

**COMPANY OVERVIEW**



COMPANY WEBSITE  
www.kirbygroup.com

Founded in 1964, Kirby is a mechanical and electrical engineering contractor. The company operates in Ireland, the UK and Northern Europe, and directly employs over 850 highly-skilled employees. Kirby provides full mechanical and electrical contracting services as well as specialist high voltage (HV) and medium voltage (MV) design and construction services to clients across a number of different sectors including Data Centres, Life Sciences, Industrial Manufacturing, Substations and Renewables, Power Generation, Petrochemical and Commercial. After 55 years in business,

Kirby has earned a reputation, supported by client references, for excellence in high-value mechanical and electrical engineering contracting services. This reputation is built on early engagement, finding innovative cost-effective solutions for complex build challenges and an uncompromising approach to safety, quality and delivery. Kirby has strong capabilities in prefabrication, modularisation and digital construction, along with a Lean approach to project delivery, which ensures excellence and value for its clients.

**OVERVIEW & BACKGROUND TO THE LEAN INITIATIVE**

**AUTHORS**



Martin Searson



Kevin Wall

Kirby’s strong capability in prefabrication, modularisation and digital construction, along with a Lean approach to project delivery, ensures excellence and value for our clients. As early as 2012, Kirby started following an EFQM (European Foundation for Quality Management) framework approach to quality which included a philosophy of continuous improvement. Lean and value became more and more prevalent to our strategy moving forward.

As the construction industry’s value moved more towards Lean, including standardisation and consistency of outputs, the requirement for this is being realised ever more on projects through Quality Assurance (QA) Benchmarking, First of Kinds (FOKs) and/or sample Mock-Ups. These methodologies help establish a consistency and standard work approach, by ensuring a right first time

(RFT) approach to the first installation of a service, equipment or system from a Mechanical and Electrical (M&E) perspective or from a Civil, Structural & Architectural (CSA) perspective for designed and/or construction building elements or building fabric finishes. This was a major change to the industry and Kirby had to move with the industry or fall behind the standards being set and expected by clients.

This process is still being rolled out throughout the industry and certain clients have not requested Benchmarking, FOKs or Mock-Ups, as yet. Where it is requested, Kirby has established a process flow to follow to ensure completion and archiving is standard. A new form (MF6.27 – QA Benchmarking Inspection) was created for completion and to be signed off and stored electronically, including photos, as standardised work.

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

A philosophy of continuous improvement within the construction industry determined that standard work would become the norm, where possible, to add value to customers and meet legal regulations. This resulted in the development of Quality and Lean tools including Benchmarking, FOKs, and Mock-Ups. Construction contractors could either utilise these tools or get left behind. In addition, this provides a standardised reference standard for trades and professional personnel to benchmark the installation requirements versus the project specifications, i.e. design criteria, for consistency and replication, site wide. Previous to this, there was waste through defects, rework, rectification, change management,

over-production, over-processing, and underutilised skills. This impacted the bottom line of any project, and also had an impact on schedule and reputation. Designing and getting approval of FOKs aimed to reduce all these wastes, and, as each component would be still used as the first installation, it removed these wastes from arising.

*Mock-Ups and First of Kinds (FOKs)*

Typically, the specialist installation company provide a schedule of Mock-Ups and FOKs of Capital Equipment and Field installation works within the first two to six weeks of starting a contract. The specialist installer and their qualified

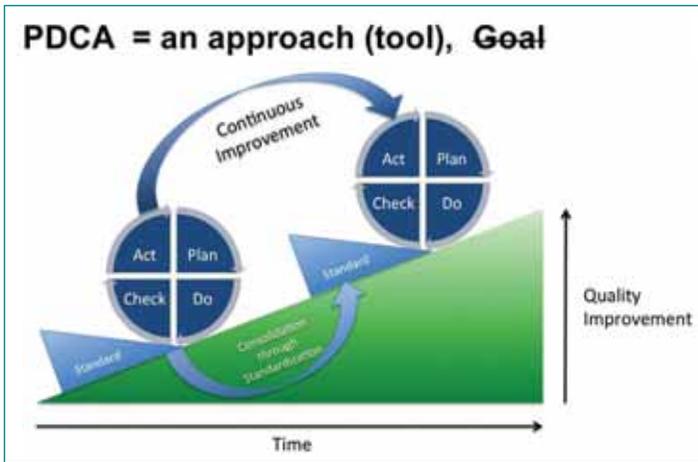


Figure 1. PDCA (Plan-Do-Check-Act) Approach

trades personnel will construct Mock-Ups (or FOKs in situ on site) as required to demonstrate the quality of finished work, for approval. The Construction Management Team (CMT) and the Client then perform inspections of these Mock-Ups and provide feedback, review comments on any deficiencies, engineering updates or changes required versus the project specifications and standards and/or regulatory requirements to set the benchmark standard. Once the Mock-Up (or FOK) has been agreed as meeting the requirements and specifications by both CMT and Client, it is then recorded using photographs where necessary and logged through the submittal process accompanied by the relevant QA Benchmark or FOK form, as a receipt/acceptance of the specialist installer's FOK/Mock-Ups.

This then serves as a benchmark agreed between the parties for quality of materials and workmanship for the full scope, as contracted. Future work will be compared to the benchmark in order to establish whether it meets the requirements and project specifications, i.e. engineering matching. Mock-Ups must not be removed or covered over without the prior permission of the CMT. Where agreed with the CMT, the specialist installer may utilise the first sample or portion (FOKs) of the permanent works as the benchmark or Mock-Up. The CMT will examine the first 5% to 10% of the permanent works in stages, where appropriate, in accordance with the project approved Inspection & Test Plan (ITP) and provide feedback to the specialist installer on the quality of the works and workmanship, provided thereafter, in accordance with the contract and customer requirements. The matrix in Table 1 summarises the provision and use of samples across the various construction disciplines.

Discipline	Mock-Ups	FOKs	Photographs (incl. As Verifying Documents)
Civil/Structural	-	Yes	Yes
Architectural	Yes	Yes	Yes
Roofing, Cladding, Glazing	Yes	Yes	Yes
Clean Rooms	Yes	Yes	Yes
Mechanical & Piping	Yes	Yes	Yes
Building Services (incl. HVAC)	-	Yes	Yes
Electrical & Instrumentation	-	Yes	Yes

Table 1. Discipline Field Installation Sample Matrix

Submittals, samples, Mock-Ups, and FOKs would in the first instance be presented or submitted to the CMT who then refer to the Design Engineer, Client, End User's Operational team and others as appropriate for comment/approval before responding to the specialist installer. No work would be undertaken prior to obtaining and incorporating as required the comments of CMT, Client, and nominated others. Typically, the following status codes would be used by the CMT when returning comments on drawings, calculations, method statements, submittals or any other submitted documents, i.e. QA Benchmarks or FOKs. The standard quality assurance forms used by Kirby Group Engineering are:

- MF6.26 QA Benchmark Register template R0
- MF6.27 QA Benchmark Inspection form R0

Figure 2. MF6.26 QA Benchmark Register Sample

Figure 3. MF6.27 QA Benchmark Inspection form R0

This results in a standardised work approach on sites. The benefits of standardised work includes documentation of the current process for all changes made, shifts, reductions in variability, easier training of new operators, reductions in injuries and strain, and a baseline for improvement activities. This standard work approach can be considered an RFT approach bringing quality to the source.

Advantages of the RFT approach include:

- Reduction in waste (material, time, manpower, rework).
- Improvement in productivity.
- Better understanding of the production issues and process variation.
- Empowerment of employees in achieving the desired quality.
- Awareness of the importance of the quality throughout the organisation.

Through the creation and approval of a standard, it can be considered mistake proofing (known as “poka-yoke”). A poka-yoke is any mechanism in any process that helps a construction worker to avoid (“yokeru”) mistakes (“poka”). Its purpose is to eliminate product and material defects by preventing, correcting, or drawing attention to human errors as they occur. It is a case of taking over repetitive tasks or actions that depend on vigilance or memory, and it can free workers’ time and minds to pursue more value-added activities. In addition, it reduces variability in processes and installation methods, as employed, during to varying trade crews working on site and across the project.



Figure 4. Site First of Kind (FOK) Example (signed off)

## LEAN INITIATIVE IMPROVEMENTS & IMPACT

The improvements seen since 2012 with the introduction of QA Benchmarking, FOKs, and Mock-Ups are highlighted by the growth of Kirby Group within the construction industry. It has resulted in a much more competitive service with a high reputation of delivering quality and on time. Thus adding value for our clients and stakeholders, though consistency and standardised work.

This new process was initially rolled out on a number of high priority projects, but has now become more and more client driven as they have seen the value in this process. Kirby management have also increased the scale of this process to now reach as many new projects as possible within the M&E scope of works.

Defect (snag) elimination has become a major focus within Kirby operations and our approach to quality management (as shown in the previous Kirby Case Study in 2018). Through the application of QA Benchmarking/FOK/Mock-Ups, this complements additional defect reduction (or effective elimination) on a construction project, though a systematic approach to minimising rework activities arising. Thus given further time and cost savings back to the client, to the elimination of duplicate activities or rectification.

The concept of implementing an improved and automated defect management, i.e. ‘snagging’, process was proven through the following tangible benefits:

- A cost saving of 45.16% was made per processing of one snag.
- The number of snags per €1Million project value was significantly reduced, predominantly due to removal of duplication.
- Improved snag categorisation – proper allocation of categories that allowed effective action, with “Other” category snags decreasing from 33% to 9%. (This proves the concept that the improved and automated Snagging Process brings significant savings to the business, as well as

competitive advantage.)



Figure 5. Site First of Kind (FOK) Visual Management Board In Use

Visual management boards were created within the site office to highlight this new process and where the team could go to check the QA Benchmarks. All new site staff were instructed to these new processes as part of their induction. This helped, and, continues to help, bring about a further behavioural change with site staff on the benefits of Lean and their future involvement in additional Lean improvements as part of our continuous improvement strategy.

### *Benefits of visual management:*

- It gives a chance to an operator (trades person/engineer) to see and correct a mistake before it becomes a big problem.
- It gives a chance to an individual to see and correct standards if there is any deviation from set standards or

specifications.

- It is set of 6S tools that enables a working environment where everyone feels safe and facilitated.
- It helps avoid workplace injuries.
- It gives a chance to see non-compliance of any set standards immediately.
- It helps operators to see how we are performing and allow them to improve their score in case the low output from set standards and/or any negative variance present.

*Why visual management is so important?*

- One of the most important reasons to implement the visual management system is to place/introduce a problem-solving culture, adopt an improvement-driven approach/mindset, eliminate response time, and prepare teams to continuously work on eliminating waste and improving quality issues highlighted through visuals.
- They are a tool that provide a lot of information at a glance with just visuals and limited text.
- It helps to improve communication within a team.  
As part of the continuous improvement mentality within

Kirby that includes Plan-Do-Check-Act (PDCA), we are constantly trying to have positive behavioural changes for site staff. By educating to Lean Thinking, it is no longer the norm to ask the same questions all the time. Hence, we have also revised the register and QA benchmark form a number of times, and we will continue to review it as clients continue to engage with us.

It is now a case where Lean Construction has become part of the values of Kirby and staff are now engaged within all regions where Kirby operates. It is clear that there is now a greater focus on high standards, adding value to the clients, and reducing and removing wastes. This will allow us to continue to grow and aspire to be the most trusted provider of high-value engineering and construction services. Kirby consistently wins national and international awards in areas of Quality and Environment, Health and Safety (QEHS), reflected in our 10th consecutive RoSPA and 7th consecutive National Quality Award nominations. We credit this to our strong performance culture, our outstanding Kirby team, and our reputation for quality and service delivery.

