

## The McAvoy Group: Smart Offsite Construction Through BIM

### Background

The McAvoy Group is one of the UK & Ireland's leading offsite construction specialists. An independent, family-owned business and an established principal contractor, McAvoy has been providing bespoke offsite solutions to the education, health, residential, commercial and infrastructure sectors for nearly 50 years.

Challenging market conditions post the 2008 recession necessitated focus on new markets and innovation with specific focus on the UK and increased research and development of new products.

As a result, McAvoy has developed a culture that has seen them excel in Smart Offsite® construction leveraging digital technologies. They now offer a complete Design, Build and Installation solution which is complimented with an established and trusted supply chain underpinned by its commitment to the adoption of an open BIM approach.

The Group now has two purpose-built manufacturing centres spanning more than 120,000sqft. McAvoy has also enthusiastically embraced the principles of the UK Government's Construction 2025 policy, which aims to foster an efficient and technologically advanced construction industry that leads the world in low-carbon and green construction exports.

Innovation and technology are key drivers behind all of McAvoy's operations and BIM is an increasingly critical element in its design and programme planning. McAvoy became the first offsite modular construction company to achieve BIM Level 2 Certification ahead of the UK Government's mandate that came into effect in 2016. Harnessing BIM has enabled them to

achieve optimum energy efficiencies through intelligent virtual design team collaboration, enhanced manufacturing and site installation methodologies, as well as the over-arching management of all their resources. They have further improved resource efficiency through additional investment in innovation, such as implementation of a new IT infrastructure, a cloud-based information management solution for sharing and collaboration on project information with dispersed teams. Figure 1 provides an image from one of the two purpose-built manufacturing centers.



Figure 1 – Manufacturing center

### Smart Offsite® Construction and Open BIM

Working collaboratively as an established principal contractor The McAvoy Group provides offsite turnkey construction solutions. They have recognised that early engagement is vital to the success of any offsite project and have committed to ensuring that clients, technical advisers, planners, engineers and architects

work together from the outset as part of a cohesive and professional team.

Construction in controlled factory conditions has resulted in the delivery of buildings with significantly less risk and disruption than site-based construction, as well as fewer vehicle movements to site for a safer, quieter and cleaner building project. The application of robust offsite processes has significantly reduced waste and material damage at every stage of the construction cycle, as well as resulting in shorter programmes for earlier occupation.

This process has been partnered with the latest digital construction technologies through an Open BIM approach. Software packages including ArchiCAD V19, Tekla Structures V20, Revit and Mitek Woodengine are all seamlessly integrated into their smart offsite<sup>®</sup> construction workflows. The correct application of these technologies enables the client to become engaged, informed and updated throughout the entire build process.

## Case Study Examples

McAvoy delivers offsite construction projects for the education, health, residential, commercial and infrastructure sectors. For the purposes of this exercise one case study has been selected for each sector.

**Education:** McAvoy designed and built the new state-of-the-art Concordia Academy, a 630-place primary school. The £8.2m 2,972m<sup>2</sup> school was built offsite which resulted in an exemplar learning environment for local children. On this project, the solution from McAvoy enabled the development of a highly restricted and challenging brownfield site. Offsite construction delivered programme benefits as the construction work was progressed offsite simultaneous to the extensive civil works package. The building was craned into position (Figure 2) as 67 steel-framed building modules

in just 12 days. A 300-tonne crane was used for the modules which are up to 16.5m long and weigh up to 17 tones.



Figure 2 – Building craned into position

**Health:** The McAvoy Group was awarded the £15m contract for the offsite construction of a new wing at Northumbria Specialist Emergency Care Hospital in Cramlington. The 6,500m<sup>2</sup> three-storey building is linked to the existing hospital. The first floor was fitted out as part of this contract to accommodate one of the UK's first purpose-designed Ambulatory Care units, with the other two floors fitted out in the next phase of the development. This highly complex project which was on a live hospital site pushed the boundaries of offsite construction. McAvoy developed a hybrid solution which incorporated both offsite and in-situ building methods. This enabled them to maximise fit-out in the factory, enhancing quality and reducing disruption to staff and patients. The project required bespoke modules up to 14.85m long which were specially engineered to provide a structural flooring solution that seamlessly integrated with the existing hospital building. This met the key requirement for efficient patient flows, removing the need for ramps and steps. Mechanical ventilation, heating and cooling systems were installed in the ceiling voids in the McAvoy factory. This hybrid construction solution had a three-storey offsite structure with an in-situ built

curved link on each floor, a roof-top plant room and full-height stair towers.

**Commercial:** South Gates is a new €22 million 2,200m<sup>2</sup> passenger boarding facility which has been developed to meet the huge growth in passenger numbers at Dublin Airport (Figure 3). It provides seven boarding gates to serve nine aircraft stands and can accommodate around 1,000 passengers at a time and up to 8,000 people a day. The new boarding zone was constructed offsite to reduce the programme for earlier occupation and meet the rising demand for flights from the airport. It was craned into position in just 16 days as 77 steel-framed modules, up to 12m long and weighing up to 13 tonnes each. Clear uninterrupted spans of over 19m were required for the 120m long facility. This was achieved by engineering the building modules to incorporate hot rolled structural steel beams which removed the requirement for internal columns. External glazing was factory installed to create a weatherproof envelope for fitting out. Five roof-mounted modular plant rooms were also fabricated offsite and delivered fully fitted with extensive mechanical, electrical and plumbing installations. BIM was used extensively in the tender and design stages. McAvoy created a virtual reality model of the building to demonstrate the building design and offer a fully immersive Virtual Reality experience. This allowed the client team to review the internal environment and in particular, the innovative acoustic ceiling solution. 3D drawings and models were produced for both the steel structure and architectural modelling, and a common data environment was created. BIM was also beneficial for clash detection for the installation of complex M&E services.



Figure 3 – South Gates Dublin Airport

**Residential:** The Joymount development in Carrickfergus is currently under construction. McAvoy will provide 40 much needed homes to help address the severe shortfall in social and affordable housing in Northern Ireland. The £4.7m contract for Clanmil Housing Association is the first offsite housing scheme to be built in Northern Ireland. The use of the McAvoy offsite housing solution will reduce the build programme by around 60% to just 40 weeks. The homes are being manufactured and fitted out offsite which will improve the quality of construction and will allow earlier handover to move people from the housing waiting list. McAvoy has manufactured 111 steel-framed building modules and the homes will be installed on site in Summer 2019 ready for the final stages of fitting out. The new homes are designed in accordance with Lifetime Homes and Secured by Design standards, and will benefit from timber-framed double glazing, more precise factory construction processes, and high levels of insulation to help reduce heating costs and energy consumption. Figure 4 details a rendered illustration from the 3D model.



Figure 4 – Rendered image from the model



Alan Hore, Peter Browne, & Barry McAuley  
McAvoy site visit, 8<sup>th</sup> March 2019

## Conclusion

The McAvoy Group workflow provides a meticulously planned and streamlined process that has provided greater transparency and certainty of delivery, as well as flexibility to deliver sizes and configurations to meet the precise needs of projects and building specification. A smarter offsite construction solution has given The McAvoy Group the opportunity to offer a service that can guarantee both cost and program certainty, earlier return on investment and a safer working environment.

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Case Studies sourced from

<http://www.mcavoygroup.com/case-studies/>

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