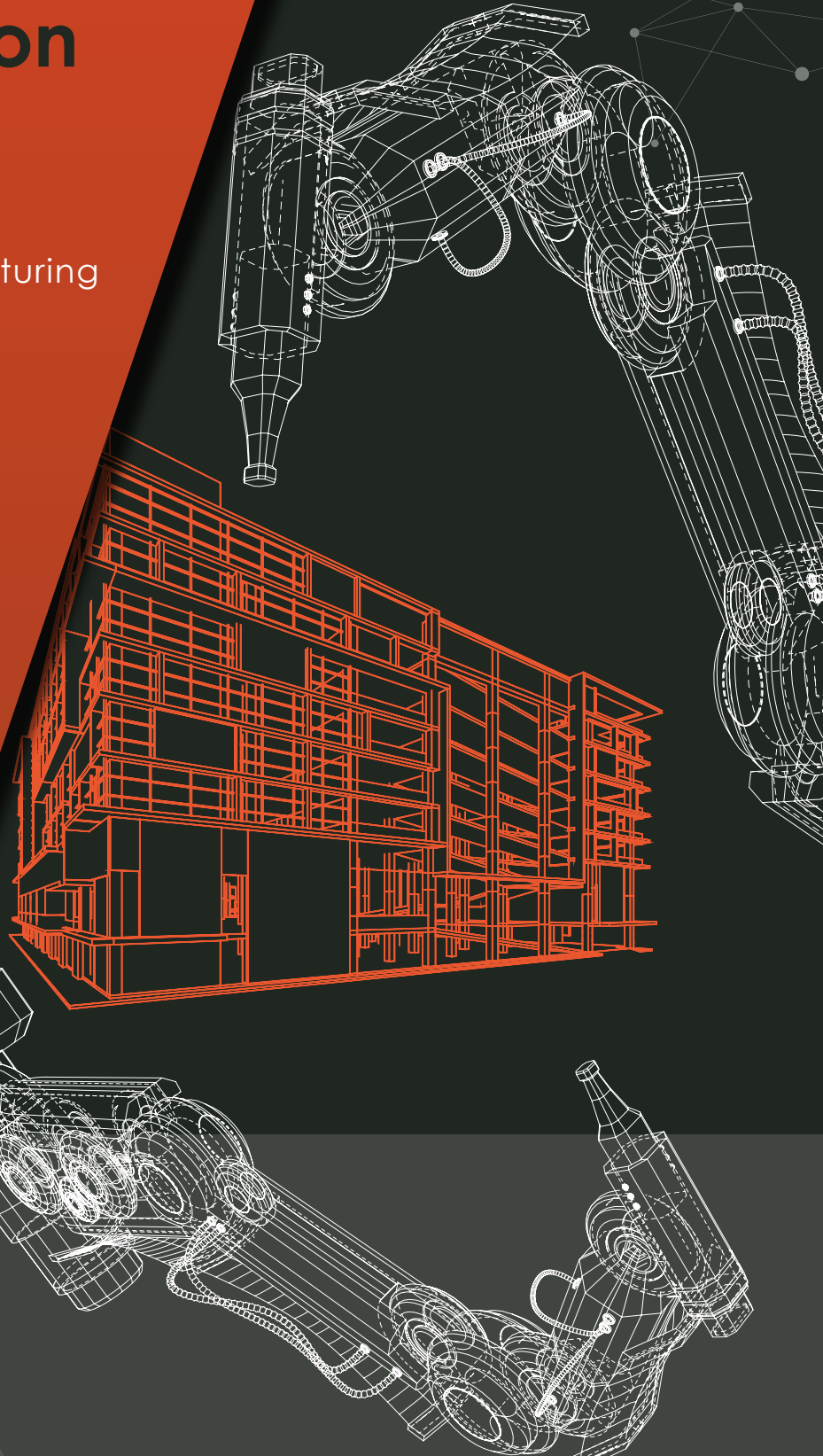


Modern Methods Of Construction

Capability Brochure

Harnessing off-site manufacturing
and new ways of working
in the built environment



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Introduction

Modern Approaches To Emerging Challenges

Addressing Traditional Setbacks

Modern methods of construction (MMC) are gaining traction in the industry. They are viable solutions to a shrinking labour market, under performance and organisational fragmentation, which are key themes in [The Farmer Review of the UK Construction Labour Model](#).

Commissioned by the Construction Leadership Council, its headline recommendations for tackling these challenges included increased investment in research and development via a shift from traditional approaches to MMC.

Additionally, the government's [Construction Playbook](#) includes MMC in its call for durable reforms in how projects are procured and delivered. This is especially pertinent in light of the UK's pledge to achieve net zero by 2050, the [Levelling Up](#) agenda and the [Building Back Better](#) plan.

Embracing Modern Methods

We therefore see tremendous value in MMC and the principles of Design for Manufacture and Assembly (DfMA), which support MMC scalability.

As adopters of off-site manufacturing and lean construction, we continue to move in step with the Playbook's policies that "[drive] innovation and Modern Methods of Construction, through standardisation and aggregation of demand, increased client capability and setting clear requirements of supplier."

As such, we are embedding MMC in our strategies for safely, efficiently, and sustainably delivering our projects. We are taking advantage of pre-manufactured and off-site solutions to provide our customers with low-risk, repeatable results in controlled environments.

For over 130 years, Tilbury Douglas has survived and flourished due to our ability to adapt and lead in the construction and infrastructure industries. We therefore continue to explore MMC for its benefits to our business, the environment and the communities we serve.





What Are Modern Methods Of Construction (MMC)?

Defining MMC

Although MMC is not new, it is experiencing a resurgence in popularity due to its innovative and manifold benefits. These include swifter on-site progress, safer working conditions, new labour opportunities and reduced waste.

A [Gleeds 2020 survey](#) revealed that 65% of respondents would harness MMC in their projects as a result of the pandemic, and there is a clear shift towards its long term, collaborative and predictable approaches.

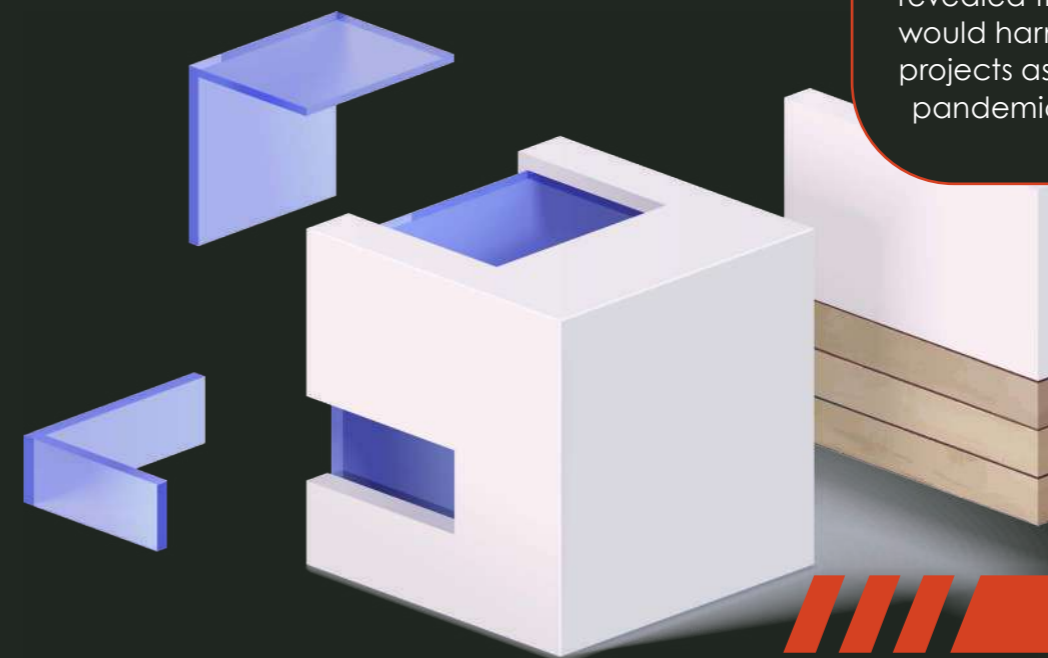
While the construction industry does not have a specific definition, MMC broadly refers to off-site manufacturing systems, whereby construction components are prefabricated in factory settings and then transported to site for on location assembly.

It can also refer to novel ways of working that drive efficiencies, promote healthy practices and reduce risk. As such, MMC can include on-site innovations for improved delivery.

Simply put, it pivots from traditional construction methods and provides alternative approaches based on manufacturing and digitally-supported solutions. Perhaps spurred by the Farmer Review warning to “modernise or die”, the construction industry is focussing on MMC for benefits encompassing shortened programmes, safer sites and sustainable practices.

A Gleed's 2020 survey

revealed that 65% of respondents would harness MMC in their projects as a result of the pandemic.



On-site assembly of prefabricated building components is a key feature of MMC.

MMC Benefits

By harnessing MMC, we trigger predictable outcomes through greater control over our construction processes. Our teams mitigate the risks of poor weather conditions, labour shortages and unforeseen disruptions due to the regimented factory settings characteristic of this delivery approach.

We are increasingly adopting MMC in our delivery process under our ethos of continuous improvement. As a result, we share the below benefits with our people, customers and communities.

Collaboration



- » Standardised processes bring opportunities for early engagement.
- » Smoother information exchange between teams due to more interoperable software in design, construction and handover.

Safety



- » Factory fabrication reduces on-site risk of injury.
- » Automation cuts lifting-related injuries and risks of falling.
- » Safety designed into component design and manufacture.

Quality



- » Factory settings and automation provide specific quality parameters.
- » The results are reduced need for on-site snagging and fewer defects.

Sustainability



- » Waste is designed-out of a component due to factory production.
- » Off-site building components can be reused on future schemes.
- » Reduced on-site noise and dust.

Cost



- » Reduced labour costs.
- » Reduced need for snagging costs.
- » More efficient use of resources (time, labour and materials).

Productivity

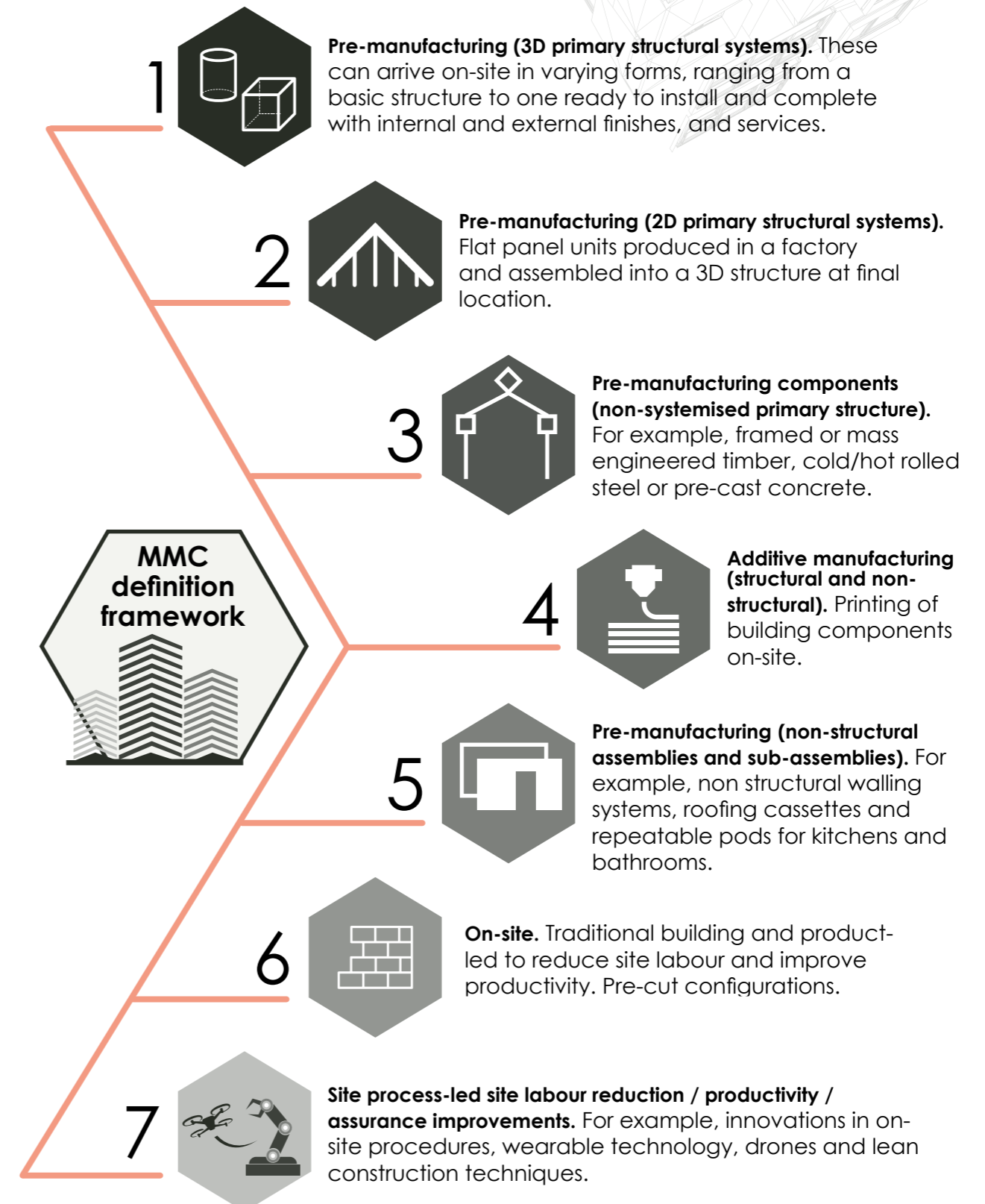


- » Increased delivery speed.
- » Predictable outcomes from pre-construction to handover.
- » Reduced disruption.

Types Of MMC

Throughout all of our projects, we utilise the strategies and MMC processes that were developed in the Department for Levelling Up, Housing and Communities' [definition framework](#).

We take advantage of all seven of its categories, which encompass pre-manufacturing, on-site materials and procedural innovations. Whilst balancing other crucial factors, such as social value and carbon reduction, we target 70% MMC on our new build projects and 50% MMC on our refurbishment works.



Design for Manufacture and Assembly

A fundamental principal of MMC is Design for Manufacture and Assembly (DfMA). It is a design principle geared towards factory producing a building's constituent parts. DfMA draws from the most suitable MMC options in line with the project scope.

We apply the DfMA approach to drive scalability and eliminate any unnecessary processes or components in our delivery. As such, it favours the reduction of waste, risk and cost. In our MMC projects, designers, delivery teams and supply chain partners progress a DfMA design that considers manufacturing in the context of swifter and more productive on-site construction activity.

DfMA also requires our project stakeholders to engage early with one another for the purpose of information exchange.

Industrialised Construction

While MMC is an evolving driver of change in the industry, its innovations take place within the environment of Industrialised Construction (IC). Although a specific definition does not exist, [A RIBA 2021 report defines IC as:](#)

“The process of adopting more manufacturing practices, including specialised tooling, mechanisation and automation, to make the construction industry more efficient and productive, with better quality assurance for better-value, more reliable and more sustainable long-term outcomes.”

IC can be viewed as blending digital tools, processes and governance with manufacturing and automation practices for more efficient, sustainable and value-driven infrastructure and construction projects.

It is the direction Tilbury Douglas is heading as we standardise and commoditise our delivery processes. We are harnessing innovation via a focus on data and factory production for higher quality work, increased safety and improved standards for our people and the environment.

As such, we are aiming our IC initiatives throughout the following delivery processes:

- Prefabrication and off-site construction
- Additive manufacturing (also known as 3D printing)
- Robotics and automation
- Big data, artificial intelligence (AI), and predictive analysis
- Internet of Things (IoT)

Design for manufacture and assembly is a design principle that allows the options within modern methods of construction to become scalable.

Industrialised construction encompasses the scalability of MMC and digital tools to treat construction as a commodity.

Tilbury Douglas Capability

Home-Grown Strategy

The black swan event of COVID-19, the aftermath of Brexit, the race to net zero and industry under performance have triggered new ways of thinking and planning in construction.

Although MMC is not new, it is emerging as an increasingly viable solution for future-proofing the industry against potentially de-stabilising disruptions, such as those above.

For MMC to be successful however, widespread collaboration needs to happen so that the industry as a whole can withstand the unexpected and also be disruptive in its own right.

The Construction Playbook and our sustainability strategy, [People, Planet and Performance \(PPP\)](#), emphasise reform in the industry for enduring positive impacts that extend beyond the work site.

These include, but are not limited to:

- Sustainability as an inherent outcome in the design, delivery and use of a structure.
- Increased job opportunities that include positions for new and emerging roles.
- Efficiency as best practice.
- Maximise long-term social value initiatives in the delivery process.
- Data and manufacturing techniques as standards in delivery.
- Working alongside the Playbook.
- Tilbury Douglas draws from the Construction Playbook as we deliver our robust MMC capabilities.

The below Playbook policies sit behind our PPP activities and behaviours:

- Harmonise, digitise and rationalise demand.
- Further embed digital technologies.



The PPP helps us align our MMC activities in accordance with the Construction Playbook.

MMC and the importance of collaboration are key elements of the PPP.



Further MMC Support Throughout The Business

Other key areas of our business are also driving MMC systems across their works, meaning that modular, off-site and prefabrication solutions are not limited to Tilbury Douglas's construction initiatives. The buy-in of all of our people is proving to be a major component in providing our customers with standardised and predictable outcomes.

Engineering

Tilbury Douglas Engineering (TDE) provides intelligent solutions from design, procurement, installation, commissioning and ongoing aftercare, for all aspects of mechanical and electrical engineering services.

Our engineering teams continually look to deliver our projects in the most efficient way possible. MMC plays a key part in delivering project efficiencies and this approach is part of our culture within TDE. Through the early consideration of MMC engineering on our projects, we have standardised our design and construction techniques to promote modularisation.

We have significant experience in providing MMC solutions for a wide range of sectors and frameworks over the last 13 years, and we have delivered some of the UK's largest modular plant rooms.

Our MMC engineering experience includes horizontal corridor modules, vertical riser modules, plant skids and plantroom modules, which are all tested, insulated and identified in the workshop. Services also include modular wiring, pre-wired luminaire systems, pre-plumbed bathroom pods and fitted out custody cells within the Justice sector.

Infrastructure

Our infrastructure arm is also dedicated to applying MMC systems to safely and efficiently deliver projects. In these works, they harness a cloud-based design and performance platform to oversee all parts of a programme, aiming for 70% of a project's programme to be delivered away from site using MMC. The remaining 30% occurs during the assembly on-site.

A key part of embedding MMC infrastructure processes is the manufacturing plan, which dictates the standard components to be used. We source components from a UK based supply chain in an open competitive market. This is followed by the pre-assembly phase which makes up 70% of an infrastructure project's programme (and therefore running cost risk). Our manufacturing partners deliver products to our pre-assembly hubs for assembly, which involves different suppliers working together collaboratively under one roof. By assembling as much of a project away from the site as possible we also reduce health and safety risks for our people.

During the on-site phase we use a 'plug and play' approach to assembly, which will increase productivity and enhanced quality. Once operational, the use of intelligent asset management and standardised operation and maintenance increase efficiencies further and provide real time data to improve future infrastructure projects.

Our engineering and infrastructure arms are also driving MMC systems across their works.



Aligning To The Construction Playbook

Harmonise, Digitise And Rationalise Demand

“Contracting authorities should seek opportunities to collaborate in order to develop and adopt shared requirements and common standards. This should be done to enable standardised and interoperable components from a variety of suppliers to be used across a range of public works. This will create a more resilient pipeline and drive efficiencies, innovation and productivity in the sector.”

The Construction Playbook, Modern Methods of Construction

Organisations

We look to these organisations for research-led insights, trends and project opportunities. They are also valuable resources for tracking how developments in MMC, BIM and tech-driven solutions impact design, procurement and commercial activity as industrialised construction gains traction.

As framework suppliers and organisation members, we further stay abreast of customer needs amidst the changing construction landscape. This allows us to consider MMC solutions that can be repeated across multiple projects and sectors, saving our customers time and money.



Early Supply Chain Engagement And Off-site Systems

Our below supply chain partners (SCPs) have off-site expertise and are integral as we move towards the repeatable processes and components of MMC. By engaging and collaborating with them early in a project, we decide which type of MMC is appropriate and capture their specialisations in the DfMA design.

This type of collaboration increases the potential for programme predictability, strict quality parameters, cost certainty, enhanced safety and waste reduction.

We are also working with the Supply Chain School to provide MMC workshops to our standard suite of vetted SCPs. By providing up-skilling opportunities and exploring off-site approaches, we can help optimise their offering in MMC projects.

We are also in the process of on-boarding strategic partners that specialise in framing systems.



Premier Modular Excellence

Off-site and modular building specialists.

Off-site system

Volumetric



Innovare Systems

The only structural insulated panels solutions provider in the UK to design, engineer, manufacture, deliver and install their own system.

Off-site system

Engineered wood.



FP McCann

The UK's largest manufacturer and supplier of pre-cast concrete solutions.

Off-site system

Pre-cast concrete.

Further Embed Digital Technologies

“While the volume of data relating to UK construction is rapidly increasing, it is often fragmented or not easily accessible. Improving the consistency and quality of data will be transformational in how we can deliver projects and programmes by improving safety, enabling innovation, reducing costs, and supporting more sustainable outcomes. Contracting authorities and suppliers should apply the UK Building Information Management (BIM) Framework.”

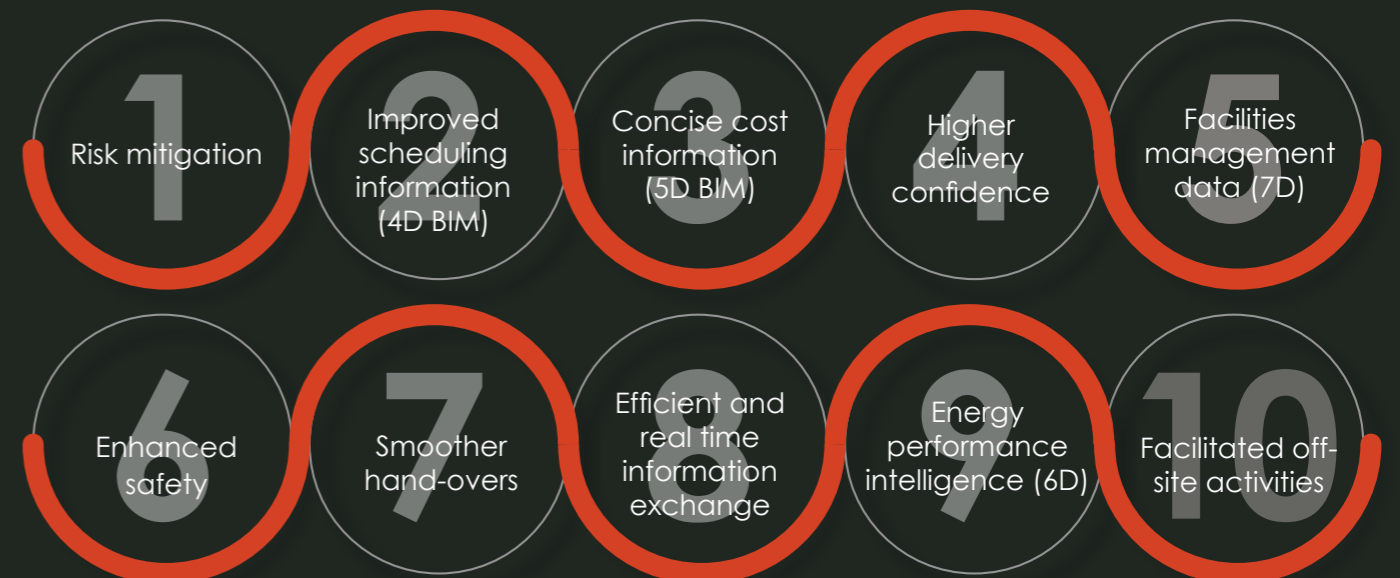
The Construction Playbook, Modern Methods of Construction

Integrated digital systems

Harnessing BIM

We have long embedded and championed Building Information Management (also referred to as Building Information Modelling) in our business. We were the first main contractor to achieve BIM Level 2 compliance from the BRE, and we are Platinum Plus Patrons of the UK BIM Alliance. Additionally, we are fully aligned with the current standards in the UK BIM Framework of ISO 19650.

BIM is an invaluable and enterprising process in building design, operations and construction. Through it, our project stakeholders create, manage and share project information. Facilitated by intelligent technology and 3D models, it maximises our efficiencies across time, cost and productivity. Additionally, we use Asite to store and exchange this information from our multiple project stakeholders. Its interoperability means that our people collaborate with one another without fear of data loss, while harnessing their preferred tools and systems.



BIM and MMC

The effective coordination of project data and information is a key function of BIM. We expertly weave this asset into our MMC activities so that high quality, speed and efficiency are natural aspects of our off-site procedures.

By providing exacting material requirements and virtual representations of their positioning, we provide our off-site suppliers with clear guidance on building components and their coordination.

This type of exchange provides valuable savings on material costs, reduces waste and maximises collaboration between different disciplines. BIM's ability to host building data is also crucial for maintenance teams, as it considers deconstruction strategies for material reuse.

Connect: A Tilbury Douglas Solution

Connect is the new Tilbury Douglas solution for collaborating in a shared digital environment.

Information management drives Connect. It enables a baseline digital offering that empowers our people through a set of core technologies, processes and governance that can be applied to any scheme.

It positions digital tools at the centre of our operations, allowing our baseline offering to include solutions based on robust outcome-focused selection processes.

A modular approach to technology, Connect allows us to continually evaluate our technology ecosystem to ensure tools are always fit for purpose and achieve the desired results. By doing so, we are able to enhance or replace tools appropriately.

This baseline offering and standardised approach eliminates the need for new project strategies. As such, planning and coordination of teams and resources becomes predictable and leads to assured outcomes.

Connect creates and maintains a project's 'golden thread' of information and enables the interaction and information exchange of our various systems (such as BIM applications, Asite and DfMA). As such, it supports our MMC capabilities.

Designers, project teams and stakeholders can communicate efficiently and transparently through Connect, as it eliminates duplicated data, information loss and software incompatibilities. We can maximise our time and people resources to provide swifter, predictable outcomes for our customers.

Driving information management across our digital transformation, Connect is also ISO 19650 compliant.

connect
A Tilbury Douglas Solution

Building With The Customer

We are on track to releasing the Configurator, a revolutionary and web-based design tool where clients drag-and-drop from a catalogue of standardised components to virtually assemble their desired building. These pre-designed building components come from our kit-of-parts library and provide our customers with greater control and insight into the structure they desire and how they want it to perform.

Our design and project teams develop this digital representation into early Stage 2 designs. As such, we are revolutionising how we capture and embed customer requirements and priorities throughout our construction processes.

Learn more about Connect, the Configurator and digital transformation in our dedicated Digital Brochure.



Our interactive design platform, the Configurator, will empower our customers to play an active role in the design of their desired building.

Measuring Outcomes

We measure our MMC outcomes through our PPP strategy, using its categories as metrics for assessing our strengths and exploring opportunities for improvement.

As such, an intriguing possibility for MMC is the cradle-to-cradle strategy, which mimics nature's ability to reabsorb and reuse waste in its organic processes. For business, it is the practice of implementing a closed-loop system of recycling waste and used materials in new processes, again and again.

There is a natural potential for cradle-to-cradle in MMC. Our kit-of-parts and digital twin capabilities strongly support the reuse, recycle or re-assignment of building components in new projects.

We push for strategies such as cradle-to-cradle so that constructing a building also means delivering solutions across sustainability and social value. By using the PPP as a performance monitor, we can align MMC with our sustainability goals, business strategies and also government guidance.

Performance

Motion-activated lighting monitored for energy efficiency and usage trends.

People Workforce

Planet and MMC

Pre-manufactured non structural wall recycled from a previous end of life project.

MMC

Pre-cast concrete columns from specialist SCP.

High-level depiction of People, Planet and Performance and MMC interacting in a built environment.

Organisation Strategy

Experienced Leadership

As Technical Director, Mark Buckle oversees Tilbury Douglas's digital transformation strategy and application of MMC. Wielding over 30 years' worth of construction knowledge, he leads our skilled Technical Team in driving off-site manufacturing solutions and standardised delivery processes.

Championing modular systems throughout our operations, Mark also ensures that Tilbury Douglas remains in step with the Construction Playbook's MMC governance.



Mark Buckle
Technical Director



Aneesa Mulla
Head of Digital



Andy O'Dwyer
Commercial Director MMC

Regional Businesses





Moving forward

Although our MMC approach will always continue to evolve and become more refined, it hinges on implementing standardisation and scalability across our project delivery.

Making measurable strides towards these goals will have beneficial impacts on our business, people and the communities that we serve. That is because MMC's potential for positive change is far-reaching and potent. As such, we are keen to develop our off-site capabilities to provide swift and efficient infrastructure solutions for a growing population, especially amidst an intensifying housing crisis.

Our aim is for sustainability to become a natural outcome of our digital twin technology through energy monitoring and reusable building components. Our increased use of carbon absorbing materials could help offset existing emissions and be a driving force in the UK's race to net zero carbon.

Additionally, growing employment possibilities exist under our MMC aims, as new skills will be needed to deliver more ambitious construction methods. We also believe in up-skilling existing personnel, supply chain partners and SMEs so that this current industrial revolution does not degrade into exclusion.

Working in alignment with the Construction Playbook and our PPP will provide quantifiable KPIs and holistic results in our MMC approaches. As a value-driven operation, we know that buildings and infrastructure are only as great the benefits they bring to the people and communities who use them.

We are keen to develop our **off-site capabilities** to provide swift and efficient infrastructure solutions for a growing population.



Recent MMC Experience

The Union Student Accommodation

Client Alumno Developments Ltd
Value £10.6m
Location Leamington Spa
Sector Residential/Education

We successfully delivered The Union, a student accommodation project in Royal Leamington Spa. The project comprises a new build 187 bed student accommodation development aimed at providing a welcoming and secure home for students attending both Coventry and Warwick universities.

Situated next to the iconic Grand Union Canal, the fresh, modern architecture and internal fit-out of the new four-storey buildings complements the historic, industrial surroundings. Towpath enhancements, pocket parks and modern art installations bring to life a previously neglected brownfield area, demonstrating our collaborative expertise in urban regeneration.

By embracing off-site and modular construction techniques, the project team were able to deliver the high quality building the client required, whilst making savings on both programme and cost. The innovative light gauge steel frame (LGSF) and brick slip solution gave our client the brickwork finish that they desired, whilst reducing the amount of piling required and making the building more light-weight. This was a huge benefit to the project given the site's close proximity to the Grand Union Canal. It also meant there was a reduction in the volume of concrete needed for the podium bases, saving significantly on cost and programme while reducing health and safety risks on-site.

The introduction of off-site manufactured bathroom pods provided a high and consistent quality of fit-out. It reduced long-term maintenance obligations, health and safety risks and on-site labour requirements, ensuring the best value for money both during construction and over the lifetime of the building.



The Union Student Accommodation, Leamington Spa
Modular construction techniques



The Lansdowne - Birmingham

Client	Seven Capital and Long Harbour
Value	£27.1m
Location	Central Birmingham
Sector	Residential

This high-end development was one of the first Build-to-Rent schemes and forms part of the overall plans for the Five Ways Gateway, one of the main entry points for visiting Birmingham.

Situated next to the iconic Grand Union Canal, the 18-storey, 12,500m² scheme provides 206 luxury private rental apartments, including penthouse apartments with balcony terraces overlooking Edgbaston and the city centre.

We promoted the use of off-site manufacturing due to the benefits in terms of quality, consistency, safety and programme.

The car park was demolished to make way for the new tower which was constructed using market leading pre-cast concrete panels. All of the bricks were cast in-situ during the off-site manufacturing process.

There were also benefits for the neighbouring community with vehicle movement and emissions significantly reduced.

The structure was delivered throughout one of the harshest winters on record. However, off-site manufacturing resulted in the timely completion of the pre-cast frame in early 2018. The asset incorporated a 410mm thick sandwich panel external envelope, 200mm thick hollow core floor planks and a steel frame structure sitting on top to form the penthouse balconies.

The Lansdowne was delivered within budget and ahead of programme, handing over six weeks early. The building was praised by the Client, Funder and Clerk of Works for the high quality finish and minimal outstanding snagging at handover.



The Christie Proton Beam Therapy Centre

Client	The Christie NHS Foundation Trust
Value	£90m
Location	Manchester
Sector	Health



The state-of-the-art Centre houses the first NHS high energy proton beam therapy in the UK and will treat approximately 800-1,000 people annually.

Delivered under the P21+ Framework, Tilbury Douglas Construction (TDC) and Tilbury Douglas Engineering (TDE) completed the works on time and under budget.

Measuring 9,000m², the clinical facility includes treatment and consulting rooms, CT and MRI scanners, offices, outpatient and rest areas, catering and training facilities.

Developing our MMC strategy early in the preconstruction process optimised the programme, while Building Information Modelling (BIM) helped identify the elements for prefabrication. We harnessed Categories Five and Seven from the Department for Levelling Up, Housing and Communities' definition framework. Our strategy resulted in labour and programme reductions, improved installation quality, and design certainty. It also enabled 43% of MEP installations to occur off-site.

For example, we introduced prefabricated service modules with all items placed at correct levels and pre-tested, resulting in quicker install times than traditional construction. Heyrod, our reinforced concrete subcontractor, prefabricated the conduit frames for casting into the walls rather than assemble them in-situ, reducing on-site labour.

Technology was a crucial tool in the works. A Trimble robotic station surveyed and set out from the BIM process, transferring the building design onto the site. This provided TDE with pin-point accuracy of installation, greatly reducing the risk of errors. The Trimble instrument also allowed us to mark up and position hangers for prefabricated services modules six weeks prior to installation, eliminating trade downtime. We saved 1,200 site hours in setting out and made our workforce more efficient. Additionally, Sysque, a Revit bolt, allowed purchase of the components used in our model. Once the design was complete, we easily scheduled our order of prefabricate items as per our needs.



Wolsingham Sewage Treatment Works

Client Northumbrian Water
Value £5.77m
Location Durham
Sector Water

Increased population growth in the surrounding area required upgrading the facility in the Wolsingham Sewage Treatment Works (STW).

The project embedded modern methods of construction (MMC) throughout delivery, favouring Design for Manufacture and Assembly (DfMA) and off-site manufacturing for new STW components.

Our designers collaborated with water industry experts to develop key facility components, such as new primary tanks, final tanks and an inlet works screen, that were manufactured in factory-controlled conditions. These innovative designs needed non-standard materials with exacting fabrication standards in order to fit into the build and achieve MCERTS certification. Off-site manufacturing also made it possible to create bespoke assets that had never been produced before.

Additionally, we prioritised transparent communication and close collaboration with our suppliers. Their skills were crucial in the off-site production of components and delivering higher quality results than traditional methods. The clear and deliberate focus of DfMA and off-site manufacturing resulted in the following benefits:

- A 20% time reduction in on-site construction.
- Savings of 12 weeks on the programme.

- Client savings of £1m.
- Increased predictability on delivery times.
- Improved safety performance.

Our ambitious and innovative MMC approaches also resulted in winning the Innovation and Civil Project of the Year categories at the Constructing Excellence in the North East (CENE) awards.

As such, our success on this project has inspired the client to harness off-site manufacturing on future works, upholding the project as a standard. We have also shared our insights and best practices with our other delivery teams.



Winner of the **Innovation and Civil Project of the Year** categories at the CENE awards.



Walsall Manor Hospital Winter Pressures

Client Walsall Healthcare NHS Trust
Value £2m
Location West Midlands
Sector Health



Via Procure22, Tilbury Douglas Construction (TDC) and Tilbury Douglas Engineering (TDE) provided the Trust with fast track conversions to existing spaces. By doing so, we supported increased patient volumes associated with Covid-19 and winter related pressures.

The works took 15 weeks from initial conversation to final handover on December 24th 2020, with a time saving of 7,000 hours.

The works involved refurbishing and remodelling the existing CMU unit into a new Frailty Emergency Service unit, along with supporting accommodation such as clean and dirty utilities, cleaner's room, staff rest area and an accessible WC. We also delivered modular buildings in the hospital courtyard areas and linked the existing ward buildings to help increase bed provision.

We incorporated our MMC strategy early into the preconstruction phase, engaging with our in-house design team as soon as possible. In line with our overall MMC approach, technology was a key resource throughout the project. TDE harnessed Matterport scanning to complete missing data from the existing model (i.e., the substation/route for HV cabling). The tool also provided internal and external stakeholders with monthly scans of the site for progress updates.

Building Information Modelling (BIM) enabled off-site prefabrication for precise installation quality, while large monitors displaying BIM were distributed throughout the site, providing greater visualisation to the teams. Additionally, robotic setting out for hangers and walls accelerated the programme.

In order to respond swiftly and meet the Trust's critical need, a modular solution proved to be time and cost effective. It also helped reduce disruption to the existing hospital site with the modules craned into the courtyards. This approach reduced material movement throughout the hospital compared to traditional solutions.

To further advance the programme, we completed the final fit-out on-site, enabling the construction to commence while the design was still being completed.



Murdoch's Connection Bridge, Hull

Client Highways England
Value £22m
Location Princes Quay, Hull
Sector Public infrastructure

We delivered this distinctive landmark to strengthen Hull's connectivity between the city centre and waterfront.

Locals voted to name the bridge after Hull's first female GP, Mary Murdoch. Spanning 60 metres, the structure arches over the A63 and provides direct city access for pedestrians and cyclists.

The bridge was prefabricated in sections at an off-site facility before being assembled in a nearby and temporary location. From there, a self-propelled modular transporter carried the 150 tonne single piece down the dual carriageway. The 24 hour procession required meticulous planning and road closures to successfully jack the bridge into its final destination.

The project also called for extensive collaboration between Tilbury Douglas, our supply chain partners and the local council. This was facilitated through BIM, which was invaluable in modelling time sequences and planning the logistics around this complicated installation.

Additionally, pre-fabrication allowed works to continue indoors, eliminating the impact of weather-induced delays on the programme.



Winner of the
**Institution of Civil
 Engineers Centenary
 Award 2021**



Waterfall House

Client NHS Trust
Value £27m
Location Birmingham
Sector Health



Tilbury Douglas Construction (TDC) and Tilbury Douglas Engineering (TDE) worked with Birmingham Children's Hospital as part of the P21+ Framework. We delivered Waterfall House, a new four-storey clinical building providing specialist accommodation for children.

The Trust needed to bring together disparate facilities from across the existing and outdated estate. By providing three new ambulatory theatres and daycare surgery, we increased capacity and consolidated efficiency in the provision and management of surgical services.

Each of the four floors were designed in close consultation with both staff and patients. They boast staff breakout rooms, single en-suite rooms, play areas and a teenage common room for cancer patients. Large windows and internal glazed screens were used to maximise daylight. Rainscreen cladding on the main façades and high quality fit out provide a modern, contemporary feel.

The Trust required the building to have long term flexibility so that it could be adopted if the main hospital relocated in the future.

TDC developed a steel frame structure to aid off-site fabrication and a standard room layout which provided flexibility within the building.

TDE delivered a complex rooftop packaged plant-room and utilised prefabricated risers and service runs to reduce deliveries to the site. This minimised disruptions to the hospital and maintained its smooth operations.



Haribo Confectionery Plant

Client	Haribo UK
Value	£10.5m (total)
Location	Pontefract, West Yorkshire
Sector	Industrial / Manufacturing

At Tilbury Douglas Engineering (TDE), we delivered the extensive services for the purpose-built production facility. The new site includes a 30,700sqm three storey production building, four storey office block and designated energy centre. Now fully operational, the plant produces 48,000 tonnes of treats a year.

The project embraced off-site manufacturing including multi-service modules, prefabricated pipework, a packaged chilled water plant room and plant skids. This approach improved programme periods, reduced waste and improved Health and Safety.

For example, the packaged chilled water plant room was delivered to site in four sections. Comprising of chilled water pumps, a buffer vessel, expansion tanks and controls, it was installed within three days, saving eight weeks from the associated programme. TDE utilised Building Information Modelling (BIM) for the re-engineering and co-ordination of the heavily serviced roof top plant areas.

Haribo Key Off-site Elements:

- TDE worked closely with its supply chain partner, Ellison, who integrated the electrical transformer and delivered it to site.
- Light, safe and easy to handle, prefabricated (pre-flanged) Trubore pipework meant no welding / hot works on-site.
- TDE delivered modular packaged plate heat exchangers that provided varying degrees of hot water for Haribo's sugar melting operations. These included domestic hot water (60 degrees), factory hot water (70 degrees) and process hot water (95 degrees).
- Packaged transformers / substation.
- A steam boiler, 65mm flue and nine roof-mounted air handling units.



Leighton Hospital New Theatres And Critical Care Units

Client	Mid Cheshire Hospitals NHS Trust
Value	£8.8m (total)
Location	Crewe, Cheshire
Sector	Health

We at Tilbury Douglas Engineering (TDE) wielded our MMC capabilities to deliver the hospital's extensive plantroom. The project encompassed eight state-of-the-art theatres and 14 critical care beds, supporting an improved hospital experience for the local community.

Our scope of works included the design, supply, installation and commissioning of mechanical, electrical, public health and special installations. The safety of patients and staff was our number one consideration while carrying out the project.

At 1,730sqm, the hospital's plantroom was almost the size of a football pitch and consisted of 25 off-site prefabricated individual modules. We successfully delivered the complex services, despite challenges that encompassed working in a live hospital adjacent to active operating theatres. Additionally, we maintained services while carrying out diversions including HV ring, LV submains, mains gas and water.

The plantroom's off-site prefabrication included the following direct benefits:

- The reduced number of operatives on-site cut carbon emissions from transport vehicles.
- The limited amount of plantroom deliveries to site (26 in total) lessened impacts on the hospital's daily operations, benefiting the environment from reduced carbon emissions.
- Decreased amounts of waste due to a factory-built environment.
- Improved Health and Safety due to over 6,575 labour hours removed from site, meaning less risk of accidents or incidents.
- Diminished levels of noise pollution and general disturbances to the surrounding hospital operation compared with an in-situ solution.
- 25% reduction in programme.



Jaguar Land Rover – AJ200 Engine Manufacturing Centre

Client Jaguar Land Rover
Value Confidential
Location Wolverhampton
Sector Production / Manufacturing

Tilbury Douglas Engineering were thrilled to deliver the MEP services required in the new build 70,000sqm facility. It consists of manufacturing and assembly halls separated by a central staff service block providing office administration and welfare facilities.

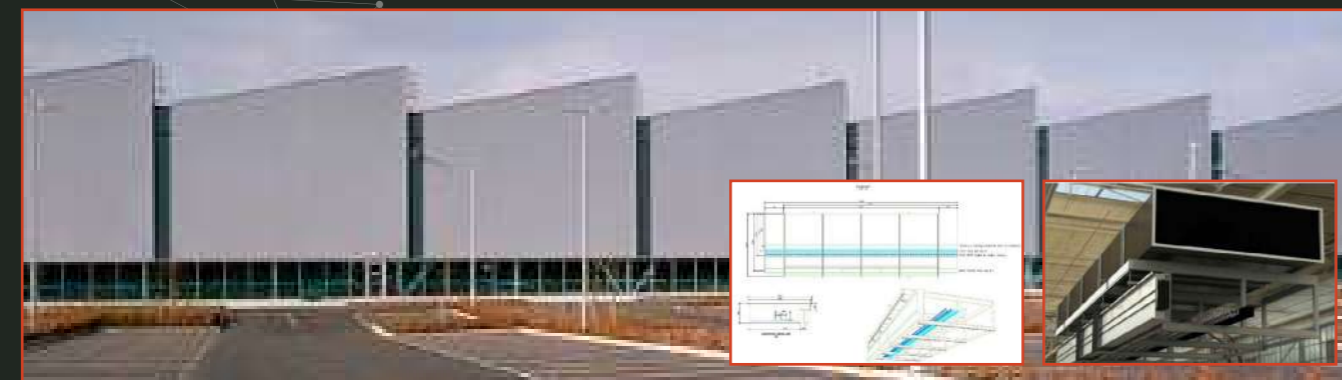
The MEP services were designed using Building Information Modelling (BIM) to provide a fully co-ordinated 3D services model. This approach allowed certainty around equipment installation, providing Jaguar Land Rover with surety that they could access the MEP services for maintenance and future provisions.

Prefabrication was used extensively within the assembly hall and central block. Over 244 horizontal 7.5m long multi service modules were installed within the halls to reduce working at height and to ensure the programme met client access dates. BIM's high level of detail and the prefabrication of building services enabled Jaguar Land Rover to smoothly co-ordinate the secondary fit out services with the horizontal service modules. This approach also avoided duplicate support steelwork.

The BREEAM Excellent scheme featured the delivery of solar thermal heating, rainwater harvesting systems and photovoltaics.

The works were completed over two sectional phases and extensive fast track enabling works were also a key part of the contract. These included diverting natural gas, mains water, sprinklers and compressed air. Additionally, the relocation of the cooling towers was key for the sub structure works starting on time.

TDE delivered the project in close co-ordination with Jaguar Land Rover's estates team to ensure their existing facility remained operational.



Mount Oswald Student Accommodation

Client Durham University
Value £80m
Location Durham
Sector Residential/Education



A key part of Durham University's 10-year development plan, the Mount Oswald project was one of the largest new education developments to be constructed in the North East region.

The development provides high quality, sustainable student living spaces, as well as social areas for two of Durham University's unique colleges, John Snow and the newly created South College. We worked closely with our project designer, Willmore Iles Architects, early in the project to develop the design in line with our MMC approach for South College. We delivered the John Snow College through traditional routes.

Due to its speed, quality and robustness, we selected PCE Ltd's 'HybriDfma' system as a key part of our strategy. Its flexibility and delivery certainty also supported on-going, low maintenance costs.

Offering comprehensive off-site solutions, HybriDfma helped drive the works through manufactured precast concrete ground beams, internal wall panels, flooring units, stairs and landings. It also encompassed structural steelwork and pre-cast insulated sandwich panels that formed the facades.

Compared to traditional construction approaches, the flexibility of off-site manufacturing allowed sample panels to be created, quality inspected and agreed ahead of mass production, which ensured the highest quality and zero defects. It also significantly improved Health and Safety by removing key risks. These included scaffolding or works at height, along with reducing the number of trades and equipment needed for the build.

Additionally, off-site manufacturing resulted in significant time savings across the construction period, on-site work hours and site deliveries. As such, it was a major contributor to delivering the project three weeks ahead of programme.



To discover more of Tilbury Douglas' technical capability, please familiarise yourself with our **Digital Transformation** brochure.



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