

**COMPANY OVERVIEW**



COMPANY WEBSITE  
www.colleen.com

Established in 1810, and trading as “Colleen Bros” until 1984, Colleen Construction is one of the leading construction firms in Ireland, and we are extremely proud of our history and reputation for building quality and excellence. The company offers a full range of construction services, including management contracting, design and build, joint venture/partnering, and turnkey contracts. We have experience in a variety of project types, including

residential, commercial, educational, retail, leisure, health, pharmaceutical, industrial, and conservation, and ranging in value from under €1Million to in excess of €300Million. We have longstanding relationships with numerous Clients and Consultants built up over the years, ensuring the company has remained at the forefront of Irish construction for two centuries. Our Client list is testament to the excellent service the company provides on every project.

**OVERVIEW & BACKGROUND TO THE LEAN INITIATIVE**

**AUTHOR**



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Colleen Construction has in the past trialled Lean on a small scale but has since moved strategically to a fully integrated Lean approach on all projects from design stage through to practical completion. This case project focused on pull planning with early collaboration between our Client, Design Team, and Subcontractors. The overall outcome was extremely successful with critical issues being identified and rectified prior to them becoming an issue for our operations team.

Colleen had previously adopted the Last Planner® System (LPS) on a pharmaceutical project and observed positive outcomes. Colleen engaged with a new client on a fast-track data centre

in a design and built capacity, and viewed it as the perfect opportunity to fully embrace the pull planning process and engage with key stakeholders at design stage to gain the best possible outcome at operations stage.

The project chosen was a €160Million fast-track data centre project with Colleen appointed as Main Contractor responsible for design and build. Initially we started with the master programme with the Key and Tag Milestone dates for each major element of works plus the equipment installation. Micro Schedules from the Vendors with key activities and requirements for their supplying Equipment were integrated into the master programme.

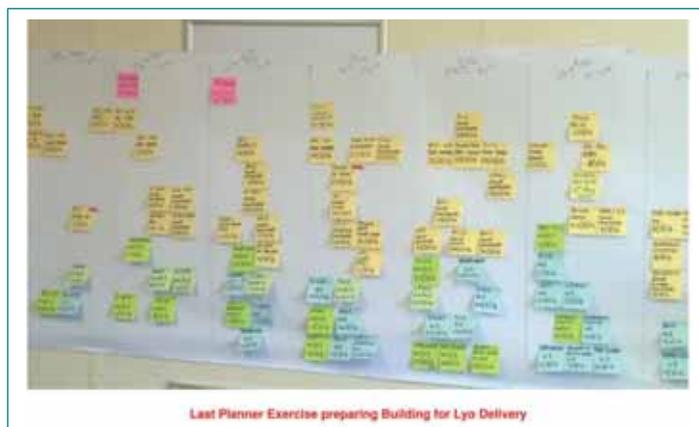
**LEAN INITIATIVE UNDERTAKEN – LEAN THINKING, TOOLS, TECHNIQUES**

Once Colleen made the commitment to embrace a Lean way of thinking, there was one clear objective at the forefront, namely to create greater value for the consumer while using fewer resources. Colleen adopted Lean principles to eliminate waste through all processes and increase operational efficiency.

Colleen found the Lean concept to be an excellent fit with our company that encourages planning, change and innovation in an ever-changing sector. In 2014, we engaged a Lean Specialist to come into the company and train our senior managers, both onsite and in the office, on LPS, with 20 members of staff receiving full 5-day training on LPS. The training was very successful as it encompassed all the elements that are standard practice to Colleen and formalised these elements into a usable template.

Colleen’s greatest strength is one that has been forged over decades “To foster a collaborative one team approach and build lasting relationships with loyalty at the core”. With this already well embedded in the company, the shift to

Lean and Pull Planning at project level was well received.



**Figure 1.** LPS Planning at Colleen Construction

*Common Data Environment*

The first element reviewed was information flow. Historically in the construction sector, the greatest barrier is the flow and

approval of information at early stages. With lead-in times onsite being reduced, there is not always time to put the necessary controls in place to ensure information is correct by the time it gets to the construction phase. This was an element Collen were keen to get right from the start.

The Collen team are very familiar with cloud-based platforms for integrated document control and transmission. The software Collen employ is “Viewpoint” (formerly “4Projects”) which is similar to several other software systems on the market in recent years. This platform facilitated full and coherent collaboration with all key stakeholders in the process. It encouraged transparency towards critical project deliverables for all stakeholders, and, as a highly configurable platform, was amended to meet specific project demands, requirements, and constraints. The platform promoted efficiency with correct information retrieval, succession, and validation. It also drove consistency in quality protocols and standards. Ultimately, Viewpoint removed duplication and created transparency right through the project from feasibility through to commissioning and validation.

The most difficult barrier was to onboard all key stakeholders to trust the system and share information through it rather than reverting to traditional outlook emails for sharing of information. Our Design Manager on the project, along with the entire Collen team, consistently encouraged the use of Viewpoint and assisted any stakeholder who was unsure of how to use the system.



**Figure 2.** Collaboration Makes the Difference at Collen Construction

Full training was carried out with each stakeholder by our Document Controller on the file structure, namely, how to retrieve, upload, and amend information on the platform. As the majority of our subcontractors work across all projects, this training proved invaluable and increased usage of Viewpoint was witnessed across all projects.

Once we had all stakeholders on board, the natural progression was to integrate our Pre-Construction Services with the Lean approach in mind and examine how we could maximise value whilst minimising waste.

#### *Communication*

Communication is key to the success of Lean Construction. From the design stage, Collen ensured open lines of communication between all stakeholders, ensuring issues were mitigated prior to them arising onsite. Weekly Lean/Design Team meetings were held onsite, and, once the design was developed enough, our first LPS session was held onsite. This involved all key stakeholders and was one of the most beneficial meetings on our project schedule. Key milestones were set which allowed Collen and all other stakeholders to clearly

identify critical times onsite and mitigate and plan for any issues that may arise. The session also gave ownership to all stakeholders of their key dates and commitments.

#### *BIM*

As part of the Lean initiative, Collen has fully embraced the BIM process and embedded it into every aspect of our daily activities. At a pre-planning/design stage, we have found BIM to be the last word from a visualisation perspective to clash detection. It is imperative that subcontractors are engaged from an early stage to ensure they are fully BIM-compliant and understand the importance of the process. Our trusted list of BIM-compliant subcontractors is paramount to the success of full BIM implementation on any project.



**Figure 3.** BIM at the Gemba Coalface

#### *Housekeeping & 5S*

Collen Construction prides itself on its strong approach to housekeeping onsite, and all materials must be stored correctly. This in turn avoids incidents, materials being damaged, and loss of control of materials onsite. It has also assisted Collen in reducing slips, trip, and falls onsite, and improved Safety across all projects. The 5S approach has brought housekeeping to the next level onsite and assisted our operations team greatly with the standardised approach it offers.

#### *Preplanning/Forecasting*

Weekly design team meetings were held to allow all stakeholders to review current works onsite and compile 4, 8, and 12 week lookahead to identify and mitigate against any issues and solve them before they affected the programme. A monthly pull planning session was held to review previous lookahead and plan for the next 4, 8 and 12 weeks. This system proved invaluable as subcontractors felt there was more transparency and ownership of the project than under the traditional siloed approach.

#### *Eliminate Waste*

The key objective was to eliminate waste in processes, materials, and time from pre-construction through to practical completion. All stages of construction were fully designed in BIM prior to the build commencing onsite. All models were coordinated and federated by the inhouse Collen BIM team. Weekly BIM coordination/design meetings were held onsite where all parties would interrogate the models to ensure they were advanced. The Logistics Manager attended all meetings to ensure the logistics schedule aligned with the 4, 8 and 12 week lookahead. Lookahead lead-in items were highlighted early, and progress updates were reported monthly at the pull planning meetings.

## LEAN INITIATIVE IMPROVEMENTS & IMPACT

The overall implementation of a Lean approach to our Data Centre Project proved to be critical as we moved towards practical completion. The most notable improvement was through the utilisation of our Common Data Environment. To have a single source for all information from pre-construction through to practical completion was invaluable when it came to carrying out due diligence on our Handover/Safety File.

The compilation of the handover file documentation proved seamless through the Lean approach to doing it right first time (RFT). Traditionally, information given at Design stage through design team specifications, and requested at Tender stage from the Quantity Surveyors, was requested again at Submittals stage through our operations team onsite, and again at Practical Completion stage by our Digital Safety Provider. Using Lean techniques, we were able to direct our digital safety file provider straight to Viewpoint where they could retrieve approved information for each element of the project. This information had been previously approved by the design team through the submittals and verified through the Quality Assurance system onsite. This one change alone eliminated hours of rechecking documentation that had already been verified by Collen, the Design Team, and Subcontractors.



**Figure 4.** Colleen Construction Factory Witness Testing

Another major benefit of the collaborative Lean approach was the increased participation and communication between our design team and subcontractors. Colleen witnessed much greater collaboration and ownership from subcontractors through the utilisation of the pull planning method. Traditionally, dates slip and milestones are not met, but through the monthly pull planning lookaheads subcontractors felt more accountable to other trades as they had a greater understanding of how their delays impacted other trades. Through working together towards a common objective, stakeholders did not just focus on their own objectives but rather on the project objectives as a whole. When issues were identified, all stakeholders came together to find a solution rather than all stakeholders working in silo with minimal effect. Alone we can do so little, but together we can achieve so much.

The final most measurable impact of the Lean approach was the full utilisation of BIM, and BIM collaboration seamlessly occurred across all disciplines within the project. Our inhouse BIM coordinator federated all models to ensure clashes were

identified early and mitigation measures put in place. Cloud access also allowed project teams to take the office to the field, with access to a live 3D model onsite.

By using BIM, our design team could plan and visualise the entire project during preconstruction and before a shovel hit the ground. These visualisations also allowed clients to experience what the space would look like, offering the ability to make changes before construction started. By having a greater overview from the beginning, it minimised expensive and time-consuming changes in the construction stage of the project.

Elimination of waste was realised through improved communication and the integration of standard operating procedures (SOPs). By challenging the traditional approach through the integration of new technology into SOPs, wastage in the processes were identified and removed. Closer collaboration with contractors led to fewer overall variations and fewer opportunities for claims as information was correct going out to tender packages. Improved overview of the project before commencing onsite allowed for increased time for prefabrication and reduced waste on unused materials onsite.

Modular prefabricated elements were utilised to their full potential on this project, and they greatly improved the quality of the finished project and safety onsite as they were fabricated in a factory environment rather than the traditional construction site environment. BIM data greatly assisted in the modularisation process, and it was used to instantly generate production drawings for manufacturing purposes, allowing for increased use of prefabrication and modular construction technology. By designing, detailing, and building offsite in a controlled environment, waste was diminished, efficiency increased, and labour and material costs reduced.

In the same way that many of these benefits save money, they saved time by reducing the time of project cycles and eliminating construction schedule setbacks. BIM allowed design and documentation to be done at the same time, and for documentation to be easily changed to adapt to new information such as site conditions. Schedules were planned more accurately and communicated exactly, and the improved coordination assisted the project by completing on time or early.

Overall, we could not recommend the Lean approach highly enough. Whilst some of our team were sceptical to start with, and they viewed Lean as a manufacturing-based tool, they soon realised it was a vital tool required for the ever-changing world of construction.



**Figure 5.** Colleen Construction Lean Practitioners

