

## **CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT**

### **Effective reporting of rework in the UK construction industry**

With stubbornly low profit margins, rework has become a significant focal point for the UK Construction industry. Conservative estimates predict rework to be 12.5% of all construction project spend, offering a significant opportunity for profit retention. In order to begin reducing rework on a project, errors or nonconformities must first be recognised and assessed to establish the root cause. However, identification of errors is challenging, with contractors typically unwilling to voluntarily report an error. This is exemplified by the type of research that has been carried out on rework to date, which has been either a questionnaire based qualitative studies or highly detailed quantitative, observation based studies on one specific project, yielding a typically low number of errors from which to carry out analysis. This research aims to demonstrate effective reporting of rework and improve on the quantitative analysis currently available by utilising data captured on a number of Crossrail projects.

All case studies used were based on NEC Option C, a pain gain target form of contract. The contract also included specific clauses that ensured a NCR was raised promptly in order to be considered as cost reimbursable. This gave contractors a very distinct incentive to raise NCR's. Crossrail has been collecting NCR data digitally since 2012. Four separate major projects authorised for their data to be used. This allowed for a detailed, and quantitative analysis to be undertaken on just under 2900 non-conformances. The research and analysis revealed that 87% of NCRs were raised by contractors, suggesting that the contractor was suitably incentivised to raise all errors, irrespective of who was at fault. The research also showed a strong correlation between the numbers of NCR's raised and project spend leading to an equation that can be used to benchmark performance. The differences between client and contractor raised NCR's were examined and detailed root cause trends are compared to previous research, indicating a much higher bias towards leadership than has been previously demonstrated and less error caused by design than would traditionally have been expected.

**Sean Connolly**

**October 2017**