbeing.

Our Smart Buildings team is involved in an exciting range of projects, spanning finance, healthcare, retail and commercial sectors, in new and existing buildings. Our multidisciplinary specialists are helping developers, designers and occupiers make better use of diverse data to enable better human experiences and improve performance. Together, we are shaping a smarter future.

▼
CIRCULAR BUILDING
London Design Festival 2016



CERN Science Gateway
Geneva, Switzerland

Inspiring future scientists in a new education and outreach centre

As part of its mission to educate and engage the public in science, CERN is creating a new scientific education and outreach centre. Arup is working with Renzo Piano Building Workshop to shape this new hub to inspire people with the wonder of science.

ENGAGING AUDIENCES OF ALL AGES

With a footprint of 7,000m², the Science Gateway will include inspirational exhibition spaces, laboratories for hands-on scientific experiments for schoolchildren and students, and a large amphitheatre to host science events for experts and non-experts alike.

Exhibitions will explain the secrets of nature, from the smallest elementary particles to the vastness and evolution of the universe. They will also feature CERN's accelerators, experiments and computing, how scientists use them in their exploration and how CERN technologies benefit society.

Inspired by CERN's unique facilities, such as the Large Hadron Collider, the world's largest particle accelerator, the architecture of the Science Gateway celebrates the inventiveness and creativity that characterise the world of research and engineering.

SHAPING THE ARCHITECTURAL VISION

Arup is engineering the four major architectural elements:

The Bridge: a raised street for exhibition and educational spaces, 6m above ground and crossing the Route de Meyrin.

The Photovoltaic Collectors: three photovoltaic panels of 40m x 40m, floating above three pavilions. One contains classrooms, another offers flexible space for conferences, science shows and other events, and the third is designed for interactive exhibitions.

The Tunnels: two tubes raised above ground, for CERN's permanent and temporary exhibitions, immersing visitors in an environment representing the accelerator tunnels 100m below ground.

The Forest: 400 trees that connect existing buildings with the new facility to provide a great pedestrian experience.

“The Science Gateway will enable CERN to expand significantly its education and outreach offering for the general public, in particular the younger generations. We will be able to share with everybody the fascination of exploring and learning how matter and the universe work.”

FABIOLA GIANOTTI
Director General of CERN

Client: CERN
Architect: Renzo Piano Building Workshop with Brodbeck Roulet
Services: Structural engineering | Lighting



Creating new spaces for collaborative thinking on global challenges

Marshgate I is the larger of the first two buildings at UCL East, the new UCL campus built since the university was founded. Opening in 2023, Marshgate I will provide new spaces for collaborative thinking to solve the biggest challenges facing humanity.

DESIGNING FOR COLLABORATION

Marshgate I will provide over 34,000m² of academic space, as well as café and retail space. A central atrium, open to the public, is designed to draw people into accessible spaces and exhibition areas, while the upper levels encourage cross-disciplinary working, with open plan and circulatory spaces. Located on Queen Elizabeth Olympic Park, Marshgate I will bring together researchers, students, communities and partners from diverse faculties and academic centres.

Initial uses include Advanced Propulsion Laboratory, Fuel Cell analysis, Conservation and Exhibition design, Manufacturing Futures Laboratory and a Media Suite, along with the Institute of Making and learning spaces.

OVERCOMING ENGINEERING CHALLENGES

The diverse communities and purposes of Marshgate I made this a challenging and fascinating project to work on. Our engineers designed specialist areas for groundbreaking research including battery and fuel cell production and testing, along with co-working and social spaces.

Extensive CFD modelling was used to develop low energy operational strategies for year-round comfort in

the central atrium space. Working closely with UCL and Stanton Williams Architects, we designed flexibility into the specialist areas, so spaces can adapt to future changes in courses and research needs. This will extend the useful life of the extensive building services systems.

SUPPORTING UCL'S AMBITIOUS SUSTAINABILITY GOALS

Marshgate I is designed to exceed BREEAM Excellent standards. To accelerate progress to net zero carbon, our sustainability team carried out embodied carbon assessments and ensured these were understood by the client. TM54 energy-modelling evaluated operational energy usage, allowing us to size heating and cooling equipment for optimum performance. We also partnered with UCL on circular economy research and shared our findings to improve industry understanding.

“Our UCL East buildings will provide facilities for cross-disciplinary research and open innovation, new approaches to practical learning, opportunities for public engagement, and student living spaces that are modern and sustainable.”

PROFESSOR PAOLA LETTIERI

Academic Director for UCL East

Client: University College London

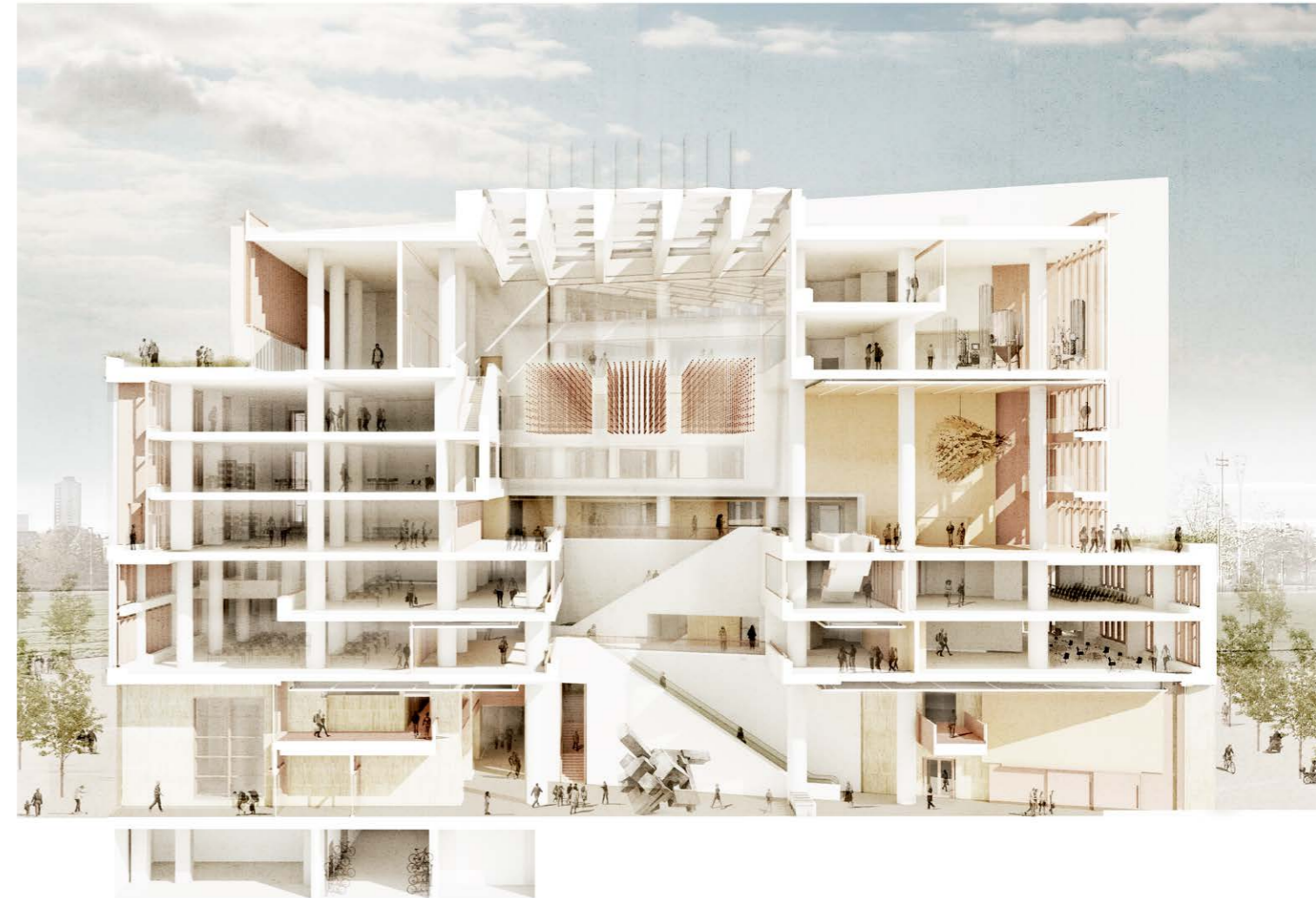
Architect: Stanton Williams Architects

Services: Civil engineering | Building services (MEP) engineering |

Fire engineering | Accessible environments | Acoustics | BIM |

Façade design | ICT and audio visual | Lighting | Logistics | Security |

Sustainability consultancy | Vertical transportation



Heartspace
University of Sheffield, UK

New space to grow engineering talent in a world-renowned faculty

Housed under an expansive new glass roof, Heartspace links the Grade-II listed Sir Frederick Mappin Building and the 1885 Central Wing. This collaborative project has transformed two of the University's oldest buildings and created a state-of-the-art hub for the Faculty of Engineering, whose students are now inspired every day by the display of innovative architectural engineering above them.

ADDING NEW LIFE TO HERITAGE SPACES

Heartspace has turned a utilitarian courtyard into a quadruple-height atrium building under a feature curved glass roof. Two historic buildings have been fully refurbished and new space created for laboratories, offices, a café, research and IT spaces, meeting rooms and an employability hub, where students and businesses come together. Care was taken to protect the existing heritage structures, ensuring that the project's historical integrity was neither damaged nor overshadowed.

WORKING AS A TRUSTED ADVISOR

Arup has a long-standing relationship with the University of Sheffield, and the project involved three structural engineering firms (Arup, Eastwood & Partners, and Waagner Biro) working together across 10,300m² of refurbishment and 2,200m² of new build.

Arup led the design of the roof geometry and supports, using parametric modelling to develop shapes that met site constraints and practical requirements, and were also

visually inspiring. We investigated a range of variables to optimise the size of glass panels and develop a lighter steel frame. Our design kept the new roof as structurally independent as possible from heritage structures, to avoid overloading or the need to strengthen them.

CONTRIBUTING TO OUR LOW CARBON FUTURE

The dense brick façade of the historic buildings and exposed concrete of the new building allowed for passive design measures to regulate temperatures. Arup advised on solar control and opaque glazing to mitigate the need for mechanical cooling. To cut embodied carbon, we specified 50% cement substitute (GGBS) in the concrete mixes. The exposed nature of the new structures further reduced waste and embodied carbon, while enhancing the visual aesthetic. Additionally, the optimisation of the structure reduced the steelwork weight (reducing embodied carbon within the material, transport weight and number of lorries required), saving an estimated 53,600kg of CO₂.

“This has been an incredibly ambitious and demanding project, but it was absolutely worth it. We are delighted with the scheme which helps underpin the facilities of one of the world's best engineering faculties.”

KEITH LILLEY

Director of Estates and Facilities Management at the University of Sheffield

Client: University of Sheffield

Architect: Bond Bryan Architects

Services: Structural engineering | Geotechnical engineering |

Wind engineering | Façade design



Shaping people-centred spaces

Shaping a better world means helping people in every corner of the globe improve their lives and enhance their communities. We do that in a wide range of ways – from projects that support high quality healthcare operations to inclusive urban dwellings that redefine living standards.

GARRISON
SQUARE

CHELSEA BARRACKS STAGE 3A
London, UK

Chelsea Barracks Stage 3A

London, UK

Transforming a military base into one of London's most coveted neighbourhoods

Our engineering and façade experts are contributing to the transformation of an historic military base into one of London's most coveted neighbourhoods.

BALANCING ARCHITECTURAL HERITAGE AND 21ST CENTURY LIVING

Chelsea Barracks provides exceptional residences and townhouses designed around seven new garden squares, with five new acres of gardens and public spaces in the heart of the capital.

Garrison Square is home to shops, an art gallery and al fresco dining. A destination restaurant within an elegant masonry building designed by Ben Pentreath is at the heart of Chelsea Barracks.

Arup has been involved in multiple phases of this 12.8-acre neighbourhood. We have been the trusted adviser for all structural and geotechnical aspects, from the secant piled wall around the site, to engaging with nearby residents on neighbourly matters.

TAKING INSPIRATION FROM ENGLAND'S GREAT BUILDING TRADITIONS

Beneath Ben Pentreath's design for a traditionally expressed masonry market square building – with its masterful use of traditional materials to create the beautiful façade and interiors of the restaurant – lies a complex, modern building.

To meet modern energy conservation standards, the masonry piers need to be thermally broken to incorporate insulation behind the outer skin of masonry.

Early construction advice also suggested a traditional mass masonry and timber building would be too slow, and uneconomical to construct.

This led to a hybrid building with separated internal and external self-supporting masonry arches and domes in traditional brickwork, laid using lime mortar to eliminate the need for vertical joints, and an internal reinforced concrete frame supporting the roof and providing restraint to the masonry arches and domes.

Large, glazed swing doors are set between each façade arch to allow the restaurant to be opened to Garrison Square in the summer months or closed in the winter. The doors and glazing are designed and installed to high thermal, weather and air tightness and acoustics standards.

285,000 handmade bricks

form the arches, domes and piers of the restaurant

Client: *Qatari Diar*

Architect: *Ben Pentreath | PDP Architects*

Services: *Structural engineering | Fire engineering | Acoustics |*

Façade design | Geotechnical engineering



Ebury Bridge Renewal
London, UK

Creating a world-class City for All in Westminster

Arup is leading the delivery of 375 high quality affordable homes in a groundbreaking redevelopment for Westminster City Council and the local community. The new Ebury Bridge Estate exemplifies Westminster's City for All objectives.

Currently the largest regeneration project in Westminster, the renewal of the Ebury Bridge Estate will create new places to live, shop, work and relax, including public open spaces. This will be a pedestrian-friendly neighbourhood, healthy and sustainable, with high quality design across all tenure types.

CO-DESIGNING WITH THE LOCAL COMMUNITY

A resident-led body called the Community Futures Group is at the forefront of decision making. Based on the residents' love of their communal garden, the design team incorporated a further five large public squares for everyone to enjoy. These reflect a contemporary approach to classic London squares and introduce 45m distances between buildings, allowing more sunlight into surrounding homes.

All new homes will be modern and well-equipped. They will be bright, with large windows, and around 90% will have dual-aspect living rooms to open up different views. The façade balances performance, carbon and cost. A highly insulated envelope provides a comfortable environment and reduced bills for residents. Wellbeing is enhanced by private balconies for every home and green shielding to reduce noise from nearby railways and roads.

SUPPORTING GLOBAL SUSTAINABLE DEVELOPMENT GOALS

Proposals for Ebury Bridge support the United Nations' Sustainable Development Goals and target BREEAM Communities Excellent. The new neighbourhood will be almost car-free, aside from disabled parking. It will offer excellent access to public transport, along with pleasant walkways and over 1,400 cycle spaces.

Arup took a whole lifecycle approach to establish a pathway to net zero carbon. This includes ground source heat pumps, photovoltaic panels and high efficiency building systems. The façade system and materials were selected to minimise embodied carbon and designed for prefabrication and disassembly at the end of service life. Heating and cooling emissions will be 90% lower than currently.

“We want the Ebury Bridge renewal scheme to create a new high standard in estate regeneration.”

CLLR MELVYN CAPLAN

Westminster City Council

Client: Westminster City Council

Architect: astudio

Services: Civil engineering | Structural engineering | Building services (MEP) engineering | Fire engineering | Geotechnical engineering | Wind engineering | Façade design | Acoustics | Archaeology | Economic planning | Hydrogeology | ICT and audio visual | Lighting | Logistics | Masterplanning | Transport planning | Security | Sustainability consultancy | Vertical transportation | Community engagement



Wellness – an essential in placemaking design

The term ‘wellness design’ has crept quietly into our vocabulary over recent years. We might have been forgiven for at first thinking it was just another marketing term, with the push for increased ventilation and filtration in conflict with reducing energy demand in buildings, our key priority for sustainable development. Does ‘total design’ not already consider ‘appropriate’ wellness design elements?

The answer in part is yes, but increased self-awareness of health and wellbeing, combined with rapidly advancing technology and availability of data, means that ‘wellness design’ has in fact created its own identity. Organisations are starting to understand more clearly the link between wellbeing and productivity, and financial outcomes, and want to measure and demonstrate this. So emerged both a desire to create wellbeing strategies and the arrival of wellbeing certification schemes, such as Fitwel, Reset and WELL.



ANNA BARLOW
Associate



Launched by the International WELL Building Institute in 2014, following six years of scientific, practitioner and medical research and development, WELL has established itself as the main player worldwide. Now on its second major iteration, WELL V2's ten wellness categories – Air, Water, Nourishment, Light, Movement, Thermal Comfort, Sound, Materials, Mind and Community – provide a comprehensive way to evaluate health and wellbeing.

Three of our Arup offices worldwide are now WELL-certified and more will follow. In London, we are providing WELL consultancy services for, among others, Lipton Rogers Developments' and AXA Investment Managers' 62-storey tower in the City of London, 22 Bishopsgate, a 1,275,000 sq ft workplace that puts people first. When completed later this year, it is destined to become one of the largest WELL buildings worldwide.

All too often, the people who will use the buildings still do not have a significant voice at design meetings. So, buildings may be, within a relatively short period, considered unfit for purpose and torn down, only to be replaced by a shiny new structure; and so the cycle repeats and the carbon footprint increases. We simply cannot afford – environmentally or financially – to design buildings that

people don't want to use. The needs of end users must be at the heart of design decision making from the outset.

So what will post-pandemic workplace design look like? In the short term, the focus will undoubtedly be on hygiene and minimising the risk of virus transmission, with designing-out touch and high levels of ventilation top of the agenda. In the longer term, it is unlikely that we will see a return to the workplace of the past. People and organisations now have a choice: for many, the benefits of home working, coupled with a lack of lengthy, costly commutes will outweigh the desire for face-to-face contact. Whatever it looks like, the workplace of the future will need to become the destination of choice, and that process must involve a holistic approach to health and wellbeing.

Not all our clients will want, or indeed need, formal wellness certification for their developments. In the post-pandemic world, however, they will have to navigate a journey (for some previously untrodden) through wellness dilemmas, as they create workplaces of the future. With our wealth of expertise and as a collaborative Arup, we are in an ideal position to support them on this journey.



SKY CENTRAL
London, UK

Victory Plaza
London, UK

Opening the first phase of one of the largest private rental schemes in the UK

Victory Plaza in London's East Village is the first phase of one of the largest private rental schemes in the UK. It provides flexible rental accommodation across 482 apartments above shops and restaurants, opening onto Victory Park.

Two towers create a powerful sense of place and point of arrival. They are anchored with podium buildings that relate in scale and texture to existing buildings constructed for London 2012 athletes.

INNOVATING TO IMPROVE PROCESSES

Following our concept design for the end client, our engineers supported the contractor Mace in developing an award-winning 'rising factory,' which involved extensive prefabrication, including bathroom pods, MEP systems, cores, risers and cladding. This improved quality and resulted in significantly faster construction time for the tower floors. It also reduced disruption to neighbouring residents and is making ongoing maintenance easier. We used detailed 3D digital modelling to design and coordinate services for prefabrication.

DESIGNING FOR PERFORMANCE AND FLEXIBILITY

We worked closely with the architect and Get Living London, who will manage the buildings, to design for operational performance and long-term maintenance. This will enhance the experience for residents and reduce their running costs, while cutting carbon emissions.

Adopting an integrated approach to sustainability, we optimised apartment layouts, façades and heat distribution to be comfortable with natural ventilation rather than

mechanical cooling, even on south-east and south-west façades. Our modelling and designs informed CIBSE Guidance TM59 on Overheating Risk Assessments, which has become an industry design standard.

In a world where the climate is changing, we also incorporated pipework so cooling can be introduced if required in the future, extending the potential lifespan of the building. All fresh air systems incorporate heat recovery and the buildings connect to a Park-wide district heating system. Extensive green roofs and rooftop gardens on the podium buildings add interest for residents and maximise ecological benefit.

Level 4

code for sustainable homes and lifetime homes

BREEAM Excellent

for commercial elements

45% improvement

over Part L requirements

*Client: Qatari Diar Delancey | Get Living London | Mace
Architect: Lifschutz Davidson Sandilands | Adamson Associates
Services: Civil engineering | Building services (MEP) engineering |
Structural and geotechnical engineering (to Concept stage) |
Fire engineering | Wind engineering | Acoustics | ICT and audio visual |
Logistics | Security | Sustainability consultancy | Transport planning |
Vertical transportation | Daylighting*



Springfield University Hospital
London, UK

State-of-the-art healthcare facilities

Arup is providing multidisciplinary design services for two new mental health facilities at Springfield University Hospital in Tooting, south west London.

REVOLUTIONISING CARE FOR GENERATIONS TO COME

This £150m development will create two new state-of-the-art mental health facilities, including eight new inpatient wards. These have been designed alongside clinicians and service users to provide the most supportive environment and innovative facilities for mental health care. The facilities will greatly improve the way South West London & St George's Mental Health NHS Trust delivers mental health services.

The development programme will also create new homes and a 32-acre public park. The Trust has successfully built the case for change to support the development of mental health facilities fit for the 21st century and to become a part of the community, working to reduce the stigma of mental health conditions.

COLLABORATING TO CREATE THE BEST FACILITIES

Arup worked with the design team and the Trust to develop facilities that most effectively support patients on their journey of recovery and allow health professionals to provide the best possible care. Our early engagement with stakeholders included attending user group meetings for each ward type.

To give service users control over their indoor environment, we designed a natural ventilation system for all service user bedrooms and corridors adjacent to gardens or external walls. We worked closely with the architect to integrate openings into the façade. We also carried out extensive modelling of air flows, temperatures and air quality within the rooms to evidence that they met all required standards. This user friendly and low carbon approach was welcomed by the Trust and contributed to the project achieving BREEAM Excellent rating at design stage.

“This new environment will make a huge difference to our patients and the way we provide the best quality care towards their recovery.”

ANN BEASLEY CBE

Chair of South West London & St George's Mental Health NHS Trust

Client: Sir Robert McAlpine

Architect: CF Moller Architects

Services: Building services (MEP) engineering



Cloud-based multisensory environments

To realise Lush's vision for a truly immersive spa experience, Arup experts designed and produced a cloud-based audio and light media player, described by the client as “revolutionary”. This is now used in Lush Spas in cities around the world.

INNOVATING TO OVERCOME CHALLENGES

Lush wanted people to be able to choose sounds, colours and smells to complement their treatments. With no commercial product able to synchronise sound and light, and coordinate media content globally, Arup created a cloud-based sound and light open-source media player called Lushroom Pi.

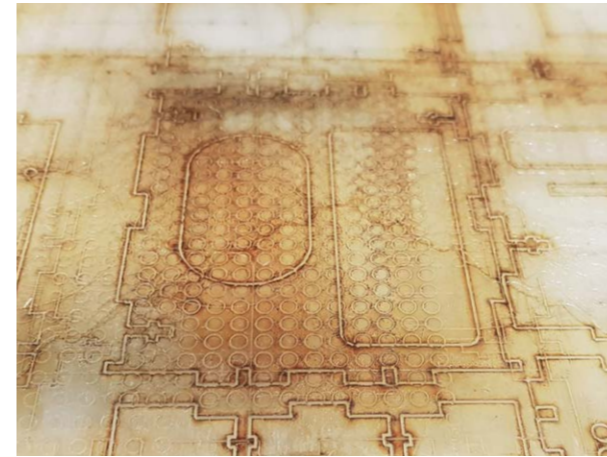
This empowers therapists to choose, play, pause and stop multisensory treatments via a simple-to-use tablet interface and an extremely cost-effective open hardware media player. From calming lighting to inspiring music performed by a 52-piece orchestra, the player accompanies people on a journey of wellbeing.

DESIGNING FOR SIMPLICITY AND PERFORMANCE

The Arup Smart Buildings team developed a simple solution to a complex system integration challenge, using open-source hardware and software. Lushroom Pi is built from widely available electronic components – a Raspberry Pi, touchscreen, Tinkerforge brick and Tinkerforge DMX bricklet. It integrates lighting using DMX and Philips Hue, and integrates audio using Dolby surround sound, to fully synchronise lighting and music.

The system is deployed on the Google Cloud Platform and updates with no manual requirements, thereby simplifying operations. There is no need for therapists to load USB sticks for lighting and sound before every appointment, reducing the risk of error and minimising any friction linked to digital infrastructure. It's time to relax and enjoy.

Client: Lush
Services: Smart buildings | Security | Product design | Materials | Cloud system | Software development | IT network



Grange University Hospital
Cwmbran, Wales

Opening a critical care centre a year early for COVID-19

We contributed to accelerating the opening of Grange University Hospital to provide vital beds for Wales during the COVID-19 pandemic.

CARING FOR THE SICKEST PATIENTS

Grange University Hospital was commissioned as part of the Aneurin Bevan University Health Board's Clinical Futures Strategy. It centralises specialist and critical care services into purpose-built facilities for critically ill patients, who require the most urgent, complex diagnostics, treatment and care pathways.

We supported architect BDP and contractor Laing O'Rourke in accelerating the partial and temporary opening of the hospital a year early in April 2020. At a time when the NHS was facing unprecedented challenges, this early opening provided up to 350 additional beds and facilities.

Once fully complete, the £350m hospital will offer 471 beds and be home to more than 40 specialist services, with a helicopter pad for patients who need to arrive by air ambulance.

IMPROVING OUTCOMES TOGETHER

Working collaboratively, the whole team used the Field View app, including around 70 subcontractors. This mobile technology replaces pen and paper in the field, which allowed us to quickly flag issues online for contractors to resolve. It proved invaluable in accelerating the opening, with contractors uploading photos of completed tasks that we then closed out remotely.

This followed our daily site walk-arounds at earlier stages to highlight issues before completion. We have raised and closed around 12,500 observations with the project team. We have also inspected sample rooms to set benchmarks for subsequent rooms, visited factories and pre-fabrication facilities to verify products, and ensured that every system in the hospital has been fully tested and commissioned.

We added further value by providing technical observations, drawing on our experience and expertise to identify opportunities to improve operability and the user experience. These were welcomed by the Health Board and often implemented.

“I have had the pleasure of working with every different discipline within Arup on this scheme and, not only do they provide competent, professional and timely advice, there is a high level of trust and confidence they give our organisation.”

ROSS ANDREWS

Aneurin Bevan University Health Board

Client: Aneurin Bevan University Health Board

Architect: BDP

Services: Architecture | Civil engineering | Structural engineering |

Building services (MEP) engineering | Geotechnical engineering |

Commissioning | NEC supervisor



Royal National ENT and Eastman Dental Hospitals
London, UK

Patient-centred design unites two historic healthcare institutions

Bringing the Royal National Throat Nose and Ear Hospital and the Eastman Dental Hospital together in a new building has created one of the largest specialist centres in Europe for dental, ear, nose, throat, hearing and balance services.

PUTTING PATIENTS AT THE HEART OF DESIGN

The new £100m hospital maximises clinical space, while providing light and airy areas for patients. It has the capacity to host more than 220,000 appointments each year. Facilities include over 60 clinic and testing rooms, ten procedure rooms for complex surgical treatments, and hearing and balance rooms with specialist equipment. An entire floor is dedicated to children and young people.

WORKING AS A TRUSTED ADVISOR

Arup co-designed the building systems with patients and hospital teams, holding sessions to understand how they use spaces and systems. Specialist designs included circadian lighting control, medical gas installations and healthcare-compliant electrical services supply and distribution (UPS and IPS). We also worked with the design team and UCLH to minimise space required for engineering systems. The vertical distribution of services below and above ground was highly coordinated, reducing the amount of detailed coordination required by the contractor, and the likelihood of issues being encountered on site. We used Building Information Modelling (BIM) Level 2 to improve decision making.

Arup has worked closely with UCLH over the past ten years, as consultants for the Proton Beam Therapy Centre,

Macmillan Cancer Centre and the Royal National ENT and Eastman Dental Hospitals. On this latest project, we identified design changes to deliver cost savings during construction and guided the team to achieve BREEAM Excellent. This included collaborating with façade architect Pilbrow & Partners and contractor Mace on the sustainability and energy performance of the hospital's award-winning modular façade, which combined handmade bricks, aluminium, triple glazing and precast concrete, blending sensitively with the historic surroundings.

“Our newest hospital has the very latest technology, new treatment rooms for complex ear, nose and throat procedures, dental chairs and imaging equipment. It can offer the world's most advanced treatment and represents the NHS at its very best.”

MARCEL LEVI

Chief Executive of University College London Hospital

Client: University College London Hospitals NHS Foundation Trust

Architect: Scott Tallon Walker Architects

Services: Building services (MEP) engineering | BIM |

Sustainability consultancy | Vertical transportation



Brentford Community Stadium
London, UK

Premier League-ready stadium for an ambitious club

To support their ambitions, Championship football club Brentford needed a new home. We helped create a Premier League-ready stadium for the ambitious club to pursue its goals and delight fans.

WORKING AS A TRUSTED ADVISOR

When Brentford FC first drew up plans for a new stadium, the numbers weren't stacking up financially. That's when they brought in Arup. Our multidisciplinary team revisited every aspect of the project, seeking marginal gains to add value and reduce costs. This included removal of spaces that did not support the business case of delivering a football-focused stadium. Our team worked together to reduce the overall area of the building by 27%, enabling the financial model to become successful and allowing the project to proceed to construction. We also equipped the stadium with an advanced outside broadcasting centre and media facilities to open up valuable new revenue streams.

Everything is designed for a great fan experience, from the top-of-the-range sound system to the giant LED screens and field of play lighting. The 17,250-capacity venue will also be home to Premiership rugby team London Irish, realising their desire to return to their heartland.

FITTING A MAJOR STADIUM INTO A CONSTRAINED SITE

Bound on all sides by railway lines, major roads and homes, the site was highly constrained, so we made sure our team included engineers with a track record of successfully partnering with Network Rail. We reduced the height of the

planned structure and brought the stadium edge in slightly to significantly reduce complexity and make construction feasible with trains and cars travelling by.

CONTRIBUTING TO OUR LOW CARBON FUTURE

Our design removed 50% of the embodied carbon, substantially saving costs versus the original scheme and reduced the amount of primary steel by a third. We carried out solar path mapping to optimise the rooftop photovoltaic clean power generation, further reducing emissions.

“I am absolutely confident that the unique nature of the site will result in a stadium that is still different to the majority of new stadiums, is small enough to create a fantastic atmosphere, yet big enough to enable the continued growth of our supporter base and offer a brilliant matchday experience for all fans.”

MATTHEW BENHAM

Owner of Brentford Football Club

Client: Brentford FC | Ecoworld

Architect: AFL

Services: Civil engineering | Structural engineering | Building services (MEP) engineering | Fire engineering | Acoustics | BIM | ICT and audio visual | Security | Sports lighting | Sustainability consultancy | Transport planning | Vertical transportation



Crystal Palace Dinosaurs Bridge *London, UK*

A crowdfunded bridge into the dinosaur kingdom

We continued our collaboration with architects Tonkin Liu to create a pivoting pedestrian bridge to Crystal Palace Park's Grade-I listed dinosaurs. This entirely crowdfunded project received widespread support and won unanimous approval from the local planning committee.

CREATING A NEW GATEWAY

Unveiled in 1854, Crystal Palace's dinosaurs were the first attempt anywhere in the world to model extinct animals as full-scale 3D creatures from fossil remains. Reflecting the knowledge of the time, today they are one of Crystal Palace Park's most important features, but their condition had deteriorated.

We engineered a high quality, permanent but retractable bridge across the waterway to the dinosaur islands. The 8m swing bridge rotates on a pivot, so it can be spun into place to gain access to the dinosaurs or disconnected to protect the islands from potential vandalism. This will make maintenance easier, conserving the models for generations to come, as well as allowing carefully managed access for around 1,200 visitors each year.

INNOVATING TO OVERCOME CHALLENGES

Inspired by the natural world, steel sheets were laser cut to form two 'combs', with the teeth of each comb bent to form the handrail, deck and support strut for one side of the bridge. These combs were then welded to a central spine beam. By bending and welding comb sections to a central spine, we halved the amount of welding needed, saving time and costs. We used 10mm thick steel sheet for

almost all the components, striking a balance between the demand for strength and the ability to shape the bridge.

WINNING WIDESPREAD SUPPORT

The plans won unanimous approval from Bromley Borough Council's Planning Committee, with the Chair remarking that she'd never seen an application in which every interested party supported the proposal. This followed input and enthusiastic support from Historic England and a wide range of local stakeholder groups.

BKI Architecture and Materials

Prize – Royal Academy Summer Exhibition 2019

Client: Friends of Crystal Palace Dinosaurs

Architect: Tonkin Liu

Services: Civil engineering | Structural engineering |

Geotechnical engineering | Wind engineering | Bridge design |

Sustainability consultancy



Awards

FY 2019-20 UKIMEA Buildings

ARUP AWARDS

American Productivity and Quality Center
– Excellence in Knowledge Management Award, Winner

Building Design Architect of the Year Awards
– Infrastructure Architect of the Year Award, Winner, awarded to Arup Architecture

Building Equality Awards
– Member Organisation of the Year Award, awarded to Arup Manchester

Camden Climate Change Alliance
– CCCA Carbon Champion – Mark of Achievement

IEMA Sustainability Impact Awards
– Consultancy and Collaboration category
Highly Commended, awarded to the Digital Steering Group (Arup, WSP, Mott MacDonald, Arcadis, Atkins, ERM, Aecom, Royal HaskoningDHV, Quod, Sweco, Stantec, Jacobs, Capita, Waterman and Barton Willmore)

Management Consultancies Association Awards
– Best Use of Thought Leadership
Winner, awarded to Arup for Cities Alive: Designing for urban childhoods

The Prince's Trust Million Makers Competition
– Creativity Award, Runner-up and Certificate, awarded to Team Aruption

PEOPLE AWARDS

Adrian Collings
– Midland Geotechnical Society Les Nichol Award, Winner

Louise Ellis
– Management Consultancies Association Awards Thought Leader Consultant of the Year, Winner
– The Times Consultant of the Year, Winner

Laura Frost, Ritu Garg, Adele Carey, Martha Hart, Jennifer Kelly, Clare Lavelle
– Women's Engineering Society Women in Engineering Award, Sustainability Winner

Rob Henley
– Institution of Civil Engineers South West Graduate of the Year Award, Winner

Zishu Liu
– European Transport Conference
Neil Mansfield Award, Winner

Shannon Martin
– Institution of Civil Engineers South West Apprentice of the Year Award, Winner

Dervilla Mitchell
– Royal Academy of Engineering
President's Medal, Winner

Michal Nowinski
– Greater Birmingham Chambers of Commerce
Future Faces of Industry, Winner

Selina Rai
– Institution of Civil Engineers
Emerging Engineers Award Yorkshire & Humber and the North East, Winner

Seamus Sands
– Institution of Civil Engineers ICE
Northern Ireland region – Brennan Cup, Winner

Ben Weller
– Ground Engineering Awards
Rising Star category, Winner

Stephanie Welch
– Institute of Workplace and Facilities Management
Impact Awards – Manager of the Year category, Winner

PROJECT AWARDS

1 Triton Square
London, England
– BREEAM Design Award 2020, Winner
Commercial Projects

21 -31 New Oxford Street
London, England
– Structural Steel Design Award 2020, Winner

52-54 Lime Street
London, England
– Structural Steel Design Award 2020, Winner

6 Burlington Gardens
London, England
– Cultural Buildings £5m and Over
AJ Retrofit Awards 2019, Winner

ABSA Ridgeside Façades
Umhlanga, Kwazulu-Natal, South Africa
– SAIA-KZN Award for Architecture 2019, Winner

Arts & Humanities Building,
Manchester Metropolitan University
Manchester, England
– Digital Construction Award, North West Regional
Construction Awards 2020, Shortlisted

Baggage Safety & Welfare BC6315
Heathrow Airport, Hillingdon, England
– Excellence in Engagement and Employee
Experience, Association for Business Psychology
2020, Winner

BBC Wood Lane
London, England
– Best of the Best, BCO National Awards 2019, Winner
– RIBA London Award, BCO 2019, Winner
– RIBA National Award 2019, Winner

Beatrice Shilling Building
Royal Holloway, University of London
Surrey, England
– Social Infrastructure Project of the Year
BCIA 2019, Highly Commended

1 Finsbury Avenue
London, England
– Social Impact Awards 2020

Brunel Building
London, England
– Structural Steel Design Award 2020, Winner

Can Line 2 Refurbishment, Jacobsen House
Northamptonshire, England
– Social Impact Awards RICS 2020
East Midlands Commercial, Winner

Cardiff Central Square Plots 6 & 7
Cardiff, Wales
– Building Project of the Year
Constructing Excellence in Wales 2020, Winner

Coal Drops Yard
London, England
– Leisure and Retail, RIBA National Award 2019, Winner
– Bazalgette Award for Sustainability, ICE London
Awards, Winner
– Structural Transformation, IStructE Structural
Awards 2019, Winner
– Popular Choice Award in the Architecture and
Engineering category Aplus Awards 2019

Colwyn Bay Civic Offices
Colwyn County Borough, Wales
– Regeneration, RICS Wales Awards 2019, Winner

Cork House Eton
Berkshire, England
– Stirling Prize, Shortlisted
– Stephen Lawrence Prize, RIBA 2019, Winner
– Sustainability, RIBA 2019
South Regional Award, Winner

– House, RIBA 2019 National Award, Winner
– AJ House of the Year, RIBA 2019 Manser Medal,
Winner

Defence and National Rehabilitation Centre
England
– Heritage and Culture, RTPi Excellence
in Planning 2020, Shortlisted
– Health and Wellbeing, RTPi Excellence
in Planning 2020, Shortlisted
– Healthcare Design, Healthcare Estates IHEEM
Awards 2019, Highly Commended (over 25,000sqm)
– Design for Health and Wellness,
European Healthcare Design Awards 2019, Winner
– Regeneration, European Healthcare Design Awards
2019, Highly Commended
– The Small Project Award, ICE EMMA's 2019, Winner
– Integrated Project Team of the Year, ICE EMMA's
Future of Consultancy Public Sector Client 2019

Digital Fusion
Brighton, England
– Religious, Symbolic and Spiritual buildings /
monuments IDA 2019, Bronze Award Interior Design

Gasholders
London, England
– RIBA Regional Awards London 2018, Winner

Kresen Kernow
Cornwall, England
– Preservation and Rejuvenation Award,
Constructing Excellence 2019, Winner

Lima Pan Am Games – Phase 1
Lima, Peru
– International category, MCA Awards 2020, Winner

Macallan Distillery
Moray, Scotland
– Workplace, RIBA National Award 2019, Winner
– RIBA Stirling Prize 2019, Shortlisted
– Design Through Innovation,
RICS Scotland Awards 2019, Winner

Awards

UKIMEA Buildings

New College Practice Rooms

Oxford, England

- Social Infrastructure Project of the Year, BCIA 2020, Shortlisted

New Marlborough Primary School

London, England

- Civic Trust Award 2019, Winner
- RIBA National Award 2018, Winner
- RIBA Regional Awards 2018 – London, Winner
- Education, BDA Brick Awards 2018, Winner
- School Project of the Year, AJ Architecture Awards 2018, Winner
- Education, NLA Awards 2018, Commendation
- Social Infrastructure Project of the Year, BCIA 2018, Winner

Park Square

Umlhanga, Kwazulu-Natal, South Africa

- Spaces, Darc Awards 2019, Shortlisted

Places Leisure Eastleigh

Hampshire, England

- LABC Building Excellence Awards 2018, South East England, Winner
- Community Benefit, Engineering Excellence Awards, Winner

Royal Academy of Music – The Susie Sainsbury

Theatre and Angela Burgess Recital Hall

London, England

- Peter Lord Award, Institute of Acoustics 2019, Joint Winner
- BCIA Cultural & Leisure Project of the Year 2018, Winner
- London Building of the Year, RIBA 2018 Regional Awards, Winner
- Tourism and Leisure, RIBA 2018 London, Winner
- Building Acoustics Award, RICS 2018, Commended
- Cultural Buildings – Performance and Events, RIBA 2018, Winner
- Higher Education Project of the Year, AJ Retrofit Awards 2018, Winner
- Culture and Community, NLA Awards 2018, Winner

Royal Opera House Open-Up

London, England

- Performance, RIBA 2019 National Award, Winner
- Culture, NLA 2019, Commendation

Southbank Centre

London, England

- Performance, RIBA 2019 National Award, Winner

St Fagans National Museum of History

Cardiff, Wales

- Art Fund Museum of the Year 2019, Winner
- Tourism and Leisure, RICS 2018, Winner

Television Centre Phase 2

London, England

- Housing, RIBA 2019 National Award, Winner

The Diamond Jubilee Galleries

London, England

- Heritage, RIBA 2019 National Award, Winner

The Manchester Proton Beam Centre

Manchester, England

- Digital Construction Award, North West Regional Construction Awards 2019, Winner
- Client of the Year, North West Regional Construction Awards 2018, Winner

The Standard Hotel

London, England

- Cultural & Leisure Project of the Year BCIA 2020, Shortlisted

University of Cambridge – Judge Institute

Cambridge, England

- Best Conservation, Alteration or Extension of an Existing Building (over £2m), RIBA East Award 2019, Winner
- Campus, RIBA National Award 2019, Winner
- Overall Winner, Schueco Excellence Awards for Design and Innovation 2018
- Education Building Award, Schueco Excellence Awards for Design and Innovation 2018, Winner

University of Northampton Waterside

Northampton, England

- Higher and Further Education, Civic Trust Awards 2020, Highly Commended
- Creative Re-use, AJ Retrofit Awards 2019, Winner
- Education Structures, IStructE Structural Awards 2018, Winner

University of Sheffield – Concourse Lighting

Sheffield, England

- Light and Surface Exterior, IALD 2020 Surface Design Awards, Winner
- Outdoor Lighting Project of the Year, Lux Awards 2019, Winner

University of Sheffield, St George's Heartspace

Sheffield, England

- Social Infrastructure Project of the Year, BCIA 2020, Shortlisted

University of Warwick,

National Automotive Innovation Centre

Coventry, England

- Innovation Award, BCO 2020, Winner
- Sustainability Design Award, AIA UK 2020, Winner

Westminster Abbey Triforium

London, England

- Heritage, RIBA 2019 National Award, Winner

Windermere Jetty Museum

Cumbria, England

- Design of the Year, Civic Trust Awards 2020, Winner
- Cultural Project, AJ Architecture Awards 2019, Winner

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CERN Science Gateway, bookends

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FURTHER INFORMATION

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CERN SCIENCE GATEWAY
Geneva, Switzerland

