

COMPANY OVERVIEW

COMPANY WEBSITE
www.sheahancollinsconstruction.com

Sheahan & Collins Construction (S&C) is a young construction company offering Main Contracting, Fit-out/Refurbishment, Pre-Construction, and Project Supervisor Construction Stage (PSCS) services operating in the broader commercial sector, including hotels, nursing homes, multi-unit accommodation developments, and office buildings. S&C is driven to offer

innovative, solutions-based methods to its projects in the safest possible manner. Motivated by 'building better through collaboration' S&C place emphasis on an inclusive non-silo approach to project delivery and is dedicated to applying Lean Construction principles and methods in-house and across its supply chain.

OVERVIEW & BACKGROUND TO THE LEAN INITIATIVE**AUTHORS**

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The initiative for Lean was two-fold. Firstly, as a young company, the opportunity presented itself to 'start as we intend to go on' and commence the company's Lean journey during the company's infancy, building systems with Lean Construction in mind and incorporating Lean methods into our management systems. Secondly, during the early stages of the Dublin City project which is the focus of this case study, the need to apply a different approach to project delivery was recognised in order to successfully hand over the project to the client ahead of the new academic year in September 2018.

This was based on the obvious challenges such a project presented, plus experience – the same approach to project delivery typically led to similar outcomes, thereby highlighting the

need for a different approach to effect the required outcome. The project consisted of a Design & Build (D&B) purpose-built student accommodation (PBSA) development in Dublin City comprising a 6-storey over-basement building delivering 128 bed spaces and ancillary spaces in a very compact site and with much of the layouts governed by existing planning permission. The development also utilised the entire footprint of the site, which only left public spaces remaining for staging construction works. Apart from the normal logistical challenges of such an inner-city site, including being on a main thoroughfare adjacent to a large school plus a significantly larger construction site next door, the building's four separate blocks and cores added to the significant challenge of making everything fit.

LEAN INITIATIVE UNDERTAKEN – LEAN THINKING, TOOLS, TECHNIQUES

The building design and internal floor layouts went through a number of iterations to optimise the cluster apartment arrangements so as to ensure rooms were adequately sized with efficient layouts, and also to address the limited floor-to-ceiling height for services routes and installations (the site was acquired with planning and thus increasing the building or floor-to-ceiling heights was not an option).

It was recognised early in the process that the project would therefore present certain challenges from both design and construction perspectives as noted above, as well as dealing with day-to-day construction operations and activities. S&C identified the opportunity to implement certain Lean Construction processes and tools to address or assist with the above. While some members of the project team were aware of or had prior experience in Lean, the majority of the team, including key trade partners, were not familiar with or experienced in Lean. The project commenced in 2017 and S&C quickly followed with the procurement of key trade partners (structure, envelope works, M&E services installations, lifts, interior fit-out), and with these appointments the Lean initiative commenced in earnest.

The main tools and techniques implemented were:

1. Early engagement of key trade partners.
2. Structured M&E design coordination meetings (design consulting engineers, specialist contractors, and main contractor in attendance to negate working in silos).
3. Implementation of Last Planner® System (LPS) for schedule management.

Early Engagement of Key Trade Partners

This led to overall improvement of project team performance over the course of the project. It also fostered a real culture of a project team which was evident to newcomers to the team. As trades joined the Project, evidence of an integrated approach rather than a siloed or segregated approach was confirmed.

The main parties were aligned to the client and project goals from the outset, leading to a more united effort in achieving this. Key players – the parties who ultimately influence the outcome of the project and hold responsibility for its delivery – understanding the project goals and client's critical success factors earlier than normal enhanced the likelihood of those success factors being achieved.

There was expert input into design of critical items at the

beginning of the design process, which led to improved design through enhanced coordination. Adopting the approach of ‘the answer is in the room’, all parties played their part in developing a workable design at the early stages of the project.

There was better coordination of design, leading to improved construction (safety, time, budget), reduced re-work, and less waste. Buildability and coordination challenges were dealt with via optioneering on exploring budgets, current technologies, materials and systems, service routes, and so on. All of this led to safer construction, improved productivity, and less waste.

It helped establish a more collaborative environment for the project with less confrontation and a greater willingness to address the issues via collective effort. This helped foster the team environment where there was genuine interest and understanding of each other’s work and scope. The impact of each on the other became clearer with improved effort to make it all work.

It enabled key trade partners to engage with their respective supply chains earlier and in focusing on procurement, material, and equipment options, thus resulting in better value for the project.

Structured M&E Design Coordination Meetings

While detailed M&E services coordination meetings are a standard process on construction projects, S&C and the team identified this as an area that required particular attention. Given the aforementioned challenges presented by the building structure (floor-to-floor height, block and core arrangement), the sizing and routing of M&E services throughout the floors and in the main plant rooms located in the basement required significant effort from all parties to make the M&E systems work.

The architects and structural engineers used BIM for the building design, and this model was then shared with the M&E consultants and contractors for their systems to be inputted. This allowed sizing and routing of key services to be determined accurately, as well as locating key equipment in limited spaces. Front-end design and construction planning meetings were held by the project team where M&E services designs were worked through the project BIM model, with issues and clash detection worked through to avoid issues on site during the build.

When the M&E contractors commenced on site, weekly team meetings were held on site to maintain the collective effort through design development and to also facilitate Gemba Walks to review and address any design, spatial, or buildability issues that presented. Whilst not unique in having these meetings on site, the starting of the process as early as possible, and continuing on throughout the project, created and fostered the integrated approach with shared responsibility for addressing any issues and finding workable solutions promptly.

Implementation of Last Planner System® (LPS) for Schedule Management

S&C engaged a Lean Construction Ireland (LCi) commended consultant for introductory training on Lean Construction and LPS with the key trade partners on site. This was aimed at firstly giving background to Lean

Construction to help the project team get an understanding of Lean thinking and processes, and secondly to put in place a structure and process to assist in the management of schedule and project delivery.



Figure 1. Project Team Trained on Lean Construction and LPS

The focus on LPS came from a combination of research on its implementation, traction within the local sector on its use and reported success, and a clear understanding by S&C that traditional Critical Path Method (CPM) scheduling methods are limited due to the following:

- Inadequate of input or buy-in by trade supervisors.
- Lack of understanding of the project plan as presented on Gantt charts, etc.
- Absence of clear tracking of progress on day-to-day or week-to-week as work is detached from the CPM schedule.

S&C understood and implemented the following five elements of LPS:

1. Master scheduling – setting milestones and identification of long lead items (what *should* be done).
2. Pull Planning – specifies work handoffs and identifies conflicts that will impact work (what *can* be done).
3. Make Work Ready Planning – utilising lookahead planning to confirm work is ready for installation (what *will* be done).
4. Weekly Work Plan (WWP) – team makes commitments to perform defined work in a specific manner (what the team will *do*).
5. Learning – measuring percent plan complete (PPC) and conducting root cause analysis of failure, and conducting lessons learned for future improvements.



Figure 2. Pull Plan for Mock-Up Suite

With considerable effort over the course of the project, the team realised the benefit of LPS with the process providing

ongoing opportunity for rich learning. The commitments made in WVPs as a result of a collaborative process became more honest and meaningful, with genuine efforts to

identify/remove constraints, and a keenness to have honest conversations when planned tasks were not completed for learning opportunities.

LEAN INITIATIVE IMPROVEMENTS & IMPACT

The project was completed on time and within budget, with Practical Completion achieved July 2018 in advance of the start of the new academic year, thereby allowing the client requisite time to hire and train key staff ahead of a busy opening period.

Schedule Improvements

Practical Completion was achieved in 42 weeks from completion of the ground floor slab (completion of 6-storey structure, envelope, internal fit-out of 128 bedrooms, ancillary spaces) and this could not have been achieved in that timeframe if LPS had not been used. LPS negated earlier project delays on site and facilitated project completion through primarily normal working hours, without significantly increasing crew sizes.

Lessons Learned

A Lessons Learned session held with key members of the project team (client, design consultants, key trade partners, main contractor) yielded some valuable findings along with overwhelming endorsement of the Lean initiative undertaken. The highlights regarding improvements and impact were the improved quality and safety, collaborative approach to teamwork, the use of LPS, the resultant change in people's mindset, and an improved project team feeling overall.

Last Planner® System

With LPS, the Villego® simulation training was a seminal moment in people realising the positive impact of effective communication and working together. This contributed significantly to the change in mindset on the project, and it had optimal impact as it occurred at the outset of the Lean journey.



Figure 3. Villego® Training with Key Trade Partners

Also, the introduction of Pull Planning led to improved

and consistent flow of work, enabling confidence to grow amongst the trades with regard to schedule commitments being made. Trades were also able to maintain smaller crew sizes as a result of the improved flow.

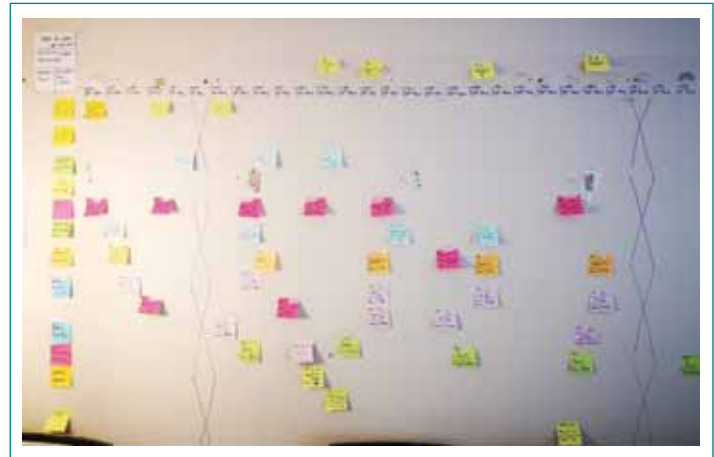


Figure 4. Pull Plan for Part of the Works

Safety and Quality Improvements

The benefit of improved flow area-to-area and floor-to-floor resulted in work being carried out much more safely. While pressure remained to deliver, it was in a controlled fashion due to reliable commitments on productivity being made and achieved. This also improved quality with a 'right first time' approach being encouraged throughout and achieved for the most part. Re-work rates were reduced, again improving flow and also reducing costs and waste throughout.

Early Engagement Benefits

As noted above, the goals of early engagement of the project team were evidenced in the integrated and collaborative approach. Improved daily and weekly communication was as significant as it was simple – people talked and trades supervisors engaged effectively on a daily basis. Morning huddles were anticipated and attended consistently in large numbers as their benefit quickly became apparent to all. Questions were asked of each other to gain an understanding of what the other needed and how they could be assisted in their work.

Integrated/Non-Silo Working

The electrical contractor's project manager noted it was the first project he worked on in a non-silo environment. As a result, he now approaches work with a different mindset. This was echoed by the mechanical contractor, who remarked it was the best project he had experienced from a site communication perspective. This is not to say there were not problems, delays or site issues, but rather that the difference on this project was the approach to dealing with each of these issues as and when they arose. People offered help, expertise, solutions, support, ideas – a problem became a team problem and a solution came from the team for the team.

Long-Lasting Impact and the Future of Lean at S&C

The impact of the Lean initiative was immediate on the project with enthusiasm and buy-in evident from the initial training. It should be noted that to maintain the initial impetus, a significant and concerted effort by the project team was required. Again, it should be noted that this was not without challenge and periodic ‘recalibration’ of the effort was required – stock taken, opinions and ideas given, processes tweaked, and so on.

Long-term impact has materialised in the form of S&C now deploying Lean as one of its core management systems. It has recently been successfully deployed on a hotel refurbishment project with some of the same project team members, and is becoming embedded within the group and some of our key trade partners. Also, a culture of organisational continuous improvement has evolved on the back of the Lean initiative, with everyone in the group encouraged to contribute to the enhancement of the processes. The target future state is that S&C is recognised for Lean project delivery with a solid core set of processes deployed on each project, and we become a contractor of choice for our clients based on track record, and for key trade

partners based on an integrated and collaborative team approach to project delivery.

Key Benefits and Outcomes

Some key benefits and outcomes arising from the Lean initiative are:

- Understanding and appreciation of the what Lean is and how it can be applied to have positive impact on a construction project.
- Positive change in mindset of project participants – integrated, non-silo approach, while having an awareness of waste.
- Active participation in collaborative planning and problem solving.
- Buy-in to daily collaboration (morning huddles) and weekly LPS meetings based on evidential benefits to the management of the project.
- Key trade partners have embraced the learning and the tools used on the project, and are implementing on new projects.
- Key trade partners are adopting Lean principles within their own organisations as a result of their experience on the project.

