

Annual Review

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Cover

Morpheus

Macau, China

An abstract manifestation detailing BuroHappold's realisation of the building's unique exposed exoskeleton. The striking steel and glass lattice shell, sculptural in its appearance, provides both a distinctive identity for the tower and an opportunity to optimise the spaces within.

The luxury 40 storey-high, 150,000m² hotel, designed by Zaha Hadid Architects, opened on 15 June 2018.

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OUR GLOBAL LEADERSHIP TEAM



PAUL ROGERS
Senior Partner



NEIL SQUIBBS
Chief Executive Officer



JAMES BRUCE
Chief Operating and Financial Officer



NEIL BILLETT
Global Design and Technology Director



MISTI MELVILLE
Global Human Resources Director



ALAN HARBINSON
Managing Director – Cities



SARAH PRICHARD
UK Managing Director



HAUKE JUNGJOHANN
Managing Director – Europe



MIKE SEYLE
US Regional President



ANDREA SCOTTI
Managing Director – Middle East



NICK GREENWOOD
Regional Director – Asia



KRISHNENDU MUKHERJEE
Regional Director and Engineering
Services Leader – India

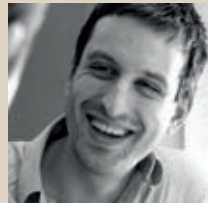


RICHARD SYKES
Non-Executive Director

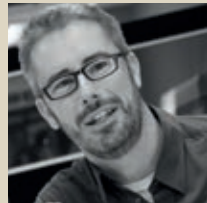
OUR **PARTNER** COMMUNITY



ROB AMPHLETT



ANTE BARIC



ANDREW BEST



MATTHEW BIRCHALL



IAN BOOTH



ANDREW COMER



MIKE COOK



ZBIGNIEW CZAJEWSKI



PHIL DALGLISH



MIKE ENTWISLE



DENZIL GALLAGHER



DAVID HERD



ANIL HIRA



STEPHEN JOLLY



ANDY KEELIN



GEORGE KELIRIS



PADRAIC KELLY



JAROSLAW KUJAWA



DAVOOD LIAGHAT



KARL LYNDON



IAN MADDOCKS



WOLF MANGELSDORF



ROD MANSON



RICHARD MARSHALL



CHRIS McCLEAN



FERGUS McCORMICK



EMILY McDONALD



ROB MOYSER



ANDY MURDOCH



NICK NELSON



ROGER NICKELLS



HAYDEN NUTTALL



ANGUS PALMER



ANDY PARKER



MARK PHILLIP



JUSTIN PHILLIPS



OLIVER PLUNKETT



DUNCAN PRICE



FRANCK ROBERT



LAWRIE ROBERTSON



CRAIG SCHWITTER



PATRICK SMALLBONE



CLAIRE SMITH



MATTHEW SMITH



JOHN SWIFT



GAVIN THOMPSON



ALAN TRAVERS



SIMON WAINWRIGHT



STEVE WILLIAMSON



ANDREW WYLIE



ALASDAIR YOUNG



JERRY YOUNG



STRATEGY AND SUCCESSION PLANNING

PAUL ROGERS SENIOR PARTNER, ON THE DELIVERY OF EXCEPTIONAL OUTCOMES



The last few years has been a period of consolidation across our industry. This is not unusual and, periodically, you observe more or less of this activity across the global marketplace.

BuroHappold is an independent firm owned by our Partners who lead our people. However, from time to time, we ask ourselves, is our ownership structure truly appropriate and the best way to serve our clients as well as our own ambitions? For example, when two established organisations join together and communicate their future plans, we at BuroHappold question what the strategic impulse was that led to such a decision? It is vital that we challenge our own thinking.

Being a Partnership allows us to have choices in our strategy but also gives us the responsibility to ensure we enable succession within the ownership of our firm. It also means we must balance individual reward alongside the need to invest in our firm. We must develop both our future leaders as well as the service offerings that best respond to future environmental and economic challenges.

A motivated and diverse leadership community ensures the BuroHappold practice continues to shape the thinking across the built environment. We are extremely proud to have appointed seventeen new Partners to the leadership community of our firm over the last sixteen months. Our global community is diverse and ambitious and we are

confident that together as one leadership team, we will continue to build a strong, resilient BuroHappold over the coming years.

A key aspect of our strategy is investing in the career development of all our people. We believe this creates a confident community of consultants, planners and engineers with whom our clients and collaborators will wish to engage. Professor Sir Ted Happold was a strong believer in “the sum of the parts”. It is very exciting to see, through the projects showcased here, what a diverse community can achieve by working together with our clients and collaborators.

As we plan for the year ahead, we will evolve our ownership structure and invest in the collective capabilities of all our people. This ensures BuroHappold has the strength and depth to confidently deliver exceptional project outcomes for every user, at any scale, in every environment.

A handwritten signature in blue ink that reads "Paul Rogers". The signature is fluid and stylized, with the first letters of the first and last names being capitalized and prominent.

Paul Rogers Senior Partner



OUR **VISION** AND **STRUCTURE**

NEIL SQUIBBS, CEO, WITH HIS VIEWS ON THE YEAR AHEAD

Ted Happold said that a 'world that sees art and engineering as divided is not seeing the world as a whole'. This integrated outlook, alongside our ability to adapt to change, has been key to our success in 2018.

What makes BuroHappold different? We consider the outcomes first of all. Working out what a client wants to achieve most from their project is our key to producing built structure solutions for our clients that work on all levels, for all users, and over a long period of time.

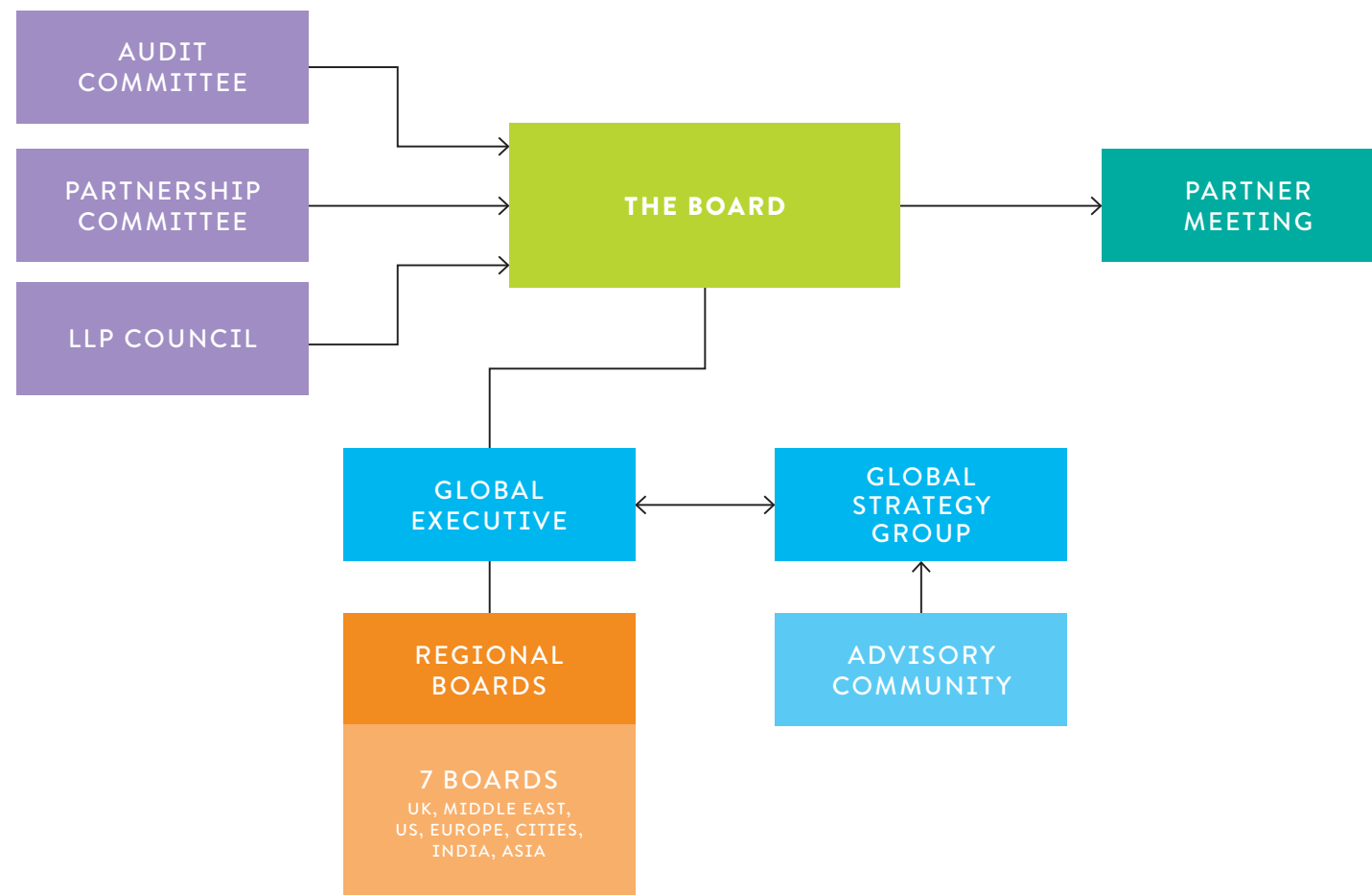
So, if BuroHappold was a 'project', what do we want to achieve in the long term? In essence, we need to build on our strengths and seek to create the right balance in our practice. Balance in our markets and the services we provide for our clients. Ultimately this will lead to growth. Within that, a deeper knowledge of our sectors, a culture that nurtures, inspires and promotes talent and the flexibility to adapt to a changing world, keeping one step ahead of every technological advance.

To achieve this, we have been looking at how our practice is structured. The last major change was the creation of the Limited Liability Partnership (LLP) in 2008, which enabled a wider group of Partners to participate in leading and owning BuroHappold. Going forward, we are exploring alternative forms of ownership, that we feel would be more inclusive of all our people, and allow us to grow for the benefit of our clients and people.

Alongside this, we will continue to invest heavily in our practice to create opportunities for talented people, and to balance our operations more evenly between UK and non-UK locations. We will continue to invest in the core of the business – excellence in engineering and consulting.

This evolution of our work at BuroHappold is inspiring, and allows us to cement ties with key decision-makers and clients on a macro-level, setting the stage for future challenging and profitable work.

Neil Squibbs CEO



OVERALL BOARD STRUCTURE

This shows the new structure for the firm, going forward, with the introduction of a global strategy group. This development is intended to develop and assess our work in buildings and cities, as well as improve the balance of work between the UK and elsewhere in the world to ensure we are a strong resilient business that is thinking about the future.

INVESTING IN **GROWTH**

JAMES BRUCE – CHIEF OPERATING AND FINANCIAL OFFICER



2017/2018 was a year of consolidation for BuroHappold as we focused on strengthening the resilience of our business and positioning ourselves for solid profitable growth in the coming years.

We've been investing heavily, rebalancing markets and developing our offer to better meet the needs of our clients. People are our biggest asset and by investing in individual and collective talent, together with streamlined processes and emerging technologies, we're sharpening BuroHappold's competitive edge, strengthening our impact, and deepening our market penetration.

We believe in digital design. The practice is totally committed to technological transformation both to drive efficiencies on behalf of our clients as well as deliver previously deemed impossible designs. Data analytics give us fresh insights which lead not just to greater transparency and accountability, but to even more imaginative transformational outcomes for our clients. And in spite of increased commercial and political pressures (including Brexit in the UK, where the largest proportion of our business occurs), we continue to deliver world leading projects for our clients such as Morpheus in Macau's City of Dreams and Louvre Abu Dhabi, the jewel in the crown of Saadiyat Island.

With a focus on growth for the coming years we aim to better balance our markets and geographical presence, identifying new markets and looking to gain presence in new territories. We will focus on developing our sector offerings and continue the development of our integrated service offers to continually raise the bar, providing clients with the world class cutting edge delivery they've come to expect from BuroHappold. In an industry of largely group-owned engineering consultancies, BuroHappold remains fiercely independent, both in spirit, and as a business.

FINANCIAL PERFORMANCE 2017/2018

Increased economic headwinds in the UK led to a slight decline in the group's turnover, generating a turnover of £163.6m (2017: £171.9m) and an operating profit margin of 10% (2017: 13%). Turnover by destination saw a decline in the UK of 4% but roughly stayed proportionally consistent at 38% (2017: 37%) with Middle East turnover down by 6%, representing 28% (2017: 29%) of group turnover. This was somewhat offset by increased turnover in the rest of Europe of 18%, now representing 9% (2017: 7%) of group turnover.

FINANCIAL PERFORMANCE (CONT.)

The reduction in operating profit from £22.8m to £17m is attributable to three main factors:

- tighter operating conditions in the UK
- challenges with debt recoverability in the Middle East, resulting in an impairment of bad debt of £3.4m (2017: £1m)
- expenditure of £2.1m on a number of investment projects.

Exchange rate fluctuations will always affect the Group's results because of the greater proportion of overseas earnings although we do seek to hedge risk where feasible. This resulted in an exchange loss of £1.6m (2017: gain £1.9m). The fair value loss on foreign exchange forward contracts was £0.1m (2017: gain £0.4m).

Cash has fallen in the year from £32.1m to £16.6m, linked to the increase in DSO of 12% to 120 days driven by ageing debt in the Middle East. Payments to current and former members increased by £5m to £22.5m and advance payments from clients declined £5.5m. Working capital management remains a key focus of the group, with DSO and cash forecast to improve during 2018/19.

The average number of employees remain consistent with turnover generated per employee of £98,000 (2017: £103,000).

A solid set of results providing a platform for continued investment and future growth of the business.

James Bruce

Chief Operating and Financial Officer





HOW TECHNOLOGY **TRANSFORMS** AND **INSPIRES** US

NEIL BILLETT – GLOBAL DESIGN AND TECHNOLOGY DIRECTOR, ON HOW TECH IS INGRAINED IN EVERY ASPECT OF OUR WORK

From the beginning, BuroHappold has always strived to deliver an enhanced outcome. What makes our offering so special in 2018, is that our designs have the power to transform; the client's business, the user's experience and performance, and increasingly, opportunities for future projects and investment.

When we started out 41 years ago, our main role as engineers was in solving complex technical challenges. The challenge then was to understand materials – steel, plastics, concrete, glass, fabrics. By gaining deep understanding of a material's strengths and limitations, we were able to exploit each to the limit, creating awe-inspiring structures with unique lines, long roof spans and breath-taking elegance.

This was only the beginning. BuroHappold's engineers and consultants graduated to focus on passive design which avoids the use of natural resources, minimising any

negative impact on the environment. We sought to use materials more efficiently and make construction as easy and safe as possible. How did we do it? Through integrated design and evidence-based data, leveraged by inquiring and entrepreneurial people. This was, and is, fundamental to our client offering. It is multi-faceted, and work ranges from looking holistically at future scenarios for a project, to tracking people movement, to mining our vast bank of project knowledge for relevant, useful data and insights.

The advancement of new tools like big data, coding, machine learning and BIM mean that every project lead now incorporates data and computational analysis in the design process. Augmented and virtual reality enable us to experience environments as yet unbuilt. As part of our design process, we demand of ourselves to explore and define not only expert vigorous technical solutions, but also breakthrough solutions for our clients. It is through the constant collection, analysis and use of project data that allows us to transform and elevate a design. Combine the use of data, computational analysis and human behaviour studies, and we authentically deliver transformational outcomes for users and the environment.

Our work is becoming even more exciting as we increasingly realise the future potential in computational design and engineering. In a space where we are among the leaders in our field, we apply expertise to challenges few can overcome, and technology is at the heart of that. Three channels guide our work:

INTENSIFY

Improving internal workflows and efficiency, generating more time for thinking, consulting and collaborating – time for application of holistic 'intelligence',

INNOVATE

Innovating to add value to clients' core business drivers and increasingly, using our consulting engineering inquiry to establish new insights that create additional value through the built environment,

INCUBATE

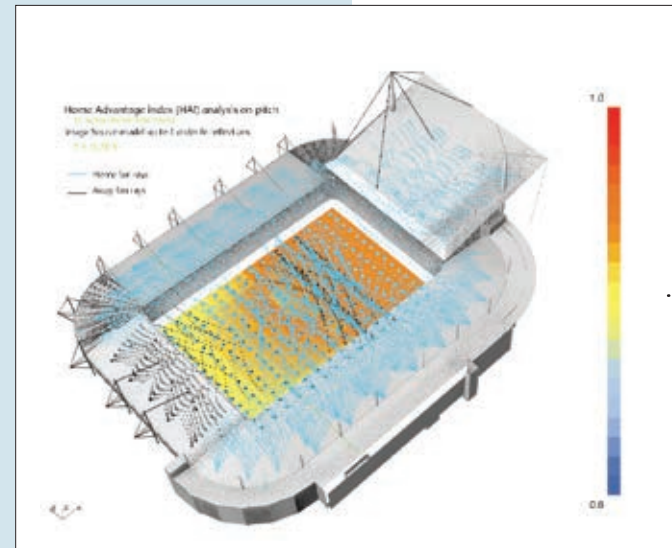
The creation of new opportunities within and outside the built environment, broadening our reach to include industry, academic, client and user organisations.

A woman with blonde hair, wearing a purple cardigan and a patterned scarf, is pointing with a pen at a diagram on a whiteboard. The diagram appears to be a site plan or architectural drawing. A man in a light blue shirt is standing next to her, looking at the board. The whiteboard is covered with various papers, including photos and documents, held in place by blue pushpins.

Neil

13

Design sprint discussion:
co-generation of
future opportunity and
potential responses
working with our leading
experts and industry
gurus and stakeholders.



Using fan-generated sound
analysis modelling to
maximise stadia design for
the home advantage.



Virtual reality can be used to
simulate how a building functions
for a wheelchair user. This is just
one way that technology allows us
to transform our client offering
into something more intelligent,
reactive and forward-facing.

THE BUROHAPPOLD **PRINCIPLES**

Most BuroHappold people would agree we are a practice with values that have endured for more than 41 years.

In changing times, we decided to confirm the priorities and articulation of our Principles. In May 2017 we took the unusual step of asking our people for input.

Using a mobile app, we invited debate and discussion from everyone across the practice on 15 themes. This got the conversation started.

From analysis of 500 of the most detailed responses we synthesised six key Principles that reflect our combined view of what we all value.

Partners were delighted. The elevation of Wellbeing to a position of singular priority is especially relevant in a rapidly urbanising world, as is the linkage between technology and empathy.

- 1. We value human wellbeing, and are discontented with limitations. We commit to taking this as seriously for our people as our projects.**
- 2. We are a diverse, one-firm culture. When we get it right, it sings. Internal barriers are always to be overcome through inclusivity.**
- 3. We embrace mutual responsibility. It is easy to default to individual success. Teams need to share success and failure in the same way.**
- 4. We are more than a business. We care about the legacy of our work. We have a responsibility of care as an employer and influencer in the shaping of the world.**
- 5. Sustainability is intrinsic to the economic and social impact of our work. Going beyond compliance requires challenging preconceptions, taking extra steps.**
- 6. It takes courage to create. Our culture fosters a dynamic between technology and empathy to gain deeper insight, unleash imagination, and manage risk.**

**If you live by these principles,
roll up your sleeves and join us.**

OUR PEOPLE

MISTI MELVILLE – GLOBAL HUMAN RESOURCES DIRECTOR



Across the practice through our leadership and human resources professionals, we strive to support our employees to achieve their potential. A number of initiatives across the areas of learning and development, reward and recognition, wellbeing and recruitment underpin our culture.

Talent management is at the heart of our approach to ensure that our business goals are achieved and clients receive the best transformative outcomes. To support this goal, we have re-energised how we manage performance and support employees in achieving their career goals. Our appraisal process has been transformed to include the latest research in neuroscience and neuroleadership, and has resulted in what we have called My Career Plan and Objectives (My CPO).

The introduction of a career management portal, known as My Career, allows all partners, employees and line managers to access their career plan, annual objectives and our learning and development framework. It is proving to be an invaluable tool for everyone to have at their fingertips to support their career aspirations, and will continue to evolve and embrace new technologies.

With offices in 11 countries across the globe, we strive to ensure effective ways of working across the practice. The running of cultural awareness workshops in UK, Europe and Mumbai have focused on breaking down the barriers to ensure increased collaboration, idea generation and the sharing of best practice across the globe.

To ensure that we are collaborating across our offices, we have introduced a peer-to-peer advice app, available on phones and desktops. Known as Runway, the app provides real-time connections globally and provides the business with insightful analysis of the trends impacting our people.

Recruiting the best people into the practice continues through our use of social media sites such as LinkedIn, Glassdoor and Instagram. This activity has enhanced our employer brand and employee value proposition through market-segmented branding and audience targeting for specific regions, teams or languages. Consequently, we are ensuring that we recruit the right people with the right skills at the right time.

Our employee survey provides a valuable insight into engagement across the practice. We use the survey to provide targeted solutions to different office and employee groups to ensure that BuroHappold remains a great place to work. Initiatives include the implementation of a no-weekend-work approach in our Indian offices which has successfully reduced overtime requirements, resulting in a much healthier work-life balance in the office.

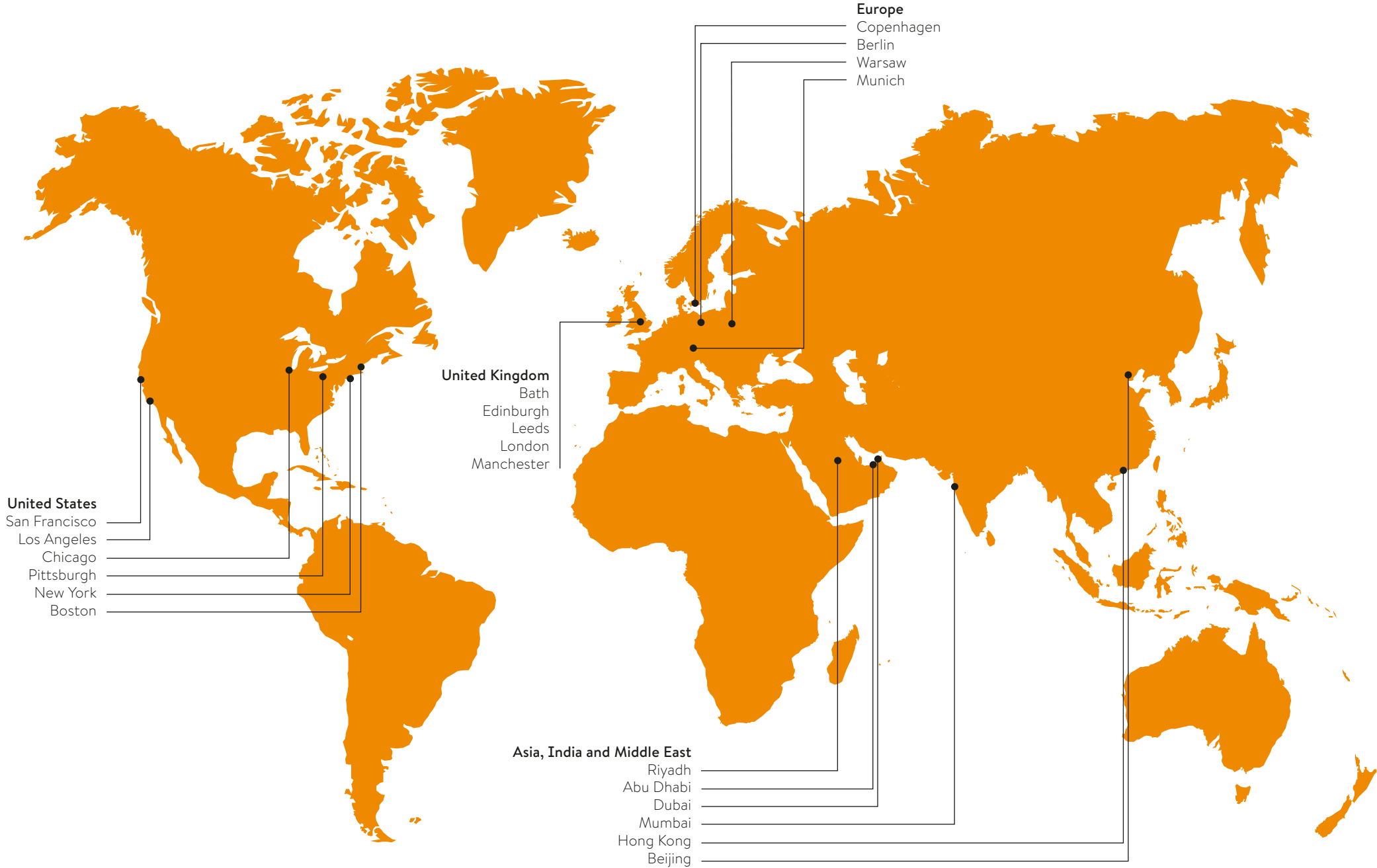
In the Kingdom of Saudi Arabia offices, “Wellbeing” is a key focus and we have successfully introduced programmes such as office-based yoga sessions in Riyadh. This is not something that is common practice in Saudi Arabia and employees were appreciative as very few other organisations have implemented wellbeing benefits. In the United States, we have introduced healthcare benefits, reducing the base medical plan to zero employee contribution at employee-only level and thereby offering a free medical coverage plan.

We aim to continuously improve our people practices and opportunities by listening to our people and drawing on research about the latest innovations in talent development.

Our work continues on both a global and local office level to ensure that we remain a great place to work.

Misti Melville
Global HR Director

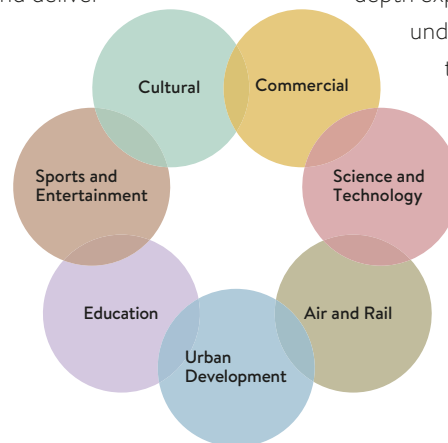
OUR PEOPLE AROUND THE WORLD



A GLOBAL COMMUNITY OF WORLD LEADING ENGINEERS AND PROFESSIONALS

As an integrated engineering practice, we are able to unite experts from across disciplines to solve some of the world's most complex engineering challenges. 60 partners and 1,700 employees operate from 21 locations across the globe. We employ creative thinking, evidence-based analytics and digital design technology to realise inspiring and sustainable projects that improve the built environment for communities and the planet alike.

Our expertise spans seven core sectors and draws on 29 distinct specialisms. So whether a client is looking to realise a cultural venue of value, breathe new life into a former industrial site, or raise their game with an iconic sports stadium, we have the skills to realise their ambition and deliver beyond it.



Our seven core integrated Sectors

For every project, we can handpick leading engineers and professionals from across our global practice to create a bespoke team that can respond to the unique challenges presented. This allows us to combine extensive sector experience, in depth expert knowledge and vital local understanding to realise projects that exceed expectation and excite the imagination.



An example of a range of integrated specialisms that could be employed to achieve a project vision

THE YEAR IN NUMBERS

Turnover (£m)

163.6

Operating profit (£m)

17.0

Margin (%)

10

Average number of employees

1,672

based in

21

global offices

Social media followers (1,000s)

52

LinkedIn

16.5

Twitter

Worked in more than

70

countries worldwide

Offering our clients

29

value-led specialisms

Through

9

service offers

Across

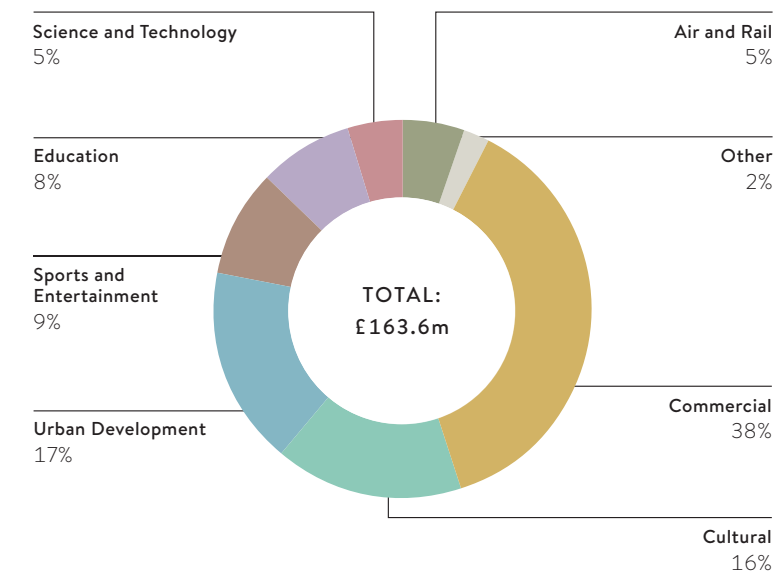
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market sectors

SECTOR REVIEWS

SHAPING OUR WORLD WITH INTELLIGENT ENGINEERING

Seven key sectors: Sports and Entertainment, Urban Development, Commercial, Cultural, Education, Science and Technology, Air and Rail



GROSS WORK DONE BY SECTOR 2017/18

SPORTS AND ENTERTAINMENT

65 projects in **8 countries** worldwide

World's first 14.5 acre **oculus roof**

1 unique retractable pitch



MATTHEW BIRCHALL

Sports and Entertainment Sector Global Lead

ENT

Passion is what drives us forward in the sports and entertainment sector. Our team are not only fanatical about sport and entertainment, we are obsessive about producing better outcomes for clients, whether that's for a Premier League football ground, international Olympics venue or world-class entertainment arena.

Last year saw the completion of the iconic Atlanta Falcons Stadium with its unique retractable oculus roof. This year, we have been building on this success, and looking for great project opportunities in US Major League soccer and collegiate venues. The recent win for the 2026 FIFA World Cup, to be shared by the US, Canada and Mexico is creating some great opportunities which we are already pursuing.

We have also been expanding our profile eastwards, and are currently supporting a consortium bidding for the transformation of the iconic Kai Tak airport site in Hong Kong into a multi-purpose sport and leisure destination.

We don't just build stadia. Increasingly, our focus is about looking beyond the built asset, seeking out additional development opportunities and revenue streams for clients. Our engineers and consultants are taking a stronger lead on projects, delivering better outcomes for those we work for. To do this,

we have developed some fantastic tools to analyse very complex, compound parameters and link those directly to client outcomes. By engaging with other stakeholders in an environment of co-creation, and supported by a culture of confidence and humility, we are starting to capture significant insights that deliver success for us and our clients. We've made significant progress in this area throughout 2018, enabling us to deliver better value and cement long-term ties with our clients.

BuroHappold's Sports and Entertainment team has a winning combination of three things. Firstly, experience – clients benefit hugely from working with a team with over 20 years of experience and knowledge between them. Secondly, computational skills – our development and use of advanced metrics allow us to analyse how stadiums perform, linking client outcomes directly to design. Thirdly, passion – we love sport and entertainment. This enthusiasm is what drives us to deliver the very best for our clients.

THOUGHT LEADERSHIP

IN SPORTS AND ENTERTAINMENT

Andy Pottinger, BuroHappold's Venue Performance Specialist, explains how the sector is using outcome-driven design and performance modelling.

Our experience, computational skills and passion are now being deployed to actively support clients in their pursuit of outcomes. Outcome-driven Design is the umbrella term for multiple strands of outcome modelling which will increasingly become multi-sector.

In the Sports and Entertainment sector we often call this Venue Performance Modelling.

So what do we mean by performance? In this instance we're talking about how a venue performs for its owners. For example how does it help the team? How

does it help generate revenue? How does the venue help the club's reputation and brand? Results, revenue and reputation are categories in which most, if not all, of a club's overall desired outcomes can be framed. Below these lie another deeper layer of desirable outcomes such as positive fan experience, fan influence, concourse revenue, construction cost and construction programme.



“The new, performance-based approach to Stadia design that we are pioneering engages clients, stakeholders and the wider project team.”

Andy Pottinger
Associate Director



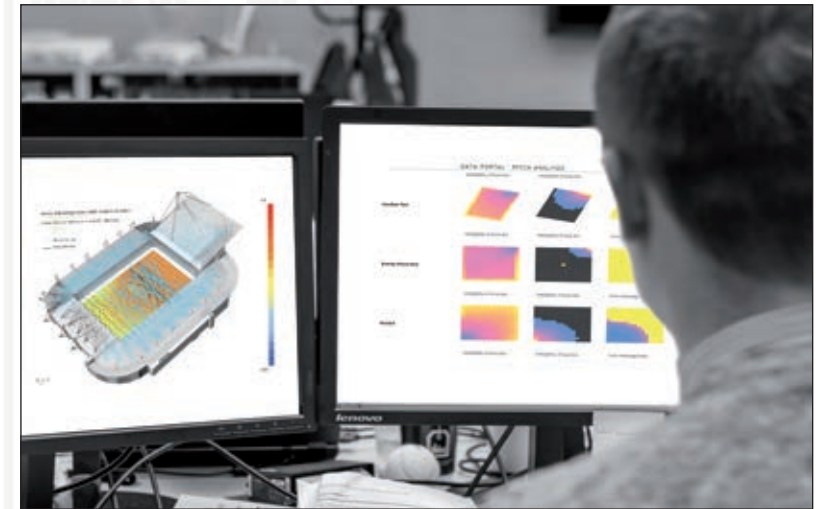
What do all of the aforementioned outcomes have in common? They are what we call composite metrics. By this we mean that they can be measured and analysed by breaking them down into individual metrics. Examples of individual metrics are bowl form, roof angle, wifi coverage, fan type, seat width, and the time it takes you to get a beer! The list is endless, and BuroHappold are well placed to interpret all of it. Put simply, we've designed a lot of stadia, and we've got a huge number of people across the practice with computational skills, so we've brought that together.

Using Rhino and Grasshopper we can now quickly create initial stadium concepts, formed from more than a hundred individual metrics. Then we can sit with clubs to understand how each of these concepts might relate to the composite metrics which they consider most important. If minimising construction cost is paramount, we can focus on that; if the maximisation of fan influence on the pitch is paramount, we can focus on that; etc. This is a story of co-creation – we

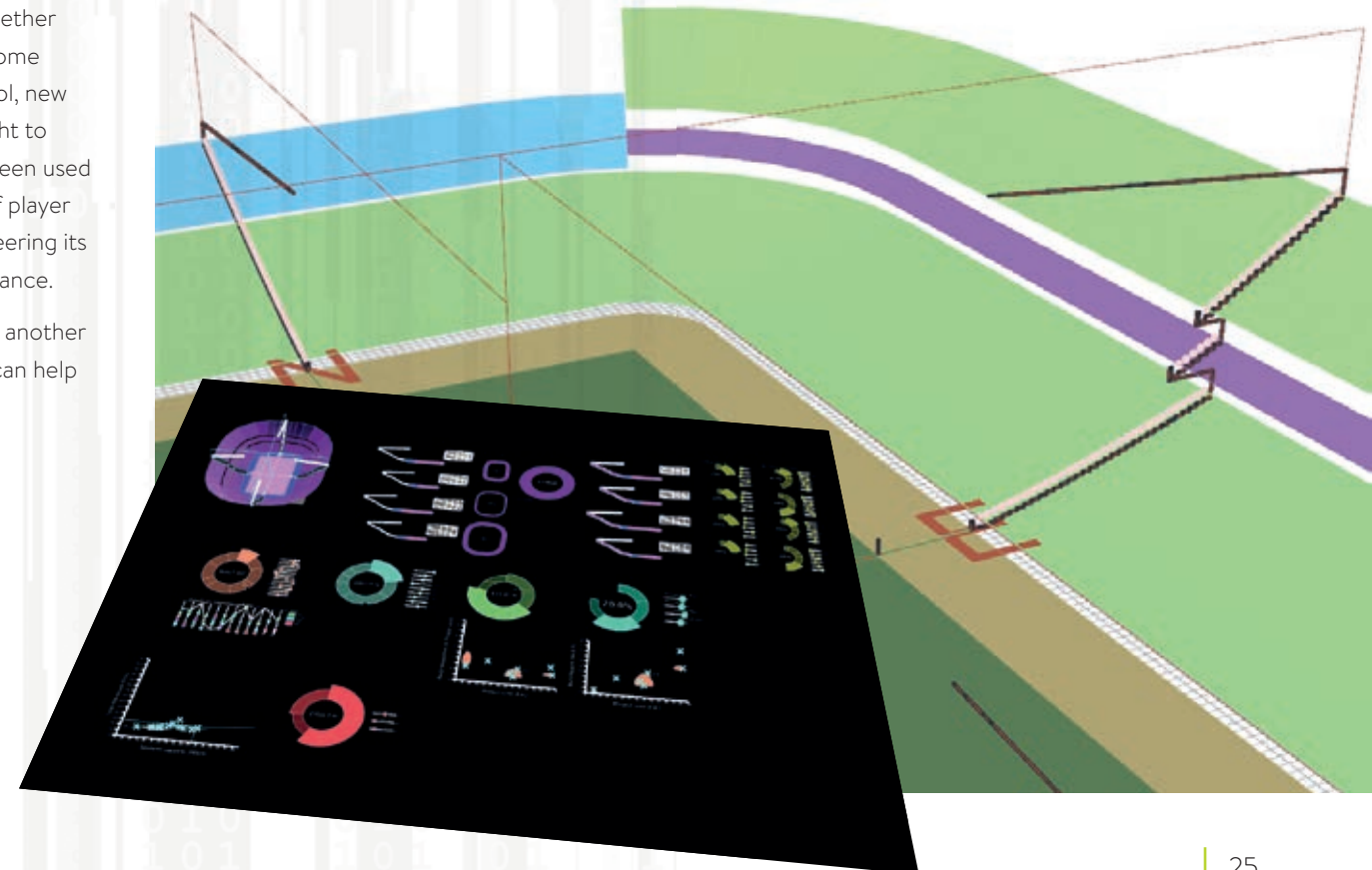
work with supporters, players, managers, owners, to understand exactly what high performance means – and it's different for every club.

Venue Performance modelling is one way of us saying 'get us involved early' to clients, and one way of us showing how broad our understanding is. We can study how to achieve their desired outcomes scientifically, and then we can monitor how those outcomes are being pursued throughout the design process. We can understand the impact of multiple design interventions – whether that be introducing a single tier 'home end' (Borussia Dortmund, Liverpool, new Spurs), or introducing more daylight to concourses. Science has already been used to transform our understanding of player performance, so now we are pioneering its use to transform stadium performance.

A club's history is not a rigid thing, another page gets written every year. We can help clubs to create history.



BuroHappold has established a suite of performance metrics to bring science to stadia and shift to outcome-driven design.



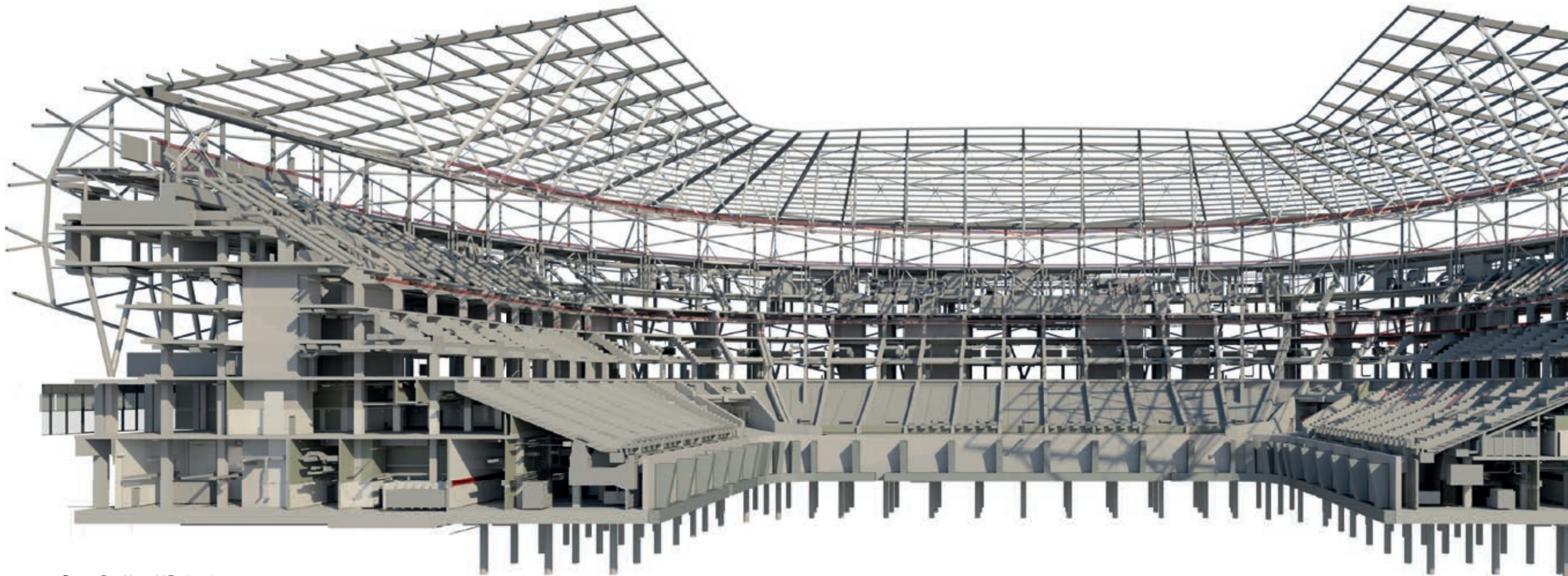


Image: BuroHappold Engineering

Education City Stadium (Qatar Foundation Stadium)

Doha, Qatar

Created for the FIFA World Cup 2022, this 40,000 seat stadium is set to complete this year. Enclosed in an outer shell shaped to resemble a diamond, the stadium glints as it catches the sun, and glitters under the illumination of thousands of diodes at night. Our design features an innovative bowl cooling system and pioneering cable roof structure that will deliver an exceptional spectator experience. Our work transformed the previous programme of design, enabling the high performance of the brief to be retained whilst substantially reducing the cost.

The stadium will feature an advanced cooling system, ensuring comfortable temperatures all the year round for players and fans.

DELIVERING A DIAMOND-
INSPIRED STADIUM THAT
WILL ENCOURAGE
SOCIAL AND ECONOMIC
DEVELOPMENT IN QATAR





Image: WilkinsonEyre

THE **COMPTON** AND **EDRICH STANDS**

WILL BE IN PLACE FOR THE 2020 SEASON OF CRICKET WITH THE COMPLETED FACILITIES OPENED THE FOLLOWING SEASON

Compton and Edrich Stands, Lord's Cricket Ground

London, UK

Lord's is the historic and spiritual home of cricket and occupies a large site in a prime residential area of London. BuroHappold is in the early stages of redeveloping two stands at the Nursery End of the Ground – the Compton and Edrich stands. The new three-tier stands will seat around 11,500 members of the public, with a walkway linking both stands. The lower tier has approximately 6,600 seats, the hospitality level on the middle tier, 2,385 seats and the upper tier, 3,765 seats. Three per cent of all seating will be for wheelchair users or those with restricted mobility, and unlike the current stands, the top tier of the new stands will be partially covered.

REALISING A NEW **MULTIPURPOSE** STADIUM AND **REVITALISING** THE COMMUNITY BEYOND

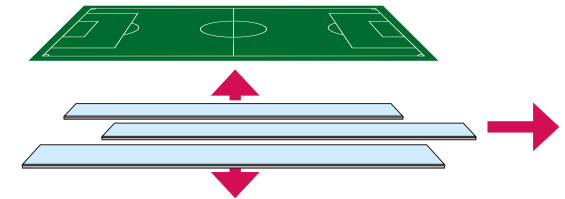
Tottenham Hotspur FC

London, UK

The new stadium will increase spectator capacity from 36,240 to 62,062 and provide Tottenham Hotspur FC with state of the art facilities designed to support football matches, NFL games, music concerts, and private events such as conferences and banquets. Our pioneering design enables the football pitch to split three ways and slide beneath the south stand of seating, transforming the stadium from a bespoke football ground into a flexible venue.



Images: Populous



URBAN DEVELOPMENT

Building robust **socio-economic** and **business** cases

Working with the environment to deliver **resilient developments**

Creating **efficient city systems** to minimise resource inputs and waste outputs

Developing transport solutions to promote **active, healthy** and **accessible** districts

Using technology to **improve the quality of life** for citizens and businesses

ENT



ALAN HARBINSON
Managing Director – Cities

Our vision is to make cities great places to live and work. Cities are constantly changing and adapting to evolving demands and challenges. Our engineers and consultants help city leaders to both manage and facilitate this change; adapting, enhancing and planning the built environment on a local, city and region-wide scale.

This has been another financially successful and busy year for our Urban Development 'Cities' team, with projects on every continent. From the design of a new city centre Enterprise Campus for Bristol University, and the development of Vauxhall Nine Elms Battersea, the most significant regeneration programme in the UK, to masterplanning new cities in Saudi Arabia, we are working on every level across all disciplines.

Helping clients plan for a more sustainable future, we have helped the New York State Canal Corporation and NYPA to envision a bold new future for the 500-mile canal system, a National Historic Landmark. At Neues Gartenfeld in Berlin, we have developed a self-sufficient and car-free masterplan for a new residential area, setting new standards for urban design. We are also helping the London Borough of Kingston transform the area around its central station and help promote a more active lifestyle.

Global warming continues to be one of the key urban challenges. We are working to reduce greenhouse gases in New York, particularly supporting those on a ground level responsible for implementing that change through better infrastructure. Our ongoing consultancy work for C40 around addressing the challenges of emissions and air quality led to two C40 events this year that brought together city environmental planners and directors from around the world. BuroHappold's tools and methodologies empowered them to take more effective action on air quality.

The BuroHappold Bridges team enjoyed another successful year, with the delivery of the stunning Northern Spire, and an international win for our design of a new river crossing in Budapest. They were also a major contributor to our winning concept for a new urban centre in Linköping, that combines new public spaces with a high-speed rail interchange.

In addition to major urban developments, we are working on projects in almost every sector, from university campuses to airports, and commercial office developments to sports stadia.

THOUGHT LEADERSHIP

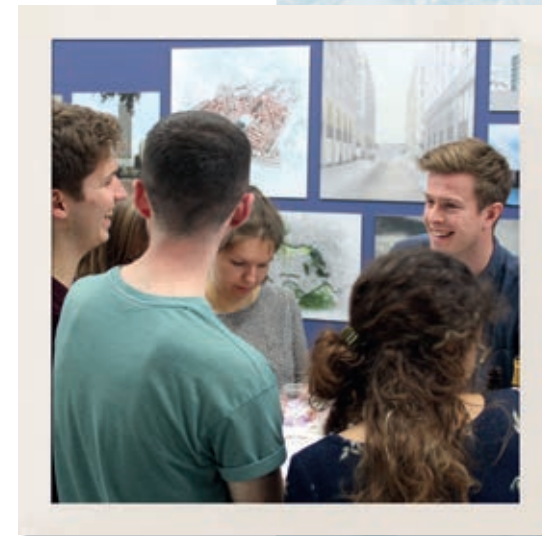
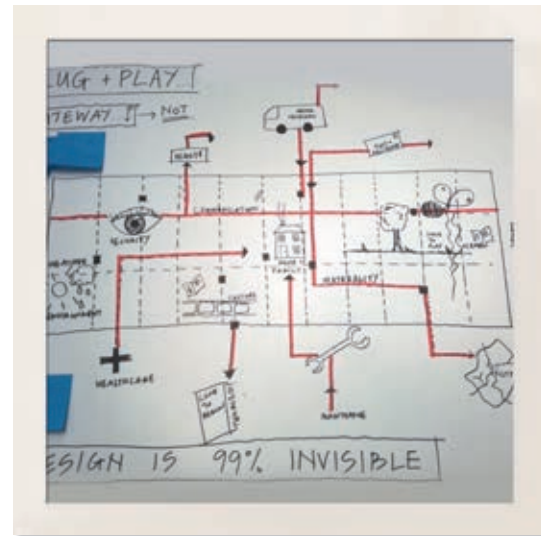
IN URBAN DEVELOPMENT

BuroHappold took 16 of its brightest young engineers to Berlin recently. Alongside architects from Allies and Morrison and Henning Larsen, two of our most important collaborators, the team was tasked with finding innovative solutions to a topic associated with one of our live masterplans.

GARTENFELD – HOW CAN WE MAKE IT CAR FREE?

Over the course of three days, the group looked at issues such as:

- How to apply textbook car-free urban planning best practice to the Gartenfeld masterplan, understand its compromises and explore possible improvements.
- Develop a brief for the point of interface/transition between the car-free neighbourhood and the broader car-based urban plan. If home is where the hub is, what should the hub be?
- What community functions must it embrace?
- How should it evolve over time as mobility trends change?





DESIGN **INGENUITY** CREATES A **LANDMARK LINK** FOR COMMUNITIES



Images: Sunderland City Council



The deck launch was a major achievement. 300m of the 340m long bridge deck was assembled on the south bank and launched across the river on temporary supports and associated foundations, with the remaining portion (the approach span) lifted into position by crane afterwards.

Off-site construction saved delivery time and improved site safety.

Northern Spire

Sunderland, UK

Forming a major part of the regeneration of the North East, Northern Spire is the first road bridge to be built in Sunderland for more than 45 years. A key part of our work involved developing an innovative construction method that includes an incremental deck launch and roll up of Northern Spire's main pylon. This approach allowed off-site manufacture of the bridge steelwork, which was then delivered by sea to the Port of Sunderland. The pylon was transported as a single, 100-metre-long, steel element, standing in its final position at 105 metres high.



WINNER

ICE NE ROBERT STEPHENSON SPECIAL PROJECT AWARD 2018

FINALIST

CONSTRUCTING EXCELLENCE IN THE NORTH EAST AWARDS 2018



PLANNING FOR FUTURE **STABILITY** AND FINANCIAL **SUSTAINABILITY**

Reimagine the Canals Competition

New York, NY, USA

The New York State Canal System was listed as a Historic National District in 2014 and designated a National Historic Landmark in 2017.

To date, much of the canal system's potential to stimulate tourism and economic activity in the communities along its corridor remains untapped.

The New York State Canal System is a 524-mile network comprised of the Erie Canal, the Oswego Canal, the Cayuga-Seneca Canal and the Champlain Canal. Earlier this year, the New York Power Authority (NYPA) assumed control of the Canal System from the New York State Thruway Authority and initiated a strategic planning process to assure the long-term vitality of the canal system. As part of this process, NYPA and

the New York State Canal Corporation engaged BuroHappold to run the *Reimagine the Canals Competition* and help develop a strategy for the future of the New York State Canal System. The competition was envisioned to seek bold ideas for infrastructure projects and programming initiatives that foster economic development and tourism, promote the canal system's heritage, and improve its financial sustainability.



Image: New York State Canal Corporation



SUSTAINABLE THINKING KEY TO **URBAN** **DESIGN** MASTERPLAN

Neues Gartenfeld

Berlin, Germany

The Cities Berlin team have been working on an exceptionally ambitious residential masterplan on an island in Berlin that aims to serve as a blueprint for urban design for the 21st century.

Our team's vision has transformed the isolated nature of the island into a strength by reducing resource flows between the site and the external environment, and creating an autonomous, self-sufficient masterplan. The development will feature small, flexible heating networks with an emphasis on renewable energy, a high quality neighbourhood ICT platform, and a pneumatic waste disposal system. Sustainable principles are embedded throughout; 100% of stormwater will be reused, and 60% of the buildings will have green roofs.

The mobility strategy was the greatest challenge for the team as the site has no existing public transport links but will be totally car free. Our engineers have developed a concept for an autonomous public transport loop for the island, with two mobility hubs connecting the site to the wider city public transport network.

Image: UTB GmbH

A GATEWAY TO INVITE SLOWER AND MORE **SUSTAINABLE,** **HEALTHIER** MODES OF TRAVEL



WINNER
NEW LONDON AWARDS 2017
'WELLBEING CATEGORY'



① Cycle bridge

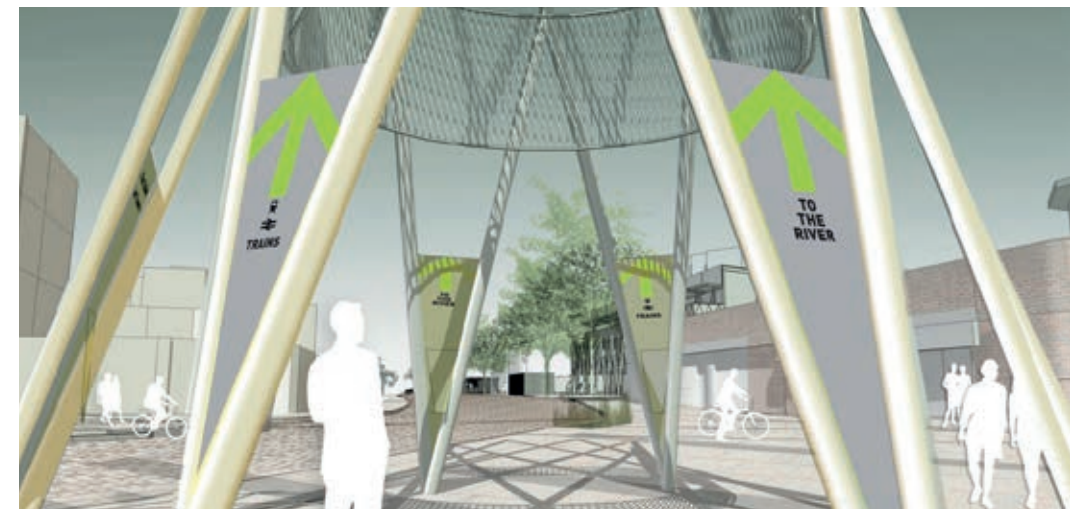


② Hub, with cycle rack

GoCycle: Kingston Station

Kingston, UK

BuroHappold Engineering was commissioned to upgrade the forecourt at Kingston Station, with a focus on improving facilities for cyclists and pedestrians in an area otherwise dominated by vehicles. Our team developed a vision defining how the station area might act as a gateway for multiple user groups to different areas of the town and beyond. The resulting design included improved connections to the River Thames via a new pedestrian and cycle bridge, improved wayfinding into the town and provision for up to 700 cycles in a new facility adjacent to the station.



③ Beacon



FUTURE VISION: CITY EXPANSION DESIGNED TO **LINK COMMUNITIES**

Åatad Linköping

Linköping, Sweden

BuroHappold designed a winning concept for the delivery of Linköping's urban development project. As part of the 2030 vision, it incorporates an extension of Linköping's city centre and the development of a high speed rail interchange. The new sustainable urban centre will be complete with mixed land use, new building volumes and the positioning and scaling of a railway station. Other planned developments include public parks, piazzas, streets, footpaths, cycle paths and new recreation spaces around the Stångån river.

The inner-city developments will use a combination of decentralised combined heating, power systems, and renewable energy sources to provide efficient distribution systems – maximising efficiency and contributing towards a zero carbon environment.

SETTING THE HIGHEST **GREEN** **STANDARDS** IN URBAN DESIGN

Neu Schöneberg

Berlin, Germany

The site, formerly a railway yard, is a new urban neighbourhood that when completed will consist of 300 apartments, retail units, a nursery and a fitness centre. BuroHappold worked closely with the developer and design team to develop a plan for the new urban district, delivering a masterplan, sustainability strategy and urban district certification.

The development's park location and superb infrastructure connection, along with the addition of public courtyards, ensure a peaceful, green escape within the urban realm. To achieve the DGNB certification, the masterplan incorporated a progressive energy concept using a central Combined Heat and Power (CHP) system, renewables and waste water heat recovery.



Image: Collignon Architektur

“Our progressive energy concept has resulted in a 60% reduction in CO₂ for the entire project.”

Thomas Kraubitz Associate, BuroHappold

COMMERCIAL / WORKPLACE

1.5 million m² of office commercial
and retail space engineered

Working with over **500 clients** worldwide
in over **40 countries**

10,000 homes delivered and
50,000 work stations created

BuroHappold's commercial team look beyond the building. Our engineers no longer look at a structure as just a place to live and work, they are looking further, designing spaces that not only work for businesses, but also create happy and healthy communities.



ANDY KEELIN

Commercial Group Director

A focus on holistic transformations has been key to the BuroHappold commercial team's success in 2018. Clients increasingly want people-focused design with emphasis not only on the building itself, but the spaces around it. Computational and evidence-based engineering allows BuroHappold to deliver high-performance commercial projects that succeed on every level. Our work in developing our workplace analytics capability and pioneering building performance and asset optimisation show our forward-thinking outlook this year.

Projects continuing in 2018 include Here East, a new creative hub for the capital. Based in the vast former International Broadcasting Centre (IBC), Here East is now home to both global and start-up companies side by side, with the aim of bringing technical ideas and innovations to life. A key element of the design was the need to develop a space that was highly flexible so that it could be sub-let to a wide range of businesses, encouraging the growth of both high-tech creativity and high-value employment opportunities.

The David Attenborough Building, University of Cambridge, has won multiple awards this year. Refurbishment of the building, carried out with Nicholas Hare Architects, won the Engineering and Sustainability Project of the Year, Best Conservation, Alteration or Extension, and Considerate Contractors awards.

On a larger scale, we are involved with International Quarter London, located in the southeast quarter of the London 2012 Olympic site. Our role has been to look at how we can provide public recreational space as well as work on two new buildings which will house ultra-efficient residential accommodation that provides high level, sustainable urban living.

We are an award-winning team, and are building on our portfolio of clients who rely on our ability to tackle complex, multi-disciplinary projects with flair and ease. By working directly with clients from the very start, we are able to advise and influence design, creating commercial buildings that promote positive interaction between people and truly perform.

WITH **LEED PLATINUM** CERTIFICATION, THIS IS NEW ENGLAND'S MOST **SUSTAINABLE** **BUILDING** OF ITS TYPE



LEED PLATINUM CERTIFICATION

Images: BuroHappold Engineering



888 Boylston

Boston, MA, USA

This new 432,600 ft² commercial office building has 16 floors containing offices, retail and amenity spaces. Our work here puts occupant experience and sustainability at the heart of its design, delivering a range of health, wellbeing and productivity benefits to its users. Sustainable features will include a 107 kW PV array and a 14 kW wind turbine arrangement on the roof. Floor-to-ceiling glass windows will also reduce the need for synthetic lighting, helping the project to establish a new benchmark in efficient design.



**LIGHT AND
EXPANSIVE**
INTERIOR
SPACES,
REDUCING
THE ENERGY
NEEDED FOR
ARTIFICIAL
LIGHTING

Images: Buro Happold Engineering

Two St. Peter's Square

Manchester, UK

Set in the heart of Manchester, this project involved the development of a new build, Grade A office space. A key driver of the client's brief was the provision of flexible, column-free accommodation, capable of multipurpose usage. To achieve this, long-span composite steel beams were employed to form the floor plates and support a profiled metal deck. The first floor is set back from the perimeter and hung from above, further enhancing the feeling of space. This creates a beautiful partitioned public realm, a significant addition to the busy city centre.



The International Quarter (TIQ)

London, UK

This ultra-efficient residential accommodation provides high-level, sustainable urban living designed to meet both current and future needs of the growing local community. Designing with Revit enabled us to help our client realise the maximum value of their property in terms of net apartment area, as well as allowing us to identify significant efficiency and opportunities early in the design development process. These included installing modular, prefabricated heating solutions that reduced necessary plant room space and mitigated the need for an additional, costly basement level.

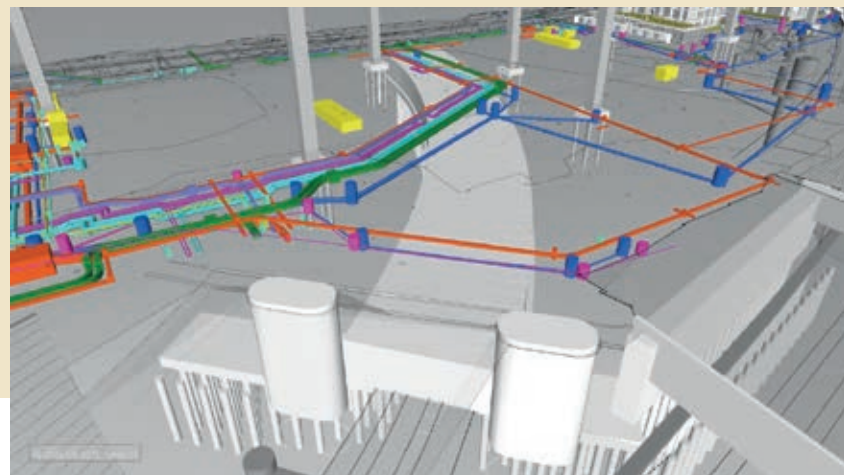


Image: SCBD Limited

ENERGY EFFICIENT SYSTEMS
INCLUDING A **PIONEERING**
GREY WATER SYSTEM IN EACH
INDIVIDUAL APARTMENT

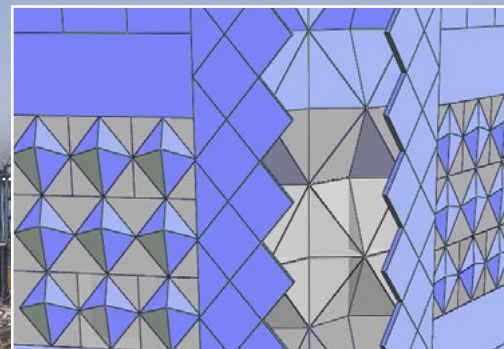
BREATHTAKING HEAD OFFICE FOR OUR CLIENT WITH **LEED GOLD** STANDARD ENERGY EFFICIENT CREDENTIALS



SAMBA Bank Headquarters

Riyadh, KSA

The SAMBA head office comprises 30 floors of office space, seven executive floors and three levels of sky gardens, all of which revolve around a stunning central atrium. Central to the team's vision is the futuristic 'power tower', a 70-metre spire which tops the 170-metre high main tower. To optimise the design, we modelled a full-scale section of the tower and subjected it to environmental stresses. The aerodynamic properties were tested in a wind tunnel. Our research determined the design of a tuned mass damper, which mitigates the effects of vibrations on the structure.



FACADE GEOMETRY

We extensively modelled the building to optimise the facade, minimising heat from the sun whilst maximising daylight and views.



Images: BuroHappold Engineering



Partners Healthcare Administration Space Consolidation

Somerville, MA, USA

A new administrative campus for Partners HealthCare, Massachusetts' largest hospital and physician organisation. We incorporated LED lights, high efficiency water systems and lighting controls to increase energy efficiency, while extensive CFD analysis was carried out to optimize thermal comfort. Flexibility was key and to achieve this, we installed an underfloor air system in the new offices, which as well as being designed to allow wall configurations to be moved easily, also offers a high level of thermal comfort and energy efficiency.

Facilities include 4,400 workstations, conference rooms, collaboration spaces and an occupational health centre.

CULTUR

Working with **105** different **cultural institutions**
across **15 countries**

58 venues used by **30 million people** annually

Building the **cultural infrastructure** of the future

AL



STEPHEN JOLLY
Cultural Sector Leader

17/18 has been another great year for BuroHappold in the cultural sector, designing and delivering great cultural experiences in cities around the world. This is a sector we want to grow significantly over the next five years, with an increasing focus on strengthening long-term relationships, both with client and design architects.

Long-term relationships matter. Our cultural sector team recognise that by maintaining close ties with clients over a long period of time, we can add even more value and also cement our reputation as trusted, experienced advisors.

Key relationships are built through continuity and time. By advising our clients on strategic planning and asset management as well as capital projects, we show our commitment to adding engineering value to their ambitions. We help our clients understand the extent and condition of their estate both from an engineering services perspective and from visitor experience feedback, so they can properly plan their strategic investment. Museums and cultural districts are often amalgams of old and new buildings, built campus-style over a long period of time. It is vital that these assets are managed effectively, which is where our expert engineers can advise.

As well as maintaining estates, our consultants and engineers are also increasingly advising cultural venues on maximising the performance of their existing buildings. Cultural institutions are amassing more and more data on their visitor experience through customer feedback. We are using our analytics technology to unlock that data and helping our clients understand where they can invest to

improve that visitor experience. Our expert team helps clients not only optimise their existing buildings but also plan new ones.

Confidence is strong. Our work spans the globe, with projects that range from the Albright-Knox Art Gallery, Buffalo, USA, to the Nuremberg Concert Hall in Germany, to the Xiqu Centre in Hong Kong. We are using our engineering skills to support the strategic decision makers, as cities continue to invest in their cultural infrastructure. for example, helping the Barbican to develop the business case for the new Centre for Music in London.

This forms part of The Culture Mile, a 'masterplan' that links up a host of cultural venues, including the Museum of London at Smithfield, the Barbican, St Paul's, and Tate Modern. We are helping these institutions make a bigger impact as part of a larger plan, using our analytical skills to help them improve that interconnectivity and the visitor experience between the buildings.

Our passion for the cultural sector continues to grow across the practice. By adding more relationships, we will continue to grow this sector.

CREATING A NEW **CULTURAL** **DISTRICT** FOR LONDON

Stratford Waterfront at East Bank

London, UK

Stratford Waterfront at East Bank is the lynchpin of a new cultural and educational district in Queen Elizabeth Park. BuroHappold Engineering is working on the development alongside Allies and Morrison, O'Donnell + Tuomey, and Arquitecturia.

The Stratford Waterfront development contains new buildings for the Victoria and Albert Museum, Sadler's Wells, University of the Arts, the London College of Fashion, as well as the BBC Concert Studios, housing the BBC Symphony Orchestra and rock and pop studios. The cultural and educational buildings will be supplemented with a significant new residential development, which both helps fund the development and supports the creation of a diverse new neighbourhood. This project builds on our ongoing relationship with Queen Elizabeth Park in Stratford.



Image: Allies and Morrison



BuroHappold is providing a full multidisciplinary engineering service across this complex project. This ranges from masterplan design and utilities, to transport, people flow and bridge engineering.

University of Arts London
College of Fashion will integrate
its' six sites onto one campus,
accommodating 6,500 students.



The BBC's new site will
house the BBC Symphony
Orchestra and state-of-
the-art music recording
and rehearsal studios.



The V&A East is a collaboration
with the Smithsonian Institution in
the USA and will also be home to
the museum's new collection and
research centre.



Images: Allies and Morrison & Ninety 90

Sadler's Wells East's 550-seat
theatre will establish a new centre
for choreographic practice and a
hip-hop academy.



Images: Killa Design

RADICAL. CHALLENGING. VISIONARY.

The Museum of the Future challenges
conventional attitudes to how we
design the spaces we inhabit.

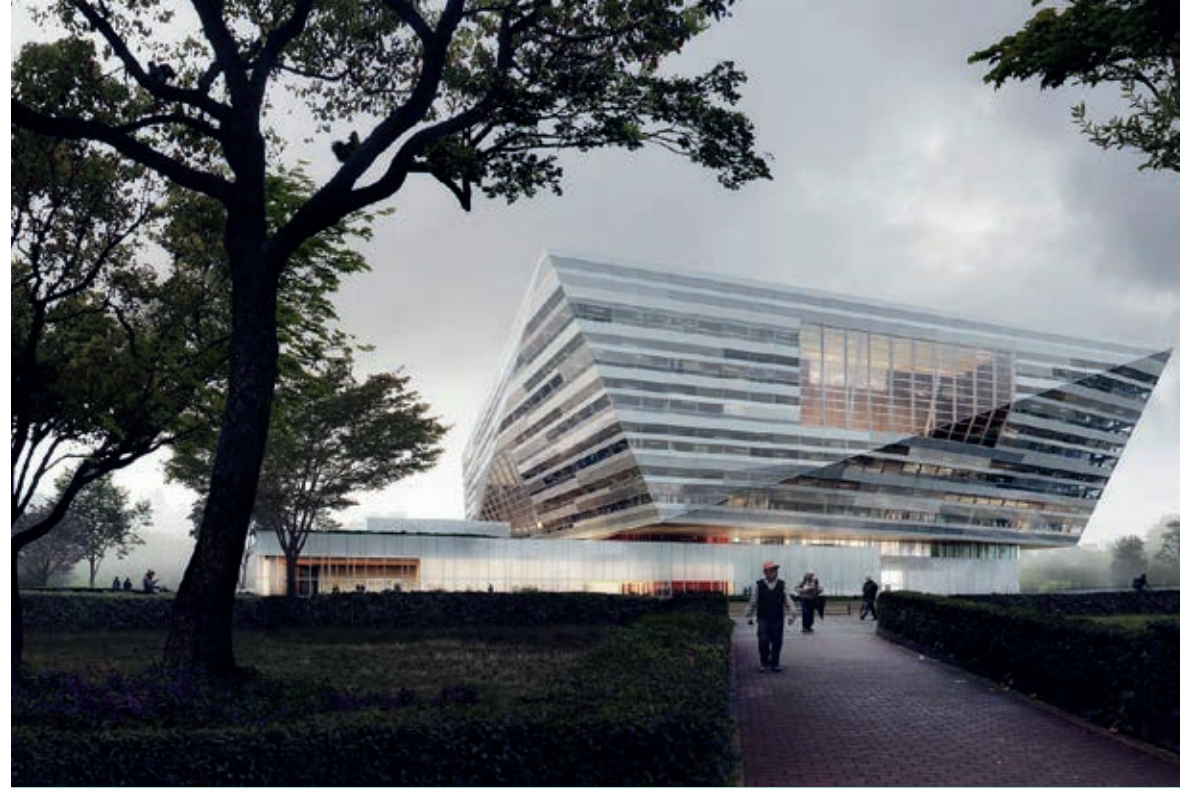
Museum of the Future

Dubai, UAE

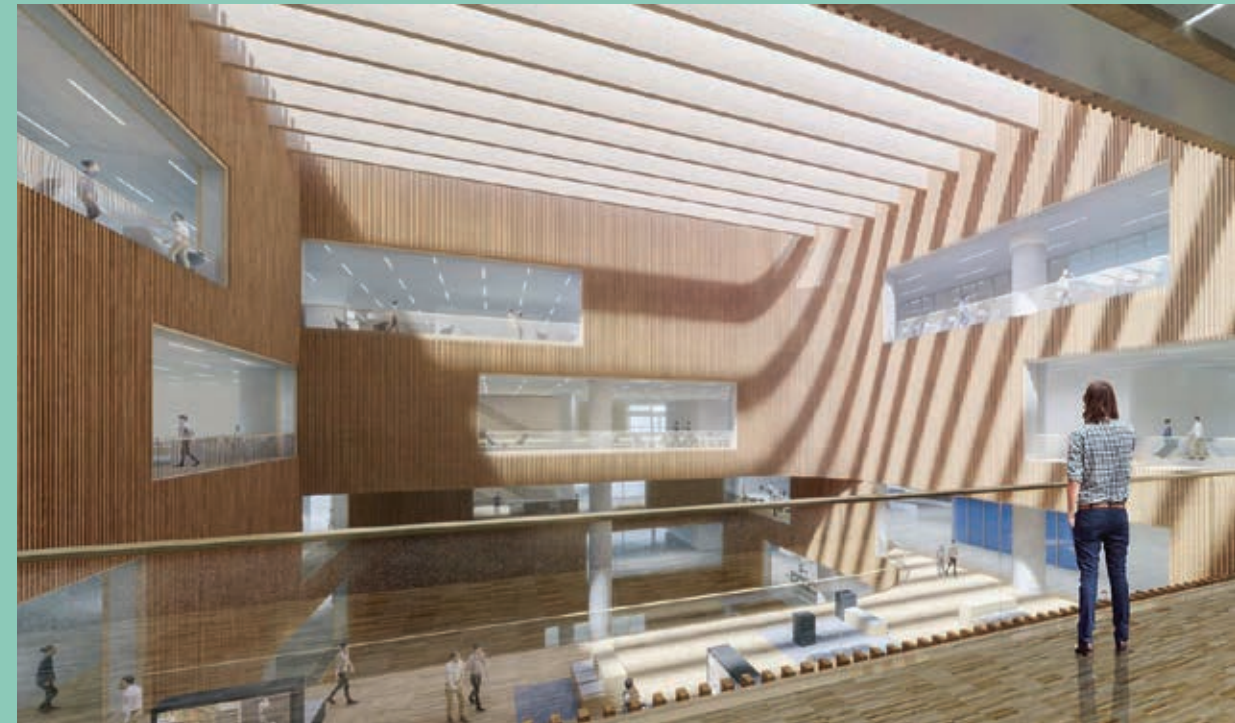
The Museum of the Future symbolises both future progress and the regional design influence of Dubai with its use of modern materials, and Arabic poetry written by HH Sheikh Mohamed Bin Rashid Al Maktoum which is represented in 3D on the facade surface. The quotations express his vision for the future of Dubai.

Translating the artistic and symbolic concepts inherent in the design into a 30,000m² (approx.) building clad in stainless steel was always going to be a challenge. Add to that the building's unique torus shape, the client's requirement to attain LEED Platinum status, and the team's determination to embrace BIM at every stage of design and construction, then clearly, the building's centre void is not the only aspect of this project that represents a step into the unknown.





SANCTUARY FOR KNOWLEDGE IN SHANGHAI



Shanghai Library East

Shanghai, China

Arranged as a series of open plan floors around a central 60,000m³ atrium, the main library will house 4.8 million books, and sit atop two pavilions that contain a 1,200 seat performance venue, exhibition and events space, and a dedicated children's library. Taking into account the Shanghai climate, hot and humid in summer yet cold in winter, we proposed the use of an innovative radiant floor system combined with conditioned air supplied at a low level to enable displacement ventilation. This low energy strategy ensures temperate conditions that suit visitors and books alike.

Images: Design Development Phase renderings: SHL



A NEW **CULTURAL ICON** NESTLED BETWEEN TWO OF BERLIN'S MOST SIGNIFICANT BUILDINGS

Nationalgalerie20, NG20, Berlin

Berlin, Germany

The new 28,000m² museum will house a significant part of the Berlin State Museum's 20th century art collection. The design challenges on NG20 include an exacting gallery climate specification, intricately linked atrium and gallery spaces, an expressive facade with varying levels of translucency, and a highly constrained site. The BuroHappold team is working closely with Herzog & de Meuron to optimise basement technical space design, and developed a cascaded ventilation system. The engineering thus enables the gallery floors and roof to remain largely free of technical equipment, allowing the museum to remain architecturally pure.

"We are delighted to have played a part in this winning design by architects Herzog & de Meuron. The new museum building will become integral to the city of Berlin, it will complete the Kulturforum."

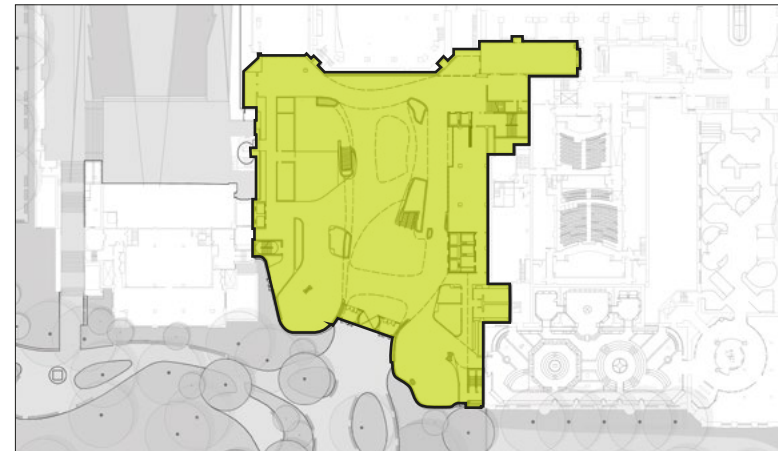
Stephen Jolly Cultural Sector Leader





The five-story high, 21,000ft², glass-walled Collections Core will be both a critical resource and a spectacular feature, revealing the specimens and artefacts that scientists use to investigate and answer fundamental questions and identify new species.

The Middle School Zone serving grades 5 through 8, is a resource where invited schools without laboratory facilities can attend “research field trips,” expanding students’ access to scientific equipment as well as to collections and exhibition halls.



Approximately 80 percent of the 218,000ft² project will be located within the area currently occupied by the Museum, creating vital connections throughout the complex.

Three existing buildings within the Museum complex will be removed to minimize the impact on land that is now open space in Theodore Roosevelt Park to approximately a quarter acre.



Images: Studio Gang

AMNH Richard Gilder Center for Science, Education, and Innovation

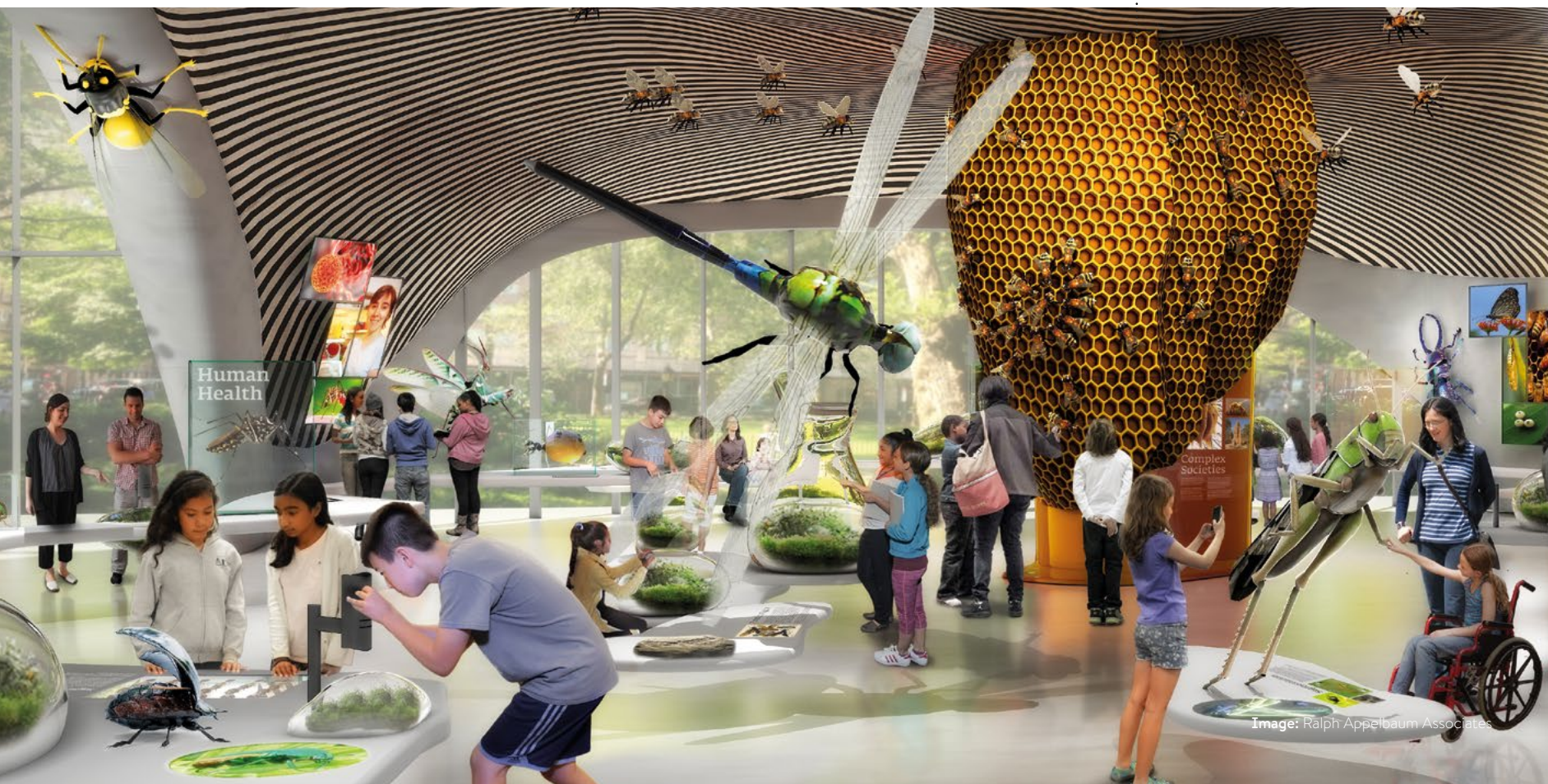
New York, NY, USA

The Richard Gilder Center for Science, Education, and Innovation is a significant expansion to the American Museum of Natural History (AMNH). The Center will create a landmark entry for the AMNH facility, greatly enhance visitor circulation and connect an array of existing galleries to new ones. It will highlight intellectual links across scientific disciplines and facilitate interaction within classrooms, laboratories, collections and library resources. Working with the design team, BuroHappold is providing multidisciplinary engineering services including MEP/FP engineering, fire analysis, energy analysis, facade design, and energy studies for the project.

NEW WAYS TO
LEARN ABOUT
SCIENCE AND
SHARE IN THE
EXCITEMENT
OF **DISCOVERY**



The Insectarium: an inspiring venue for school visits and family learning featuring live insects, insect specimens and scientific research tools.



EDUCAT

Working in **73 cities** across **8 countries**

Applying our ingenuity to over **190 projects**

Engineering specialist spaces for **165 educational** and **research facilities**

ION

The education sector continues to show significant global growth, in developed markets like the UK and US, as well as South East Asia and the Middle East. Urbanisation and the role of technology are playing increasing roles in how people learn and collaborate, with increased crossover between the worlds of work and education.

Whether on a city, campus or building scale, the physical realm of education links into many other typologies, including cultural, sport, leisure, research and offices, with an increasing recognition that the 'spaces between' often provide the greatest value in enhancing student and researchers' experience and outcomes.

As ever, we have delivered a fantastic range of projects this year, including four RIBA National Award winners as well as awards from the Public Design Commission, the Chartered Institution of Building Services Engineers and the Structural Engineers Association of New York, and AIA Los Angeles. Highlights include the 'Living Laboratory' that is the Urban Sciences Building at Newcastle University and the Brown University Engineering Research Centre. The sheer range of schemes in this diverse sector range from the LEED Platinum University of California Santa Barbara, heritage buildings from the 19th century (Yale University and the Fry Building at the University of Bristol) through to Denys Lasdun-designed buildings from the 1960s (the University of East Anglia and the Institute of Education at UCL) as well as projects at some of the US and UK's most prestigious schools.



MIKE ENTWISLE
Education Sector Global Lead

Looking forward, significant project wins in 2018 include the Temple Quarter Enterprise Digital Campus in Bristol, where our masterplanning team has shaped its vision, and our education buildings team is now designing the buildings. We are also working on Arizona State University's Interdisciplinary Science and Technology Building VII, a new innovative research facility that will focus on research around the 'Food, Energy and Water' theme.

Alongside campus and building analysis tools, recent initiatives include leading a unique set of events which aim to investigate how the physical environment can assist with student mental wellbeing. With a rapid increase in mental health issues being reported amongst students across the globe, we have been undertaking sprint events in some of our key university locations, with a view to gain a better understanding of how the physical environment affects mental health – look out for one held near you in the next year.

THOUGHT LEADERSHIP

IN HIGHER EDUCATION

DESIGNING FOR STUDENT WELLBEING

Good mental health matters. This is the message that is increasingly being heard, and listened to, by government, employers, teachers and universities. Amongst the most high profile examples are university students.

Away from the support of family and friends, the pressure of adapting to a new lifestyle, with all its academic, social, and financial pressures, is often too much to cope with.

Very little research is being done to investigate how the physical environment influenced and affected the mental health of students. Bringing together multi-disciplinary teams, we ran sprint events to discuss and co-create design solutions that address the critical issue of student mental health. Having kicked off the programme in the UK in late 2017 we have held three events – one each in London, Edinburgh and Manchester. In order to gain a truly global view on this, we now plan to expand our programme to ‘sprint’ in carefully chosen locations across the globe.

Working at a range of scales, from individual spaces up to city context, key issues highlighted include the promotion of interaction and connectivity, access to support, optimising space allocation to simplify movement, and ensuring that the quality of the environment that people move through is given as much priority as the formal learning spaces. Building on our existing international research programme within the higher education sector, it’s been fascinating to join together with collaborators, student support practitioners, and broader influencers to discuss how we can create spaces that enhance mental wellbeing for students.

WHAT ARE DESIGN SPRINTS?

BuroHappold adapted the Google Ventures (GV) process for answering critical business questions through design, prototyping, and testing ideas with customers. Usually held by Google over five days, BuroHappold condense the process into four hours. However, remaining true to the multi-disciplinary nature of sprints, we ask a broad range of disciplines to join the sprints. We also follow GV’s lead by asking teams to address a specific challenge within a tightly defined context.

The teams generate design solutions ranging from the pragmatic to the visionary, and while many of these ideas might be considered fanciful, they highlight important issues which can be addressed in a myriad of ways to improve outcomes.

WHICH DISCIPLINES MADE UP THE SPRINT TEAMS?

| | | | |
|-------------------------------------|-----------------------------|--------------------------|----------------------------------|
| Directors of estates and facilities | Architects | Student welfare officers | Directors of property management |
| Student residential officers | Politicians | Psychologists | Mental Health Charities |
| Landscape architects | Students (past and present) | People flow designers | Estate development managers |
| Design Engineers | Sustainability experts | Urban designers | Heads of space planning |
| Inclusive design experts | Economists | Transport planners | Academics |

ONGOING EDUCATION SECTOR INTERNATIONAL RESEARCH PROGRAMME KEY OUTCOMES

In 2015, BuroHappold Engineering began researching the role university estates play in the business of higher education and the academic experience. The ongoing study gathers together the views of vice chancellors and estate professionals from 20 interviews and survey data from just over 1300 UK and 3000 US students, to identify and address key topics.

Through our US and UK student surveys, we know that students have a strong preference for well-connected spaces within buildings, in between buildings and at a campus/city scale. We also know that students prefer green, landscaped campuses and buildings that provide ample daylight along with reduced noise and thermal comfort control.

We know that the built environment is not the only factor contributing to good or poor mental health, and we do not pretend to have answers to this complex issue. We do however have a responsibility to design spaces in and around universities that provide the best possible opportunity for students to be physically and mentally healthy, happy and productive.

DESIGN SPRINT HIGHLIGHTS



An ambitious campus-to-city linking 'skyline' with glass glass cable cars.



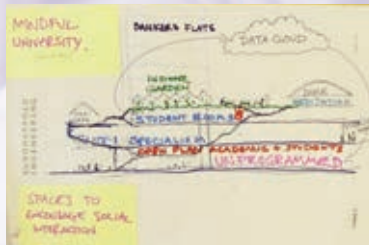
Stressing the benefits of exercise to greater wellbeing – this multi-functional learning building has an exercise circuit on the roof (green putty), a viewing area (white putty) and sheltered areas for students to meet and mingle outside (orange putty).



Exploring cohesion and connectivity by linking disparate university campus buildings across a city.



Inspired by the BuroHappold project the New York High Line, this team created an elevated area where students could walk, cycle, meet, eat, socialise and relax above the busy city below.



Designing spaces within buildings to encourage social interaction.

THE CHANGING NATURE OF HIGHER EDUCATION AND ITS ENVIRONMENTS

On May 4, 2018, BuroHappold hosted a one-day higher education planning sprint with executive directors, vice-presidents, and campus planners of higher education institutions in the USA to discuss the challenges universities face in relation to their physical space.

The aim of the event was to discuss that despite the rise in virtual learning everywhere, physical campuses still matter. Technology and lifestyle changes have, however, fundamentally changed the types of space being designed, the way students move between places of learning and the desirability of being in campus style universities, as opposed to those set in a city context.

Session 1: Technology and space needs: The way campus spaces are being used is changing dramatically. Large classrooms are, in many places, being abandoned in favour of remote learning or smaller interactive spaces. These spaces range from libraries to informal open spaces where people can be "alone in public." Transforming existing spaces is not easy to do, and funding constraints exist everywhere. Sharing labs and co-locating other university spaces with third parties or other universities needs to be further explored.

Session 2: Connectivity and mobility: Geographic contexts vary widely across American universities, and hence mobility and connectivity needs vary as well. Traditional mobility planning has focused on more sustainable forms of transportation – buses, bikes and walking. Some universities are, however, questioning the need for movement between distant parts of campuses and are exploring techniques to minimise it, including synchronous learning – where one teacher simultaneously teaches two classes.

Session 3: Urban regeneration: Increasingly, American universities are being seen as regenerative forces in their communities. Historically, these universities have not capitalized on mixed-use opportunities to increase utilisation of their downtown spaces. Today, a number of universities located in suburbs or exurbs of towns are moving downtown – some adaptively reusing historic structures and using placemaking to attract and recruit new students.

Further work is being undertaken to address the areas of interest of our participants and broader issues affecting the sector in the US, including the nature of car utilisation, autonomous vehicles and parking, the future of libraries on campus, student mental health, and the operation of public-private development relationships in areas that go beyond their traditional territory of student accommodation.

With a wealth of information from our range of outreach and consultative programmes, we are focused in our support for universities as they seek to attract and serve students and researchers in a competitive world. A short paper addressing key areas is likely to be developed as part of the upcoming SCUP (Society for College and University Planning) conferences.

Yale University, Pauli Murray College and Benjamin Franklin College

New Haven, CT, USA

This new 460,000ft² residential college comprises two buildings housing student residences, dining areas, and additional academic and administrative facilities. BuroHappold Engineering provided MEP and sustainability consulting services throughout the project to minimize its carbon impact on the campus, and ensured it achieved a LEED-NC Gold rating. We provided complete BIM across both buildings to produce all the MEP, IT and security documentation required for the later construction phases of the project, creating a streamlined, efficient building programme that reduced the development's impact on wider campus operations and kept the project on budget for our client.



LEED-NC GOLD RATING



Images: Peter Aaron/OTTO for Robert A.M. Stern Architects

OUTSTANDING EDUCATION AND **MINIMAL CARBON IMPACT**

WORLD-CLASS **SUSTAINABLE** FACILITY ENABLING GREAT SCIENCE AND A **COMMUNITY HUB**



Images: BuroHappold Engineering

Brown University, Engineering Research Center

Providence, RI, USA

This new 80,000ft² academic and research building for the Brown University Engineering Research Center was part of a plan to increase faculty by 30 per cent, focusing on the areas of micro-nanotechnology, biomedical engineering, energy and the environment and entrepreneurial education. BuroHappold provided integrated engineering services including structural, MEP, lighting design and energy modelling. Through a seamless engineering approach, the team maximized the performance of the various building systems to create an innovative facility worthy of the distinguished engineering institution.

FLEXIBILITY: THE FUTURE OF ENGINEERING

UCL at Here East

Queen Elizabeth Olympic Park, London, UK

Here East is a new creative hub for the capital and was awarded the prestigious AJ100 Building of the Year in 2018. Based in the former International Broadcasting Centre (IBC), Here East is now home to University College London. BuroHappold Engineering delivered the original engineering design as well as working with iCity to modify and adapt the facility for its new incarnation. Design had to be flexible, encouraging the growth of both high-tech creativity and high-value employment opportunities. The design team replaced the original interior with a series of mezzanine floors and the windowless building envelope was removed and replaced with a fitted glass facade, maximising natural light and ventilation.



2018 AJ100 BUILDING OF THE YEAR



Image: Hawkins\Brown



Image: Broadway Malyan

A SUPER-LAB WITH SUPERB **SUSTAINABILITY CREDENTIALS**

Coventry University Science and Health Building (SHB)

Coventry, UK

Acting as the cornerstone of the university's health and well-being faculty, this new 'super laboratory' allows students to conduct diverse and innovative research, as well as providing teaching and simulations spaces. Flexibility was key to the design, with laboratories and teaching spaces requiring unique acoustic and thermal environments. Working closely with both specialist technicians and stakeholders, we recommended bespoke acoustic solutions to address differing noise levels in the laboratories and teaching spaces. We specified highly rated acoustic walls, and sealing wall penetrations with acoustically rated partitions. The new faculty building is one of a kind, presenting a unique opportunity for students to train in caring for patients along the entirety of their journey, from when they first need medical assistance through to their treatment and rehabilitation.



Images: Hawkins Brown & Kristen McCluskie

Urban Sciences Building, University of Newcastle

Newcastle, UK

The 12,500m² Urban Sciences Building will be the first structure on the University's 24 acre science central development on the city's former Scottish & Newcastle Brewery Site. The facility includes a variety of high quality teaching and research spaces around a central collaborative forum. As a centre for urban sustainability research, this 'building as a lab' is also highly energy efficient. The facility is completely electric powered, with future connections into a district heating plant possible. The structural solutions have been tailored around an ambitious space plan design, mixing teaching and research at a number of levels and delivering a high architectural standard. The building blends lab and non-lab space and makes the facility accessible to the wider community in a radical way.

ENVIRONMENTALLY ADVANCED URBAN DESIGN



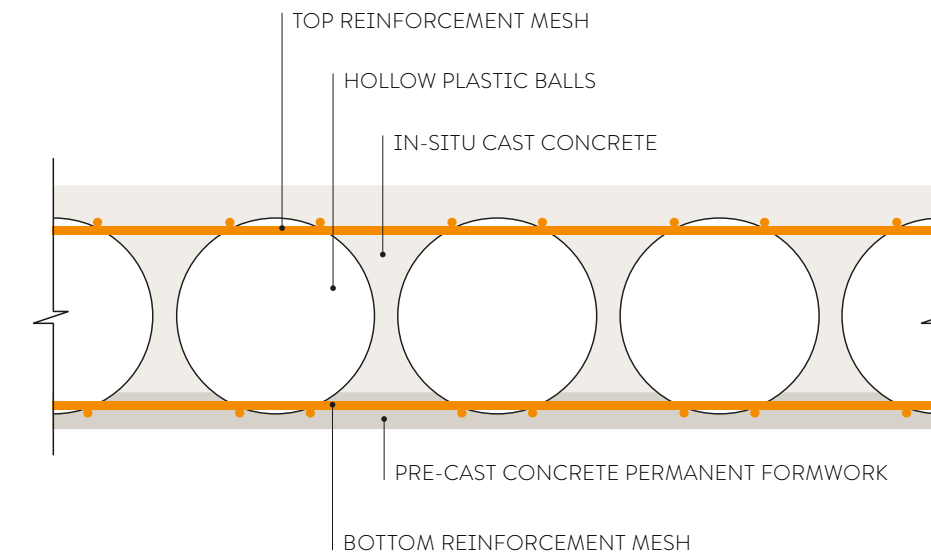


Image: Moore Ruble Yudell Architects & Planners

Carnegie Mellon University, Tepper Quad

Pittsburgh, PA, USA

A hub for technology-enhanced learning and research, the five-story home to the Tepper School of Business will feature 305,000ft² of collaborative, flexible spaces for students and staff. The health and wellbeing of occupants was a key concern for our clients, in addition to achieving LEED Gold certification. Using significantly less concrete than traditional slabs, our efficient BubbleDeck structure considerably reduced the embodied energy of the building. As BubbleDeck is a new concept for the US, we had to work closely with both our client and the contractor to prove the value of this approach and ensure its successful application.



BUBBLEDECK TECHNOLOGY

BubbleDeck technology incorporates recycled plastic balls within concrete to create a honeycomb structure that is as strong as a solid concrete slab, yet weighs 35% less. Compared to solid concrete, a BubbleDeck structure can reduce a building's embodied carbon by 30%. Carnegie Mellon is the first university to use BubbleDeck technology in Pennsylvania, and the Tepper Quad has the largest floor area of any BubbleDeck building in the USA.



Image: Moore Ruble Yudell Architects & Planners



Image: Moore Ruble Yudell Architects & Planners

INNOVATIVE **BUBBLEDECK** BUSINESS SCHOOL

SCIENCE AND TECHNOLOGY

80+ projects currently being led by this sector

Working with over **70 separate organisations**
across **13 global markets**

Understanding the needs and requirements of the
world's top universities and research institutions



ANDY PARKER

Science and Technology Sector Director

Groundbreaking biomedical facilities. Efficient automotive complexes. Leading centres for education and electronics research. The range of client sectors served by BuroHappold's science and technology teams is broad, and thriving economically. This year has seen a record number of projects delivered and completed, reinforcing our reputation as a leader in the field.

Our reach is wide, and getting wider. Work this year has stretched from Boston to LA, Hong Kong to Germany and of course, the UK. Internal collaboration has been key in integrating our global teams to ensure the best engineers are working on the right projects. Our centres of science and technology excellence in London, Boston and Edinburgh have shared knowledge and skills across our network, delivering the very best for clients.

Despite, or perhaps because of, global uncertainty, countries still see investment in research and development, as absolutely fundamental to the success and growth of their economies. Such investment ensures funding for science and technology projects is solid. The market continues to be strong.

We are creative engineers. Clients say they choose BuroHappold for projects that are technically very difficult, require a high level of multidisciplinary thinking, or those with a strong aesthetic or design element.

This year we have delivered on all fronts, from the expansion and update of Draper, a 456,000ft² advanced technology centre in the US, to the complex construction of the Quadram Institute in Norwich, a research and diagnostics centre, to the ground-breaking Jaguar Land Rover automotive campus.

Increasingly, we understand much more about how people use our buildings. By really studying a facility's efficiency and effectiveness, we are starting to predict whether one building is better than another for inspiring and producing ideas and work.

What is the purpose of buildings in this sector? To have ideas, and to discover ideas. Our aim moving forward, is outcome-orientated engineering. We have started using modelling techniques that enable us to predict the likely effectiveness of a research environment. Research effectiveness is fast becoming key to our engineering, in each and every project.

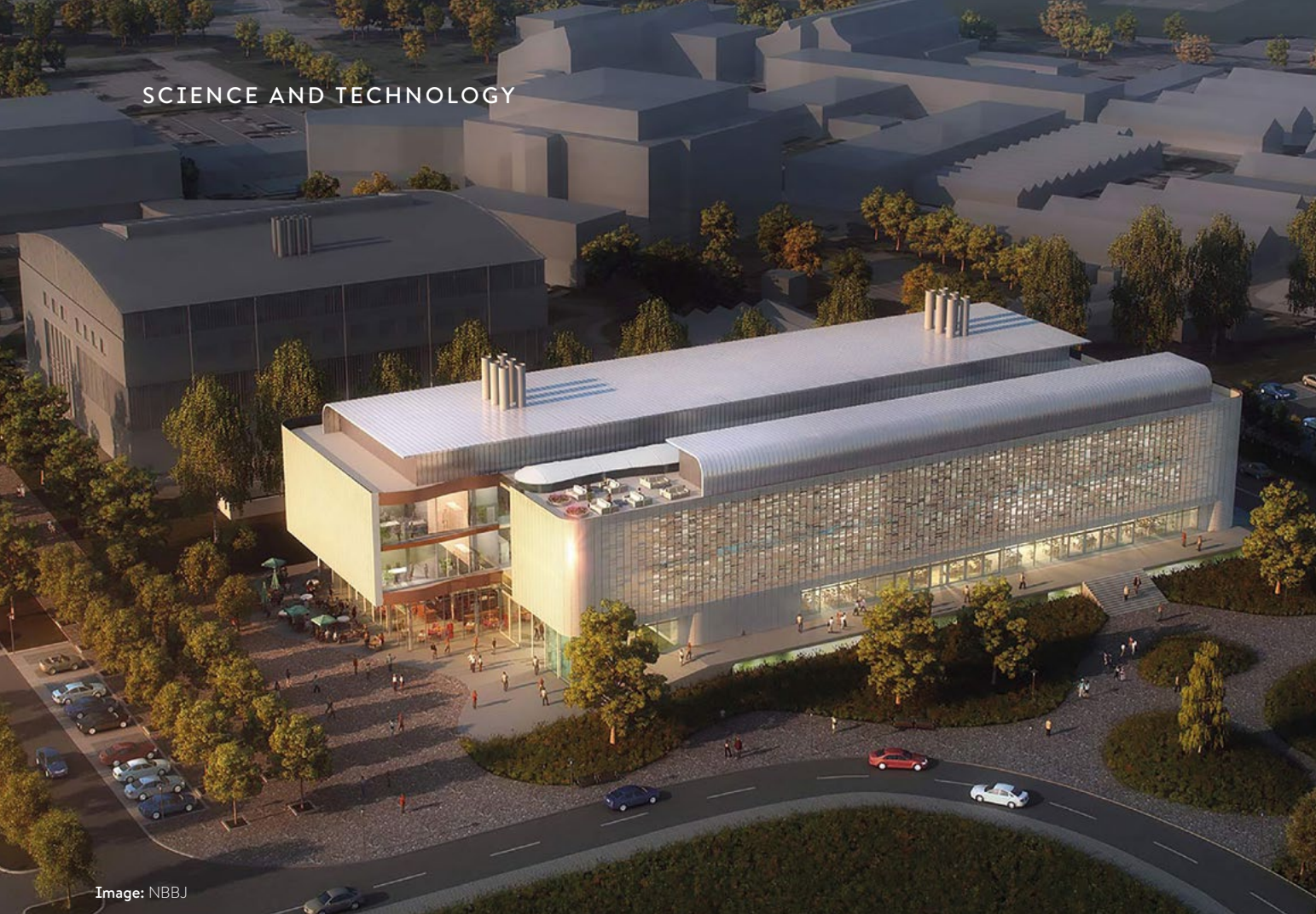


Image: NBBJ

Quadram Institute

Norwich, UK

The Quadram Institute in Norwich will see the coming together of the Institute for Food Research, the University of East Anglia and departments from the Norfolk and Norwich University Hospital into a single facility. This interdisciplinary institute will focus on understanding how food and gut microbiota are linked to promotion of health and prevention of disease. Our MEP engineers designed the laboratories to include exposed high-level services, allowing the use of fabric ductwork for optimal air distribution and easy maintenance and adaptability, as well as creating a greater sense of space. By bringing a number of disparate specialities together under one roof, the Quadram Institute will allow scientists to work collaboratively to combat diseases that affect us from when we are born through to old age. The building will also see innovative research into food science and safety, with the aim of reducing the impact on health services. BuroHappold's work has contributed to the creation of spaces that encourage interaction across disciplines, offer exceptional laboratory environments and reduce emissions.

GROUND-BREAKING LAB FACILITIES
THAT ENCOURAGE **INTERACTION**
AND **EFFICIENCY** BETWEEN
DISCIPLINES



SHARED GOALS, A CLEAR PROCESS AND **ADDED VALUE** FOR STAKEHOLDERS

Brown University, Engineering Research Center

Providence, RI, USA

BuroHappold Engineering collaborated with the design team to create a new 80,000ft² academic and research building for the Brown University Engineering Research Center. BuroHappold provided integrated engineering services including structural, MEP, lighting design and energy modeling. Through a seamless engineering approach, the team maximized the performance of the various building systems to create an innovative facility worthy of the distinguished engineering institution. The project was driven by an Integrated Project Delivery (IPD) model, which ties owner, design team and contractor together contractually for shared goals, a transparent process, and added value.



Images: BuroHappold Engineering



ADVANCING **INNOVATION** THROUGH **INVENTIVE,** **COHESIVE** DESIGN

Centre for Cancer Immunology

Southampton, UK

The Centre for Cancer Immunology at Southampton will provide a world class facility, designed to University, NHS and HSE requirements, all delivered within a limited project budget. The new 4,000m², four-storey building will house state-of-the-art equipment to support the development of new cancer immunotherapies – from discovery in the lab through to clinical trials. Internally, the building design has been developed to promote innovation by enhanced social cohesion. The four-storey building is horizontally split with the lower two floors housing workspace for researchers and administration with the upper floors containing the laboratories.

RESILIENCE AND GROWTH GUARANTEED THROUGH EVALUATION



Image: Elkus Manfredi Architects

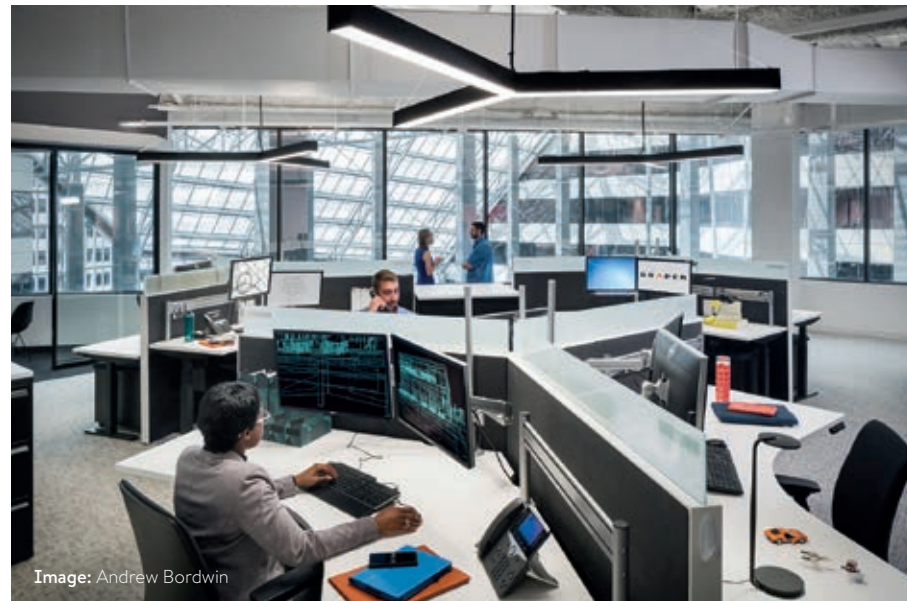


Image: Andrew Bordwin

Draper, addition and infrastructure upgrade

Cambridge, MA, USA

Draper is a non-profit research and development organisation that specialises in advanced technology solutions for national security, space exploration, healthcare and energy issues. The first part of the project included supporting Elkus Manfredi Architects to complete a 90-day concept study to test options for a new full-glazed, 20,000ft² atrium infill and evaluate a test fit for executive offices on the building's seventh floor. In addition to the concept design evaluations, the engineering team evaluated the condition of the existing mechanical and electrical infrastructure for the campus to identify potential future building upgrades/improvements. One immediate upgrade included providing new centralised laboratory exhaust with energy recovery. Upon completion of the study, BuroHappold then provided MEP/FP engineering, energy performance analysis, CFD modelling, daylighting design and IT engineering for the new atrium, which encloses the courtyard and provides new pedestrian walkways among the three sections of the building.

AIR AND RAIL

Passenger-centred design – enhancing the **passenger experience**

Working with **35** different **airport, transport** and **government organisations** across **12 countries**

Understanding complex demands and commercial realities



JUSTIN PHILLIPS
Rail Sector Director

BuroHappold's air and rail teams have a proven track record in delivering complex, multi-disciplinary, visionary projects. This year was no exception, with a large breadth of rail and aviation projects delivered by our talented engineers.



KARL LYNDON
Aviation Sector Director

Our aviation engineers are increasingly taking a strategic role, starting with a client's desired outcomes and working backwards through the design process. We recognise the importance of engaging air passengers from the moment they arrive, as a positive passenger experience will encourage return visits, loyalty, and greater potential for revenue growth.

Clients benefit from our deep understanding of air travel. Our experts are able to draw on their roles as airport clients, consultants, systems integrators and contractors. We are also skilled in using a range of sophisticated simulation tools for example, SmartViz Airport Analytics – our in-house software, and commercial tools like Legion, Exodus, and CAST.

We have a proven track record in optimising airport resources to maximise airport process throughputs and enhance passenger experience. Clients and passengers benefit from efficient processing and operational management intervention.

Our rail and transit engineers have also seen their roles shift, with a greater emphasis on technology as well as a change of focus on how transport infrastructure is funded. Cities across the globe are being challenged by growing

populations, climate change and the need to create sustainable communities that match the rising aspirations of their citizens. However, the need to forward fund critical transport infrastructure is a major blocker to sustainable growth faced by most government agencies working with limited budgets.

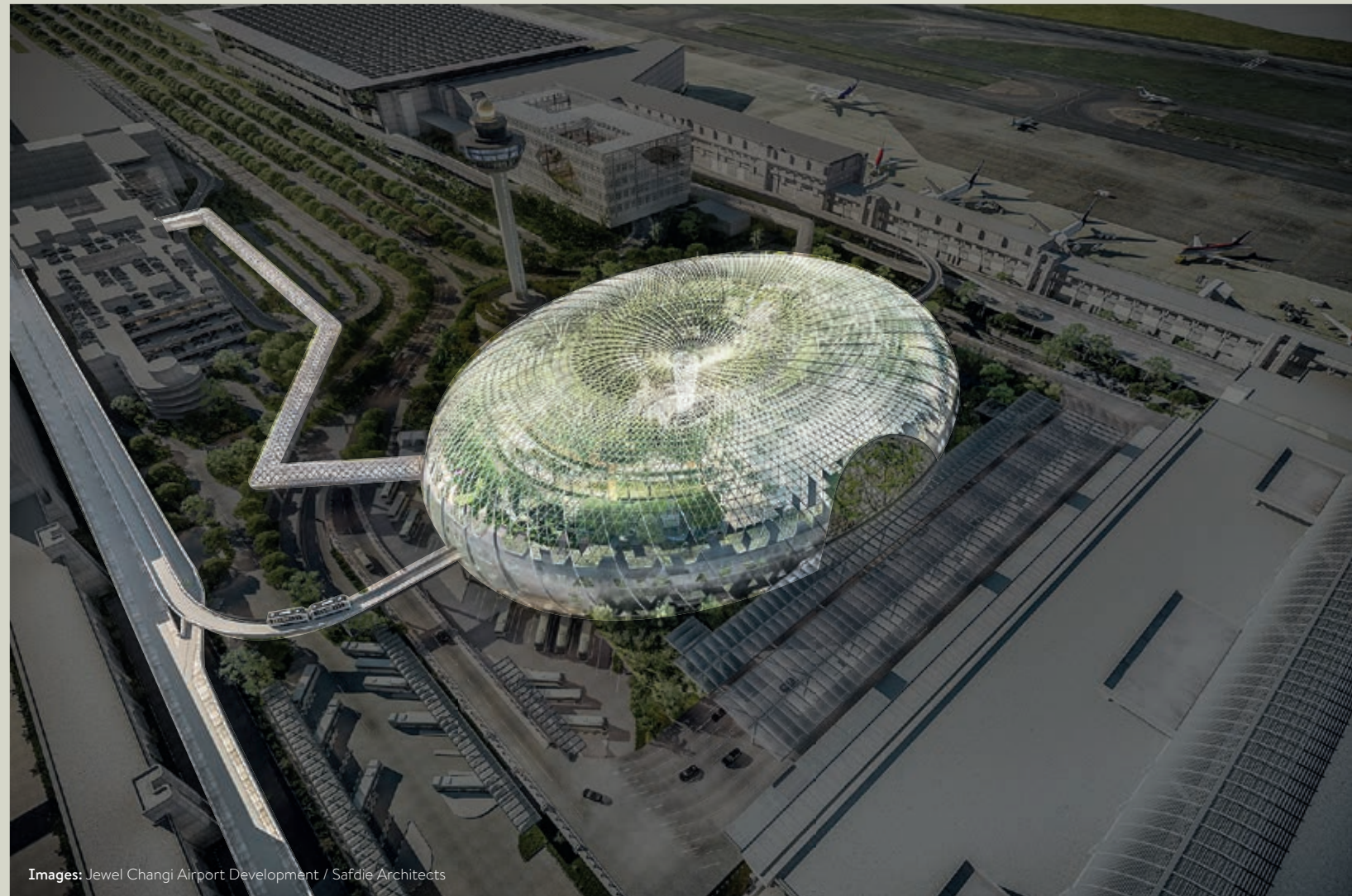
When effectively planned and delivered, Transit Orientated Development (TOD) provides a much needed catalyst to urban development through creation of well balanced, high density, sustainable communities that provide a significant boost to housing, jobs, mobility and quality public spaces. Often creating destinations in their own right, the resulting development value provides a significant revenue stream to help fund much needed transport and interchange.

Our DNA in the air and rail sector is founded on multi-disciplinary thinking. We blend creative and innovative planning and design with data-driven technology that focuses on the required outcomes for our clients and their end users. By using data and our ingenuity to provide real-time solutions, we can assess, model, optioneer and optimise the desired benefits that transport infrastructure can bring.

The Jewel

Changi Airport, Singapore

The Jewel at Changi Airport elevates the passenger experience, by reaching beyond the realm of aviation to unite Singapore's international airport with city life beyond. Beneath its glittering glass dome, bespoke aviation facilities combine with luxury retail outlets and unique attractions, such as the world's tallest indoor waterfall, to create a compelling lifestyle destination for travellers and residents alike. In doing so, The Jewel will boost Singapore's reputation as a leading international air hub, draw new revenue in from the city itself, and give Changi Airport the edge amid intensifying competition in the global aviation sector.



Images: Jewel Changi Airport Development / Safdie Architects

PROJECT JEWEL'S OVOID SHAPE,
WITH A DIAMETER OF APPROXIMATELY
650FT, WILL BE ONE OF THE WORLD'S
LARGEST GRIDSHELLS

THE RAIN VORTEX

Falling 40m in height, the Rain Vortex will be the world's tallest indoor waterfall.

This will serve a dual function. As well as enchanting visitors, the waterfall will act as a conduit for rainwater that will be used to irrigate the surrounding gardens and many of The Jewel's MEP systems.



Bespoke aviation facilities will include an integrated transport lounge that provides ticketing, boarding pass and baggage transfer services in one convenient place. This will allow passengers to check in early, and then spend the day enjoying the attractions on offer.

A **TRAINING ENVIRONMENT** FOR A NEW ERA OF RAIL INFRASTRUCTURE

The purpose-built college comprises an extensive teaching and workshop space, 150m of external track and catenary (overhead line), and a full size train engine. Other technologies include advanced CNC machining facilities, a 3D visualisation suite, CAD/CAM facilities and an engineering and materials laboratory.



Images: Bond Bryan Architects



The extensive workshop area was designed around the range of technologies being used by those leading the rail industry. For maximum flexibility the services infrastructure was based on a repetitive grid over the 2000m² floor space, ensuring the workshop could be easily adapted and equipped as required.



WINNER

2018 RIBA YORKSHIRE AWARD

WINNER

2018 RIBA YORKSHIRE SUSTAINABILITY AWARD

ACCREDITED BREEAM EXCELLENT

National College for High Speed Rail (NCHSR)

Doncaster, UK

This is one of two new flagship academic facilities designed to train thousands of engineers. The College offers training that will equip learners with the skills needed to deliver High Speed 2 (HS2), the new railway that is planned to connect London, Birmingham, the East Midlands, Leeds and Manchester.

The NCHSR has been developed with people in mind, incorporating a range of specialist working environments set in an inspiring atmosphere. The dramatic open learning space is a great example of where this objective has been achieved. Offering an abundance of natural light and fresh air it acts as a hub for social activity, casual learning, catering and event hosting. Featuring bespoke specialist facilities, as well as an environmentally conscious design, the award-winning NCHSR is set to become a major asset in the development of the UK's rail network.



PRIORITISING **SECURITY**, BUT GUARANTEEING PASSENGER **COMFORT** FOR GENERATIONS OF TRAVELLERS

Astana Rail Station

Kazakhstan

Iconic train station in Kazakhstan's new capital city. The station is a mixed-use complex with an overall construction area of 210,000 m². With an expected 36,000 people travelling through it per day, developing a strategy for the movement of people, vehicles and goods was critical. The security strategy combines passenger comfort and optimal security to achieve the requirements of Kazakh Rail Authority KTJ. BuroHappold worked with the philosophy of Crime Prevention Through Environmental Design (CPTED) to design a space that is a cost effective, robust defence against terrorism and other security threats without compromising passenger comfort.





Image: David Holt London

HIGH CAPACITY TRANSPORT LINK TO SUPPORT VAUXHALL NINE ELMS BATTERSEA (VNEB)

Northern Line Extension

London, UK

Stretching from Kennington to Battersea, the £1 billion Northern Line Extension will provide a fast, high capacity transport link across the southwest of London. This project underpins the wider regeneration of the Vauxhall, Nine Elms and Battersea area, which will create 16,000 new homes and 25,000 new jobs. Two new stations at Nine Elms and Battersea Power Station will be built to serve these businesses and communities. BuroHappold is working concurrently on the Battersea Power Station redevelopment, and liaising with team members across each project to coordinate schedules and ensure the NLE station is operational prior to occupation of the Power Station, in line with planning requirements.

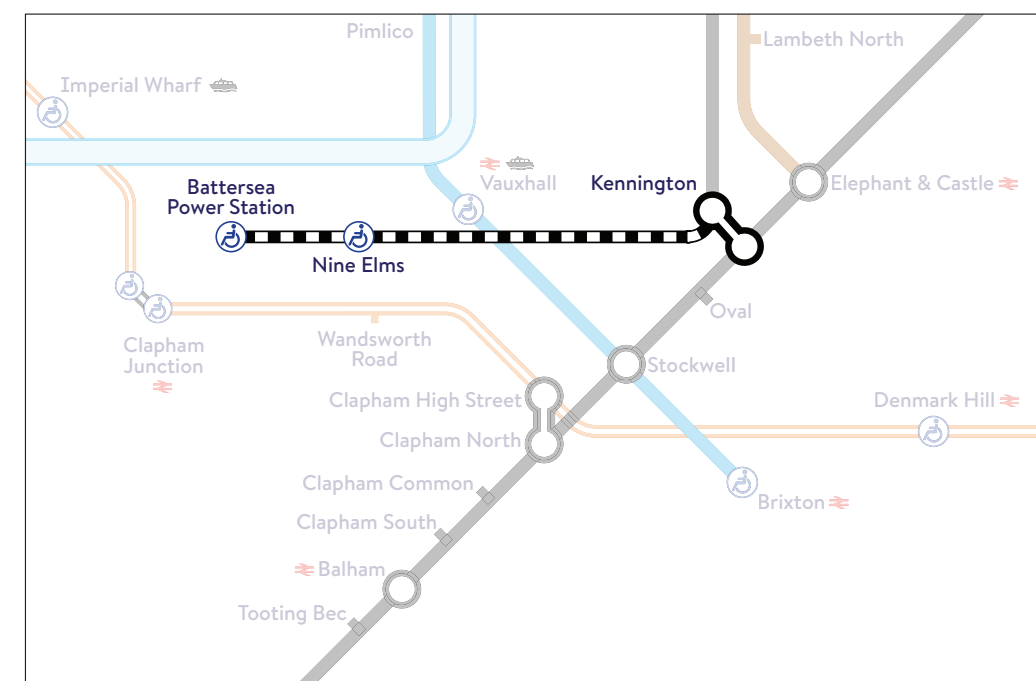




Image: Pascal + Watson

CREATING A
WORLD-CLASS
WELCOME THAT
SENDS A CLEAR
SIGNAL THAT
BRITAIN IS OPEN
FOR BUSINESS

Manchester Airport

Manchester, UK

This £1 billion transformation project will see Terminal 2 more than double in size. BuroHappold is the civil, structural and facade engineer for the main terminal building, pier, baggage hall, car parks and site-wide infrastructure. We are currently developing concepts for prefabricated and pre-assembled structures to reduce build time and cost, as well as a terminal facade that can withstand a bomb blast. Due for staged completion from 2020-2023, this ambitious development will allow Manchester Airport to accommodate 10 million additional passengers in the next decade, and double airport jobs to 40,000 within 30 years.

Riyadh Metro

Riyadh, KSA

Riyadh boasts a population of over six million, and this number is expected to double by 2035. To accommodate this growth, the city is set to open the Riyadh Metro system in 2019. This is the biggest urban mass transit system that’s ever been created from scratch, and will connect the people of Riyadh via six metro lines, running through 85 stations, and spanning nearly 110 miles of track. BuroHappold is delivering two of the three stations across the line that feature iconic architecture and design.



Image: Zaha Hadid Architects



Image: Gerber Architekten / bloomimages

Riyadh Metro: KAFD Station

Riyadh, KSA

BuroHappold spent four years developing integrated designs across 17 engineering disciplines to realise Zaha Hadid’s striking vision for this iconic station. We worked closely with the architect to develop a facade that undulates in echo of the sand dunes beyond, featuring a series of concrete waves interspersed with curved Mashrabiya screens. This beautiful organic appearance belies an incredibly complex design with unique construction requirements. To ensure these were understood and achieved by the contractor, we adapted our digital designs to provide the level of data required to create a clear road map for construction.

Olaya Station forms a subterranean interchange between lines one and two.

Riyadh Metro: Olaya Station

Riyadh, KSA

Olaya Station will establish both a vital transport hub and an attractive new urban realm. The station itself lies deep underground, and additional corridors with break out panels have been incorporated into its design to accommodate new connections in the future. Above ground, Olaya’s gently sloping green roof creates an accessible oasis in the city for the residents of Riyadh to enjoy. BuroHappold designed a road system around the station that links it to the surrounding business district, and provided pedestrian access to the natural landscape of the wider Olaya / Batha corridor.

THE KAFD WILL
DELIVER **12,000 NEW
HOMES**, THOUSANDS
MORE JOBS, AND
BEAUTIFUL **PUBLIC
SPACES** FOR RIYADH

The King Abdullah Financial
District station forms one of
eight stations and one transit
hub on the yellow line.



| | | |
|---------------|-------------------|-----------------------|
| 6 | 85 | 190 |
| lines | stations | vehicles |
| 176km | 3.6M | passengers per day |
| system length | expected capacity | |

BEYOND ENGINEERING

YOUNG ENGINEERS FORUM

The Young Engineers Forum (YEF) is an inclusive community, open to all, that connects junior members of BuroHappold staff through their shared interests, and provides a nurturing environment in which they can strengthen working relationships and cultivate friendships.

2018 saw a surge in inter-office YEF collaborations. Berlin YEF welcomed the Warsaw YEF to their office, reciprocating Warsaw's invitation to Berlin last year. In October, the Berlin YEF also hosted members of the Bath and London YEFs, as well as young architects from FCBS and Grant Associates, for a weekend gaining insight into the architecture and culture of the city, through interactive tours and design sprints.

The YEF along the US West Coast is continuing to grow and once again, members from the Los Angeles and San Francisco offices met up to get to know each other. A ski trip to Slovakia was attended by multiple YEFs, headed up by the Warsaw office. The UK YEFs are excited about their annual camping trip in September. This global interaction amongst BuroHappold's young engineers provides invaluable connections across cultures and countries, strengthening professional links across the practice.

With the recent focus on public speaking and digital design at BuroHappold, both the New York and London YEFs have been helping members to improve their skills, with the Leeds YEF focusing on design communication, not only in person but also through different software. The Manchester YEF organised and set up an office digital design group whilst London YEF recently launched 'Conversation Street'; senior

members of staff speaking on social responsibility, inclusive design, an engineer's role in natural disaster relief and the future of BuroHappold.

Talks are key to the YEF community, with YEFs across the globe continuing to focus on some engaging talks and CPD opportunities. The Mumbai YEF has had a number of CPD opportunities and, in all the offices, workshops have been held looking at the YEF's view on work in the Middle East. Bath YEF thoroughly enjoyed hosting some key senior members of staff to speak on their vision and passion for the company, including Paul Rogers and Neil Squibbs.

As always, the YEF is a very social community and this year, karaoke has been a big theme. Edinburgh picked up the microphone in May for a karaoke social; Warsaw YEF went one step further with a karaoke social once a month; whilst back in November graduates from all the YEFs were welcomed to Grad Week in Boston, where the Boston YEF hosted a scavenger hunt and karaoke night.

As well as promoting a sense of community, the YEF continues to push outreach and external collaboration globally. As the YEF in Copenhagen starts to stabilise in numbers after their recent formation, they have been

collaborating with local architects, including writing scientific papers together. All the UK YEFs continue to promote STEM careers through outreach with schools and local organisations. The Leeds YEF have set up links with a social mobility foundation charity and the London YEF has been helped by the STEM Education Coalition forum, allowing BuroHappold to have a cohesive and integrated approach to outreach activities.

All the events and activities have only been made possible through the hard work and emotional investment of countless individuals. Over the year ahead, the BuroHappold YEFs will continue to provide a platform for our engineers to foster friendships, share ideas and celebrate achievements as one global community.

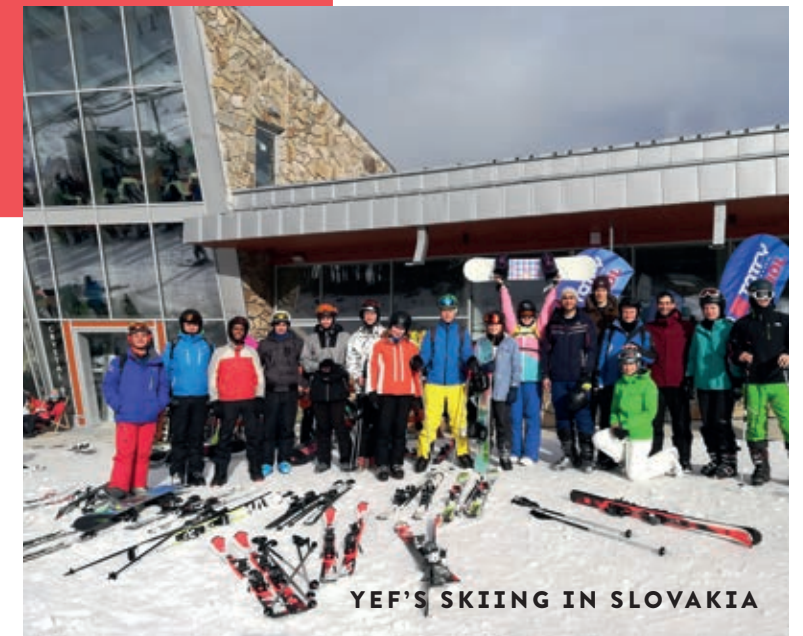
GLOBAL YEFs



BUROHAPPOLD UK YEF GROUP



YEF'S GAINING INSIGHT ON SITE



YEF'S SKIING IN SLOVAKIA

SHARE OUR SKILLS

For the past four years, BuroHappold's Share Our Skills programme has provided employees with the opportunity and support to apply their skills to causes they are passionate about. To date, we have awarded 800 days of staff time to enable 50 projects across the globe.

This has been a significant year for the scheme with a record number of applications from teams across our global office network. This year, 200 days will be given to enable 14 exciting initiatives. Here's a little more on three of them:

Thane Sanitation Complex, Mumbai

Driven by Indian Prime Minister Narendra Modi's *Swachh Bharat Abhiyan* initiative to make the country open-defecation free by 2019, a team from BuroHappold's Mumbai office are working with global non-profit organisation, Habitat for Humanity, to provide sustainable design services for a two-storey sanitation facility on the outskirts of their city.

When open, this development will provide washing and toilet facilities to over 1200 local people in one of the poorest areas of the city.

BuroHappold are providing advice to Habitat for Humanity against a reference design on sustainable and low-cost solutions including waste and water recycling, rainwater harvesting, PV powered lighting and low-impact construction techniques. It is hoped that this improved design can become a template to be replicated for further developments around India.



Agri-Tech Centre, Cambodia

Alongside the project architect, SAWA – *Socially Active Workshop Architecture*, and the client, Greenshoots, BuroHappold is providing engineering support, in the form of structural and sustainability design input to the Agri-Tech Centre project, set in rural Northern Cambodia.

In this area, society is heavily reliant on agriculture, with relatively few skilled jobs available. This project will provide training for locals, allowing them to become more efficient in their agricultural work. Whilst improving the skills of the local work force, it will also facilitate economic growth in the local community.

The project includes a training centre, to be used to train local people how to use their environment more efficiently and sustainably. It also incorporates other structures, including toilets, storage buildings and a chicken shed. These have all been designed with constructability and their environmental impact in mind.

It is the hope that this project will be the first phase of a larger development, which will further improve the quality of life for the local community in this region.

Ankarafa Field Station, Madagascar

In November 2017, BuroHappold was contacted by the Richard Feilden Foundation to provide specialist engineering support for the development of a field research station in Madagascar.

The purpose of this fascinating conservation initiative, in the Ankarafa Forest in the north-western region of Madagascar, is to study the behaviour and ecology of the critically endangered blue-eyed black lemurs. These lemurs are one of the 101 species of lemurs found exclusively in Madagascar, most of which are endangered due to deforestation and habitat loss.

Improving the research station's existing facilities will allow researchers to expand the scale and effectiveness of their conservation work, ensuring they are at the forefront of the conservation research in the area. This station will also act as a hub for conservation in the entire region and will aim to create a link between the local community and the forest. Through increased education of the local community in sustainable farming methods and construction techniques, it is hoped that they will begin to view the forest as a valuable asset worth preserving, both for themselves and for future generations.

We are working on the design of this new field station alongside Grant Associates, Feilden Clegg Bradley Studios and Bristol Zoo. With construction underway, a site visit to phase one of the site is planned alongside the rest of the team. It is hoped that BuroHappold can continue its involvement with future phases of the project as well as in the long term, following completion.



THE ESSENCE OF BUROHAPPOLD AWARDS

PAUL ROGERS, SENIOR PARTNER, ON THE CELEBRATION OF BEST PRACTICE

Annually we celebrate great people and teams across our global community with the Essence of BuroHappold awards. Championed by our Senior Partner Paul Rogers, the awards recognise best practice around the regions and our people who are truly embracing our Essence, and who we are.

This year a panel of both BuroHappold and external judges sitting in different cities around the world met to review more than 120 nominations – a record number. The judges were impressed by the quality and diversity of people and projects nominated.

PAUL ROGERS Senior Partner



Winner – team: **Battersea Power Station Phase 2 Team**

An iconic sight in London, the Battersea Power Station (Phase 2) development project is transforming the dilapidated 1930s power station into a modern, world-class, mixed-use development; bringing significant benefits to the local community and acting as a catalyst for regeneration.

With over 40 people in a site based project office, the team has collaborated with colleagues from Edinburgh to Warsaw, a shining example of the truly global essence of BuroHappold. The team turn up every day with a positive attitude, confident in their design solutions, and developing engineering solutions that are both technologically advanced, yet sensitive to the architecture of the existing building.



Winner – individual: **Michael Bartyzel UK BIM Lead**

Michael is the UK's BIM lead within the building environments team based in London. For over 25 years, Michael has been a leader in his field of 3D computer automated design and Building Information Modelling and because of this has been instrumental in making BuroHappold a global leader in technology.

With a truly global reach, his mentoring, invaluable leadership skills, and dedication to internal communication has driven knowledge sharing within the practice. As a result, initiatives such as global work-sharing and implementation of BIM standards have flowed from the standard integration of BIM and associated software tools.

THE HAPPOLD FOUNDATION

The Happold Foundation is a charity that for over 23 years has been dedicated to using engineering skills and experience to make a positive impact on people's lives. Working with young people, educators and researchers to shape a community who want to improve the built environment.

Originally funded from shares transferred by Ted Happold, the charity continues to be supported by donation from the current partners of BuroHappold. Now established for more than two decades, it has been able to support hundreds of students, researchers and engineers in their aspirations to improve the built environment for all.



'CARE' INDIA'S SHELTER PROGRAMME



OUR GLOBAL DESIGN SPRINT



WHITEHALL PRIMARY EDUCATION PROJECT



HANNAH LITTLE, 2017 HAPPOLD SCHOLAR



ALUMNI WORKSHOPS

The Happold Foundation has four key focus areas where it allocates resources and plan its future initiatives. We also promote the work our alumni undertakes to improve our world and build stronger communities.

Engineering futures

Our work with schools where we design exciting education programmes for 6-11 year olds are inspiring the next generation. This year we are entering our second year of the Whitehall Primary Education Project in London, where we have been engaging Year Five pupils with exciting engineering concepts.

Engineering education

The Happold Foundation helps students who want to pursue a career in engineering to access scholarships and work experience opportunities. 45 Scholarships were awarded this year – 32 in the UK, two in Central Europe, four in The Middle East, five in North America and four in India. Additionally our *Happold Brilliant* prize – a £1000 award that recognises excellence in teaching, was presented to MidKent College.

Engineering thinking

The annual Happold Foundation Lecture is one of the ways in which we bring together the most talented people in our industry to discuss some of the world's most challenging issues. Harriet Tregoning, former principal deputy assistant secretary for the office of community planning and development at the HUD, gave the keynote speech on the physical and social consequences of rising sea levels across the country.

Engineering for human development

Our work in this area helps engineers and organisations access the training and funds they need to get involved with humanitarian projects across the globe. Two of this year's projects were supporting Abundant Water to train Lao villagers to sell, and install low cost water filters; and awarding a grant to the Rural Education Development (RED) Project Borneo, a student-led initiative that runs skills based education programmes for marginalised Bornean communities.

IAN MADDOCKS
Happold Foundation Chairman

GAVIN THOMPSON
Past Chairman

INCLUSIVITY, DIVERSITY, AND FEEDBACK



BuroHappold is determined to continuously improve as an organisation comprising a diverse and inclusive practice which reflects the varied cultures of the communities and clients we serve. A culture where all our people, irrespective of gender identity, ethnic or national origin, sexual orientation, marital or civil partner status, pregnancy, race, age, religious belief, or disability have the support and opportunities to reach and exceed their potential.”

Paul Rogers

Partner Commitment to Inclusion and Diversity statement

THE WORLD OF BUROHAPPOLD PEOPLE

The values of diversity and inclusion are integral parts of life at BuroHappold. Our inclusion and diversity strategy for 17/18 focussed on three key areas. These are:

- To improve retention and development of female employees
- Broaden our talent pipeline to become more culturally and socially inclusive
- Foster an inclusive culture

We have made great strides in delivering on these goals.

GENDER EQUALITY

When compared to other organisations in the engineering sector, we have made considerable progress in recruiting and retaining female employees. From a recruitment and development perspective, almost half of our graduate intake in 2017 consisted of female engineers and we have grown the number of female Partners in the practice by 30%. To improve retention of female engineers we have launched our maternity returners programme.

In 2018 we launched our UK Gender Pay Gap Report which provides a useful benchmark and shows the need for further measures to help improve female representation at our senior grades. This along with positive role modelling through the work of our Women's Business Network, the *#nominate* video series and the celebration of events such as International Women's Day is helping to increase transparency and opportunities for all.



SOCIAL MEDIA SUPPORT

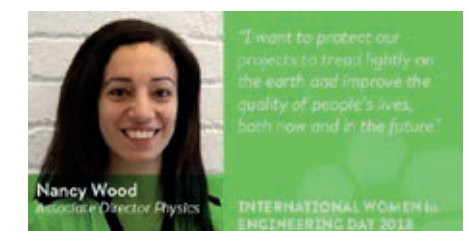
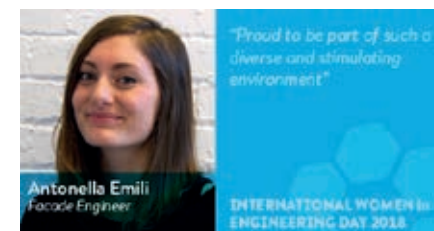
We ran a popular campaign to promote International Women in Engineering Day 2018.

INCLUSIVE SAFE ENVIRONMENT

Our LGBTQ+ employee network groups are active in supporting underrepresented groups and are both global in reach and open to all employees. They provide an inclusive and safe environment for employees to share ideas and offer support. Led by our LGBTQ+ community, Inclusion Week included a range of activity from face-to-face meetings, nights out and talks, while LGBT History Month celebrated iconic figures and colleagues from BuroHappold.



London, July 2018.
This year BuroHappold supported Pride events around the world from London to LA.



GLOBAL CUSTOMER FEEDBACK PROGRAMME

We take the care of our clients and collaborators very seriously and believe it's important to continually improve the services we offer.

As part of our commitment to those we work for, we appoint independent consultants to survey our clients to measure various aspects of service delivery in order to ensure that we meet their specific needs and expectations.

Across the practice, we gather feedback both formally through our Customer Survey Programme and informally through our day to day working relationships. By monitoring all feedback, we are able to draw out common themes and any improvements necessary. Our Executive Board regularly reviews this feedback and implements changes accordingly.

Additionally, results are fed to our learning and development programme to aid continuous learning.

WHAT OUR CLIENTS SAY

Our clients and collaborators value our coherent but independent culture. A benefit of our culture is the ability to harness our skills and creativity to add value to our consultancy. We are able to leverage our knowledge efficiently – a great advantage in a competitive commercial market.

We are recognised for large complex projects that require problem solving, our lateral thinking and high levels of expertise.

Clients and collaborators often comment about the level of trust and openness we have with them, how easy our engineers are to communicate with and how generous we are with information sharing – which fosters a supportive relationship.



“

With BuroHappold's engineering ingenuity, technical capabilities and advanced analysis, PNC achieved a cutting edge building that far exceeds expectations.”

Gary Jay Saulson, Director PNC Financial Services Group

Project: *The Tower at PNC Plaza*

“

BuroHappold are good at nurturing young engineers. They are not frightened to give young staff the chance to take on responsibilities and I am pleased they encourage young women.”

Carol Lelliott, Partner, Nicholas Hare Architects

“

There's a strength of relationship between Populous and BuroHappold, it's not just transactional. I do see the relationship as being in partnership, it's the best way to work. There are clear elements of trust and honesty between us which is important.

Tom Jones, Senior Principal, Populous

.....

The words our clients often use to describe us perfectly reflect our aims, ambitions and aspirations.

COLLABORATIVE
CREATIVE
EXPERT
INNOVATIVE
INTELLIGENT
PASSIONATE
PROFESSIONAL
SPECIALIST
TRANSFORMATIVE

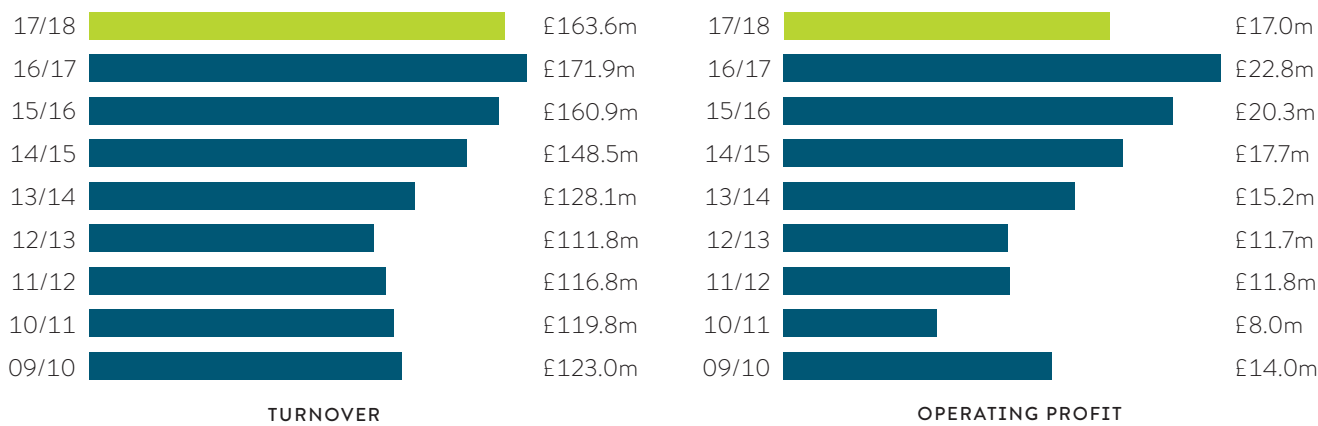
FINANCIAL OVERVIEW

PERFORMANCE

During 2017/18 the group generated turnover of £163.6m and an operating profit margin of 10%.

The decline in the group’s turnover was driven by market conditions in the UK (-9%) and AIME (-10%), partially offset by an increase in Europe (+19%).

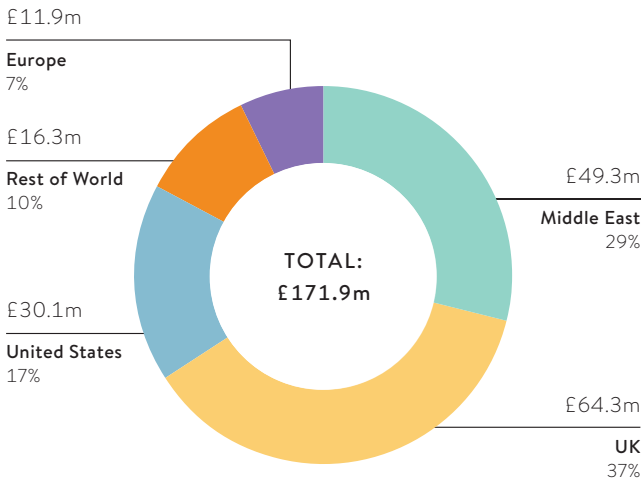
The reduction in operating profit margin is attributable to tighter market conditions in the UK alongside increased expenditure on investment projects enabling us to create sustained resilience and develop our Forward Integration strategy.



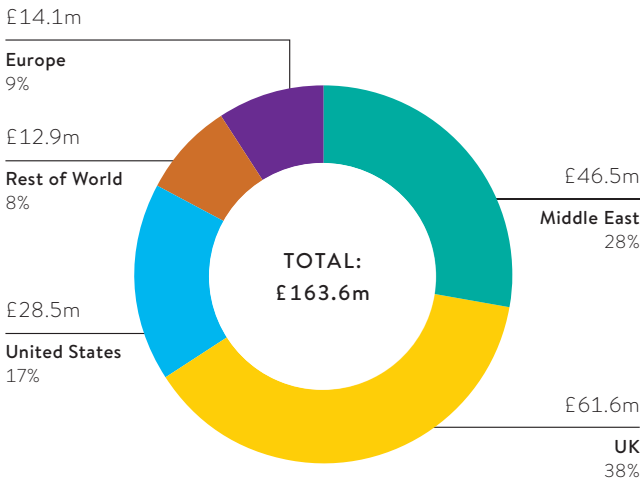
GEOGRAPHICAL ANALYSIS

BuroHappold has a significant international presence, generating turnover in over 70 countries during 2017/18.

Turnover by project location remained consistent with prior year, the most significant being 38% (2017: 37%) generated in the UK and 28% (2017: 29%) in the Middle East.



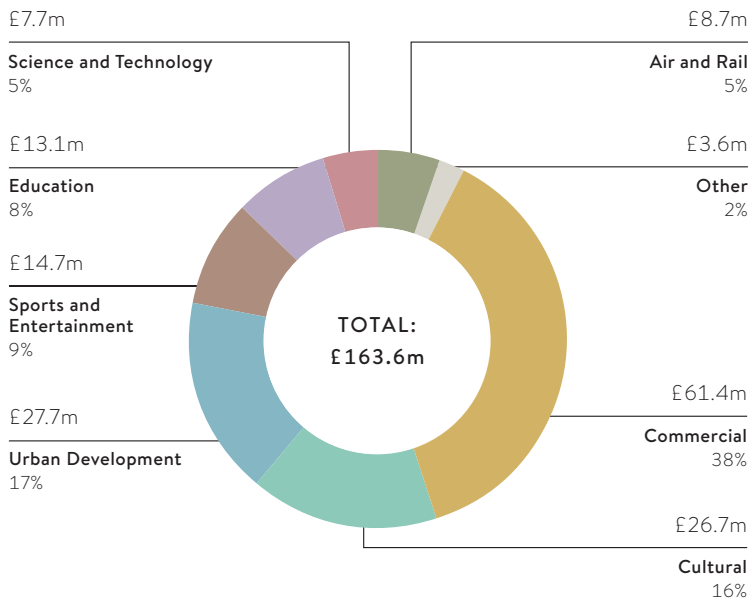
TURNOVER BY REGION 2016/17



TURNOVER BY REGION 2017/18

SECTOR ANALYSIS

Our routes to market through our client sectors of Culture, Sport, Commercial and Urban Development remain as strong and balanced as ever. Clients are increasingly calling for our expertise, experience and insight to be applied to a growing proportion of Science and Technology, Air and Rail, and Education. Holding a multi-sector portfolio is of strategic importance to us. It allows us to focus our understanding on a targeted selection of clients language and core business needs and simultaneously allow those experiences, insights and innovation gains to be cross fertilised making our contribution to each and every sector richer in the process.

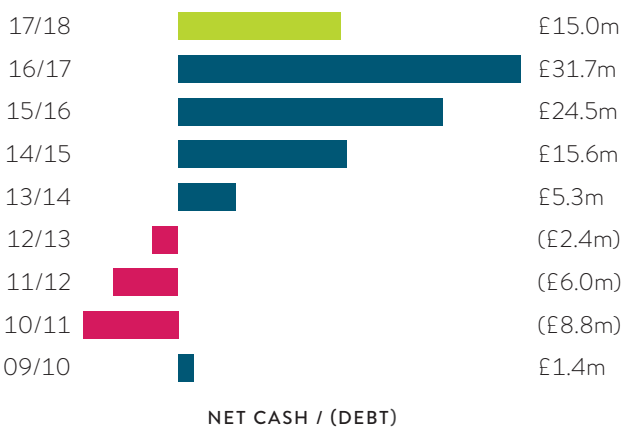
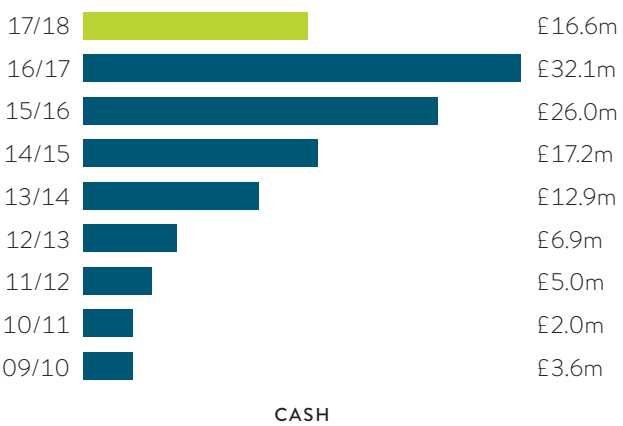


ACTUAL GWD BY SECTOR 2017/18

LIQUIDITY

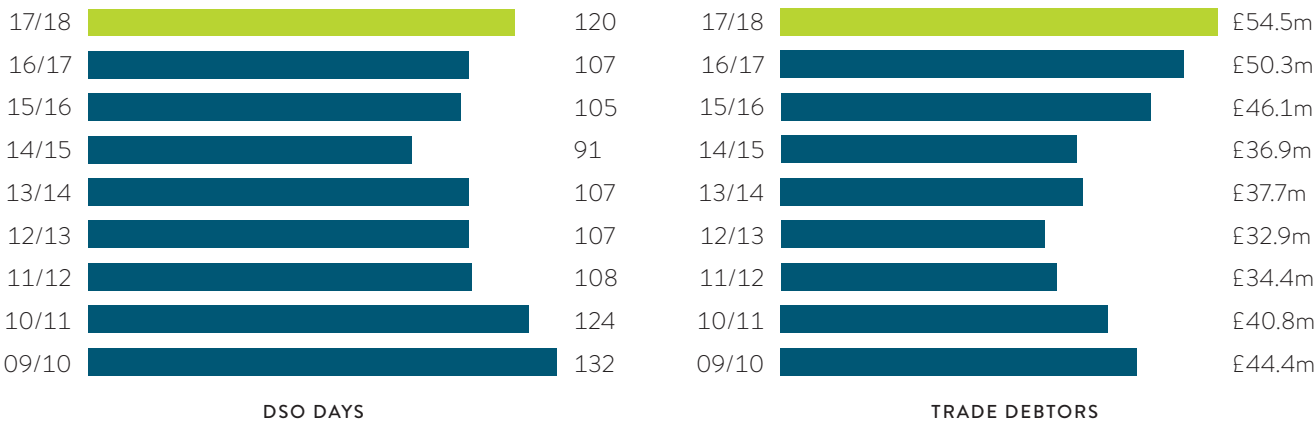
Increased investment expenditure in our processes and technology to continually improve and strengthen the business along with a reduction in advance payments from customers has contributed to the reduction in cash to £16.6m (2017: £32.1m).

In addition, payments to current and former partners increased by £5m due to payment of return on investment following on from the successful performance in recent years.



WORKING CAPITAL

DSO increased from 107 to 120 days largely driven by amounts owed by customers based in the Middle East. This is also reflected in the increase in trade debtors from £50.3m to £54.5m. Working capital management remains a key focus of the group, with DSO and cash forecast to improve during 2018/19.

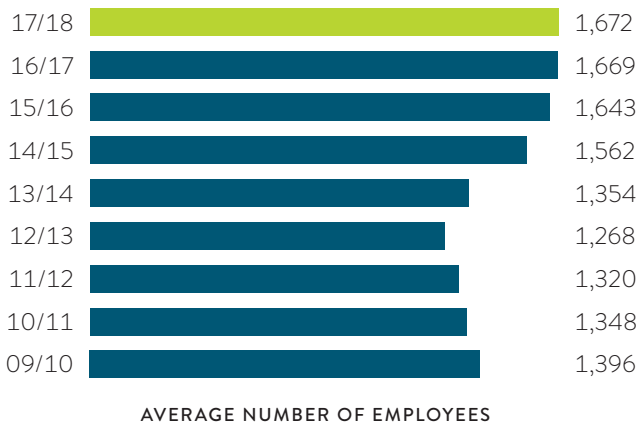


Days Sales Outstanding (DSO) represents the average number of days in which trade debtors are paid.

PEOPLE

We are dependent on the skills and approach of our people, and throughout they year we have been extremely proud to be able to nurture and attract exceptional talent at all levels.

We are a diverse and inclusive practice, reflecting the varied cultures of the communities and clients we serve. We strive to create a safe and inclusive workplace for all our employees to bring their whole selves to work and be accepted for who they are.



We are grateful to all those who have contributed to this snapshot of our work over the last year and beyond. We always work as part of a larger collaborative network both internally and with our collaborators externally. It would have been impossible to produce this without their enthusiasm, knowledge and experience.

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