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Chairman's introduction

I believe that at some point during 2015 we reached something of a transformational tipping point in industry and client interest in the project and organisational opportunities offered by offsite solutions. This is a long way from achieving across the board understanding that the use of offsite solutions is not simply a like-for-like alternative for traditional means of construction, but is a fundamentally different approach to the process of design and delivery. Progressing the longer term challenge requires a sustained effort to achieve evidence-based knowledge transfer, support for education and training, and action to build the skills that a different industry will require. This is the programme that Buildoffsite has long advocated and undertaken and to our knowledge there are no short cuts or magic bullets to make the task any less onerous.

I have no doubt that offsite has now moved on from being regarded as something fringe and relevant only to certain sectors such as retail or hotels where fastest possible construction time is perhaps the most pressing client driver. The wider benefits of offsite are increasingly better understood and there has been something of a step change in the number of clients looking to their professional advisers to consider the opportunities to shift away from traditional methods of construction.

It should come as no surprise that the benefits of offsite construction lock together in such a compelling way. Building 'the offsite way' brings with it the benefits of quality factory-based manufacturing, speed and certainty of assembly on site, plus minimum waste and reduced impact on the environment and local communities. In addition there is reasonable certainty that the performance of the as-built construction will actually deliver the performance and the cost in use that the client has asked for.

This shift in market demand has been underway for some time. It has further been accelerated by the combined effects of significant rises in the price of traditional materials and products, the increasing difficulty of recruiting and retaining good quality traditional labour and, in some parts of the UK, the eye-watering increases in labour rates.

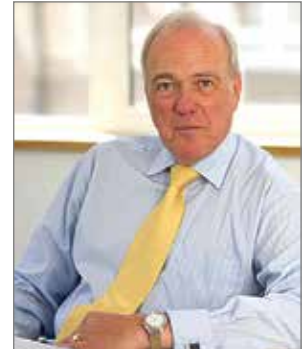
It is also the case that on the demand side there are increasing pressures for built assets to be delivered to a high standard with predictable cost of ownership as quickly as possible. Unless there is a remarkable transformation in the state of public finances and in the level of investment that the private sector is willing to contribute then simply throwing more

money at construction is not going to happen. This is the conundrum for our time – how can we transform the productivity and value provided by the construction industry? No more fiddling at the margins, no more general talk about collaboration, and no more vague proposals to energise the innovative brainpower of those who work in the industry. What is needed is action and the only form of action that I am aware of that can demonstrably deliver a value transformation is based on the use of offsite construction methods to reinvent construction processes and to strip out waste in all its forms. The challenge is substantial, but the need for change and the potential benefits are compelling.

The rapid expansion in school building is just one example of a need for the fastest possible delivery of projects. Get this wrong and it will be the education and opportunities for children that suffer. In terms of buildings for health then it will be the health of all occupants that will be put at risk. I can think of no merit in an approach to construction that regards building out a site more slowly than possible as being in any way acceptable.

In my view there is nothing wrong in demanding that the building process should happen more quickly than the painful drawn-out process that we have now.

We all want the benefits of new construction, but if we are being honest no one wants the noise, nuisance and inconvenience that is so often part and parcel of the process. I can see nothing beneficial for construction to take longer than it needs to be simply because that is how



Richard Ogden, Chairman



things are. Look at this incredible statement with fresh eyes and see it for the special pleading that it is. My mind is clear on this and if building faster to bring construction into use faster was not sufficient argument then what about building faster to minimise preliminaries and making more effective use of skilled and expensive labour? Building faster to minimise the cost of project finance, and to reduce the impact on the local environment and community etc.

If you know that you can build substantially faster on site, and if it suits the needs of the client, then why not start later on site, and reduce the impact on cash flow and financing costs? Any way you look at this, the benefits of offsite that enable faster and higher quality construction provide a compelling argument.

The need to build faster cannot be met by the use of traditional methods of construction. It is not credible that such a transformation will emerge from a supply side that has been unable to deliver more than a trivial gain in productivity over decades. Fresh thinking is needed. The entire process for delivering the asset needs to

be radically different. There is, however, little point in radically improving the productivity and performance of only one aspect of a project if the surrounding processes remain unchanged. Design, information modelling and offsite thinking need to be closely coupled with construction teams working together not separated as they generally are at present to discover just what is possible if client pressure and support is exerted.

There are, of course, significant challenges that need to be overcome before the use of offsite construction becomes the method of choice for new construction in all markets. For the supply side it is necessary that increased client and specifier interest should be matched by an across the board increase in manufacturing capacity. Indeed, some of the demand could be serviced from imports as is the case now with much of the material and product used by the traditional industry. However, the ambition has to be that much of the growth will be met by UK manufacturing resources. For the demand side and the contracting community there is the ongoing challenge for the industry to help customers to get the best out of available offsite solutions. For years there has been a compelling argument that suppliers should be able to talk directly to clients and main contractors. To get the best out of offsite solutions this becomes an imperative and it is precisely what leading clients are now doing.

In this new market place the role of Buildoffsite will no doubt evolve, but it will remain pivotal to the ongoing development of the offsite industry. Innovation of product and process will continue to advance at break-neck speed. Buildoffsite will continue to support knowledge transfer and provide opportunities for collaboration and shared research and development. We will also promote as widely as possible the achievements of our Members and provide the platforms for clients and funders to talk directly to the supply chain. Buildoffsite's practice of challenging manufacturers to constantly look to improve their offering to better meet client needs will also be maintained. As we did in 2015 we will also look to exploit opportunities to improve Continuing Professional Development (CPD) and training in support of the new skills required to get the best out of offsite solutions. Our skills organisations, our professional institutions

and our universities have an incredibly important job to ensure that those who work in construction have the skills needed to support an industry fit for the 21st century.

In terms of a prediction for 2016, I believe that whether viewed from the perspective of the Construction Leadership Council (CLC), from the National Infrastructure Commission or from the perspective of thousands of businesses operating in the real world the big challenge for the construction industry will be how to improve levels of productivity either to do the same with less resource or better still to do more with the scarce resources that are available. As I have said here, the only way this challenge can be addressed is through the increased use of offsite solutions and the transformation in approach to construction that the intelligent and integrated use of offsite methods can inform and enable in practice.

A clear sign that offsite is becoming increasingly recognised and important has been the positive reaction of many event organisations to consider delivering promotional or celebratory events for the offsite sector. Some of this may be opportunistic, but some is well intentioned. Buildoffsite has been approached by many, but we have been very selective about those organisations we are prepared to work with. For us the driving force is not about making money, but rather delivering outputs that will serve to support intelligent debate and informed knowledge transfer that will nurture the further development of the offsite construction industry. I was delighted that we were able to collaborate with Buildoffsite Member Marwood Events to deliver the Offsite Construction Show 2015, with Buildoffsite taking the lead in delivering the conference programme. Yes, we could have done a few things better, but on balance I believe that we got most things right. The Offsite Construction Show 2016 will be bigger and better, but will stick to the fundamental aims of great networking, showcasing advances in offsite solutions and exceptional knowledge transfer opportunities.

Introducing Andy Dix

Andy will formally take over at the start of next year, but will actually start work in a shadow capacity from this September.

Andy has had an amazing career in the construction materials industry including spells at Marshalls PLC and most recently as MD of Aggregate Industries subsidiary Charcon Construction Solutions



Andy Dix, new Chairman

Ltd. Andy is certainly no stranger to offsite construction methods and the clear business and project rationale that drives a fresh approach to construction. He is also a staunch supporter of skills development and is a Fellow of the Institute of Purchasing and Supply.

About Buildoffsite



Buildoffsite is a unique membership organisation that works collectively to promote knowledge transfer and continuous improvement in offsite construction solutions. It aims to deliver better value for clients, customers and to improve awareness and commercial opportunities for suppliers.

Buildoffsite's membership is drawn from across the construction industry client and supply communities.

We believe that intelligent use of offsite solutions is fundamental to re-engineering the process of construction. It can also deliver substantial improvements in productivity, 'as built' quality performance in use and achieve significant improvements in environmental and health and safety outcomes.

Buildoffsite is the recognised voice of the offsite industry and member organisations are seen as being in the vanguard of those looking to innovate and improve the performance and reputation of the construction industry.

Mission statement

Buildoffsite's mission is to work to bring about a step-change increase in the use of offsite construction solutions in support of a more productive industry delivering better value to clients and customers.

The benefits of Buildoffsite membership

Buildoffsite is a unique organisation with membership that provides both tangible and intangible benefits. Some of the more obvious benefits are:

- Unique opportunities to engage directly with clients and other senior stakeholders and understand their needs and ambitions.
- Establish business to business contacts with key individuals across the supply chain.
- Market and sector-focused networking events sharing market, product and process intelligence and providing a forum for business development and collaboration.
- Focused marketing and promotion of member businesses, services and achievements.
- Tracking and showcase the latest market developments and product innovations.
- Working with Buildoffsite, as the recognised voice of the offsite industry, to promote the case for offsite solutions and to collectively address the challenges and impediments to growing the market for offsite solutions.
- Helping Buildoffsite be responsive to evolving Member interests and business needs.
- Influencing the content of Buildoffsite work programmes to reinforce the case for offsite solutions and to enable market opportunities for members.

To get the most out of their membership it is essential that members participate directly in Buildoffsite events and activities to represent their organisations and also give feedback to their company colleagues on

Buildoffsite activities and opportunities. There is really no substitute for regular attendance at face-to-face meetings and making the most of opportunities for networking and presenting your business to a many like-minded individuals drawn from across the construction industry.

Buildoffsite in action

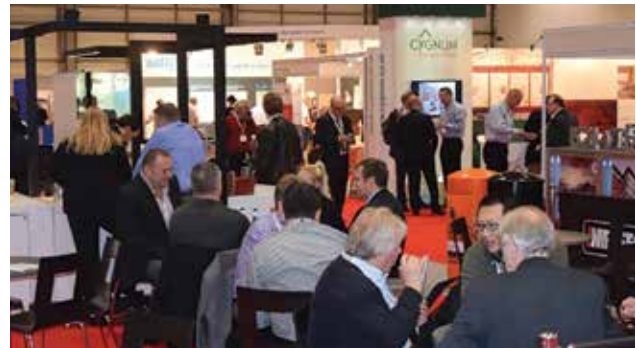


Offsite Construction Show 2016

The Offsite Construction Show 2016 will take place on 12–13 October at ExCel in London's Docklands. It is managed by Marwood Events and free to attend. Buildoffsite will deliver the conference programme plus a number of masterclass sessions to address key learning points to support industry, the supply chain, and allow clients to get the best out of offsite construction.

The Show will be the 'must attend' experience of the year. It will provide a unique platform for the latest products and solutions. Over two days it will create the industry's most important venue for knowledge transfer and networking in the fastest growing sector of the construction industry.

For more information about the show, visit:
<https://offsiteconstructionshow.co.uk/>





Direction Group meetings

One of the core activities of Buildoffsite is the programme of regular Direction Group meetings, which are open to all members and to selected guest contributors. About half of these meetings take place in at Buildoffsite's London office and half at the offices of hosting members around the country.

These meetings provide regular opportunities for members to come together, introduce and meet with new members, and to contribute to the Buildoffsite work programme being delivered on behalf of the membership.

Direction Group meetings facilitate the two-way sharing of information and the identification of developments and opportunities that will advance the market opportunities for offsite solutions. Members will be given an update on core activities being undertaken on behalf of the wider membership and will hear about developments that are particularly relevant to the advancement of offsite solutions in all market sectors.

Significantly, each meeting will provide opportunities for members to share information on their own company activities and experiences, and to identify issues where co-ordinated action would be useful.

Direction Group meetings provide huge opportunities for members to meet with and network, and to identify the scope for potential collaboration.

Member to member events

Buildoffsite organise bi-annual events for the membership, with special guests. These events provide great opportunities to engage with key topics that affect the future of the construction economy and on business.

Members are encouraged to make suggestions for topics and offer to host future events.



Discovering offsite visits

Discovering offsite visits provide opportunities to visit members' manufacturing construction sites and other facilities to get a real sense of innovative products and services that are available. Where possible, Buildoffsite are now combining these visits with Direction Group meetings to improve overall value to the membership. Taking part in an organised visit provides a great opportunity to gain a wider appreciation of the innovations available and at the same time to network with other members. Some visits are open to non-members for a fee.

All members are encouraged to host visits and those wishing to do so should contact Buildoffsite:

info@buildoffsite.com

It is interesting to note that other organisations are now starting to operate their own versions of discovering

offsite visits – which we see as a compliment! Activities that promote increased awareness of innovation and encourage collaboration can only be a good thing.



Buildoffsite Property Assurance Scheme (BOPAS)



Interest in the Buildoffsite Property Assurance scheme continues to grow. This acknowledgement has not been restricted to the UK – offsite manufacturers have been assessed in Spain, Germany, Austria, Sweden, Turkey, Lithuania and China.

While the scheme was developed in conjunction with the Royal Institute of Chartered Surveyors (RICS) and the main lenders to facilitate mortgage finance for offsite construction systems, crucially it has also delivered business performance benefit



Terry Mundy, Lloyd's Register

as evidenced by some of the testimonials received from BOPAS-accredited offsite manufacturers:

- SIG Building Systems:

"BOPAS took us on a journey that made us analyse the business in a way we had never done before. It presented many questions, some of which we would have not thought to ask. BOPAS has created the fundamentals behind our business model, is now an integral part of our culture and defines the way we operate on a day-to-day basis."

- B and K Structures:

"Gaining BOPAS certification has had a positive impact on our business. This has been not only in the form of continual improvement through audit and review of our management systems, but has also given key stakeholders complete confidence in all aspects of our delivery. BOPAS certification has created greater business opportunities for us in a very challenging market and assured the integrity of our work for years to come."

- Stewart Milne Group:

"BOPAS accreditation has been invaluable to our company. Not just in terms of giving comfort to the major mortgage lenders and insurers that our Sigma II Build System is durable for at least 60 years, but also in providing advice on our systems and processes, which has enabled us to fine tune how we operate making us more effective as a business and ensuring we stand out in the industry."

Based upon current enquiry levels and scheme take up, it is anticipated that BOPAS will achieve 100 per cent growth in accredited offsite provider in 2016 relative to 2015 performance.

For more information go to: **www.bopas.org**

Contact:

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Buildoffsite hubs



One of the most significant developments for Buildoffsite has been the trialling of a number of sector 'hubs'. These provide a particular focus for those members who wish to participate in a programme of work intended to grow the opportunities for offsite construction solutions in particular market sectors.

The driving force behind these hubs has been interest and enthusiasm from individuals who see an opportunity to use networking and co-ordination through Buildoffsite to develop market opportunities and address issues.

Establishing a hub provides a mechanism for concentrated sector development activity, which would be difficult to sustain through conventional Buildoffsite meetings and other activities.

All hubs share a number of common features including:

- Strong support from a section of the Buildoffsite membership.
- Engaging with a significant sector of the UK construction market.

- Involving repeat clients and investment programmes with opportunities for knowledge transfer and innovation.
- A work programme developed by participating Buildoffsite members as appropriate to the need of supporting the case for the increased use of offsite solutions in that particular market.
- A clear focus on the promotion of offsite solutions, the identification of impediments to the increased take up, and the identification of appropriate remediation measures and supporting work programmes.
- Action to grow the Buildoffsite membership to increase the capacity to bring change to the sector.
- Direct contact with the Buildoffsite Executive Group to enable communication across and between the hubs sharing best practices and working methods.
- Organisational and tactical support provided as necessary by the Buildoffsite Secretariat.

Three hubs are well established – water, housing and refurbishment, and brief updates are provided here.

Hubs for rail, education, pharmaceutical and manufacturing will launch in 2016.

The progress of all hubs is reported in the Buildoffsite website. To be effective each hub needs to recruit and retain the active participation of members and requires a clear work programme to drive the case for offsite solutions.

Buildoffsite housing hub

The housing hub was established just over a year ago with the support of the Department for Communities and Local Government (DCLG). Within government there is a recognition that in order to increase the supply of new homes, the supply side needs to adopt the practices of other manufacturing sectors.

- A substantial annual increase in the demand for homes.
- An effective limit on the number of new homes that the housebuilding industry can deliver based on traditional construction methods.
- Skill shortages and rising labour and material prices.
- A decline in the ability of housing associations to invest in conventionally-funded new social housing developments.
- Ambitions from some local authorities to develop new homes for a mix of tenure types, but including development for sale to generate profits to finance cross subsidies.
- An increase in the supply of new homes in the private rented sector.

The ability to increase the number of new homes being built depends substantially on the supply chain increasing capacity and the client and funding communities investing in alternative construction methods including offsite.

The housing hub has focused its work around an agreed set of priority tasks including:

- connecting with clients
- promoting and communicating hub activities
- sharing knowledge
- raising awareness
- demonstrating value.

The case for the increased use of offsite solutions is now increasingly recognised by all client sectors including speculative house building. However the supply chain needs to be able to offer solutions that are attractive and work financially in terms of quality and performance for various client interests.

During 2016 the housing hub will focus on several activities including to:

- connect serial clients with offsite housing suppliers
- explore opportunities for consortia building to create manufacturing capacity that deliver larger house-building contracts
- promote client practices that can help nurture a viable and financially secure supply side
- encourage and enable the use of terminology that supports an improved understanding of offsite solutions, and advocating more effective and informed marketing information by suppliers.

Buildoffsite water hub

The water hub is gaining momentum. At the request of the clients leading the hub, Buildoffsite has agreed a number of actions. These include the development of a maturity matrix (to allow individuals and companies to assess their progress towards implementation of offsite solutions) and also the development of a pilot document to showcase standard pumping station solutions.

The hub is planning to showcase a number of offsite solutions for the water industry at the Offsite Construction Show 2016 (see page 4).

Buildoffsite refurbishment hub

The refurbishment sector of the construction industry is substantial. There are extensive opportunities for the offsite industry to develop innovative solutions for high quality, rapid refurbishment. Initially this will be in markets where the primary concern of clients is maintaining customer services, minimising disruption and preserving image and reputation.

The hub vision is to create and continually develop generic offsite/Lean solutions for end users with a high demand for interior refurbishment.

The hub initial objectives include:

- Establishing the challenges faced by end users.
- Delivering innovative products, services and solutions that contribute towards overcoming end user challenges.
- Establishing a benchmark model based on traditional construction using an end user project.
- Preparing and continually developing an alternative offsite/Lean model delivering improvement against the benchmark.
- Delivering demonstration projects.

The retail sector is strongly featured in the initial group of clients participating in the work of the hub. These include Asda, AstraZenca, Marks and Spencer, Waitrose, John Lewis, McDonalds Restaurants, Greggs, Heathrow Airport and Morrisons.

The work to date has included:

Establishing the key deliverables

- Ensuring flexibility allowing rapid and cost-effective reconfiguration of space.
- Cost neutral or better compared to traditional solutions.
- Reducing time on site and using deskilled labour.
- Delivering collateral from the initial activities to support buy-in at board level.

Identifying offsite solutions

- Identifying shared solutions available from within the Buildoffsite network for services, floors, walls and ceilings.

Identifying the benefits

- Conducting a shared analysis of offsite benefits compared to traditional construction using a previously delivered small format store model.

Identifying a real world trial project

- Deliver a generic 'back of house' solution for M&S, Asda and Waitrose. The hub chose a generic accessible washroom as the starting point. An end user specification and cost model have been agreed.

Infrastructure projects

Traditionally, infrastructure has been regarded as assets that support the delivery of utilities such as power, water, sewerage, transport and communications. However, the precise definition is not as important as that of ensuring these assets are efficiently delivered, operated and maintained.

Infrastructure assets are often owned by a limited number of companies, usually characterised in terms of their scale of operation, their history as public bodies and, in many cases, their accountability to a public regulator. The yearly spend on assets to support UK infrastructure runs into tens of billions of pounds with significant opportunities for UK businesses to develop overseas markets.

Over the last four years Buildoffsite, in collaboration with Mott MacDonald, has delivered annual knowledge transfer conferences at the Institution of Civil Engineers (ICE). At these events, leading clients and their suppliers have demonstrated some of their exemplary infrastructure projects and the innovations in product and process that have been developed to improve value, productivity and quality including the increased use of offsite construction methods. These highly popular conferences have also showcased some of the leading infrastructure projects being undertaken globally and highlighted the opportunities to deliver substantial improvements through the adoption of technologies and practices that are commonplace in other industries.

The ambition for these conferences has been to stimulate fresh and informed thinking and to encourage those working within the infrastructure sector to identify opportunities to rethink the delivery of assets. Typically these will include the use of offsite solutions, through the application of Design for Manufacturing and Assembly (DfMA) techniques, through optimising opportunities to standardise design and construction solutions and

to encourage a culture of sharing of best practices and innovatory thinking across the entire sector.

It is clear that the future will see a continuing fusion between what might be regarded as traditional construction activities and the opportunities enabled by the widespread application of digital technologies. This will embrace the design and delivery of assets, and also asset management and maintenance to maximise the performance of existing assets over time.

Our conferences have explored a wide range of emerging issues in support of more effective infrastructure. At the same time highlighting the targets to improve the performance of the construction industry as set out by the CLC.

Offsite housing – where are we now?

Three years on from the publication of the Offsite Housing Review co-author Prof. Nick Whitehouse reflects on what has changed in the interim and what the future looks like.

Most people agree that everyone should have somewhere to call home, yet the housing crisis in this country gets worse each year. The current government has promised to address the problems of housing supply.

Three years have passed since the review was published, and now is a good time to consider what has been achieved. Have the report's recommendations been implemented and if so have they have been effective?

The team that produced the review researched and analysed the issues associated with the housing market in England and the potential for offsite construction methods to play a more significant role in the future.



Offsite Housing Review (courtesy Construction Industry Council)

The review quantified the housing stock shortfall and predicted future needs across the market segments at in excess of 230,000 homes per annum. This figure has been generally adopted as the national target. However, in the years following the report's publication, about half the houses needed each year have been provided. As identified by the review by 2020 there could be a shortage of two million homes. Private housebuilders have improved their delivery in response to rising sales and increasing margins, but confirm they are just about at full capacity and have systemic constraints to further expansion. The major housebuilders continue to be the main constructors of homes across the market sectors. If the targets given in the review are to be achieved, growth at scale is needed from the housing associations, re-energised local authorities and an expansion of the private rental sector. Coincidentally these are the markets that also particularly suit the attributes of offsite supply. The review also identified the need to develop new models for the delivery of housing including those that can best influence the contribution offsite solutions can make to process efficiency, quality and value.

To date the government has taken no decisive action to incentivise the offsite industry or to increase manufacturing capacity for housing. This is contrary to the recommendations in the review. Instead targets have been set by the UK Government, but without adequate consideration of how they are to be achieved.

The help to buy scheme, supported by the government, has been acknowledged by the housebuilders to have helped sales of new houses. However, it has contributed to a further rise in house prices. Similarly, the rapid rise in renting has been blamed on house shortages and the move of some investors into the buy-to-let market that has also had an inflationary effect.

New construction through the traditional supply routes for affordable sale or rental has declined. However, novel delivery models are appearing including housing investment funds (HIF), typically a partnership between a pension fund and a local authority or housing association. These interventions in the market have considerable potential for the long term, as the developments are likely to be delivered at scale, constructed quickly with robust

performance, designed with predictable 'low cost in use' and supplied using offsite construction methods.

Buildoffsite has taken the initiative to set up an offsite housing hub to act as a focus for all the stakeholders and raise awareness among clients and the supply chain, and to tackle any perceived impediments to rapid growth. This initiative has been supported by the Department for Business Innovation and Skills (BIS) especially in terms of training and skills.

A number of local authorities and housing associations are investigating and in many cases making use of offsite construction methods including through their own manufacturing facilities. They recognise that the characteristics of offsite supply can increase speed of delivery and quality, and also deliver predictable performance and cost in use. Private housebuilders are making some increased use of offsite construction particularly in response to the rapid increase in costs of labour and traditional materials. Similarly, the availability of traditional materials and skills are in short supply in some parts of the country.

Indeed, Randstad have arrived at the sobering statistics that the traditional residential building industry will need to hire and train a million more people to meet the production target for 2020. This is in an industry that has become more labour intensive in recent years, but has a declining workforce.

The demand for homes is increasing at a rate higher than predicted due to the level of net immigration and the low number of houses built year-on-year. The entry of major investors/developers in private rental sector who require speed, predictability, robust performance with low cost in use is likely to be a major influence in the take up of high quality offsite supply at scale.

The slower implementation of higher carbon standards through the Building Regulations is a disincentive for change away from onsite construction. However, even with the existing standards onsite construction is struggling to close the performance gap between as specified and performance in use. The use of offsite for homes is likely to increase steadily and generally to be in addition to traditional supply chains. Change will

accelerate when sufficient scale of supply is available to the manufacturers to improve their efficiencies through volume within a stable market. In the foreseeable future housing supply will be at a rate that will not meet the Governments ambitions nor the needs of society.

How BIM is already shaping the future



Sharing models in real time, around the world is enhancing collaboration and project delivery, especially where offsite solutions are concerned. This is just one of the increasing Building Information Modelling (BIM) trends that is bringing Trimble's customers multiple benefits. Duncan Reed, digital construction process manager, takes a look at how BIM is redefining the way we work and shaping the future UK, and global, BIM landscape.



Duncan Reed, Tekla

Redefining the way we work: BIM online, offline, anytime

The way we work is changing rapidly around the world, and the construction industry is no exception. Globalisation and technology have brought great opportunity yet with it comes the pressure of meeting client demands even faster and more cost effectively.

People are also seeking change with the Millennial Generation, otherwise known as Generation Y, choosing to redefine how it works, and from where, in search of personal freedom. It is these factors, coupled with the complexity of buildings, which has led to those working in engineering and construction to look for alternative work strategies that will enable them to meet these demands and manage associated workloads at the same time.

Historically construction has been siloed. But by taking a digital approach, now whole teams are able to work on the same projects regardless of their location, be it a global project group or multiple office locations of a company. When one time zone goes to sleep, modelling work on the other side of the globe can continue seamlessly. Work can be divided with more clarity and security than ever before.

The rise of model sharing on megaprojects

On megaprojects, such as airports, railways and stadiums, many architecture, construction and engineering companies are using BIM to enhance collaboration and sustainability in design, construction, and operation.

However, with megaprojects requiring companies to collaborate with offices around the world – one project could require co-ordination between New York, Berlin, Riyadh, and Shanghai – they are facing increasing urgency to share models quickly and efficiently.

Traditionally, many companies have sent large BIM files via email, which can be time-consuming, especially if they are using different software to read files in different file formats.

With time and accuracy vital to delivering megaprojects, companies cannot continue to risk the potential time delays, clashes that are not detected in every model, and version control issues, which may not incorporate the previous day's model changes.

Using advancing BIM solutions with model sharing facilities, architecture, construction, and engineering companies can share real time models, around the world. This frees up teams to work in different offices, and allows balancing workloads across teams and offices, depending on resources and requirements.

With data stored locally, and then transferred via encrypted, secure networks, staff can work online or offline, and then upload only the changes that they have made, rather than re-send the entire model. This is especially useful in countries with slow internet connections.

Cloud-based solutions make BIM more mobile

Cloud-based model sharing is also rising. With increasing use of smartphones and tablets, staff can bring these

models out of the office and onto mobile devices on the construction site, and use immediately. Mobile-friendly software allows staff to provide on-the-ground insights to the office in real time, which enhances efficiency and collaboration in the field.

With BIMs easily available and always updated, often in the cloud, companies can visualise and understand how to create reinforcement, extract documentation, and create schedules. Contractors can then use a specialised application programming interface (API) with capabilities to create an application that can connect to structural software enhancing particular aspects of construction, such as rebar production.



Structural engineers adding value with constructable models

Instead of following the lead of architects who suggest or require the use of BIM, structural engineers are now taking the lead by building 'constructable' models that can be used downstream by all subcontractors throughout the life of the project. This adds a revenue source for the structural engineer, while at the same time providing the owner with a streamlined process that should reduce overall costs.

Structural engineering companies that routinely build and share constructable models add huge value to projects through better designs, enhanced collaboration, better cost management, less waste and jobsite efficiencies that

go right to the bottom line. This leads to satisfied owners, more repeat business and referrals, lower risk and even reduced liability insurance premiums.

More small firms now adopting BIM

Contractors frequently still use 2D drawings for projects, which can be costly, time-consuming, and lead to inaccurate results. But it can be a challenge to change the organisational mindset of “that’s the way it’s been done for many years, why change now?”

Often, companies may also be reluctant to adopt advanced BIM technology and train their staff due to tighter budgets. However, more companies are starting small with BIM for specialist work, such as rebar fabrication or automating concrete pouring.

With BIM solutions and advanced information transfer and management technologies, such as the cloud, companies do not need to invest heavily in IT.

In fact, based on the experience of customers who use Tekla Structures, investment in BIM and the associated training can pay off within three to four months. This allows companies to expand their services, become more competitive, and finish jobs more quickly with less labour and waste.

What next?

With the UK Government’s initiative for its construction projects to be BIM Level 2 already a reality for Tekla clients, BIM Level 3 or ‘digital built Britain’ is already set to become the next big move for the industry, helping to improve on the solid benefits that offsite construction brings.

The use of BIM in offsite is increasing year-on-year, helping to enhance planning and project management and making sure projects are delivered on time and on budget. However, developers, government organisations, and contractors need to continue to invest in BIM, increase staff training, and maintain the careful co-ordination between the public and private sectors to encourage successful adoption of BIM in decades to come.

Developing the skills the industry needs



Background

The Offsite Management School launched in 2015, and we now have a consortium of partners, including Skanska, Carillion, Laing O’Rourke, Costain, United Utilities, Saint Gobain, Prater, and McAvoy alongside leading knowledge-based organisations, such as BRE, TotalFlow, Exelin, Buildoffsite and CITB.

What is the Offsite Management School?

The school is an initiative of leading contractors and clients who are committed to helping their supply chain develop to meet the big challenges that we will face over the next five years.

Self assessment tool

The construction industrialisation self assessment tool has been designed to help you assess your company’s current industrialisation strengths and to identify the areas in which you can develop your competence. You can then work your way up from member through to gold status by engaging in the school, including viewing resources, completing e-learning modules and attending events.

Supplier days are aimed to raise awareness of the school and are targeted at companies or people who are not yet registered members.

Training workshops are free, half-day sessions that focus on specific competency issues such as change management, collaborative planning and project management. You need to be an active member of the school in order to register for a workshop.

E-learning

We currently host 12 e-learning modules in a range of offsite related topics including design, product and process, offsite, collaborative planning, onsite, logistics, change

management, marketing and business development, project management, leading change, quality, best in class maintenance and supply chain management.

The future

The School will be focusing on DfMA and design in 2016–2017. We will be doing this by delivering various workshops around the UK, and providing e-learning resources through the school's website: www.offsiteschool.com

Comparator

New developments well worth waiting for

The research funding from the UK Commission for Employment and Skills (UKCES), which enabled Bernard Williams and his team at IFPI to build an onsite/offsite comparative appraisal tool during the last year, has also opened the door for significant developments beyond those envisaged when Buildoffsite's comparator project got under way in October 2014.

The basic functionality required for whole-life cost and sustainability comparison already existed in IFPI's web-enabled CombiCycle model. So the research team, headed by chartered quantity surveyor's BWA, had the task of adding in everything necessary to introduce the cost and sustainability of offsite solutions in a form in which they could be compared with more traditional approaches.

The steering group, chaired by Richard Ogden, and comprising the major professional institutions and many leading players in offsite construction, oversaw a project that started out with fairly simple aspirations, but finished with a degree of functionality beyond the agenda for the original study.

For example, the traditional elemental format was replaced by a new 'modular' form of analysis, which is more user-friendly and readily embraces the various modular and volumetric approaches to construction. Another major breakthrough has been the development of a methodology for calculating the program time and showing how this will be shortened by offsite solutions and increases in productivity. The effects on preliminary

costs and material waste are also translated into capital cost and embodied carbon savings at the same time.

A further development has been the facility to display a project Gantt chart linked to the model's project time prediction and to adjust the sequences of construction to suit alternative design concepts and constructors' preferences.

A key feature of the model is that it is designed to be used at project inception before designers have committed to layouts, which might preclude the efficient use of offsite solutions.

Several case studies have been carried out including a fast food-drive thru, a £30m office building, a parade of townhouses, a superstore and a volumetric hospital ward.

The program was due to launch in spring 2016, however IFPI have delayed this until autumn 2016 while they complete version 6 of the CombiCycle model. This model is being set up to calculate using prime costs, as well as linking in to BIM libraries and suppliers' websites, and facilitating the introduction and analysis of an unlimited range of products and materials.

The revised prototype of the educational version of the model will be trialled at Oxford Brookes University (key members of the comparator research team). The IFPI team are now keen to discuss linking their products to the final educational version of the model with Buildoffsite members – a great way to promote their products and the benefits of offsite construction to the next generation of designers and quantity surveyors.

If you would like to get involved can contact Bernard Williams at: bernardw@int-fpi.com

A new guide to offsite

Buildoffsite and the Building Engineering Services Association (BESA) have collaborated to produce *An offsite guide for the building and engineering services sector*, which was showcased at the Offsite Construction Show 2015. It is now being featured at a series of events in 2016 including the BESA health and safety focus forums.

The scope of the guide is wide and considers projects in a holistic sense:

“Section 3 puts the case for using offsite construction in the benefits and any downsides. Section 4 looks at what you need in order to use offsite construction effectively and when you should consider it. Sections 5 and 6 provide a practical overview of the factors to be considered and actions required to make offsite construction work well, considering the tasks at each project stage in Section 5 and providing illustrative case studies in Section 6”.

The glossary of terms and case studies in particular draw on input from Buildoffsite. The project stages considered align with the digital plan of work and CIC/RIBA work stages. The project team comprised Nigel Fraser, Buildoffsite and West One Management Consulting, Gay Lawrence Race, services engineer and editor, Anna Winstanley, Lean BIM Strategies (formerly Laing O'Rourke), Richard Kelly, BuildingSmart (formerly Heathrow) and Paul Hancock, formerly Crown House Technologies, who also chaired the steering group.

The guide is available from BESA publications:
www.b-espublications.co.uk/Default.aspx

Opinions

Graham Cleland, NG Bailey

Investors in the offsite supply chain often hear that the immediate future 'appears positive'. The somewhat over-familiar 'jam tomorrow' promise does not constitute new messaging for those parties who have been investing for a long time. It does not matter if it is a single aim such as the UK Government's Construction 2025, the increasingly politicised affordable housing crisis, the reducing numbers of skilled construction workers, or a combination of these and multiple other factors, there is no question of a sea change occurring. Indeed, there is evidence that



Graham Cleland, NG Bailey

savvy clients are starting to appreciate that they need to establish direct links with the offsite supply chain and connections are starting to be made.

For specialists operating in offsite mechanical, electrical and plumbing services (MEP) in particular, the benefit is that these savvy clients understand that overall build programmes can be directly affected by timely, specialist input during design development. Combined with an explicit plan to transfer construction operative hours from a site to a manufacturing environment, they understand the need for intervention in the procurement process to secure their ambition. Change is not happening across all market sectors with some organisations in the construction supply chain continuing to trade traditionally and generating thin returns as a result. However, a sufficient increase is occurring to give genuine cause for optimism. Such positive sentiment is being felt by offsite MEP providers who are active in the infrastructure, industrial manufacturing and residential housebuilding sectors in particular.

The importance of the direct connection between clients and the offsite supply chain cannot be over-stressed. Rather than leave issues of programme surety, build quality and cost certainty to chance, these clients can be seen today wanting to test the capability and capacity of potential offsite MEP providers for themselves. Such assessment is showing as more than just a simple pre-qualification exercise, rather the dialogue is proving pivotal to the decision making and detailed planning logic that end users are helping to develop for delivery of programmes of work, as opposed to single projects. The ability to apply continuous improvement as a result of lessons learned is realistic only if there is some consistency in the team of people who will deliver such programmes, and savvy clients know that the conventional approach of a main contractor forming a team for a project only to disband the same at practical completion is too limiting.

Like investors in the offsite supply chain, clients are appreciative of the fact that maximising benefit to all requires longer term thinking. The opportunity that these blossoming partnering arrangements are starting to have on product/process innovation, improved health and safety (H&S) performance by removing requirements

for headcount at construction sites, better through-life building performance etc, present a rich reward for all who are involved, but most importantly provide the rationale for ongoing investment into the offsite arena.

Jaimie Johnston, Bryden Wood

In the last year there has been a huge shift in the general acceptance of prefabrication and offsite solutions. For many years the industry has tried to convince clients, designers, contractors and operators of the benefits of a DfMA solution, with varying degrees of success. However, increasingly it is found that these stakeholders no longer need convincing, and their question is no longer 'why?' but 'how?'



Jaimie Johnston, Bryden Wood

My belief is that this is linked to the rapidly increasing uptake of BIM and the positive impact that this had had on changing ways of working, particularly in the way it facilitates a culture of innovation and collaboration. While no means business as usual, BIM has certainly opened up the tantalising possibility of a more sophisticated construction industry.

When questions relating to BIM were first introduced into bids they were a novelty, and became a key differentiator. The most advanced responses were able to demonstrate real value and could mark out a tender response as being 'forward' thinking. However, within an incredibly short timeframe BIM questions have become the norm – already it would be unlikely that a major client would procure a project, or a consultant or contractor respond to a bid, without expecting BIM to be a major part of the process.

As BIM becomes increasingly accepted perhaps the industry is ready for 'what next?'. For instance, while the body of published BIM case studies demonstrates significant efficiencies in terms of design and delivery, it is unlikely that these alone will allow the industry to meet the

targets set out in Construction 2025 (33 per cent lower cost, 50 per cent lower emissions, 50 per cent faster delivery, 50 per cent improvement in exports). However, it will facilitate the other innovations that will be required.

My hope is that in an industry where BIM (and the ways of working that it engenders) is becoming taken for granted, the stage is set for DfMA to become an inevitable next step. Once the effort has been made to create a highly detailed, data rich, potentially fabrication quality model bringing together multiple disciplines and manufacturers, it would surely seem a step back to break this apart into numerous packages and trades.

In the past 12 months there has been an increasing numbers of 'construction innovation' questions in bids, and these are providing the same 'differentiator' role that used to be occupied by BIM early adopters.

Kevin Jones, Portakabin Group

There is definitely much greater awareness of the benefits of offsite construction and a better understanding of the differences between interim modular and advanced, bespoke offsite solutions.

There are clearly still perceptions to change, but increasing client recognition of the role of offsite solutions is coming through in terms of sales. The significantly increased scale of the schemes we are winning, for example the £44m Riverside Schools campus, the high level of repeat projects and the exciting prospects we are generating across a diverse range of sectors are all hugely positive and a reflection of the confidence in our buildings and in the offsite industry as a whole.

Education will continue to be strong in response to the rising demand for school places and this is now translating beyond reception and primary, to secondary, further and higher education.



Kevin Jones, Portakabin Group

We are currently seeing a rise in healthcare prospects, both directly from NHS trusts and via ProCure21+ frameworks and our partnering with major contractors. In addition, the commercial sector is very positive with a number of significant opportunities from blue chip organisations. This demonstrates the increased awareness of the speed, quality and on programme/on budget benefits of our offsite construction solutions.

Offsite specialists need to be able to pull together multi-disciplinary teams, with the right level of sector experience and skills for working with advanced offsite construction solutions, particularly as the scale of projects is increasing.

It is vital that offsite manufacturers continue to work closely with advocates and influencers – such as Buildoffsite, and to participate proactively as an industry to encourage uptake of offsite into mainstream building.

The industry has to shout louder to demonstrate the true value of offsite construction over site-based building methods. This includes the more sustainable and efficient use of resources, improved build quality, shorter programmes, and consistent delivery on budget and on time.

Steve Fozard, Costain

I can see 2016 becoming a catalyst for offsite build in the UK. It is evident that clients in the highways, power, rail and water sectors are all setting ambitious targets regarding both standard products and offsite manufacture. I think we all need to recognise that offsite manufacturing is not actually a zero sum game. I often find conversations centre around “is it best to build on-site or off-site?”

when the real value can be found in identifying what elements of a project can be built economically offsite and what is best undertaken via the traditional methods.



Steve Fozard, Costain

I find the techniques are often off-set against each other, while the middle ground is left unexplored. I feel the most successful projects feature a healthy balance of the most appropriate methodologies available.

There are several outstanding opportunities for offsite construction in infrastructure, but the recent move by Legal and General to produce their own range of offsite built housing will be a real game changer. The entire house building sector is watching them and taking a keen interest in seeing how they perform. It is no secret that the construction sector faces a productivity conundrum and I believe that working closely with experts in universities will help us to transform our sectors' capability. Costain is working closely with a number of universities to help develop a 'factory thinking' approach and this is now helping us to deliver outstanding service to our clients.

The offsite movement faces a number of challenges as there is currently a core of enthusiastic advocates actively promoting its benefits. However, the group needs to grow in both size and diversity while encouraging uptake by others at every opportunity. The sector would really benefit from a clear and precise report regarding how to transform its offsite capability. This report needs to be rigorous, impartial and definitive, and is something I am currently actively developing. Construction also needs to look at other sectors for ideas and inspiration regarding how leading edge production techniques from automotive and fast-moving consumer goods (FMCG) can help us deliver a revolution in our productivity. I feel it is vital we teach these new techniques in our universities, via new hybrid degrees so we produce engineers with both an understanding and appreciation of how they can apply them in tomorrow's workplace. I am optimistic about the prospects for offsite manufacturing in 2016, but we will need to be relentless in our commitment to transforming industry in order to succeed.



Case study 1: Phase one project, Battersea Power Station Development Company, Skanska

Benefits

- Faster onsite installation, minimal quality defects and associated waste.
- Optimised transport solutions to reduce costs.
- Overall reduction in operational and embodied carbon.
- Safer working environments for staff.
- More likely to meet programme deliverables and reduce commercial risk.
- Avoiding the problems of poor weather.

The project

The Battersea Power Station Development Company phase one project has commissioned SRW Engineering Services, part of Skanska, to install hundreds of utility cupboards in high-specification homes efficiently, safely and successfully.

Taking on a challenge to deliver more than 860 utilities cupboards in the first phase of the 42-acre mixed use development at one of Europe's busiest and biggest construction sites could have been difficult. However, by standardising the design, applying rigour to the process and specialising the tasks, almost 65 per cent of them were created off-site, in a clean, modern, warm and dry environment, rather than on-site.



Significant cost and programme savings have been recorded for the project to date – 44 and 65 per cent respectively. In addition, manufacturing construction elements in a factory environment has proven to be safer for employees, ensures higher quality end products with reduced waste and can help meet tight deadlines, as well as bypassing the skills shortages issues in the sector.

Led by Skanska, the project involves partners from ModCell, Exelin, the University of Reading, and the Building Research Establishment (BRE). Together they have developed the system of 'near-site' manufacture using modern flying factories.

As part of the project, a 'tag and track' process is being applied to all of the components with radio frequency identity (RFID) tags. These facilitate quality checks and condition monitoring to support condition-based maintenance of moving and rotating machinery.

The cupboards, which contain all of the heating, plumbing and electrical controls for each home, have been built to exacting standards that, over the long-term, will also minimise maintenance requirements, thanks to consistent workmanship across hundreds of homes.

The modern flying factories concept criteria means that they are temporary and flexible, so ideally they are located within 25 miles of a site. They can be set up in rented warehouse space or within temporary hire structures erected on hard-standing. Good transport connections with the project site are also essential.

In addition, financial outlay is reduced as there is no requirement to tie-in to large overheads or high transport costs, with items ready to be delivered to site on a just-

in-time basis. It is also possible to adapt a factory to exactly fit the current needs, so the concept is opening up the potential for a huge increase in the level of offsite fabrication across the country.

If the government is to reach its Construction 2025 targets (33 per cent reduction in building costs and 50 per cent faster delivery, plus 50 per cent lower emissions) then Skanska's modern flying factories could be a significant part of the solution.



Skanska's fabrications expertise has been built up over many years and our in-house pre-fabrication facility can manufacture most system elements off-site to improve quality and reduce site activities and installation time. Pipework modules and sections are fully flushed, tested, certified and sealed and if required lagged before delivery.

We have a dedicated design team who work closely with project teams to develop innovative and bespoke modular solutions to meet clients' needs.

The modern flying factories approach enables Skanska to take existing expertise and apply it locally, close to project sites to reduce transportation and waste, while also supporting local labour markets.

Contact

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Case study 2: Beta building, GlaxoSmithKline-Bryden Wood

Client: GlaxoSmithKline plc

Project manager: John Lohan, Brydenwood Ltd

Architect: Jim Mitchell, Brydenwood Ltd

M&E consultant: Kevin Griffiths, Brydenwood Ltd

Structural engineer: Kevin Masters, Brydenwood Ltd

Cost consultant: Ivy Siew, Brydenwood Ltd

Principle contractor: Dan O'Donnell, FSI Worldwide

The project

The challenge set by GlaxoSmithKline (GSK) was for a 'zero incident, zero defect, zero waste' approach to the delivery of an ambitious factory in a box design allowing GSK products to reach 80 per cent of the African population by 2020. In addition to the challenging construction programme in difficult, varied and often underdeveloped markets, GSK requires best practice, a minimal cost footprint and delivery in an unprecedented timeframe.

The beta building is a prototype of the construction system developed to deliver this brief. The factory in a box construction system is designed around the principles of rapid, safe construction by a low skilled team delivered through composite DfMA components that can be shipped out of Europe or procured locally as required.

Mass customisation and future flexibility are incorporated and tuned to GSKs specific business requirements. Best practice operation and maintenance is provided via standardised materials, operation and infrastructure. Finally, the design extends into a tailored BIM solution enabling rapid optioneering with early cost control and allows all components to be tracked through design, manufacture, logistics, construction, operation and maintenance via an integrated QR code asset management system.

The prototype is the first built example of the GSK factory in a box system, so it was important to test the complex mechanical principles and train the multi-skilled



workforce who will deliver the real facilities. The prototype demonstrates quality and compliance, providing detailed understanding of cost, time and supply chain metrics and showcasing the programme to other parts of the GSK business. The system is specifically designed and optimised to deliver benefits over traditional construction in the following:

Safety

Work at height has been eliminated through the use of a bespoke mechanical system that allows the complex, heavily serviced walk-on ceilings to be assembled at low level then lifted into position with hydraulics or chain blocks. Both options were tested and proved and are available depending on facility size and site team preferences.

A folding portal installed in prefabricated sections achieves the same for the envelope. Composite modular components allow step-by-step site assembly via instructions provided throughout.

Fewer people, reduced working at height and reduced site materials, coupled with better instructions produce a much improved, simplified and significantly safe site environment.

Rapidity

With less site work, facility construction speed is exponentially increased. Value is also added via rapid

design optioneering in a tailored BIM ecosystem. Predesigned 3D components containing full cost/construction information drag and drop from the component library in premade configurations following 'snap into place' assembly rules and live link to the library of standard construction and fabrication details.

High quality

The component-based system allows for quality validation in advance. The offsite fabrication delivers a significant increase in quality and reduction in waste. Site interfaces have been designed out or simplified to improve quality and minimise the risk of cost and time overruns associated with snagging/making good defects. Lifecycle management is incorporated as standard via a QR code asset tracking linking all components to their design and operation and maintenance (O&M) information as well as the installation and cost metrics and service history.



Efficiency

The combination of reduced waste, increased speed to market, rapid optioneering with high cost certainty to a standardised quality and decoupled procurement to suit local market conditions help deliver solutions that are fit for purpose with little or no redundancy.

Scalable/flexible

The factory in a box solution is suitable for a wide range of building sizes and building types and delivers common facility design/operation.



Costed and proven

The tangible benefits of the system have been proved and fully costed through the prototype.

Project challenges

The challenge with the beta building was to gain as much value for a low cost. This meant incorporating all complex junctions, building a full 15 m × 15 m serviced ceiling to test lifting, build a small volumetric change module with the minimum amount of envelope and demonstrate all finishes relevant from a quality perspective.

Initially a full mini facility was proposed with working services. However, it quickly became apparent that greater benefit could be achieved by separating the various elements. The internal superstructure including the serviced lifting ceiling and cleanroom spaces were built in an existing warehouse. The volumetric change module was plugged into this externally. Once assembled various testing was undertaken including proving maintenance and repair strategies and resilience as well as trying out alternative construction methods and supplier engagement to identify successes and lessons learned.

The beta was then shown as an exemplar at a series of open days to collect feedback from all parts of the GSK business. It acted as a demonstration of what has been achieved and an example of offsite construction and the benefits for the future. Other interested parties from various parts of the construction world also visited and left feedback, thoughts and opportunities for consideration.

The prototype has now been disassembled stored in shipping containers before it is ultimately converted into a GSK training facility.

Progressing the project

The design has been undertaken by the Front End Factory (FEF), a collaboration between GSK and the research and development (R&D) side of Bryden Wood (Bryden Wood Technology). The factory in a box solution is a complementary part of the work undertaken by the FEF, which is focused on a number of areas from strategic brief development to analytical and process modelling, architectural consultancy, engineering solutions and the procurement and construction of facilities. The collaboration is designed to draw on the specialisms and skillsets available across the two businesses to solve difficult problems without being limited by the usual constraints imposed by the client, consultant and contractor divides.

The project involved very early engagement with manufacturers and the supply chain and a true collaborative approach to problem solving. The FEF and GSK have avoided the traditional risk adverse approach in favour of early engagement, long-term collaboration and a new approach to value led construction.

GSK are in discussions with a number of possible clients to use the same system for a range of other applications from pop up, relocatable hospitals in disaster and conflict zones to multi storey configurations for data centres. These will be tailored to the individual applications while building on the engineering and testing already undertaken to retain the key benefits in relation to speed, safety, scalability and flexibility.

Fit for purpose solutions

The beta is a full-scale prototype of the factory in a box system, designed to prove a wide range of criteria categorised as buildability, equipment/commissioning, logistics, facilities management and quality.

A few of the key aims that were tested and proved as fit for purpose were:

- A full 18 m × 15 m serviced walk-on ceiling can be constructed at low level and lifted into place with walkways, services, steelwork and distribution systems and that the mechanical principles and key mechanism works as intended.
- Train a low skilled team and prove that the documentation is adequate and the proposed install sequence is practical and efficient.
- Demonstrate that all elements fit into ISO shipping containers as designed and can be transported and lifted in and out without risk of damage.
- Ensure that complex services connections between lifted ceilings can be made as intended, and that pipes and sections of busbar can all be commissioned, accessed for maintenance and replaced if damaged.
- Demonstrate quality and compliance of key parts of a fully prefabricated pharmaceutical facility.
- Test and document the effectiveness and ease of the maintenance strategy for the safe repair and replacement of components.
- Collect construction and logistics cost and time metrics directly from a live project and establish the performance of key parts of the supply chain as well as identifying future risks.



Case study 3: Heathrow Flight Connection Centre, London, Bryden Wood

- 4,000 m² facility serving 9,000 passengers a day.
- Majority construction taken off-site to minimise the impact on airport operations.
- Number of site staff reduced by almost 75 per cent.
- Zero RIDDORS, lost time injuries and operational impact.
- Cost reduction of 27 per cent compared to traditional build.
- Construction timescale reduced by 38 per cent compared to traditional build.
- Total length of stand closures reduced by six months giving £1.2m saving in prelims alone.

The project

As part of the ongoing remodelling of Heathrow Airport T3 there was a requirement to create a temporary Flight Connection Centre (FCC), serving 9,000 passengers a day across an area of over 4,000m². This would allow the existing facility to be demolished and remodelled, but not affect passenger flows and experience.

As the only space available, the facility was built on Airplane Stand 323. This location came with an enormous number of restrictions due to the very close proximity of operational aircraft and the operational airfield environment serving these planes.

The operational readiness of the facility was critical for Heathrow Airport to close down the existing T1. The implications of not meeting this date and the impact on airline departure and arrival locations were considered enormous. There was no solution in place that could be constructed in the timescales or for a budget that was acceptable to Heathrow. The design and delivery of the building needed to remove as much risk and uncertainty from the delivery process as possible.

Bryden Wood took the briefing requirements, and in partnership with Mace, took the building from a sketched delivery strategy to a completed and operational building in under 12 months.



Overview

Multiple offsite techniques were used within the delivery of this facility.

Our approach was to ensure that the building was designed with a robust build strategy in mind and not simply to design to area requirements and material finishes. It was paramount that the contractor, Mace, was both comfortable and engaged in the design process.

- The foundations of the building were designed as load spreading bases above the apron level. This removed all sub-structure works required on site and meant the apron could be returned to use as a plane stand with the minimum remedial works. This represented an immediate cost and programme saving.
- The first floor 'plinth' was created using standard sections only, with minimum fabrication requirements. Precast wall shutters were used to create the floor planks as this ensured a smooth surface to both faces, which greatly reduced installation tolerances and reduced the need for decoration from the underside.
- All the primary services required for the first floor were housed in a pre-fabricated steel box truss. This provided both the central spine support to the building, and also meant that the need to install high level services was reduced.
- A perimeter ductwork distribution was installed via the use of a 'leaky sock' duct. This was both quick

and easy to install, but gave enormously efficient distribution of air throughout the space.

- The enclosure to the first floor was created using an adapted portal frame product more commonly used in farm building applications. By working alongside the manufacturer of this product, one side of the portal was designed to sit on the box truss, which would remove the central line of structure to give a far greater degree of clear span within the building.
- Ground floor coaching gate and staff areas were created using standard volumetric units. The lightweight nature and load spreading characteristics of these structures meant no foundations would be required and yet uninterrupted spaces could be achieved.
- The vertical circulation core was constructed using prefabricated large span 'tubes'. The nature of their height requirement to allow passengers to circulate comfortably within meant they had a natural spanning capacity due to the truss formation.
- The site fit-out requirements were reduced by designing a 'screen' ceiling consisting of suspended acoustic baffles that could be installed very quickly. This gave both the acoustic absorbency required for the space, but also an aesthetic that screened the robust nature of the structure above from the passenger creating a lively look to the space.





The case for the specification of offsite solutions

The restrictions of the site from a number of angles drove the necessity for a pre-fabricated solution.

The facility is both airside and on the live airfield adjacent to existing, in-use buildings. On any project the consideration of safe working is paramount, but in an environment with such obvious security and safety risks, maintaining stringent levels of health and safety requires every piece of work to be carefully planned and executed.

Use of prefabrication facilitated control of the project while reducing the number of operatives on site, which was reflected in the project's exemplary health and safety record. Deliveries and the ability to access the site during normal working hours was restricted.

Adopting traditional construction techniques would have been slow and expensive – the timescales involved were simply not suitable for the delivery of a traditional solution.

In addition, the need for the building to be decommissioned within 18 months lent itself to the use of prefabrication as the install methods could simply be reversed giving a much 'slicker' decommissioning strategy.

Benefits of offsite

All prefabricated elements were delivered to site on time, giving enormous programme and cost protection.

The building was erected six months quicker than a traditional solution. This offered a saving of £1.2m in preliminaries alone.

The number of site staff was reduced by almost 75 per cent. In addition to huge improvements in health and safety, this assisted in reducing preliminaries and facility costs. It also reduced absentees and logistic issues associated with a large workforce, which also protected programme and cost.

The reduced labour force and reduced need to work at height was a key factor in the project being delivered with zero RIDDORS, zero lost time injuries and zero operational impact.



The environmental strategy was designed around both the requirements of the building and its durations. Environmental efficiency was maximised by balancing the servicing requirements of the building with the embodied energies involved in the supply of centralised plant.

Borrowed air was used as a means of secondary cooling of the circulation space eliminating the need for further centralised plant.

The brief for this particular building was unusual. It is situated on a live, but temporary, airfield, and needed a quality solution that safeguarded Heathrow's operational and passenger experience.

The building techniques reduced the need for scaffolding or any other major working at height issues. Raised elements were all prefabricated and pre-assembled (where possible). Connections were made for safe platforms etc. The cumulative figures from this approach are shown as follows, and supported by the health and safety award that the building received from Heathrow:

- Projected man hours following traditional scheme design – 555,336.
- Actual man hours post-prefabrication solution (including programme saving) 146,574.
- A near four-fold saving in men being put to work on site.
- 2,900 tonnes of lifting materials over 90 days between December 2014 and February 2015 (day and night).
- Estimated half of working at height activities removed due to modular install.
- Zero service strikes.
- Zero RIDDORS.
- Zero lost time injuries.
- Zero operational impact.

Collaboration

The client knew that their brief was complex and outside of the normal realms of construction, so they would need the delivery strategy to be innovative.

They were supportive of the solution that Bryden Wood proposed. This allowed Bryden to develop the design quickly from sketches to scaled proposals, which helped to reinforce the ability of this design to deliver their requirements.

The project manager for Heathrow took a proactive approach to ensure Heathrow's standards were met. The design needed to challenge these standards in a positive way to ensure that the building continued to meet Heathrow's operational requirements and passenger experience but at a fraction of the normal price.

As mentioned previously, the main portal frame of the building was constructed using an adapted product often used in farm buildings. The manufacturer had



only previously used their product for single span environments. As part of a collaborative approach, Bryden Wood worked closely with their engineers to develop a 'double span' version of the product. Using the pre-fabricated central service spine to provide greater, free space within the main security hall ensures that the building continued to meet Heathrow's operational requirements and passenger experience, but at a fraction of the normal price.

Case study 4: Crofton Sixth Form Learning Centre, Wakefield, Portakabin/Yorkon

The project

Crofton Sixth Form is a pioneering partnership between Wakefield College and Crofton Academy, which has opened to meet the increasing demand for post-16 places in the region.

Crofton Academy was keen to build on its status as a highly successful secondary school catering for 11 to 16 year olds with the addition of a new sixth form facility. At the same time, Wakefield College had a requirement to expand its own post-16 provision in the region. The two institutions formed a unique partnership to create a purpose-designed learning centre.



The solution

The concept architects for the scheme were P+HS Architects, who have previously collaborated with the Portakabin Group on a number of Yorkon buildings including the award-winning science centre at Christ College in South Wales.

Following a visit by the client to the Portakabin Group production centre in York as part of the procurement process, a Yorkon offsite building solution was selected for the project.

The 528 m² building on the site of Crofton Academy was handed over after just 13 weeks on site and the craneage phase was carried out during school holidays to minimise disruption to teaching.



A challenging school site

This was a particularly challenging project with the site being located close to existing school buildings and between steep grass banks. This involved the use of a 500-tonne crane to lower the steel-framed Yorkon modules into position. Portakabin provided a full service for this project, including modular design and engineering, manufacture, fitting out and landscaping.

The building's distinctive external envelope features a bold green and black vinyl wrap, which contrasts with the dark grey external finish.

Facilities include:

- six classrooms
- study area
- computer suite
- common room
- office
- circulation areas
- lift
- toilets with disabled access
- plant room.

All teaching and study areas have full IT connectivity and one of the classrooms has a computer game design facility to accommodate a specialist course offered by the college.

A flexible building designed for future expansion

The building was designed with partitions that will be removed to open up the spaces on completion of the second phase. The Portakabin Group has already installed the ground works and service infrastructure required for the sixth form's expansion.



Comments from the project team

"The use of a Yorkon offsite solution radically reduced the programme time and the impact of construction on the school's existing operations. We simply could not have achieved that with site-based construction."

"We have a very good relationship with the Portakabin Group, and their team met every one of their commitments. The building's performance and appearance have exceeded all our expectations. We wanted an eye-catching facility and that is exactly what has been achieved. It definitely has the 'wow factor' and reflects the college's identity and values very well."

"The new facility has been exceptionally well received by everyone who has visited it, including other schools and colleges. The internal layout uses every inch of space and we now have an outstanding sixth form centre for up to 150 students. I am also delighted to report that this is the first building I have ever received with absolutely no defects."

Jon Howard, Director of Estates, Wakefield College

"We recommended a Yorkon solution for this project having worked with the Portakabin Group previously. We knew the approach would result in delivery of the building on time, on budget and built to a very high standard – and to a much shorter programme than on-site construction could achieve. Their team is always thorough, proactive and often brings additional thoughts and ideas to a project, as well as aesthetic flexibility."

"Use of a Yorkon solution will also allow the sixth form centre to be expanded very quickly in the near future to meet the increasing demand for places."

Phil Bentley, Director, P+HS Architects



Sustainable building solutions to offer unrivalled aesthetic flexibility

Yorkon building solutions from the Portakabin Group offer unrivalled aesthetic flexibility and give building designers, contractors and occupiers the benefit of thousands of configurations and permutations to meet almost any design brief, site and building footprint.



The Yorkon approach is also highly sustainable – the number of vehicle movements to site is reduced, there is less material waste, air leakage is less for lower running costs and improved thermal efficiency, and there are fewer internal columns to facilitate space planning and future reconfiguration to meet changing local needs.

The benefits of a Yorkon offsite solution include:

- Programme times reduced by up to 50 per cent for earlier occupation.
- Reduced disruption to teaching during construction.
- Columns that are no longer visible either internally or externally, for a seamless façade that can be specified with or without cladding.
- The facility to fit almost any building footprint, including those designed for site-based construction – reducing architects' design time and resources.



- Module lengths from 6 m to 18.75 m that give even greater design and space planning flexibility and the option of using larger but fewer modules to reduce craneage, transport costs and site works, which is much more efficient.
- Two module width options of 3 m and 3.75 m, three height options for single-storey buildings, and seven different heights for ground and intermediate floors on multi-storey schemes to facilitate linking to existing traditionally-constructed buildings.

The project team:

Client: Wakefield College

Concept architects: P+HS Architects

Design build contractor: The Portakabin Group

Off-site solution: Yorkon

Case study 5: C-Probe: low carbon smart concrete for the built environment



Strategic aims

- Create a cost-effective low carbon binder material for built environment applications from recycled industrial by-product materials.
- Provide integral fire and chemical resistance to reduce the cost of infrastructure build through the removal of construction processes.
- Provide add-on corrosion control from new with integrated im-pressed current cathodic protection (ICCP) capability cast within the concrete.
- Reflect the requirements of EN 1504, EN 1363-1, EN 206 and BS 8500.
- Provide long-term durability for construction, which is controllable and measurable.

Emerging technology

C-Probe Systems Ltd, working with Sheffield Hallam University, has developed a new cementitious material that has wide implications for the construction of civil engineering structures.

This new technology has been developed from synthetic

stone derived from recycled and industrial by-products combined in an ambient blending process that requires no additional heat.

This manufacturing process has ultra-low energy consumption and, in addition, the mix designs require low water as they are alkali-activated.

All these features of the manufacturing process provides an ecologically sustainable and low carbon product with up to 80 per cent CO₂e savings compared to ordinary Portland cement equivalents (oPc). These products are alkali-activated cementitious (geopolymer) materials.

International awards

This technology has seen great success with the international awards such as:

- Mott MacDonald Milne Award for Innovation 2014.
- Fiatch CETI (Celebration of Engineering, Technology and Innovation) Award 2015.
- RISE (Research Innovation Sustainability Enterprise) Awards 2015.
- International Concrete Repair Institute (ICRI) Sustainability Award 2015.



Case study 6: Boston Pioneers Free School Academy, Lincolnshire, McAvoy

The project

This primary school, located in the Witham Ward of Boston, was facing an acute accommodation problem. Initially designed to accommodate 60 four to 11 year old pupils. However, an influx of people to the Boston area has seen the school population rise to 120 pupils, with demand continuing to increase year-on-year.

Challenges

To transform a former car showroom and repair workshop premises into a bright new inspirational learning environment on a split-level site surrounded by a mix of commercial and residential properties. Part of the site is located within a conservation area.

Benefits

The spacious new build at Boston Pioneers school has enabled the school to pursue its ethos to teach children in smaller sized groups for key subjects such as maths and English. The ability to construct the main body of the school building off site enabled McAvoy to shorten the build programme by around 50 per cent.

Building in an offsite environment negated the need to have materials and labour resources delivered directly to site, which significantly reduced disruption and inconvenience to the local population. Offsite production also drastically reduced on site construction noise.

Considerable work was conducted in McAvoy's controlled factory environment, which had a dramatic impact on waste management. This meant that the amount of space required on site for waste storage and waste transport was reduced considerably.

Health and safety was easier to manage with modules being laid out on the factory floor in a dry and clean environment. Working indoors, each trade was able to work on specific elements of the project without interruption from competing trades. Materials were



brought to the point of production by forklift delivering at the appropriate level, rather than having to be carried up flights of stairs, as would be the case with a traditional method of construction.

The building was installed on site over a six-day period, with a smaller labour force than would be required over a greatly extended traditional build period.

The school's pupils and teachers relocated to a temporary building off site during the build process.

McAvoy were appointed to design and build a new purpose-built two-storey 1983 m2 educational facility capable of providing a modern, stimulating learning environment. The project was funded by the Education Funding Agency (EFA) and took a total of six months to complete on site.

The site, surrounded by a mix of commercial and residential properties, and partly falling within a Conservation area, required full planning permission. The new build primary school for four to 11 year-olds built by McAvoy can accommodate up to 420 pupils.



The school accommodation is of modular construction, and includes 21 new KS1 and KS2 classrooms, main hall, sports hall, kitchen/food technology areas, breakout space, toilets and showering facilities. There is also a 4D classroom which features interactive visuals – Boston Pioneers is the first school in Lincolnshire to have the technology. The spacious new build at Boston Pioneers School has enabled the school to pursue its ethos to teach children in smaller sized groups for key subjects such as Maths and English.

The building has high levels of insulation and is finished in the latest render wall cladding externally.

“McAvoy’s commitment to the school and attention to detail was something else. One of the best elements of the new build school was that we got to work closely with the architect to ensure all of the school’s needs and wants are reflected in the finished building.”

Jo Bland, School Principal

Case study 7: Ocean Academy, Poole, McAvoy

Challenges

To develop an existing site that previously housed a nursing home to help meet the client requirement for a high quality school building as a result of pressure on school classroom provision within the borough.

Benefits

Speed of delivery as a result of using offsite modular construction greatly reduced the overall project duration. Additional benefits including the use of whole-life costing aided by the use of BIM technology ensured project duration certainty.



With pressure on its school classroom provision, the Borough of Poole needed a solution that would be technologically advanced, future-proofed and capable of being completed quickly. The McAvoy Group delivered an outstanding school in under 10 months (excluding pre-construction phase) that has earned favorable reviews from its client, the local community and teaching staff. The first phase of the 1865 sqm school, run by Aspirations Academy Trust opened to Year 3 in September 2015.



Around 90 per cent of the school structure was manufactured offsite using McAvoy's innovative modular build techniques, as well as greatly reduced health and safety risks as a result of the client's choice to opt for an offsite modular solution.

The EFA supported project incorporates 14 bright classrooms across two floors, a large hall, with staging area for performances and a studio area for dance and other activities, smaller intervention rooms and a library/ learning resource facility.

This school is a prime example of how quality offsite modular build can help ease the pain of many local authorities in the UK who require fast, quality, permanent fixes to acute accommodation issues.

Beyond the modular build lies a green outdoor environment, which comprises raised flower beds for cultivating vegetables, a full size football/rugby pitch, a MUGA (multi use games area) for other ball games, a bug hotel, habitats and an environment that services the needs of multiple departments in the school.

"Local residents have been blown away by the new school. We have also had many positive comments from local residents about McAvoy and how they have kept local residents informed."

Vicki Wells, Head of Children,
Young People and Learning, Borough of Poole

Case study 8: Porin Puuvilla shopping centre, Pori, Finland, Trimble Tekla

Project details

Area: 100,000 m²

Volume: 400,000 m³

Total investment: circa €130m

Contract total: circa €110m

Construction period: November 2012 to October 2014

Project team

Client: Porin Puuvilla Oy, c/o Renor Oy and Mutual Pension Insurance Company Ilmarinen

Design and build contractor: Skanska Talonrakennus Oy

Architectural design: Arkkitehtikonttori Küttner & Pussinen Oy

Structural engineering: Narmaplan Oy

Element supplier: Parma Oy

Element engineering: Narmaplan Oy and A-Insinöörit Oy

The project

A hundred years ago the Porin Puuvilla mill produced cotton. Today, it is a shopping center combining old and new structures to house retail, office, warehouse and parking space. At Puuvilla the precast concrete provider, Parma, had to manage a very tight schedule, which they tackled with Building Information Modeling (BIM).

Modeling took into account the needs of all project parties, extensive use of rich model information in production and installation, and collaboration between project parties in design and fabrication and on site. The geometry, location and building section information of the precast slabs were directly transferred from the Tekla model to the factory's enterprise resource planning (ERP) system without drawings.

Puuvilla is located on the bank of the River Kokemäenjoki, in Pori, Finland. The construction project includes extending the old textile mill Kutomo and Lusikkalinna, converting Värjäämö (dyehouse) into office and business facilities, and demolishing Uusi Kehräämö (spinning mill)

and the repair shop. 3D modeling-based design was adopted throughout the project. The 13 project parties agreed that both construction process and the quality improved significantly with modeling-based design. This is the story of the Puuvilla project showcasing viewpoints of some project parties.

Maximal model information benefits

Parma supplied and installed precast concrete elements. The team used BIM from the bidding stage when Parma created a model for calculating quantities and presenting solution suggestions. For Parma, Puuvilla was a big job. With two detailing offices, seven factories and two assembly subcontractors they delivered about 10,000 precast units. For example, the Lusikkalinna part alone has a total of 4,793 precast components, including 2,097 hollow core slabs, 463 beams, 192 columns, 1,595 composite planks, 55 stairs and 130 load-bearing walls, so accurate model information was vital for production and construction.

Detailed model with exact dimensions and information

After the successful bidding, Parma continued to work with BIM. Two contracting detailing offices located in different parts of Finland, A-Insinööri and Narmaplan, collaborated seamlessly to create a Tekla model that had zero dimensional mistakes. For Lusikkalinna, no drawings were created for hollow-core and half-cast slabs as the slab designer received the detailed information using a Tekla model. The geometry, location and building section information of the precast slabs were directly transferred from the Tekla model to the factory's ERP system without drawings. To support element design management, the team used the model's element status information about the progress of detailing, and used it in meetings. Despite the busy schedule, the deadlines were met successfully and praise was given for error-free work, which was a result of collaboration and good quality achieved with BIM.



BIM for production

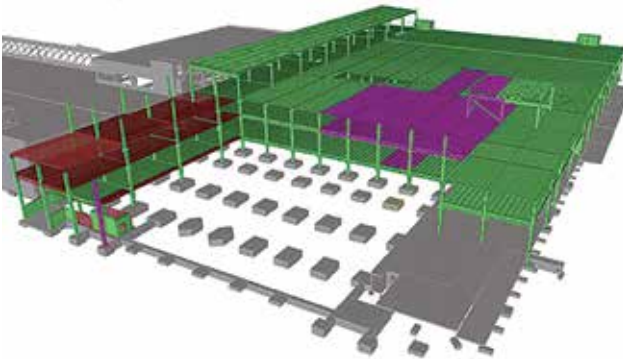
A key to keeping the tight schedule was abandoning email and paper and instead using models as communication tools. With the status information in the models, Parma monitored and managed the progress of element design and production so that the plant could prepare in advance and produce the elements fast. The fabricator's ERP systems read the dimensions and material specifications directly from the Tekla model avoiding human errors. Reliable information about the element materials, formwork and quantities was available in the Tekla model so the information could also be used for material purchase even before the all-element drawings were ready for production. The status information was read from the ERP system back to the Tekla model daily, while the other project parties used BIM to access the information on site.

"We could monitor the production and co-ordinate it with the model without the old-fashioned paper documents. This saved us a lot of time during the production planning and fabrication."

Marko Reuna, Parma Solutions

Fast installation

The framework installation proceeded at a record speed. The model information kept the site staff informed and was used for visual review before and during installation.



Production engineers entered the actual element installation dates in the Tekla model for monitoring the schedule. Any element being ahead, on or behind schedule was indicated in the model.

Transforming the way the world works

- Collaboration using precast modeling guidelines.
- Delivery at a record speed and without errors. Status management kept.
- Everybody working in design, fabrication and construction informed.

Precast modeling guidelines for collaboration

A crucial success factor in the Puuvilla project was using the Finnish precast industry's modeling instructions (Kautto, 2012). These offered common guidelines for the work of design and detailing offices, A-Insinöörit and Narmaplan.

These guidelines allowed the two companies to work on the same project following the same manner of modeling. However, primarily the modeling guideline supports precast fabrication facilities and site work and focuses on the needs that the two disciplines have regarding the model information. The project parties agreed on questions such as element naming, data fields to be completed and other fabricator specific issues. At Puuvilla, the installation contractor and the



element factory benefited from correct, easy to use model information. Models with consistent content can be effectively used and bring benefits to the entire project by saving cost, time and material. Following the precast modeling instructions should produce similar models regardless of the design office or modeler.

"BIM boosted the installation and made decision making more assured as everyone could see what we were discussing."

"As the design and build contractor we felt that sharing a common guideline for modeling was extremely important."

Juha-Matti Kujanpää, Skanska

Reference

KAUTTO, T (2012) *BEC 2012 Modeling instructions for designing prefabricated elements*

http://www.elementtisuunnittelu.fi/Download/24108/BEC2012_Modeling%20instructions%20for%20designing%20prefabricated%20elements_V103.pdf

Case study 9: Combined heat and power link, Birmingham New Street, Birmingham, NG Bailey

Benefits

- £620k cost saving.
- Three months programme saving.
- 11,000 operative hours removed from site.
- Reduction in number of site operatives from 45 to 12.
- 7,500 hot work hours carried out under factory conditions.
- Zero incidents or accidents, and reduction of hot works and confined space working at site.
- 75 per cent reduction in site deliveries.
- 28 tonnes carbon savings from installation strategy.
- 3,000 tonnes p.a. lifetime carbon savings.

A pioneering re-development has been completed at Birmingham New Street station for client Network Rail. The project provides for the distribution of waste heat to new buildings on the re-developed site and, for the first time, also connects the City's northern and southern district heating loops.

An innovative combined heat and power (CHP) link has been developed and installed by NG Bailey Offsite Manufacture. Using just over 1 km of pre-insulated pipework manufactured at NG Bailey's prefabrication factory.

This project saw NG Bailey join forces with Network Rail, Cofely, Atkins and Mace. This innovative partnership implemented one of the first sustainable solutions of its kind potentially cutting carbon emissions by 3,000 tonnes per year when combined with the wider city scheme.

With the emphasis on minimising disruption at New Street station, the solution developed by NG Bailey Offsite Manufacture represented an ideal solution. Working to a tight timeframe, with programme and cost certainty as critical client drivers, the flexibility afforded by the transfer of large portions of works offsite to support a controlled programme of night working on site ensured every milestone was achieved and the project was completed on time.

Overview

The link was designed, built and installed into Birmingham New Street station by NG Bailey Offsite Manufacture, is part of a wider £750m re-development.

NG Bailey Offsite Manufacture devised a solution for the new CHP link which could be successfully manufactured externally and then installed with no disruption to daily operations at New Street Station.

The scope of the project included over 1 km of pre-insulated, 250 mm diameter pipework, gas pipework, valves, structural galvanised steel bridges/modules to carry pipework across roof levels, expansion bellows, and electrical containment services.

By transferring works to a controlled factory environment, some 11,000 general operative hours and 7,500 hot work hours were removed from site with a commensurate headcount reduction on site from 45 to 12 personnel. The approach also resulted in 75 per cent fewer deliveries compared to a traditional construction approach and resulted in zero incidents/accidents, which led to two gold ROSPA awards.



The CHP link takes waste heat from the station and re-distributes it to supply heat to offices and other buildings in the City, including the new John Lewis building in Grand Central shopping arcade and Birmingham Children's Hospital.

A key aspect of the solution created by NG Bailey was to link the previously separated City's northern and southern district heating loops through the station itself. The CHP link will enable recovered energy to be exported to the Birmingham District Energy Scheme, owned and operated by Cofely, which would now complete a much more energy efficient and effective circle of power and heating across the whole of the city.

The NG Bailey offsite proposition featured over 1 km of pre-insulated distribution pipework, complete with leak detection system, supporting framing structures and twenty five bespoke bridge modules, gas mains containment work and pre-assembled bracketry. The products were designed, manufactured, installed and commissioned to a challenging timetable.

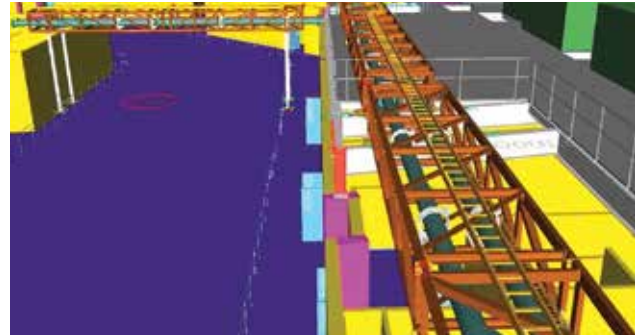
Project value and programme

Overall contract value to NG Bailey was £2.5m, with offsite manufacture works worth £1.2m.

The contract was awarded in November 2014 with completion set for July 2015 but included a milestone for

works in retail zones to be completed by January and April 2015 due to store openings. The whole project was complete by July 2015.

Design involved the development of a co-ordinated 3D model including plant/equipment, distribution pipework and supporting framing structures/bridges, and responsibility for full structural and thermal expansion calculations.



Manufacture of approximately 1,100 m of 250 mm diam. pre-insulated pipe spools, carried by 25 bespoke framing structures/bridges which also incorporated valves, gas main pipework, containment and bellows.

Installation services based on 45 deliveries and 30 contract crane lifts, with connections and commissioning carried out by NG Bailey on site.



Case study 10: Wastewater treatment works water quality, Haslemere, Costain

Efficiency levers

- productise/DfMA
- collaborative planning
- integrated BIM
- integrated SCM
- one team
- project value – £5m.

Benefits to the customer

- safer: no lost time due to accidents
- better quality: no loss of throughput or reduction in quality of treated water
- faster: 50 per cent reduction in time
- cost saving: \$2.5 capex reduction.

The project

As an urgent need of the AMP6 programme, Thames Water required the 2.9Ml/d water treatment works at Haslemere to be upgraded to treat its water sources that were contaminated by historic cryptosporidium problem. The works needed to be brought back into service to reduce the supply zone deficit risk before the summer's high demand. This involved the installation of an ultra violet treatment facility with all the attendant water quality monitoring and controls for the treatment site being fed by the two gravity springs, with a pump being installed in a third spring.

Costain applied it's factory thinking process and tools to the 20 project team solution to ensure programme delivery and right first time quality. The supply community was appointed early in the design process, and through collaboration between Bridges Electrical, ATG and the project team off-site construction was embedded into the design, using DfMA techniques. This enabled all works to be manufactured, tested and pre-commissioned before the equipment was delivered to site for assembly.

Offsite manufacture enabled simultaneous working to be employed while the basic civils were completed. In addition, the MEICA trade input on-site was reduced from nine to four weeks. Increasing safety on a small site, reducing site traffic and ensuring the project was delivered in time for the summer demand.

Case study 11: Wastewater treatment works, Liverpool, Costain

Efficiency levers

- productise/DfMA
- collaborative planning
- production planning
- product launch
- integrated BIM
- integrated SCM
- one team
- project value – £200m.

Benefits to the customer

- safer: industry leading safety
- better: no loss of throughput or reduction in quality of treated water
- faster: eight months in reduction of time
- cost saving: £25m capex reduction.

The project

Costain delivered a £200m contract for United Utilities (UU) at the waste water treatment works (WWTW) in Liverpool. The works treats wastewater from a population equivalent of one million people. To ensure process reliability the existing WWTW has been extended into the neighbouring Wellington Dock. The new dock area is being used to build a new sequencing batch reactor (SBR) and will sit as a 'floating' construction, on top of 10,000 capped piles. To minimise the footprint, the SBR has been double stacked and is fed from a new feed pumping station to high and low level distribution chambers.

There is a new sludge treatment facility to feed the existing anaerobic digestion plant. This generates gas from the sludge as fuel from a CHP unit, which can generate 1 to 2MW of electricity. Factory thinking principles have applied throughout the project as follows:

- **Productise:** smart/modularised off-site products such as pip bridges, concrete cruciform, modular stairways and precast support beams.
- **Production control/collaborating planning:** creation of heartbeat through regular monthly, weekly and daily meetings to review progress and waste.

- **Supply chain:** early engagement allowed innovation, cost and programme savings to be achieved principally around concrete applications.
- **BIM:** technical challenge and enhanced collaboration through design and build phases enabled effective programme management and improvements and enhanced information flows.

Case study 12: Student accommodation, Clarence Street, Newcastle Upon Tyne, Premier Modular Ltd

Premier Modular Ltd was selected to provide a 206 bedroom student accommodation block.

This high quality five storey building situated close to the city centre in Newcastle Upon Tyne, comprised a combination of 54 studio flats, 150 en-suite bedrooms and two accessible en-suite bedrooms with associated shared living spaces and kitchens.

Driven by an immovable programme requirement of a September student intake, Premier worked in partnership with the main contractor, efficiently manufacturing 300 modules fully fitted out and decorated in the factory. This is an excellent demonstration of the enormous time benefits realised by using the Premier off-site system. Significantly the foundations and demolition was started on site while the modules were being manufactured – ensuring no time was wasted in the process.

The construction of the building uses a combination of products from the innovative Premier range, combining light gauge steel frame modules for the bedrooms, with heavier gauge steel modules for the larger open plan communal areas.

Project value: £5,069,200



Case study 13: Goodwin Development Trust – Villa Place, Hull, Premier Modular Ltd

Premier Modular Ltd worked with The Goodwin Development Trust to design a housing block that would ensure a high quality of life for their residents. The ambition was to create the first Level 5 in the Code for Sustainable Homes (CFSH) for social housing in Hull (CLG, 2010).

The development consists of five terrace houses on the Thornton Estate located on the outskirts of Hull City Centre. The houses are three-bedroomed, five-person units, which incorporate innovative architectural design, energy saving materials and use renewable energy resources all designed to attain Level 5.

Key design features include photovoltaic panels, a communal rainwater harvesting tank, greywater recycling, triple glazed windows and doors, restricted water use per day, incorporating dual flush toilets and mixer taps/showers, low energy light fittings throughout and integral recycling bins in each kitchen.

To complement the sustainable design each property has a secure bicycle store and storage space for refuse, recycling and compost bins. The development was finished with a community planting area to promote growing food and biodiversity while encouraging social well-being.

Project value: £390,000

Site programme: 12 weeks



Reference

CLG (2010) *Code for sustainable homes*, Communities and local government, London, UK

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/5976/code_for_sustainable_homes_techguide.pdf

Case study 15: Tresham Crescent Community Centre, Westminster City Council, London, Premier Modular Ltd

Premier Modular Ltd was appointed to this challenging design and build project due to their project management experience and diverse product range.

The four storey children's community centre provides accommodation for up to three children's services providers, with modern play and learning facilities and additional children and family support services for the local area.



Premier acted as principal contractors, demolishing the existing building over a London Underground line in a high density residential area in the centre of the City of Westminster, before constructing the new children's community centre within its footprint. Premier's design and project management teams worked together to ensure that a modular solution was viable in this central London location. The flexible modular system allowed a variety of different sized modules, all within the 2.9 m transport width restriction, all delivered to a tightly controlled programme to minimise disruption.

Key design features for the brick clad building were a 6 m high two-storey modular hall, external play areas on the first

and second floors, with green roof landscaping, and exterior staircases clad with bespoke laser cut panels featuring a latticework design. The building has been sustainably designed meeting BREEAM Excellent standards.

"We are delighted to have taken this step towards providing state-of-the-art new facilities, which will make it easier for families in Church St to access the services they need."

Councillor Daniel Astaire, Westminster City Council
Cabinet Member for Housing and Regeneration

Project value: £4m





Ian Heptonstall

www.offsiteschool.com

Action Sustainability has a proven track record in delivering sustainability and supply chain solutions. We work across many sectors including high value engineering, construction, grocery, property, retail, financial services and the public sector. Our clients include Molson Coors, Cobham Aviation, FMC Technologies, Skanska, Grosvenor, Network Rail, Premier Farnell, Lend Lease, City of London, Sainsbury's, Sir Robert McAlpine among others.

Action Sustainability is also the delivery partner of the Offsite Management School, an online learning platform catering for professionals and stakeholders in offsite construction. The school, supported by several of the major building contractors, aims to help build a best in class supply chain for the UK construction and infrastructure sector that will enable the industry to deliver its Construction 2025 objectives.



Dale Evans

www.onealliance.co.uk

The Anglian Water @one Alliance is a collaborative organisation of consultants and contractors working together to deliver more than half of Anglian Water's capital investment programme. The Anglian Water @one Alliance will design and build around 800 schemes worth approximately £1.2bn between April 2015 and March 2020, known as AMP6 – the current five year investment period, working closely with Anglian Water operations teams and other key stakeholders. We design and construct water and water recycling (waste water) treatment centres that serve more than six million people in the East of England (and Hartlepool Water) and maintain and improve the water mains and the sewerage network in the region. The following organisations make up the @one Alliance:

- AnglianWater Asset Delivery
- Balfour Beatty
- Barhale
- Sweco
- MMB
- MWH
- Skanska.



Murdo MacDonald

www.aquatherm-uk.com

Aquatherm Sales UK is a wholly owned subsidiary of The Ormandy Group of Companies and is the UK provider of the Aquatherm GmbH range of products. Forty years of constant product development have seen Aquatherm maintain a market leading position for producing the most advanced and environmentally innovative plastic piping systems for the building service(s), and process industries.

The range consists of Aquatherm pressure piping systems, underfloor heating solutions, fire sprinkler system, red pipe, and our exclusive wall/ceiling heating and chilled water system, Climasystem, providing a highly efficient low energy thermal barrier to every kind of building.

Aquatherm's polypropylene piping system is considered to be the most environmentally friendly on the market. Polypropylene is a chemically inert material, creating minimal pollutants, and takes less energy to produce, install and run than traditional materials. It is also fully recyclable.

ARUP

Matt Cooper

www.arup.com

Arup is an independent firm of designers, planners, engineers, consultants and technical specialists offering a broad range of professional services. We aim to help our clients meet their business needs by adding value through technical excellence, efficient organisation and personal service.

We provide the engineering and related consultancy services necessary to every stage of the project, from inception to completion and after. These are available to clients singly or in combination, to suit the particular circumstance of the job.

Throughout the world we aim to provide a consistently excellent multidisciplinary service, which also incorporates our concern for the environment. Arup is committed to sustainable design, to its increasing incorporation in our projects and to industry-wide sustainability initiatives.

Our firm has more than 12,000 people working in 92 offices in 40 countries and our projects have taken us to more than 160 countries.



Brian Churchyard

www.asda.com

As an EDLC (Every Day Low Cost) business, ASDA is constantly seeking new ways to deliver construction solutions which will directly and indirectly benefit our customers, enhance equipment and construction life cycles, and deliver sustainable innovation. ASDA, being part of the world's largest retailer Walmart, is focused on global alignment opportunities, delivering leverage through scale, welcoming businesses which have the capacity to support and deliver big thinking.

The ASDA Model construction specifications and general requirements provide the wider business construction and engineering direction; key utilisers being implementation and procurement teams looking to deliver a wide variety of business formats at best value. From traditional food stores of varying sizes, petrol filling stations with convenience shopping, through to ecommerce online innovation like Home Shopping, and Click and Collect.

ASDA has a highly efficient and effective construction model team, which sees innovation and new thinking as a critical route to the delivery of current and future strategies, with compliance and safety being very much at the top of this delivery agenda.

Expectations are high, objectives are performance measured and target driven. Our mission is to become the UK's most trusted retailer. Our purpose is to save our customers money every day. We believe in 'service to our customers', we 'respect the individual' and we 'strive for excellence'.



Ian Adamson

www.astrazeneca.com

AstraZeneca is a global, innovation-driven, integrated biopharmaceutical company. Our mission is to make a meaningful difference to patient health through great medicines that bring benefit for patients, and add value for our stakeholders and society.

Global engineering is the major projects delivery organisation of the company, providing professional engineering and project, programme and portfolio management of the company's investment and asset change portfolio. Based in four global centres (US, UK, Sweden and China) the organisation's vision is to meet the company's investment needs, safely and at the best value, by professional, capable resource that meet the specific needs of our business.

As part of our commitment to driving Lean execution and delivery throughout our supply chains, as members of Buildoffsite, we seek to ensure we provide a coherent and challenging client input into the work of this group.



Matt Parkes

www.atlasindustries.com

Atlas Industries is one of the leading providers of BIM management and design documentation delivery services to some of the world's leading consultants and contractors in the AEC industry. Established in 1998, Atlas' operations centre is located in Saigon, Vietnam, with a team of over 270 British, Australian and Vietnamese architects and engineers engaged on major projects globally.

Our multi-disciplinary teams have provided joined up BIM solutions on projects that have included a 1.6 km viaduct in Hong Kong harbour, residential and high rise hotel developments in Australia and the UK, rail infrastructure in Australia, and new airport terminal buildings in Singapore. Being agnostic in their service delivery approach and in the use of BIM tools, Atlas' delivers using a variety of software tools that include Revit, AECOSIM, ArchiCAD, Tekla, Navisworks and Solibri. We help businesses of all sizes overcome resource constraints, meet tight deadlines, and successfully document and delivery profitable projects.



Barry Blackwell

<https://www.gov.uk/government/organisations/department-for-business-innovation-skills>

Our mission is building a dynamic and competitive UK economy by:

- creating the conditions for business success
- promoting innovation, enterprise and science
- giving everyone the skills and opportunities to succeed

To achieve this we will foster world-class universities and promote an open global economy.



Kim Vernau

www.blpinsurance.com

BLP Insurance (Building LifePlans Limited) is one of the leading providers of residential and commercial latent defects insurance in the market. Our policies are underwritten by Allianz Global Corporate & Specialty, an AA rated global insurer, and are underpinned by an independent technical appraisal aimed at minimising defects right from the design stage. BLP Insurance is part of the Thomas Miller Group and has been providing building defects insurance since 1999. It is regulated by the FCA.

BLP Insurance is also part of the Buildoffsite Property Assurance Scheme (BOPAS), which has been developed by leading lenders, valuers and industry experts, to address the issues associated with lending on innovative construction methods. They are also the leading resource for 'whole life costs' methodology in UK residential construction, and offers durability assessments to facilitate the adoption of innovative and offsite manufactured systems.



Andy Watts

www.british-gypsum.com

British Gypsum, part of the Saint-Gobain Group, is the UK's leading manufacturer and supplier of plaster, plasterboard and dry-lining systems. With a long history of providing innovative, cost-effective and reliable products that meet the demands of the construction industry, the company is renowned for its pioneering work in training, as well as its forward-thinking strategy on innovation and product development.

British Gypsum offers a range of innovative products and services, ideal for off-site manufacturing where consistency, reliability and material robustness are essential. Tangible benefits to the process include:

- manufacturing cost savings through process reduction
- consistency in product quality and dimensional accuracy
- product durability for off-site applications
- certainty that products will comply with national Building Regulations
- adaptability and flexibility of products
- environmental sustainability with the British Gypsum plasterboard recycling service.

British Gypsum provides an unrivalled technical service with a network of Saint-Gobain Technical Academies and UKAS accredited test centres offering substantiated test data to meet ongoing project requirements. This technical capability allows British Gypsum to offer bespoke products, developed with the customer to meet their needs exactly.

British Gypsum has a UK-wide distribution network allowing fast and easy access to our group product ranges.

Our products include:

- gypsum fibreboards (up to 6 m × 2.5 m)
- plasterboard (performance and cosmetic)
- acoustic ceilings, tiles, planks and boards
- fire protection/encasement boards
- jointing materials and gypsum plasters
- metal partitions, lining and ceiling systems
- thermal laminate plasterboards
- external sheathing boards.

Our services include:

- technical advice on system selection
- UKAS accredited test centres
- specification development and value engineering
- u-value calculations
- bespoke products and sizes
- bespoke system solutions
- composite loads
- flexible procurement options/routes.



Martin Wood

www.brydenwood.co.uk

On projects where we perform a partial service, our unique offering makes us better informed in all areas. We are happy to work collaboratively with other design professionals, and well equipped to communicate with manufacturers and suppliers. Our commitment to transform the construction industry has culminated in running our own construction facility, providing us with the capacity to build and test low embodied energy structures in timber, high cement replacement concrete and low weight steel. This facility produces Bryden Wood's EcoCanopy building system, as well as other buildings, prototypes and products for the construction industry. By investing in our own developments (including research and development of systems) we are able to demonstrate not only our commitment to put into practice our ideals, but also to experience for ourselves the true financial and practical implications of what we are trying to achieve.

The factor common to all aspects of our work is that we aim to drive efficiency and value through bringing a construction logic into the design process. Our ultimate aim is to instigate a new integrity in architectural design and construction.



Julia Evans

<https://www.bsria.co.uk>

BSRIA is unique among the built environment specialists in providing independent, objective and practical support across the design, construction and occupancy phases of both new build and refurbishment projects.

With specialists able to measure and compare construction performance in all phases of design through operation, BSRIA is well placed to provide factual and authoritative feedback from innovative projects. We can work either openly or in strict confidence with whole teams or individual clients.

BSRIA is happy to partner with any companies in the building services and construction industries. The 735 BSRIA membership benefit from having a more direct involvement in our innovative solutions together with online access to Europe's leading Building Services Library and Information Centre.

BSRIA is pleased to be associated with Buildoffsite, and look forward to providing clients and fellow members with tried and tested services including:

- consultancy
- on-site and laboratory testing
- modelling
- research
- troubleshooting
- instrument hire, sales and calibration
- market intelligence.

BSRIA is an Associate Member of Buildoffsite.



Graeme Jones

www.c-probe.com

C-Probe Systems Limited is a manufacturer of products for the management of the whole life performance of structures. Its products include low carbon alkali-activated (geopolymer) binders for restoration and build, fireproof ICCP/FRP for structural strengthening, galvanic and impressed current anodes for corrosion protection, embeddable probes and sensors for structural health monitoring and network management systems for service life remote control and tracking of performance online.

These products are aimed at providing constructions that are controllable against the effects of corrosion whilst being intrinsically resistant to fire, chemicals and the environment that provide durable solutions for the service life of reinforced concrete and masonry structures. Our WoW Smart® technology provides future-proofing of precast structural elements with wet-on-wet cast-in cathodic protection that uses structural health monitoring for the tracking of the whole of its service life. Our internet management system (AiMS) allows engineers and owners to assess ongoing performance at the click of a mouse in the office or on the go.

The company has received many prestigious awards over 2015/16, including in the USA from Fiatech CETI, ICRI Sustainability Award, and ENR Top 25 Newsmaker Award and in the UK from Leeds Sustainability Institute RISE Awards (2) and most recently from Construction News Awards as a finalist for Commercial Innovation of the Year. These recognised the use of the product technology as both a restoration and build material.



Phil Holmes

www.caledonianmodular.com

Caledonian Modular offers a full design, manufacture and installation service for offsite construction projects from our manufacturing facility in Newark, Nottinghamshire. Our products range from single storey structures through to high rise multi-million pound buildings. In particular we specialise in offering fully bespoke solutions and high quality designs for clients who require the advantages of offsite construction (programme savings, project certainty, quality control and reduced weather dependency) without sacrificing architectural design criteria or site utilisation.

We also have the capability to offer hybrid solutions utilising panelised systems and traditional site constructed elements to provide the most efficient and cost effective building solutions.

Part of the \$580m champion group, we work throughout the UK and Northern Europe and undertake a range of works from turnkey packages to simple unit supply to main contractors across the following sectors:

- residential
- student
- PRS
- housing
- education
- military
- custodial
- hotels
- health
- commercial and retail.



John Spence

www.calfordseaden.co.uk

Calfordseaden is a leading multi-disciplined construction and property consultancy with a trading history of almost 70 years. We provide a definitive range of services to the UK building and construction industry covering building surveying, quantity surveying/cost consultancy, project management, employer's agent/client representative, architecture and masterplanning, civil and structural engineering, mechanical and electrical engineering, sustainability, Clerk of Works, health and safety, and CDMC. Through these complementary and mutually supportive competencies, we provide our clients with a truly multi-disciplined service.

We are appointed on a variety of projects across all disciplines from single buildings to multi-million pound mixed-use regenerations. Our project portfolio encompasses all forms of housing including general needs rent, shared ownership, private sale, market rent, intermediate rent/keyworker, sheltered, supported, extra-care and student accommodation. We also work within the commercial, industrial, health, education, community, retail and leisure sectors.

In the last five years we have worked with public and private sector clients on completed construction projects totalling over £1.5bn. We are currently commissioned on projects valued at over £1bn. We have extensive experience in traditional construction, but are also a leading authority in the design and use of modern methods of construction, sustainable design and construction, renewable technologies, 2012 construction commitments, and other important factors pertaining to construction and property development.



Phillip Hulme

www.cherwell.gov.uk

Cherwell District Council joined Buildoffsite through its Build!® programme which seeks to test out new approaches to housing and regeneration.

An exciting venture for Cherwell's Build!® programme over the next few years is the acquisition and development of Graven Hill, Bicester, a former MOD site. Cherwell's vision is that this will be the UK's largest custom build site through the delivery of 1900 homes and a hub for offsite manufacturing.

Cherwell sees offsite manufacturing as a key element in its strategy for economic growth, sustainability and innovation.



Eddie Tuttle

www.ciob.org

The Chartered Institute of Building is at the heart of a management career in construction. We are the world's largest and most influential professional body for construction management and leadership.

We have a Royal Charter to promote the science and practice of building and construction for the benefit of society, and we've been doing that since 1834. Our members work worldwide in the development, conservation and improvement of the built environment.

We accredit university degrees, educational courses and training. Our professional and vocational qualifications are a mark of the highest levels of competence and professionalism, providing assurance to clients and other professionals procuring built assets.

CIOB is an Associate Member of Buildoffsite.



Dries Hagen

www.circlehealth.co.uk

Circle is a partnership of healthcare professionals, business people and clinicians who believe that there is a better way to deliver healthcare. We specialise in the designing, building and operation of both private and NHS hospitals and currently have a partnership of 1,800 consultants, the largest in Europe. We have land interests in 18 locations and are actively progressing schemes in Reading, Manchester, Birmingham, Bristol and Bournemouth.

Circle has also been selected to run the first 'franchise' of an NHS General Hospital in Hinchingbrooke, Cambridgeshire and we expect that further underperforming Trusts will be opened up to competition soon. In Nottingham we operate the largest patient volume treatment centre in Europe and our aim is to build at least 25 new hospitals over the next five years.



Bill Healy

www.ciria.org

CIRIA is the Construction Industry Research and Information Association. Operating across market sectors and disciplines we deliver a programme of business improvement services and research activities for our members, and those engaged with the delivery and operation of the built environment.

CIRIA is an independent member-based, not-for-profit association. Members include commercial companies, universities, Government departments, and other public sector agencies and organisations. Representatives are from all parts of the supply chain of the modern built environment, covering building and civil engineering as well as transport and utilities infrastructure.

CIRIA's primary aims are to improve the quality, efficiency, cost effectiveness and safety in both the provision and operation of the modern built environment. In pursuit of these aims, CIRIA seeks to be the leading provider of improvement products and services to organisations involved in procuring, delivering, owning and maintaining the fabric of the modern built environment.

Buildoffsite is managed by CIRIA.

CIRIA is an Associate Member of Buildoffsite.



Peter K Foster Jnr

www.cobuilder.co.uk

coBuilder is an international company with more than 18 years of experience developing software solutions for the construction industry. coBuilder's mission is to facilitate the collaboration between the different actors within the construction process, based on structured, accurate data. coBuilder offers BIM software products that enhance information and documentation management for construction products and hazardous chemicals complying with both European legal requirements and green market requirements.

coBuilder's goBIM platform helps manufacturers digitise their product data by lifting it from the PDFs and turning it into digital BIM-ready data that can be exported in common data formats such as Revit, ArchiCAD, IFC, COBie etc. Based on a cutting edge technology, goBIM offers a great competitive advantage for the manufacturer within an industry that is already on the digitalisation path.

As part of its product portfolio, the company also offers a solution, comprehensively automating data collection and distribution throughout the whole building life cycle – ProductXchange. The platform has been designed to ensure easy collection of as-built data at every stage of the building process, allowing seamless control over the construction whilst providing unprecedentedly accurate data for handover to clients and facility managers.

Currently coBuilder employs over 80 specialists of various backgrounds, including construction, architecture, electrical and software engineers, business development experts and marketing specialists, linguists, sales representatives and others.



Construction Specialties™

Andy Moul

www.c-sgroup.co.uk

Based in Buckinghamshire, Construction Specialties UK Ltd (CS) is part of a global, family-owned building products company, found in the US in 1948.

We work closely with architects, designers, building owners, facility managers and contractors, to provide solutions to complex building problems faced every day.

Our commitment to 'making buildings better', along with our culture of creative thinking and customer collaboration, has led to many breakthroughs and innovative solutions. We currently hold over 40 product patents worldwide.

CS' high quality, reliable products are designed to extend the life cycle of a building's fabric, reduce maintenance costs, and reduce operational costs of facilities, across a wide range of market sectors.

We are leading manufacturers of interior wall protection, impact-resistant doorsets, performance coatings, entrance flooring, expansion joint covers, architectural louvers, solar shading and explosion venting.

Our most recent product developments are also ideally suited to off-site manufacturing:

- **CS Elimax Reform** – a modular flat pack serviced wall system, providing configuration flexibility to suit project requirements. Manufactured in a controlled factory setting for consistent quality and finish, Elimax Reform ensures fast and clean installation, reducing time on site, minimising disruption and saving money.
- **CS Joint System for precast concrete façades** – a durable, reliable and maintenance free solution to the problem of water ingress, condensation and expansion in precast concrete buildings. Designed to be included in the pre-fabrication process, it is fast and easy to install.
- **CS Rapid Fix** – a mounting system enabling fast and easy installation of wall protection systems.



Steve Fozard

www.costain.com/solutions

Costain is one of the UK's leading engineering solutions providers operating in energy, water and transportation. We meet national needs through the delivery of integrated consulting, project delivery and operational solutions.

Our approach, coupled with the ability to collaborate across all levels, drives innovative engineering and technology-led solutions across the full life cycle of an asset.

Our Engineering Tomorrow strategy is about identifying, developing and implementing innovative solutions to meet the UK's major infrastructure needs. We have implemented a number of schemes which enhance the quality of project delivery, develop the skills and ideas of our people and provide cost-effective solutions.



Paul Moss

www.crownhouse.com

Based in the West Midlands, CHt Off-site provides the capabilities to meet increased demands and fast track programmes. Modularisation techniques divide complex elements into manageable modules, leading to a dependable financial control, as well as ensuring a safer, more productive site with less congestion between trades.

CHt Off-site pioneered the use of off-site manufacturing over 15 years ago, and since then have invested heavily in new and innovative manufacturing techniques. Now as part of the Laing O'Rourke group, CHt Off-site are introducing new efficiencies in production, improving health and safety in the workplace, and reducing the group's overall environmental impact.



Dr. Robert Hairstans

www.napier.ac.uk

Edinburgh Napier University delivers the skills and experience that matter. We combine professional know-how with an academic approach and work-related learning to help our students succeed beyond university. Our research shapes the world around us, improving lives in Scotland and across the globe.

In our School of Engineering and the Built Environment, our students are taught the diverse professional skills required in engineering and construction. With close links with leading organisations and employers, our degrees are relevant to sector needs, and all programmes have a high proportion of transferable skills inbuilt.

Edinburgh Napier is widely recognised for expertise and excellence in sustainable construction and transport, and our teaching and research is highly rated nationally and internationally.

We are number 1 for nurturing student talent. The Guardian University Guide 2017, which compares entry requirements with final degree awards, ranks us top in the UK for adding value to students.

Edinburgh Napier University is an Associate Member of Buildoffsite.



Mark Davis

www.ela8.co.uk

Who are we? ela8 is a specialist in R&D tax relief for the construction industry, having helped a wide range of companies make successful claims. We work with clients ranging from small start-ups through to FTSE 100 international groups and tailor our approach to suit their specific needs. We can work across the full scope of an R&D claim, providing technical justification, cost analysis and support through the entire process and have both a 100% success record in making claims and an excellent working relationship with HMRC.

What is R&D Tax Relief? R&D tax relief can provide substantial benefits to a company carrying out eligible activities. Two regimes are currently available which can provide a benefit up to 33.3% of qualifying costs for an SME, or 8.8% of qualifying costs for a large company.

Do I have a claim? Our experience has shown that many construction companies can make a successful claim, even when they have been previously advised this is not possible. We pioneered claims in the construction industry and HMRC have accepted methodologies developed by us to quantify claims where R&D is thinly spread across disciplines, projects and locations (as is often the case in construction). In recent years we have made claims for companies as diverse as architectural design practices to temporary building installers and claims may be possible even if you are being paid to carry out work or if your business is loss-making and not paying tax. Historical claims can also be made.

What does it cost? Our fees are structured to suit client preferences, but usually work on a no win, no fee basis, with our fee as a percentage of the benefit agreed with HMRC. This means that there is virtually no risk in exploring the potential for a claim.

Why work with us? Our team, established in 2007, is comprised of individuals who have been working on R&D tax relief since inception of the regimes in 2002 – we are recognised experts in our field. Our aspiration is to deliver R&D tax services with the high quality traditionally associated with Big 4 firms, but with the more personal, responsive service associated with a smaller, more focused consultancy. Our expertise in science, technology and engineering, combined with deep experience in R&D tax best practice, enables us to provide the insights into eligibility that many accounting firms find difficult to achieve. Our approach seeks to minimise the impact of making a claim on critical resources, whilst maximising the benefits realised and reducing the risk of HMRC enquiries. We are confident we will make the most of your claim.



Roland Pickstock/Kevin Arthur

www.elements-europe.com

Elements Europe, is part of The Pickstock Group an international group of companies specialising in construction, manufacturing and property development with an annual turnover of circa £200m.

Elements Europe is an established market leader in modern method of construction (MMC), delivering a wide range of off-site building solutions to the construction industry. Our services and building systems provide clients with high-quality accommodation to various sectors.

Our parent group's experience in traditional construction has shaped our approach to off-site construction and ultimately has ensured a seamless integration between our systems in the factory and work on-site.

Flexibility and our ability to offer bespoke solutions to our clients is what sets us apart. Not only do we offer a wide range of systems to numerous sectors, but we can also offer flexibility in the way we deliver projects, with the ability to act as a specialist subcontractor or offer the client a full turnkey solution.

We strive to ensure that both the visual and technical aspects of our client's expectations are met using a wide range of materials and finishes. Our design, procurement and production teams work hard to create and manufacture the most suitable product for our client whether it be a 5* hotel room or student accommodation.

Elements Europe's factory production space totals 200,000sq ft and is located in Shropshire.

We control the manufacturing process from steel rolling through to the final cleaning of completed modules and quality sign-off. Once manufactured our in-house haulage team deliver the products to site for install offering a complete service.

Innovation, collaboration and commitment are at the heart of The Pickstock Group's ethos, creating dynamic and forward thinking businesses. From concept to completion our teams collaborate with our clients to ensure that we consistently exceed their expectations.



James Cowell

www.elliottuk.com

Elliott was established over 50 years ago and is part of Algeco Europe.

Elliott prides itself on delivering a flexible and highly bespoke service based upon an extremely robust and well-proven formula for a range of off-site and modular projects.

Elliott Off-Site Solutions are a specialist offsite design and build contractor of high quality permanent buildings, operating throughout the UK, providing permanent, semi-permanent and temporary accommodation solutions to a wide range of sectors including commercial, education, health, retail and nuclear. This incorporates new build, refurbishment, remodelling and fit-out work providing high standards of quality, health and safety and environmental performance.

The company's experience includes a diverse range of construction projects across all sectors of industry.

Elliott is able to provide turnkey or subcontract packages that can include taking projects through the design and construction processes through to handover utilising a range of off-site and high quality modular building systems that encompass all forms of innovative engineering solutions.

Using this modern method of construction we are able to provide tangible benefits including:

- reduced overall build programme
- high quality
- flexible and bespoke design
- efficient and adaptable space use
- energy efficiency
- increased speed of construction
- sustainable materials use
- waste reduction
- achieving carbon reduction.



Gary Mayatt

www.enevate.co.uk

Enevate offers volumetric construction with the very latest in modular building and modern method of construction (MMC) techniques.

From a client's conceptual design, through planning, feasibility and complete construction delivery and handover, Enevate offer a 21st century approach to construction. It is our intention to continue to utilise the most advanced materials and processes to remain at the forefront of the industry. Our patented technology guarantees sustainable and efficient construction. Whatever the project, we can deliver the maximum benefits, in terms of safety, quality, value, build time and environmental savings.

We are passionate about all of our clients – whether individuals, businesses, social housing providers or local authorities we provide a long standing commitment to supplying the best possible service to our clients. Our clients span across the domestic and public sectors as well as all major groups of the commercial market.

Enevate has an established reputation for excellent product commercialisation, with certification and research forming the backbone of its development strategy. Leading the way in product certification provides an absolute reassurance that your building will conform to recognised British and European standards.



David Wallach

www.eurobond.co.uk

Eurobond is the UK's leading designer and manufacturer of non-combustible core internal and external wall and ceiling solutions.

Established in 1981, Eurobond has been at the forefront of composite panel design for over 30 years. Investing heavily in development, testing and manufacturing technology, Eurobond consistently produce high quality products to exacting tolerances, incorporating glazing and architectural features.

All of our products are manufactured in our ISO 14001 and ISO 9001 accredited UK factory using a stone wool core that has been tested to BS EN 1364-1 and can achieve up to four hours resistance (integrity and insulation). We are the only composite panel manufacturer in the UK to hold BES 6001 for responsible sourcing achieving a 'Very Good' standard. Additional to this, all Eurobond panel systems are made from fully recyclable materials that are tested and approved to LPS1208, FM 4882, LPS1181 Grade A and FM4880 standards.

Capable of spanning between main structural frame members, Eurobond panel systems can offer a wide range of architectural finishes and quickly achieve an air-tight building with thermal insulation properties to minimise energy consumption.

Eurobond products have been specified within a broad range of major projects nationwide, including schools, hospitals, stadiums and multi-million pound brand builds such as BSB, Microsoft, Heathrow Airport, Sainsbury, Asda Walmart and Tesco. Every project has benefited from Eurobond's best practice benchmark of responsible panel design.



Steve Reid

www.geologicfoundations.co.uk

geoLOGIC Foundations Limited design, manufacture and supply screw piles. geoLOGIC has been trading since 2008 and offer the best value screw piles currently available in to the UK, Europe and New Zealand. Where economically possible, we provide the highest grade of steel, which is galvanised as standard to give a design life of over 120 years.

The geoLOGIC screw pile is a prefabricated segmented steel piling system with lead sections and bolt-on extensions each ranging from one to six metres in length. The screw pile is installed quickly using a torque motor attached to an excavator which rotates the CHS shaft that then pulls the lead section into the ground by the 'screw' action of the helical plates. We can cater for loads ranging from 50 to 500kN SWL depending on diameter of the shaft, number/size of helices and the ground conditions. The geoLOGIC screw pile has the following key advantages:

- installation rate up to 25 piles per day using two operatives and an excavator
- no wet trades on site and instantly loadable after installation
- no removal of spoil and no casing or dewatering required – well suited for contaminated ground
- load bearing capacity is equal in tension and compression – ideal for variable load situations
- requires only lightweight installation equipment – can operate on soft terrain without the need for piling mats
- ideal for restricted access sites and useable where headroom is limited and even from floating platforms
- installs to laser level accuracy, within +/- 3 mm tolerance necessary for modular construction
- minimal noise and vibration, with little disturbance of the ground
- environmentally friendly lower embodied carbon and can be easily removed, reused or recycled – perfect for temporary structures
- resistant to desiccation or heave – commonly used where foundations would be affected by tree roots or archaeology.

geoLOGIC has developed a range of innovative connections and flooring systems to offer a completely dry install foundation for modular and volumetric construction. geoLOGIC is also part of a team that will shortly be bringing to market the first ground source heating and cooling system utilising the screw pile as an underground thermal energy store.



Brendan Geraghty
www.gtarchitects.co.uk

Geraghty Taylor is an award-winning architecture practice known for its connected and holistic approach to planning, design and construction.

We understand that the creation of excellent design and buildings is the product of rigorous process.

Our Brand before Building approach – which is more than a philosophy – describes the journey we take to fully understand our clients' objectives and shape a project, in so doing delivering consistently better architecture.

GTA embraces technology across all of our work and are passionate about what we refer to as 'Soft' BIM.

This use of Building Information Modelling allows a wide range of stakeholders to explore and understand projects, easily and accurately and allows the easy exchange and accurate coordination of information between project stakeholders.

We continue to pioneer the use of BIM in several key ways, to provide:

- live updating of information to site
- inclusive access to virtual prototyping of schemes, allowing exploration by all stakeholders
- exploration of brand values and culture, through the use of interactive systems such as the BIMx explorer.



John Dyson
www.gsk.com

Headquartered in the UK and with operations based in the US, GSK are one of the pharmaceutical industry leaders and employ around 99,000 people in over 100 countries.

GSK have a challenging and inspiring mission: to improve the quality of human life by enabling people to do more, feel better and live longer. This mission gives GSK the purpose to develop innovative medicines and products that help millions of people around the world.

GSK are one of the few pharmaceutical companies researching both medicines and vaccines for the World Health Organization's three priority diseases – HIV/AIDS, tuberculosis and malaria. GSK produce medicines that treat six major disease areas – asthma, virus control, infections, mental health, diabetes and digestive conditions. In addition, they are a leader in the important area of vaccines and are developing new treatments for cancer.



Keith Patrick

www.graham.co.uk



Barry Weekes

www.heathrow.com

With records that trace back to 1798, the GRAHAM Group represents a nationwide business providing construction (both building and civil engineering), asset management and project investment services through a network of local regional offices. Our construction arm operates across a wide spectrum of sectors including education, healthcare, leisure, heritage, transport, defence, nuclear, water and wastewater, renewables and interior fit-out.

The business was incorporated as a limited company in 1955 and since then has successfully completed numerous landmark projects and commissions across the UK and Ireland. Whilst remaining a wholly family owned company, steeped in traditional skills and values we operate a business model designed to achieve excellence in delivery, customer service and a 'true' value for money offering.

With over 1500 colleagues and a track record of sustained growth during the past number of years (with turnover rising from approx. £40m in 1996 to over £500m in 2016), we are extremely proud to be ranked among some of the largest construction and service businesses in UK and Ireland.

We believe our continued success is a direct result of doing things the 'GRAHAM way', ie keeping business simple, listening to our clients, being efficient and effective in all that we do, keeping our people safe, remaining committed to the protection of our environment, and working with local communities and businesses to generate long lasting and sustainable economic benefits.

We see the continued and growing focus on off-site manufactured construction as vital to the healthy growth of both our business and the industry as a whole and look forward to having our thinking challenged through Buildoffsite and developing long-term business relationships with other members.

Our vision for an expanded Heathrow is to continue to transform the airport into one integrated airport campus offering passengers a quicker, smoother experience with safety and security at its heart.

Not having to build a hub airport from scratch is a strength of Heathrow's future expansion plans. We start with one of the world's most successful airports, particularly given its transformation over the last ten years during which we have spent £11bn in upgrading our facilities.

Terminal 5 has been voted the world's best terminal by passengers for four years in a row. Terminals 3 and 4 have been extensively refurbished. Passengers have noticed this, as over three-quarters now rate their Heathrow experience as either 'Very Good' or 'Excellent'.

Terminal 1 has now closed and in June 2014 our brand new £2.5bn Terminal 2 opened. This new terminal aims to improve on the Terminal 5 passenger experience.

Heathrow continues to be a progressive construction client, constantly looking to deliver newer and more sustainable terminal facilities safely and more efficiently whilst ensuring that we minimise disruption to passengers and the surrounding community. Build off-site thinking and designing for manufacture and assembly are always essential considerations for our future projects and programmes.

The expertise, knowledge and extensive investment in infrastructure at Heathrow continues to provide a strong foundation for building additional aviation capacity for the UK.



Nick Coubray

www.howickltd.com

Howick Ltd is internationally recognised as a world leader in the development of smart construction systems.

Our innovative steel framing technology maximises the efficiency of skilled labour, enhances the ability of non-skilled labour, and enables productivity gains and cost savings across the entire project by providing an extremely accurate and easy to assemble structure.

Howick's FRAMA Machines fundamentally operate as 3D printers for the construction industry taking 3D CAD files and processing them as panels and trusses. Steel is formed by being rolled through the Howick machine, with tools being accurately punching the material to create easily assembled framing components, for load and non-load bearing applications.

Our R&D team develop bespoke solutions for our clients to best suit their construction requirements.



Keith Broughton

www.hochtief-construction.co.uk/

HOCHTIEF is one of the largest international construction groups, delivering complex infrastructure projects across the globe.

We deliver world-class projects by investing in innovation, efficiency and skills to build solutions that work for people, for the environment and for the long term.

Our heritage of engineering excellence in the face of complex challenges means we deliver smart solutions for our clients, specialising in markets such as road and rail infrastructure, energy, tunnelling and civil and structural engineering.

Offsite solutions play a key part in the success of many of our projects, so we are delighted to be a member of Buildoffsite, working together to drive forward quality, value and sustainability in the construction industry.



Tomas Garcia

<https://www.gov.uk/government/organisations/high-speed-two-limited>

HS2 Ltd is the company responsible for developing and delivering the first railway built north of London for over 100 years. It will connect the capital to Birmingham with high-speed services from 2026, Crewe by 2027 and then, along a Y-shaped route, to Manchester and Leeds from 2033. Almost a decade before the first passengers board the new trains, HS2 is already proving to be a catalyst for growth, attracting investment and improving skills and job opportunities for hundreds of thousands of people and small businesses across Britain.

The development of HS2 is accompanied by the biggest and most comprehensive consultation programme ever undertaken in this country. However, once the project is complete, it will support fast, frequent and reliable services which unlock the potential of our cities, connecting them faster than ever before with a 21st century railway line which also frees up extra capacity for local passengers and freight services on the existing network.



Paul Thomas

www.hse.gov.uk

The Health and Safety Executive (HSE) is responsible for health and safety regulation in Great Britain. The HSE and local government are the enforcing authorities. Our mission is to protect peoples' health and safety by ensuring risks in the workplace are properly controlled.

The HSE looks after health and safety in many sectors including nuclear installations, quarries and mines, factories, agriculture and farming, hospitals and schools, offshore gas and oil installations, the safety of the gas grid, and the movement of dangerous goods and substances, and many other aspects of the protection both of workers and the public.

Local authorities are responsible for enforcement in offices, shops and other parts of the services sector.

The HSE is part of the Department of Work and Pensions (DWP) and is ultimately accountable to Rt Hon Damien Green MP (Department of Work and Pensions).

HSE is an Associate Member of Buildoffsite.



Bernard Williams

www.int-fpi.com

IFPI was established in 1969 by building economist Bernard Williams concurrently with the founding of his professional practice Bernard Williams Associates (BWA).

Originally named Building Economics Bureau (BEB) IFPI has since been actively involved in research, publishing, conferences and (more recently) software development aimed at professionals at the cutting edge of property, construction and facilities management in the UK and internationally. The company's mission is to provide the means whereby many of the more complex issues currently facing the industry can be more readily assimilated and addressed by busy professionals.

The standard reference work 'Facilities economics' is available electronically, and new web-enabled programs include the EstatesMaster Facilities Benchmarking model and the CombiCycle/Comparator Whole-life Cost and Sustainability Prediction program – the latter has now been expanded to accurately reflect the whole-life cost and sustainability of buildings constructed using off-site techniques.



Prof K C Iyer
www.iitd.ac.in

Vision

To contribute to India and the World through excellence in scientific and technical education and research; to serve as a valuable resource for industry and society; and remain a source of pride for all Indians.

Mission

To generate new knowledge by engaging in cutting-edge research and to promote academic growth by offering state-of-the-art undergraduate, postgraduate and doctoral programmes.

To identify, based on an informed perception of Indian, regional and global needs, areas of specialisation upon which the institute can concentrate.

To undertake collaborative projects which offer opportunities for long-term interaction with academia and industry.

To develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

Values

- academic integrity and accountability
- respect and tolerance for the views of every individual
- attention to issues of national relevance as well as of global concern
- breadth of understanding, including knowledge of the human sciences
- appreciation of intellectual excellence and creativity
- an unfettered spirit of exploration, rationality and enterprise.

Indian Institute of Technology Dehli is an Associate Member of Buildoffsite.



Peter Weil
www.interserve.com

Interserve Construction Ltd provides whole life solutions for building and infrastructure projects from business case, through design, procurement, construction, to aftercare. The company is a business with more than a 100 year history working from our Birmingham headquarters and a network of 22 regional offices in the UK. In addition, we have overseas operations mainly concentrated in the Middle East.

ICL are part of the Interserve plc support services group with worldwide interests related to the ownership, design, construction, maintenance and servicing of property assets.

ICL operate in many market sectors. We have a wide client base, including Government departments, local authorities, utility companies, and industrial and commercial organisations.

Client needs and customer satisfaction are our priorities. By understanding clients' business objectives and strategies, our services are tailored to deliver whole life solutions, operational functionality and added value, which are achieved by innovation, creativity and continuous measured improvement which ensues from lessons learnt.



Nick Turberville

<https://www.investni.com>

As the regional business development agency, Invest NI's role is to grow the local economy. We do this by supporting new and existing businesses to compete internationally, and by attracting new investment to Northern Ireland.

We are part of the Department of Enterprise, Trade and Investment and provide strong government support for business by effectively delivering the Government's economic development strategies.

Invest NI offers the Northern Ireland business community a single organisation providing high-quality services, programmes, support and expert advice. We principally support those businesses that can make the greatest contribution to growing our economy. These are businesses that have ability to grow and drive productivity in the economy, and are keen to export their goods and services outside Northern Ireland.



Martin Powell

<https://www.istructe.org>

The Institution of Structural Engineers (IStructE) is the world's largest membership organisation dedicated to the art and science of structural engineering. It has over 27,000 members working in 105 countries.

The Institution is an internationally recognised source of expertise and information concerning all issues that involve structural engineering and public safety within the built environment.

The core work of the Institution is supporting and protecting the profession of structural engineering by upholding professional standards and acting as an international voice on behalf of structural engineers.

IStructE is an Associate Member of Buildoffsite.

John Lewis

Andrew Thorp

www.johnlewispartnership.co.uk

The John Lewis Partnership has a visionary way of doing business, putting the happiness of its customers and Partners at the centre of everything it does. It's a different sort of company dedicated to providing quality, flair, and fairness.

All 91,500 permanent staff are Partners who own 47 John Lewis shops across the UK (33 department stores, 12 John Lewis at home and shops at St Pancras International and Heathrow Terminal 2), over 350 Waitrose supermarkets (**www.waitrose.com**), an online and catalogue business, johnlewis.com (**www.johnlewis.com**), a production unit and a farm. The business has annual gross sales of over £11bn. Partners share in the benefits and profits of a business that puts them first.

JLP is committed and focused on continually improving the short and long-term sustainability impact of its buildings and interiors development work. It addresses this through considered, collaborative design processes and its Responsible Development Framework (RDF). Responsible development (which includes both new construction and refurbishment) of JLP's estate is a vital part of a wider devotion to social responsibility; it is an essential aspect of the way the Partnership conducts its business. It means providing and maintaining buildings that are healthy, comfortable, safe and productive environments for their users. It also means sourcing responsibly; reducing waste; designing buildings to be operationally efficient; consideration of climate resilience; identifying and implementing innovative measures (such as modern methods of construction), and much more.

Further information about JLP's RDF can be found at:

<http://www.responsibledevelopment.co.uk/>



Richard Darler

<https://www.kfc.co.uk>

KFC, the world's largest chain of chicken-based quick service restaurants, grew from the chicken business set up by Colonel Harland D Sanders in the 1950s. The Colonel had found a way to combine 11 herbs and spices with flour to create a unique taste, and to this day the secret recipe is only known to a handful of people. It is locked away in a vault in Louisville, Kentucky.

KFC came to Britain in 1965, with the first store opening in Preston, Lancashire. There are now 880 stores across the UK, with 25,000 employees. KFC has a mix of company and franchisee-owned stores in the UK and Ireland, however the business operates a 'one system' approach, with both given the same high level of training and support to ensure excellent service across the board.

The company's objective is to be the UK and Ireland's favourite quick service restaurant brand, through great tasting food, friendly and efficient service, motivated employees, excellent facilities and successful franchisees.

We are opening over 30–35 new restaurants every year and have a significant remodelling programme of over 150. We are committed to providing environmentally friendly buildings through construction and fit out, and all new builds are to LEED standard and BREEAM certified Drive Thru.

KFC UK, Inc is a subsidiary of Yum! Brands, Inc. (NYSE:YUM), which also owns the Pizza Hut and Taco Bell restaurants.



Jamie Hillier

www.kier.co.uk

Kier Group plc, is a leading property, residential, construction and services group which invests in, builds, maintains and renews the places where we work, live and play.

Our construction business provides a comprehensive building and civil engineering service offering construction excellence to private and public sector clients across the UK and overseas. This is complemented by a range of specialist businesses offering engineering design, interiors and refurbishments, mining, mechanical and electrical design and installation, BIM and 3D modelling.

At Kier we are driven to succeed by living upto the following core values:

- Collaborative – we work together; we consult to reach the right solution to achieve more.
- Forward thinking – we look ahead; we positively challenge the way we do things to excel.
- Enthusiastic – we make things happen; we are skilled, resourceful problem solvers, we enjoy what we do.

There is real synergy between our approach and the culture fostered by Buildoffsite and our fellow members. We are proud to be part of this organisation, collaborating to collectively develop and deliver significant improvements in quality, value and productivity across sectors of the UK construction industry.

Kier are committed to continuing to develop and investing in offsite solutions (including BoxClever modular product), digital engineering and big data analysis in an endeavour to push improvements within the industry and maintain our forward thinking approach.



Philip Heath/Richard Bromwich

www.kingspan.com

Kingspan Group, together with its subsidiaries, provides building products and solutions for the property and construction industry worldwide. Kingspan operates through five segments:

The **Industrial Insulation** segment provides pipe and duct insulation systems for HVAC/building services and petrochemical/LNG applications. These systems are ideal for modular and off-site construction.

The **Insulation Boards** segments offers insulation boards for roofs, walls, and floors, engineered timber systems and factory insulated timber frame systems. This segment's products are used in various applications in the domestic, non-domestic, new-build, off-site and refurbishment sectors.

The **Insulated Panels** segment provides insulated roof and wall panels, integrated solar solutions, benchmark architectural façade systems, controlled environments structural products and systems, steel framing systems, height safety solutions, and insulated door components. This segment serves property developers, building owners, designers, contractors, off-site and insurers.

The **Environmental** segment provides renewable energy solutions, air source heat pumps, hot water systems, pollution control solutions, rainwater harvesting and sustainable drainage, environmental containers, off-site and telemetry and management solutions.

The **Access Floors** segment offers access floor systems, data centre products, underfloor air solutions, and underfloor wire and cable solutions.

Kingspan Group plc is headquartered in Kingscourt, Ireland.



Alan Clucas

www.laingorourke.com

Laing O'Rourke Plc is the largest privately owned construction firm in the UK. We have offices in the UK, Germany, India, Australia and United Arab Emirates, with over 27,300 employees worldwide.

Led by Chairman and Chief Executive Ray O'Rourke, the business has grown rapidly since the merger of Laing and R.O'Rourke & Son Ltd in 2001.

Laing O'Rourke has a truly integrated capability, with a directly-employed internal supply chain allowing us to take a holistic view of construction.

We specialise in delivering ambitious yet achievable construction projects that delight both clients and the communities who use them every day, and the company is responsible for some of the most innovative construction solutions anywhere in the world.



Anna Winstanley



Ali Mafi

www.lean-thinking.co.uk

Lean BIM Strategies Ltd provides forward thinking consultancy and training services in the improvement of construction processes, from design through to manufacture and assembly, with Lean construction principles and the efficient application of Building Information Modelling (BIM).

Our UK and European clients include construction clients, design consultants, research organisations, and product manufacturers.

We are a unique project management consultancy that is not wedded to any tools or techniques and with no pre-determined solutions. You tell us what you wish to improve and we will put together the most appropriate mix of tools and techniques in a logical sequence to optimise realising your desired target performance.

Projects lose time every week (this is time lost for ever) and this loss is not measured or analysed, so there is little learning and in turn most projects run late. There is little focus on minimising or eliminating such weekly loss and a shortage of expertise to do so. This feeds the downward trend of the construction productivity forming part of the UK productivity, which is now at an historic low among the G8 countries.

Based on scientific data we believe that:

- Projects can ultimately be delivered 50 per cent faster (construction phase 30 per cent faster) and cost can be reduced by 20 per cent.
- All projects can be delivered consistently on or ahead of time with the completion date accurately and scientifically predicted.
- Project delivery can be hassle free and intellectually engaging.
- The decline of the UK constructions productivity can be reversed by taking a systemic view as most failures are system failures rather than people failures.
- Engaging and tapping into the collective knowledge and brain power of every individual at all levels in an autonomous and trusted environment delivers radical competitive advantage.

To deliver these we promote a systemic view of the organisation, which acknowledges the interdependency of all the parts that serve it. We support creating a learning organisation that continuously learns and improves.

Our team is made up of construction individuals with over 35 years' experience in rail, building, housing and civil engineering, as well as oil, ship building, aircraft manufacturing and IT.

Our combined knowledge encapsulates all the tools of the modern project management. We support organisations' need to develop their own unique ways of doing things and allow people to be inspired by and learn from others, but nothing will be 'imported'.



Bill Hughes

www.legalandgeneral.com



David Bryde

<https://www.ljmu.ac.uk>

Legal & General Group (L&G) is one of the world's largest insurance and investment management groups with assets under management of £745bn. L&G continues to participate in a growing range of supply side housing activities, including affordable homes, build to rent, build to sell, urban regeneration, student accommodation and care homes.

L&G is currently involved in a pipeline of over 29,000 new homes across a range of tenures.

Liverpool John Moores University (LJMU), School of the Built Environment LJMU is a UK university based in Liverpool with a positive global reputation for its research, teaching, international outcome and links with industry, being recently identified as one of the 100 best universities in the world under the age of 50, according to the prestigious Times Higher Education (THE) league table. Also, according to the Sunday Times Good University Guide 2012, LJMU is the top modern university in the North West of England.

The university has a long tradition of teaching and researching in areas related to construction and buildings. The School of the Built Environment is the oldest Built Environment School in the UK, with approximately 2,000 undergraduate students, 130 postgraduates and 60 postgraduate research students. There are approximately 50 academics in the school and 15 research assistants, running a portfolio of more than 30 programmes ranging from HNC/HND through to PhDs.

The school has strong links with professional bodies, with courses accredited by such bodies as the RICS and CIBSE. The links with the professions also extend to research collaborations, knowledge transfer partnerships and the sitting on professional body committees in order to advise on policy and practice by individual academics.

The school undertakes all types of research, from applied research that is closely linked to industrial requirements to more theoretical 'blue sky' research that seeks to push the boundaries of knowledge and understanding, and will have an impact in the future. Funding for research comes from a variety of public organisations, such as Research Councils, Technology Strategy Board, EU and The Carbon Trust, and directly from industry partners, such as United Utilities.

All the research within the school is managed through the Built Environment and Sustainable Technologies (BEST) Research Institute, which brings together academics within the school from various disciplines ranging from engineers to social scientists. The broad areas of research and associated consultancy-related activities are: water and waste water management, structural engineering, highways and pavement engineering, building materials, use of radio frequency methods, including wireless sensors and bio-fuel generation, strategic facilities management, planning and property management, and construction management and economics.

LJMU is an Associate Member of Buildoffsite.



Brian Minchin
www.lr.org/en

The Lloyd's Register Group is an organisation that delivers business performance and safety enhancements through asset management and business systems assessment.

To facilitate this, we set, uphold and apply high technical standards of design, manufacture, construction, maintenance, operation and performance across many sectors to the benefit of businesses and communities alike. We are a global safety and risk management organisation serving the following sectors: off-site construction, utilities, ports and logistics, power, nuclear, marine, and oil and gas.

In recognition of a marked reluctance by lenders to lend against innovative construction and Buildoffsite, RICS, Lloyd's Register (LR) and BLP established a working group with the lenders; Santander, Lloyd's Banking Group, RBS and Nationwide. The purpose of the group was to understand the lenders' concerns and formulate a process that would provide assurance to the lending community that risks associated with lending against innovatively constructed properties would be limited. That process has been defined and established, and is the Buildoffsite Property Assurance Scheme (BOPAS).

Lloyd's Register will be supported in the assessment process by BLP.



Simon Newton
<https://tfl.gov.uk>

London Underground (LU) has been keeping London moving for almost 150 years. It serves 27 out of the 33 London local authorities and its network has over 402km of railway. During peak hours LU operates more than 530 trains on eleven different lines, while 422 escalators and 166 lifts move passengers in and out of 270 stations. In 2011–2012, LU carried record numbers of passengers, with over 1.17 billion journeys.

At the same time LU is currently undergoing one of the largest upgrade programmes in its history with about 30 per cent more capacity being added through the introduction of new trains and signalling systems and upgrades to track. The improvement programme is key to London's future growth and to supporting its economic recovery, it also includes investment in some of its busiest stations.

During this upgrade programme LU has continued to deliver high levels of service performance for its customers with customer satisfaction scores sustained at their highest ever levels.

The safety of customers and staff remains LU's top priority and the 2010–2011 Office of Rail Regulation report indicated that the Tube is the safest significant-sized railway in Europe, with a safety record 15 times better than the European average.

LU's vision is to provide a world class tube for a world class city.



Alistair Glibb

www.lboro.ac.uk

Loughborough University's School of Civil and Building Engineering is one of the leading research and teaching centres in the built environment with more than 70 academics and 150 researchers.

Built environment research at Loughborough covers five key themes: innovative construction technologies, management of human resources, advanced information and communication technologies, improvements in construction business processes, and sustainability and building performance.

Recent research activity of interest to Buildoffsite includes:

- adaptable futures: developing strategies for buildings to accommodate effectively the evolving demands of its context, thus maximising value through life
- build freeform: developing a unique 3D concrete printing process
- off-site infrastructure: effective off-site applications for the civil engineering sector.

Loughborough University is an Associate Member of Buildoffsite.



Dr. Geoff Edgell

www.lucideon.com

Lucideon is a leading international provider of materials development, testing and assurance.

From raw materials and construction products, to buildings and infrastructure, whether new or redevelopment projects, we are experts in all things construction.

Through our state-of-the-art testing facilities in the UK, US and the Far East, and thanks to our materials expertise, knowledge of current regulations and industry experience, we are able to offer routine and customized testing, and consultancy to help customers comply with regulations, improve performance, develop new products and improve existing ones, solves problems, and realise products and projects from conception through to completion, both quickly and cost-effectively.



EST. 1884

Paul Glinn

www.marksandspencer.com

Founded in 1884, M&S has grown from a single market stall to an international, multi-channel retailer. We sell high quality, great value products to 32 million customers through our 914 UK stores and our e-commerce platform.

In our Store Development programme, we continue to explore offsite opportunities, where they can add real value.



Paul Shelley

www.marwoodevents.com

The Offsite Construction Show is the UK's first ever national offsite exhibition, the offsite construction industry now has its very own dedicated showcase attracting over 2000 attendees who represent every part of the UK's building, construction, design and engineering community, this event is a must attend for anyone involved in the offsite industry and is packed full of stands, features and cutting edge seminars.



Orla Corr OBE

www.mcavoygroup.com

McAvoy is the forward-thinking, off-site modular construction company embracing the future of the industry with vigour and enthusiasm through our niche offering of 3D modular and 2D panel system builds.

As a principal contractor who offers offsite modular construction, modular build and modular hire solutions our team works closely and diligently with clients to realise pioneering projects that span numerous industries under different frameworks - from education to health, infrastructure to sport and leisure and commercial.

With 120,000 sq. ft. of manufacturing space across two state-of-the-art factories, the very latest in information technology, highly trained people. Furthermore, we are wholly committed to continual improvement across all facets of our business.

McAvoy is the true partner of choice for private and public sector clients who want the assurance of knowing they have a construction partner they can trust.

Our design and build projects range from complete permanent buildings, extensions to existing buildings and hire products. McAvoy have delivered more than three million m² of modular accommodation for the education, health, commercial, infrastructure and hospitality sectors using our 'Think Smart. Build Smart.' mind-set.

Throughout our history, we have acquired a resilient mind-set that grows from strength to strength, evolving with the demands of an ever-changing and demanding industry.



Glen Lngdon

www.meps.co.uk

meps is a fully integrated joint venture born through collaboration between the heritage brands of MWH Treatment and EPS Group, bringing over 150 years of service experience in support of the regulated and industrial water sector.

Through immersive design (BIM) and Lean manufacturing, meps creates high-quality prefabricated treatment solutions and integration structures. With one of the strongest technology portfolios in the market, we provide support to every regulated water company in the UK.

Our ability to capture and aggregate demand in the market place is a key differentiator, enabling us to actively participate in the shift from asset standards to a world of standard assets, where off-site fabrication and assembly is embedded in the overarching delivery model. Our in-house design, Lean manufacturing and installation capability enable us to directly influence the journey to meet client outcomes through enhanced productive efficiency.

Our corporate parents bring significant experience of service delivery, operating a wide portfolio of water and wastewater treatment assets in both the regulated and industrial water markets. This valuable experience, shapes the way we think as a manufacturer of prefabricated treatment solutions; our method of off-site fabrication and assembly is embedded in our design ethos, and our service delivery experience informs our component selection decisions.

As we enter the new Totex paradigm of AMP6, meps seek to deliver solutions that offer the optimal blend of safe and speedy installations, based on robust engineering and ease of operation, maintenance and refreshment.



Robert Hartley

<http://content.met.police.uk/Home>

The Metropolitan Police Service (MPS) serves a population of over 7.5 million living in an area of 1,579 sq kms. The population is expected to rise to 8.1 million by 2016. Policing in London is a 24 hour seven days a week operation delivered by over 50,000 people.

Buildings play a vital role in supporting the delivery of effective and efficient policing for communities across the capital. The estate currently comprises just under 1,000,000 sqm and in the order of 900 properties. The MPS are committed to providing Londoners with a customer focused, effective, value for money service that is constantly responsive to the needs of the communities we serve.

Corporate Social Responsibility (CSR) – the MPS have a strong commitment to the principles of social, economic and environmental sustainability. In our long-term profiling of the estate we are taking into account:

- energy costs of our buildings
- our responsibilities towards Carbon Reduction Commitment (CRC)
- environmental target set back central Government as well as the GLA.

The MPS faces many challenges over the new few years responding to a growing and diverse population, collaborating with new partners and working within increasingly difficult financial constraints. These challenges will impact on the whole service including how we procure our new buildings and use our existing facilities.



Ministry of
JUSTICE

Tony Fletcher

www.justice.gov.uk

The Ministry of Justice has the largest mandated estate across government with some 2000 buildings with a value circa £8bn.

The Project Delivery Unit within the MOJ Estate Directorate is responsible for delivering new build, refurbishment and maintenance projects across the United Kingdom for HM Courts and Tribunals Service and the National Offender Management Service, other Government bodies such as the UK Border Agency also make use of our services. The Project Delivery Unit includes a wide range of professionals skilled in project management, construction cost bench marking, lean process improvement, private finance initiatives (PFI) and technical disciplines such as custodial security and Building Information Modeling.

This diverse range of skills allows us to provide the Ministry of Justice and other UK Government departments with an effective means of delivering projects successfully with our partners in the supply chain. The Project Delivery Unit is at the forefront of the transformation of the Ministry of Justice's estate to one of an appropriate capacity and quality, delivered efficiently, which is less costly to run and more sustainable.

We are also working closely with colleagues in the Cabinet Office and other departments on various initiatives to improve the delivery of construction projects in-line with the UK Government's construction strategy and carbon reduction commitment.



Steve Nunn

<https://www.moat.co.uk>

Moat is a housing association employing over 300 people and providing affordable homes in thriving communities for people in the south east. For over 40 years, we've delivered high quality general needs homes for affordable rent, retirement housing, and independent living, and we have a strong affordable home ownership offer.

We're one of the Homes and Communities Agency's development partners. Developing around 500 new homes every year, we're a not-for-profit organisation and all financial surpluses are reinvested to provide additional affordable homes and services.



Matthew Egan

www.modularize.co.uk

Modularize is a forward-thinking design and engineering service provider. Our aim is to create innovative products and solutions by using Design for Manufacture and Assembly (DFMA) principles to drive down manufacturing costs, while improving product quality, functionality and durability.

We are a dynamic and energetic company that believe in leveraging the latest technology in CAD, BIM, Virtual/Augmented Reality and MMC to make our projects collaborative, economical and eye-opening.

From the development of exciting new products through to the planning and simulation of cutting-edge manufacturing facilities, our belief in the beauty of simple solutions combined with appropriate technological deployment, has ensured that we provide the very best value to our global network of clients.

Our wealth of experience in the multi-disciplinary fields of offsite construction, mechanical engineering, software development and product design has provided us with a rare blend of skills, allowing us to work flexibly on projects of varying size and complexity. We pride ourselves on providing outstanding services to our growing list of satisfied clients.

We are developing products and systems to address many of the current demands in the offsite construction sector, both in the UK and internationally. It is our belief that the future will continue to demand changes from current construction techniques and increasing rely on new and innovative technology.

Modularize recognise Buildoffsite as an exciting and influential facilitator of these changes, whom we are pleased to be associated with. We are certain that this relationship will benefit our clients, colleagues and fellow members alike.



Suchit Punnose

www.modulex.in

Modulex Modular Buildings Plc is a global franchisor of steel modular buildings technology with a special focus on emerging markets. The company is led by a senior management team from the UK modular industry with more than 90 years of cumulative experience.

Specialising in volumetric, full fit out cold rolled steel frame technology, Modulex is capable of producing permanent buildings based on high quality, high speed, fixed cost and fixed time guarantees using the same materials used in traditional construction and at the same cost as traditional construction.

We are setting up India's first steel modular buildings factory and currently seeking franchisees in other emerging markets.



Cathy Travers

<https://www.mottmac.com>

Mott MacDonald is a £1bn global management, engineering and development consultancy with 14,000 staff working in 140 countries. We work in all sectors from buildings, transport, energy, water and the environment to health and education, industry and communications.

Building information modelling – BIM – is set to become an integral part of the construction industry. Mott MacDonald is an early adopter of BIM, and as a result our customers are reaping the benefits of better resolved solutions, faster project delivery, improved risk management, enhanced sustainability and improved whole-life performance.

Working within Anglian Water's @one Alliance, we have pioneered 'product-based delivery', playing a key role in developing the approach that is now successfully being used. The @one Alliance has developed 60 standard products that can be accessed via an online catalogue. This has helped to streamline design, procurement and project delivery, contributing to cost savings of up to 45 per cent, time savings of up to 90 per cent, waste reduction and improvements in health and safety.

We are also using BIM on a number of other key projects including the Victoria Station Upgrade. Here it is contributing to the management of the design and construction risks involved in enlarging and modernising one of London Underground's busiest stations; in a congested urban environment, alongside continuing passenger services.



www.ngbailey.com

NG Bailey, one of the co-founders of Buildoffsite, has been pioneering the use of offsite manufacture in mechanical and electrical construction since 2000 and its specialist division offers a modern and innovative approach to engineering solutions that present a safer, faster and higher quality alternative to labour-intensive, time-consuming on site production.

They are recognised as a 'leader' in this field and run two offsite manufacturing facilities in Yorkshire – a 66,000 sq ft facility in Bradford and a 45,000 sq.ft facility in Drighlington.

Following an investment of over £5m, the state-of-the-art facilities, have enabled NG Bailey to build a proven track record of delivering projects on time, on budget and defect free, providing significant benefits for each client.

NG Bailey is the UK's largest independent engineering, IT and facilities services business. It offers integration from the outset of a project, from planning and design through the supply chain, to offsite manufacture, installation and maintenance.



Mark Hanrahan

www.northmid.co.uk

Specialist services provider Nomenca Limited is a wholly owned subsidiary of North Midland Construction PLC.

The company has a wide scope of capabilities comprising of: design and project management of Mechanical, Electrical Instrumentation Control and Automation (MEICA) works within both combined civil/M&E turnkey contracts and standalone MEICA services. Nomenca operates nationally with regional offices in Mansfield, Warrington, Plymouth, Bristol, Leeds and St Austell in the following sectors: water, power, government, waste to energy, and materials handling.

The subsidiary also has a complimentary product portfolio encompassing fabricated steel products which are CE marked to BS EN1090-1, chemical dosing rigs for water and waste water applications, booster sets, pumping stations and UV disinfection. This is supplemented by an operation and maintenance provision for complete client service. Nomenca focusses on innovation, continuous improvement and delivering a high level of customer satisfaction by investing and developing our regional resources.

Founded in 1946, North Midland Construction PLC (NMC) successfully undertakes construction projects covering the spheres of civil engineering, building and mechanical, and electrical engineering.



Murdo MacDonald

<http://ormandy ltd.com>

Ormandy Group is just 10 years old, but already has a turnover of £25m. It has an extremely broad range of products for HVAC and specialist applications and is one of the country's leading providers of complete off-site, prefabricated M&E services.

The Group includes well-known commercial and industrial heating brand names such as Rycroft and Hartley & Sugden. It has expanded rapidly through a combination of organic growth and acquisitions, and the broad range of products now within the group allows it to create bespoke M&E packages for almost any application. The original Halifax-based Ormandy heat exchange and packaged solutions is the hub of the off-site prefabrication business and all of the group's commercial water heating equipment, storage vessels and thermal stores are supplied under the Rycroft brand name.

Ormandy Electric Heaters, formerly Heatrae Industrial, manufactures an extensive range of electric heating equipment and the group also produces a comprehensive range of industrial and commercial boilers, including high efficiency/low NOx output boilers for single or multiple installations from 40 to 6000 kW under the Hartley & Sugden name.

Newade Stainless provides stainless steel equipment for the specialised chemical, confectionery, food and pharmaceuticals industries along with stainless steel vessels, calorifiers and fabricated packages for the commercial HVAC market.

DREH, founded in 1952, supplies marine high duty and copper/cupro nickel fittings as well as fabricated solutions such as soil and waste, and fresh water float assemblies. The most recent company to become part of the group is Aquatherm Sales UK, which designs and manufactures plastic piping solutions.



Bousmaha Baiche

<https://www.brookes.ac.uk/homepage>

The University includes a specialised architectural engineering research group geared to support the off-site and building envelope sectors. The group has high level building physics analysis (including thermal design), and a dedicated new structure and building physics laboratory often used for accreditation and compliance testing.

The group works closely with industry, research councils, UK and EU Governments, and construction sector organisations, including the SCI, TRADA and Buildoffsite to provide holistic and tailored services to a varied client base. It works at the leading edge of research and cascades this benefit to clients, collaborating closely with clients' in-house teams.

It can develop products, systems or approaches from initial design through to analysis, prototype testing and delivery to market.

Oxford Brookes University is an Associate Member of Buildoffsite.



Kevin Jones

www.portakabin.co.uk

www.yorkon.co.uk

As the pioneers of modular construction, Portakabin delivers interim and permanent bespoke buildings, of any size and to fulfil almost any application, site and design. It has provided award-winning accommodation solutions of outstanding quality and exceptional service, with unrivalled on time and on budget performance, for over 50 years.

Its commitment to quality is demonstrated by a succession of industry firsts and innovations, which include pioneering customer charter and warranty packages, the most technically-advanced off-site systems, and an unparalleled range of modular buildings.

Customers in public and private sectors benefit from a series of market-leading products and services which have been engineered to meet their diverse requirements – quickly, efficiently and with much less disruption than site-based construction.

Buildings from Portakabin include facilities for long or short-term hire; award-winning and architecturally innovative off-site Yorkon building solutions; washroom facilities; site accommodation and highly sustainable recycled Portakabin buildings.



Robert Humphrey/Philip Bass

www.prp.gb.com

Potter Raper Partnership is a construction consultancy providing quantity surveying, building surveying, project management, employer's agent, health and safety, site inspectors and 3D CAD and BIM services to both public and private sector organisations across the UK.

Founded as a quantity surveying practice in 1970, we have developed throughout the intervening years into a multi-discipline consultancy delivering a variety of projects ranging from small extensions to £450m regeneration projects to clients across various sectors including residential, offices, education, retail, industrial, conservation, leisure and healthcare.

Employing over 150 staff we have substantial resources available to service any commission. We are fully conversant with the advantages of offsite construction and have provided professional services on a wide variety of schemes incorporating offsite systems.

Potter Raper Partnership can provide expert advice to any organisation wishing to use offsite technology and systems.



Hire: Eugenio de Sa

Sales: David Harris

T: 0800 316 0888

www.premiermodular.co.uk

Premier Modular Limited are specialist off-site manufacturers of steel and timber framed buildings. Buildings are available for hire or sale. With 60 years' experience in delivering modular buildings we have a proven track record in providing innovative and highly cost-effective building solutions in a wide range of sectors.

Premier Modular Limited is a wholly owned subsidiary of Waco International Pty, a global company with a turnover in excess of £300m and employing over 6,000 people. This allows us to take on large multi-million pound projects with the backing of the group.

At our large manufacturing facilities in East Yorkshire, we manufacture and deliver over 250 modules, in excess of 9,000m² of buildings per month, from our purpose built factories. This typically halves construction time and minimises site disruption. Extremely energy efficient with many low carbon features, the Premier range of modular buildings has excellent acoustic performance and is fully compliant with all relevant building legislation.

At Premier Modular Limited we pride ourselves on our attention to detail. Our flexible, customer focused approach gives us the edge when it comes to meeting the unique challenges presented by each project, with client requirements assessed individually. Premier Modular Limited is able to work as principle contractor or specialist subcontractor. Our factories operate to lean manufacturing principles and each building is subject to rigorous quality control. We have a dedicated design team offer accommodation solutions with a purpose-designed and fully warranted building solutions, delivered on time, on budget. Our buildings are already in use in the retail, commercial, construction, healthcare, education, leisure, defence and housing sectors.

The Premier range of buildings can be easily relocated, extended or modified as required. We believe that our buildings speak for themselves as we continually provide the highest quality solutions to meet customer requirements.



Lee Walker

www.reformgroup.co.uk

Utilising our quick fix integrated partitioning system to enable the creation of any internal environment.

Benefits

Faster and more cost effective than traditional construction:

- pre-piped
- pre-wired
- pre-printed
- eliminating the need for first and second fix activities
- simple reconfiguration without the need for trade skills
- elimination of defects through offsite manufacture
- reusable over the life cycle of any building avoiding waste to landfill.



Jane Duncan

<https://www.architecture.com/Explore/Home.aspx>

The Royal Institute of British Architects is the global professional membership body driving excellence in architecture. With a growing international network of over 40,000 members, the RIBA works to ensure that architecture and architects are better understood and valued by clients, policy-makers, the media, the public and a growing network of supporters.

The RIBA shares a common agenda with Buildoffsite, which is to support the delivery of well-designed, high performance and sustainable buildings with less time and money. We believe that the significant economic, environmental and social challenges facing the design and construction industry are best met by architects working collaboratively with suppliers and contractors to deliver innovative solutions through an integrated project team.

RIBA is an Associate Member of Buildoffsite.



Peter Bolton King

www.rics.org/uk

The Royal Institution of Chartered Surveyors (RICS) is the leading organisation of its kind in the world for professionals in property, construction, land and related environmental issues. As an independent and chartered organisation, the RICS regulates and maintains the professional standards of around 120,000 chartered professionals (FRICS and MRICS) and around 55,000 in other categories globally (AssocRICS, trainees and students). It represents, regulates and promotes the work of these property professionals throughout 146 countries and is governed by a Royal Charter approved by Parliament, which requires it to act in the public interest.

It is the world's leading professional body for qualifications and standards in land, property and construction. As people, governments, banks and commercial organisations continue to demand more assurance of certified standards and ethics, attaining RICS status is the recognised mark of property professionalism.

RICS is an Associate Member of Buildoffsite.

Sainsbury's

Tony Mars

<https://www.sainsburys.co.uk>

Trading since 1869, Sainsbury's is currently the UK's third largest retailer, with 564 supermarkets and 420 convenience stores.

Sainsbury's have a 16 per cent market share and serve over 22 million customers a week, employing over 150,000 colleagues.

Over the last five years we have continued to reduce the impact of our operations by using new innovations in the way we build and sustain our stores.

Respect for our environment is one of the core values of our business. It's about doing 'more with less' and we are very proud of the progress we have made in reducing our environmental impact.

We recently launched our 20 by 20 Sustainability Plan, which sets out 20 sustainability targets to be achieved by 2020. The £1bn plan will ensure that Sainsbury's remains at the forefront of sustainability between now and 2020.

We look forward to sustainable and collaborative working with Buildoffsite to transform the way we construct and maintain our customers' shopping experience, for good.



Andy Higson

www.saint-gobain.co.uk

In 2015 Saint-Gobain celebrated its 350th anniversary and re-defined its core purpose to create great living places and improve daily life. As a business, Saint-Gobain designs, manufactures and distributes materials and solutions, which are key ingredients in the wellbeing of each of us and the future of all. They can be found everywhere in our living places and our daily life: in buildings, transportation, infrastructure and in many industrial applications. They provide comfort, performance and safety while addressing the challenges of sustainable construction, resource efficiency and climate change.

Saint-Gobain is present in 66 countries and employs over 180,000 people worldwide, including over 17,000 in the UK and Ireland. It was founded in 1665 to deliver a world first – the production of glass on an industrial scale – and has continued to grow its business through adapting and innovating to provide new services, products and ways of working with customers.

Saint-Gobain in the UK and Ireland includes some of the best-known and respected companies in the construction sector including British Gypsum, Jewson, Graham, Weber, Isover, Celotex, Glassolutions, Saint-Gobain PAM, and Ecophon. Together they offer a range of high performance energy-saving products and solutions to help create great living places and improve daily life. For more information on Saint-Gobain, visit: www.saint-gobain.co.uk



Bassam Burgan

<http://steel-sci.org>

The Steel Construction Institute (SCI) is the leading, independent provider of technical expertise and disseminator of best practice to the steel construction sector. We work with clients, members and industry to help build businesses and provide competitive advantage through the commercial application of our knowledge. We are committed to offering and promoting sustainable and environmentally responsible solutions.

SCI develops and promotes the effective use of steel in construction. Our research, development and specialist consultancy activities extend to all aspects of steel construction including multi-storey and industrial buildings, bridges, nuclear facilities, renewable energy generation, infrastructure, and oil and gas facilities (both on and offshore). Our range of services includes provision of comprehensive guidance on structural design, fire engineering, sustainable construction, architectural design, building physics and information technology. We also offer an independent assessment service leading to the award of the 'SCI Assessed' quality mark.

SCI is an Associate Member of Buildoffsite.



Liam McGovern

www.shaymurtagh.co.uk

Shay Murtagh Precast is a market leader in the field of precast concrete solutions. With over 40 years of experience in the industry the company is renowned for the size and scale of products it has produced for some of the most complex infrastructure projects throughout the utility, commercial and rail sectors across the UK and Ireland.

Providing a full suite service of design, manufacture, delivery and installation if required, with a focus on innovation, responsibility and sustainability, the Company has become a collaborator and key partner to many of today's leading construction companies and end clients. Shay Murtagh Precast has embraced the latest advances in technology and while AutoCAD is still fully supported, the Company has a core BIM team in-house to consult with clients as needs arise.

Shay Murtagh Precast has an expansive range of specialist capabilities including exceptional project management, bespoke design expertise, offsite solutions, manufacture and transport of exceptionally large concrete products. Product blend includes bridge beams and other components, flood relief systems, culverts, tunnel segments, frame buildings, geosystems, pre-stressed and post-tensioned storage tanks.



Robert Colver

www.sigplc.com

SIG is the largest supplier of insulation products in Europe. The Group is the market leader in the UK, Ireland, Germany and Poland, and the leader in technical insulation in France. SIG is also the largest pure-play specialist distributor of air handling products in Europe and the largest and only national specialist supplier of roofing products in the UK, and is the largest specialist supplier in France.

SIG is a leading supplier of interior fit out products in Europe. It is the market leader in the UK and Germany, and the leading specialist in France.

Building on its market position, SIG has invested in facilities to build and install offsite products ranging from pre-assembled plumbing and heating systems to roofing solutions, panelised wall assemblies, floor cassettes and whole buildings. Based in three principal locations in the UK, SIG's Offsite business provides manufacturing, assembly and installation services to clients in retail, education, residential and the public sector.



Douglas Bennett

www.srm.com



Rob Francis/Sam Stacey

www.skanska.co.uk

Sir Robert McAlpine Ltd is a leading UK building and civil engineering company. We combine outstanding technical expertise with the personal touch that comes with being a family-owned company.

Our progressive and responsible approach is key to our sustained success and we pride ourselves on finding ever better ways to deliver excellent results with greater efficiency.

Across the business we share a common set of values which inform the decisions we make on a day-to-day basis and help ensure we work as one team to provide the best service to our clients.

Dedicated to engineering excellence, we have a long track record of delivering projects which form part of our shared national heritage. Notable projects include the London 2012 Olympic Stadium, the O₂ Arena, Arsenal's Emirates Stadium, the Eden Project, Cabot Circus in Bristol, the M74 Completion in Glasgow and Milton Court in London.

We recognise that understanding our clients' core values and aspirations is fundamental to our success and we work with them to tailor our design, construction, technical and management capabilities to meet their evolving needs.

Working to the highest standards of health and safety and quality, we are committed to fulfilling our responsibilities to the communities and environments in which we operate.

Our success is underpinned by our corporate stability, the quality and expertise of our staff, our collaborative approach to business and our skill at providing cost-effective practical solutions to construction challenges.

Skanska is involved in some of the country's most prestigious private and public sector projects. Whilst known mainly for our large high-profile schemes, we also undertake many smaller projects including public realm improvements, hard and soft landscaping as well as hundreds of utilities projects each year covering gas, electricity and water. Through our development operations we have established a UK residential business and in addition, by combining the skills of our construction and investment operations, have become a leader in UK PFI/PPP schemes.

Our business model is to integrate our core disciplines and work with our clients and our supply chain to deliver project solutions across our chosen market areas. We focus on creating sustainable solutions, and aim to be leaders in green construction, health and safety, and business ethics. We work strictly in accordance with our Code of Conduct and to our core values: zero loss-making projects, zero accidents, zero environmental incidents, zero ethical breaches and zero defects.

Our commitment to contribute to a more sustainable world is resolute. In June 2011, we were named the greenest company in the UK across all industries by The Sunday Times.

In the UK, we employ approximately 4,600 staff and undertake around £1.3bn worth of work each year. We carry out all aspects of the construction, development and infrastructure process from financing projects, through design and construction, right through to facilities management, operation and maintenance.

We are backed by the financial strength of Skanska which has 52,000 employees and sales of around £11bn.



Jeremy Wedge

www.structex.com

Structex is a new and unique precast concrete, modular construction system for housing. It is the perfect solution for a home extension, new-build project, or for the housing developer who wants to comply with current and future codes for sustainable housing, achieving quick construction times and completing the project on budget. Structex is a system-built hybrid house, incorporating all the best features of modern system building: insulated precast concrete sandwich panels for thermal mass, fire resistance and speed of erection, together with a structurally insulated panels (SIPs) roofing system. Together they offer the house builder/developer a flexible, innovative and speedy solution to house construction.

- structure meets Level 4 of the Code for Sustainable Homes
- can help achieve Levels 5 and 6 when combined with renewable technology
- U-values of $0.21\text{W/m}^2\text{K}$
- air permeability values $>5\text{m}^3/(\text{h.m}^2)$
- fire resistant
- speed of erection on site
- good thermal mass properties
- flexibility in design and material finishes.



Daniel Leech

www.tdsmidlands.co.uk

TDS Midlands Ltd was established in 1992 and comprises of a technical team of highly skilled computer aided design engineers, specialising in services for the construction industry. Our mission is to change the way things are done to improve the digital design industry for structural steelwork and architectural metalwork.

TDS remains at the forefront of technological advancements in the industry and are now one of the few companies in the UK that provide BIM Services for structural steelwork and architectural metalwork utilising Trimble Tekla Structures software. We have an impressive portfolio of project work including iconic London buildings such as the Gherkin, the Shard, the Cheese Grater, London Aquatics Centre, the Cutty Sark and Newcastle United Football Stadium.

TDS is committed developing a more efficient future for the construction industry. Our work as part of the Buildoffsite group has allowed us to network with like-minded business and people and drive collaborative partnerships as we believe these shared methodologies are what will shape the future of the construction sector.



Jill Willoughby

<https://www.tekla.com/uk>

Tekla software solutions for advanced BIM and structural engineering are produced by Trimble, which are solutions within the Trimble Buildings' engineering and construction segment, focusing on solutions that optimise the complete Design-Build-Operate (DBO) lifecycle of buildings. Used in over 150 countries around the world, Trimble Buildings' solutions are transforming the way the world designs, builds and operates infrastructure and buildings. Indeed Trimble is dedicated to transforming the industry with powerful resolutions that streamline communication and collaboration, such as increasing productivity, reducing waste and optimising schedules, budgets and real estate portfolios. These solutions will enable architects, engineers, contractors, owners, and occupiers to realise greater agility, efficiency and insight. Information about Tekla software: **www.tekla.com/uk/solutions**



Kathy Calverley

www.concrete.org.uk

The activities of The Concrete Society's advisory, technical development, professional/business networking, CPD and information services provide the construction industry with a major focal point for information, and a proactive forum for debate and action.

We play a vital role in encouraging the best use and development of concrete as a uniquely versatile and competitive material.

The Society works through the co-operation of its members who come from all sectors of the industry to exchange information and experience, and to enhance the performance, productivity and quality of concrete as a construction medium.

Supported by the technical and administrative staff of The Society, members collaborate to produce and disseminate state-of-the-art reports, recommendations and practical guidance.

The reach of The Society goes beyond its membership with subscribers, to a wide range of products and services in over 60 countries.

The Concrete Society is an Associate Member of Buildoffsite.



Tim Hall

<http://totalflow.co.uk>

Total Flow is a consultancy that specialises in whole system performance improvement. We educate, inspire, transform and disrupt. We are acknowledged as thought leaders in our approach to product and process design, operational performance, supply chain management, customer satisfaction and lean enterprise. Within Buildoffsite, Total Flow has three overlapping goals:

- To **build** one or more client-led consortia with design and construction capability to deliver innovative propositions utterly compelling to planning authorities, clients and end users.
- To **support** existing supply chains to identify and remove systemic cost, aligning their capability to the expectations of the client. The net result being the elimination of typically 30 per cent wasted resource.
- To **enable** off-site manufacturers to industrialise their operational capability – designing and developing products and manufacturing processes that achieve exceptional performance, reliability and cost. Reducing lead-times by 75 per cent, with a 30 per cent increase in productivity and 20 per cent cost down.

We have a highly skilled and versatile team of improvement professionals, who've operated at director level in the corporate world and dealt personally with the competitive issues you face.

Our services include education, consulting, change facilitation and training for companies that are ready to pursue innovation through every part of their value chain. It is a recipe for success that has made Total Flow one of the fastest growing and most inventive consulting organisations in the world.



Andrew Abbott

www.trada.co.uk

The Timber Research and Development Association (TRADA) is an internationally recognised centre of excellence on the specification and use of timber and wood products.

TRADA is a company limited by guarantee and not-for-profit membership-based organisation. TRADA's origins go back over 70 years, and its name is synonymous with independence and authority. Its position in the industry is unique with a diverse membership, which encompass companies and individuals from around the world and across the entire wood supply chain, from producers, merchants and manufacturers, to architects, engineers and end users.

TRADA aims to provide members with the highest quality information on timber and wood products to enable them to maximise the benefits that timber can provide. We seek to achieve this aim through active and ongoing programmes of information and research. Information is provided through the website, an extensive collection of printed materials and our training courses.

TRADA is an Associate Member of Buildoffsite.



Tim Broyd

<https://www.ucl.ac.uk>

University College London (UCL) is a world-leading university based in the heart of the world's most vibrant city. It has a substantial research, teaching and consultancy base across all of the technologies, processes and behavioural/social aspects of significance to the built environment and Buildoffsite, and addressing all parts of a building or facility life cycle. Focus areas of likely relevance to Buildoffsite include construction management and economics, advanced robotics and digital innovation in the built environment.

UCL is an Associate Member of Buildoffsite.



Nirmal Kotecha

www.ukpowernetworks.co.uk

If you live in London, the east or south-east of England then there's a good chance it's our underground power cables, overhead lines and substations that deliver power to your home or business.

Our electricity networks distribute electricity using more than 160,000 km of underground cables and overhead lines, and more than 135,600 substations. From small rural substations to complex delivery networks in the capital, we're working on the electricity network 24 hours a day, 365 days a year, making sure the lights don't go out. Safety and customer service are our top priorities – these are at the heart of everything we do. More often than not, our work goes unnoticed and we are happy if it stays that way, as it means we are meeting our stakeholders' expectations.



Kieran Brocklebank

E: Kieran.Brocklebank@uuplc.co.uk

W: www.unitedutilities.com

United Utilities is the North-West's water company. We keep the taps flowing and toilets flushing for seven million customers every day. From Crewe to Carlisle, we work hard behind the scenes to help your life flow smoothly.

We hold a licence to provide water and sewage services in north-west England. These services are carefully regulated – with the water regulator Ofwat reviewing our price limits every five years. We delivered significant performance improvements across this period and intend to continue this improvement. We are one of the most improved companies on customer satisfaction, and our serviceability and environmental performance places us amongst the leaders in our sector. We are also delivering on our ambitious cost saving targets.

As a FTSE 100 company with a 5,000 plus strong workforce and a major, multi-billion pound investment programme, the way we act as a business has a profound influence on the social, economic and environmental well-being of our region.

Our programme of investment in the next five years is over £3bn. For us to continue to improve for our customers, we must rely on leveraging skills and capacity from supply chain partnerships, innovative solutions and delivering more for less. This includes our commitment to offsite build solutions.

We are a Partner of the Offsite School, and we encourage our strategic supply chain Partners to develop modular and offsite solutions. We also work with others across the water industry to develop standard products.



Angus Stephen/Gavin Heaphy

<https://www.cam.ac.uk>

The University of Cambridge is a collegiate public research university, founded in 1209, making it the second oldest university in the English-speaking world and the world's fourth oldest surviving university. Cambridge is consistently ranked as one of the world's best universities.

The University is formed from a variety of institutions, which include 31 constituent colleges and over 100 academic departments organised into six schools. Last year the University had an income of £1.6bn and, with the colleges, a combined endowment of around £5.9bn, which is the largest of any university outside the USA.

The University has two main bodies involved with Buildoffsite:

- The Estate Management division is a multi-disciplinary organisation responsible for the development, management and maintenance of the University estate, along with the provision of a variety of related services.
- North West Cambridge Development (NWCD) is a vehicle set up to develop and deliver a £1.5bn, 150ha mixed-use estate providing some 3000 homes, 2000 student rooms, school, energy centre, supermarket, community centre and infrastructure and facilities required to support such a major development. the development is the single largest capital investment that the University has made in its history.

The University's operational estate, currently valued at £2.4bn, is broad and complex including 800 year old buildings protected by English Heritage, highly sustainable, state-of-the-art and world leading research facilities and a University farm. The Estate currently comprises 336 operational buildings with a total gross area of 640,000 m².

The investment pipeline is valued at around £3bn (excluding NWCD) while the current capital building programme is worth £1bn delivering a diverse portfolio of projects.



Arto Kiviniemi

<https://www.liverpool.ac.uk>

As an elite Russell Group institution, the University of Liverpool is one of the UK's leading academic institutions, with an annual turnover of £452m, including £124m for research. It is ranked in the top 1% of higher education institutions worldwide. The University of Liverpool's research has a tangible impact on people, places, policies and the planet by focusing academic efforts on the grand challenges – environmental and cultural change, security and conflict, sustainable energy, materials for the future, and global healthcare.

The Liverpool School of Architecture (LSA) is an internationally recognised centre for architectural and built environment research. The LSA was acknowledged as one of the top three research Schools of Architecture in the UK Government's 2008 Research Assessment Exercise. Since 2008, the LSA has continued to enhance the scope and depth of its research activities. Recent additions of senior researchers in the areas of BIM, sustainable design and computer-mediated design have increased the emphasis on inter-disciplinarity, especially in linking the creative, collaborative and technological aspects of developing sustainable built environments.

The LSA has networks with some of the best European architectural and engineering practices, and is a key contributor to the new Design Institute at Liverpool, set up to foster collaborative initiatives across design and engineering, such as in the areas of rapid prototyping, digital fabrication and virtual engineering.

University of Liverpool is an Associate Member of Buildoffsite.



Roger Flanagan

www.reading.ac.uk

The University of Reading is in the top one per cent of universities worldwide and is the highest ranked university in the UK to offer undergraduate honours degree programmes in surveying (2013–2014 THE World University Rankings).

The School is an internationally recognised centre of excellence for teaching and research in the built environment.

Our taught programmes reflect the leading-edge of current practice, including the latest developments in BIM and sustainability. But even more importantly, the School provides academic leadership for the sector and points the way towards new ways of working.

University of Reading is an Associate Member of Buildoffsite.



Mohammed Arif

www.salford.ac.uk/built-environment

The University of Salford's School of the Built Environment (SoBE) is one of the world's largest schools in the area of built environment and the UK's premier location for studying undergraduate and postgraduate degrees. SoBE has 1862 undergraduate, postgraduate taught and postgraduate research students from more than 100 countries. Our innovative education programmes have been designed to address the needs of our sector today and in the future. We achieve this by integrating the whole value chain of the disciplines within the built environment and by incorporating state-of-the-art knowledge into our curriculum. SoBE's built environment research was ranked 6*, the highest grade in the UK's competitive Research Assessment Exercise (RAE) in 2001 and 1996, and the only research institute in the UK to achieve this. In the 2008 RAE it was rated as the best in the UK and finished top in Research Fortnight's 'research power' table for built environment, a position we have held, consecutively, in the last 20 years.

SoBE represents a community of scholars of global reach, working in unison with learners across HNC, undergraduate, postgraduate taught and research, and lifelong learning professionals and organisations committed in making a difference in the sector we love. With very high employability successes and one of the largest global cohorts of PhD students, many of our graduates are already making a difference in our industry and also in academia by holding leadership positions in a variety of organisations and academic institutions across the world.

SoBE has a strong research background in offsite construction and was the first school of the built environment in the world to introduce a Masters programme in offsite construction under the leadership of Prof Mohammed Arif. At the moment, the focus of research in offsite is on applications in low cost housing applications and incorporation of BIM into offsite planning.



Kieran White

www.visionmodular.com

Vision Modular has been delivering volumetric solutions to the UK markets for the past 12 years. The business is focussed on the broad residential sector and spans apartment developments (for sale and PRS), student accommodation and hotels. To date, all of our project work has been in these market sectors and our development plans are to continue to exploit our experience and expertise to further grow our business in these areas.

Vision works exclusively with related contracting companies to deliver client projects. This model has been evolved over our history of project delivery and we remain convinced that it remains the most effective and efficient project delivery structure. Our track record of successful project completions on schemes from £5m up to £100m is testament to this approach.

Operating from its base in Bedford, the Vision Modular System is a proven, flexible and robust solution that has been deployed in structures up to 25 storeys – with current plans to extend this to 28 storeys. For clients, the offering is a low risk, cost effective, quality assured and scalable solution that is delivered in programmes that are 40 to 50% less than that for comparable traditional builds – and critically with cost and programme certainty.



Nigel Fraser

<http://westonemanagementconsulting.biz>

West One Management Consulting Ltd specialises in how we manage design and introduce new products applying lean principles.

It provides advice on strategy, product development, design processes (including BIM, and design for manufacture, assembly and commissioning), taking construction off site and bringing products to market.

It also provides authoring and editorial services, with a supporting graphic design capability.



Charles Tincknell

www.willmottdixon.co.uk

Willmott Dixon Group is a privately-owned contracting, residential developer and property support company that won a Queen's Award for Enterprise for Sustainable Development in 2014.

As a contractor, we work with government, local authority and private sector clients, delivering capital projects in education, justice, retail, health and social housing. We also deliver interior design and fit-out services, plus sustainability consultancy to meet the low carbon challenges we all face.

Our development arm of the business, delivers high quality residential units for sale through our company Prime Place, often as part of mixed-use projects and, through Be:here, we are involved in developing and managing residential accommodation for the private rental sector.

As a property maintainer, we deliver a range of planned, preventative and responsive care to property, which includes maintaining over 180,000 homes across the UK and providing a fast efficient service to a number of commercial brands. We also help an improve energy efficiency for residents and corporate property owners alike.