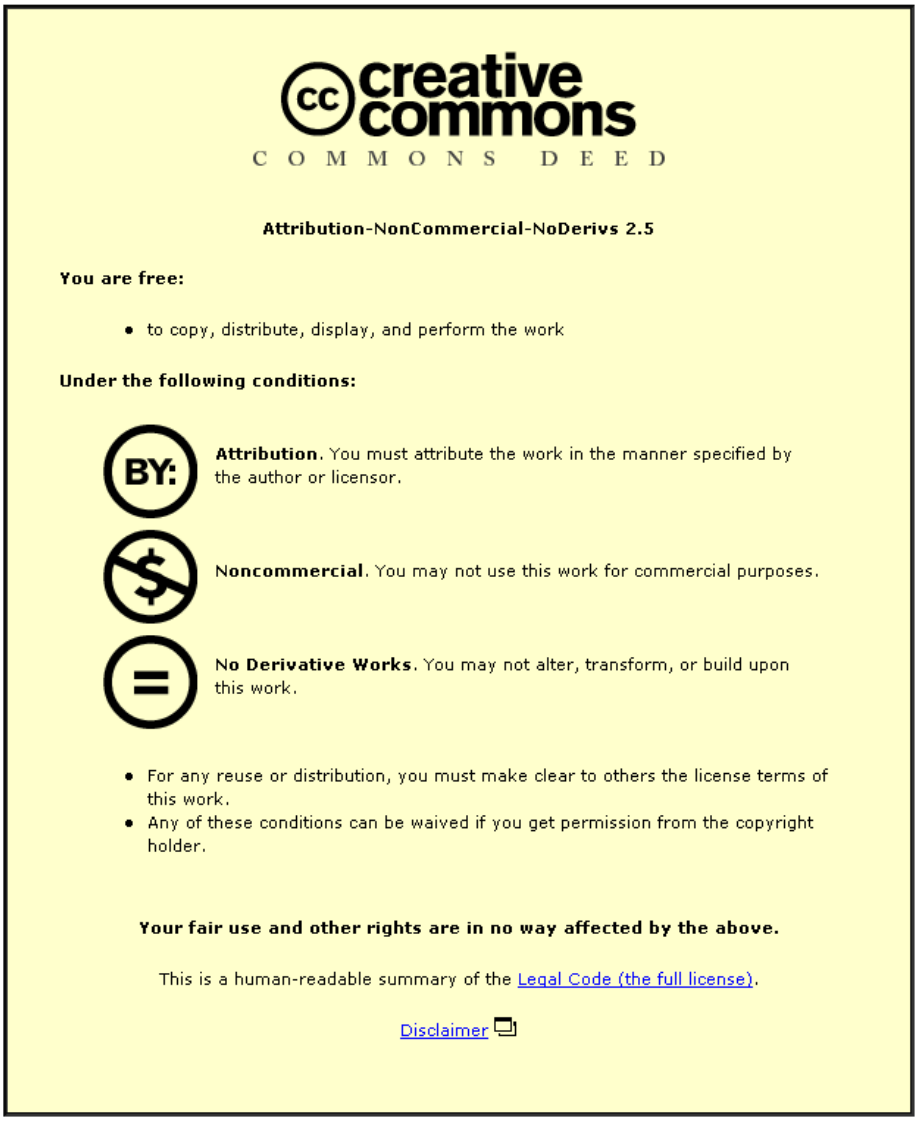

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TO SCC OR NOT TO SCC? UK CONTRACTORS' VIEWS

David Rich*
Darren Williams**
Jacqui Glass*
Alistair Gibb*
Chris Goodier*
*Loughborough University
** Lafarge Aggregates Ltd

ABSTRACT

Self-Compacting Concrete (SCC) is a construction material that has yet to be fully exploited within the UK construction industry. Whilst SCC has been utilised by a large number of contractors, its overall take-up does not appear to reflect that seen in other European and International markets. Benefits to contractors have been identified in many publications but the material still remains underused in the UK. As such, it is necessary to establish the reasons for the material's current status in the UK market and the potential for future market development.

This paper presents the findings from an extensive programme of interviews with UK contractors (48 participants), ranging from large multi-nationals to small/medium regional contractors, which aimed to investigate the issues surrounding the use of SCC in the UK and to help obtain an understanding of the role that SCC plays within contracting organisations. Previous and current perceptions of the material are discussed along with the drivers and processes for material selection and how these are influenced by the structure of the individual organisations and the wider industry.

This interview study has identified a number of conclusions with regard to SCC and its position and role in the industry. It has been made clear that SCC is currently viewed as a material which has a detrimental effect in considering the materials subsequent effect on the whole construction project, which can add subsequent value. It is the concept of value that is difficult to encourage due to the industries current and hereditary obsession with lowest cost.

Keywords: Self-Compacting Concrete, construction industry, UK, contractor, interview

INTRODUCTION

The UK construction industry has been characterised over the years to be resistant and slow to change, a characterisation that has can be said to hinder the uptake of any new or innovative construction methods. Self-Compacting Concrete (SCC) could be categorised as one such innovation, whilst present in the industry since the 1980's (1), its take-up as a construction method has been limited. The situation in the UK is contradictory to that which is experienced with European and International markets where it is used more readily within construction.

Figure 1. SCC in action (courtesy of Lafarge)

To date globally and within the UK, research has predominantly been directed towards the establishment of physical and structural performance criteria (1,2,3), with work into SCC construction methods limited to subjective and indirect studies (4,5,6,7,8). In light of this a research programme was created to clarify the effect of employing SCC in projects and to produce tools and guidance to aid adoption within mainstream construction. This paper presents some initial findings, on SCCs implementation in construction projects and discusses how project structures affect the selection process.

BACKGROUND

It has already been acknowledged that the majority of SCC research has concentrated on structural and physical performance characteristics; but as regards to on-site applications the situation is less clear. Literature currently states that SCC is selected as a problem solver (9), where its intrinsic properties enable the material to perform in a manner or situation where conventional concrete cannot. It is this approach to SCC that has supported the perception of a material for special or one off occasions (10), which can be linked to use as an architectural tool (11). Whilst employment as a problem solver is presented as the mainstay of works using SCC there are numerous reports of the gains that can be achieved with the introduction of SCC into fundamental elements of concrete construction projects. Labour, a significant overhead in construction, can, according to Damtoft et al (4), Gaimster and Foord (5) and Goodier (6), be reduced and the impact of work also reduced, due to the ease of placement and the removal of key elements of placement, for example vibro compaction (12). In conjunction with these gains SCC has also been cited to make it possible to 'guarantee' quality by removing the reliance on workmanship, primarily compaction, providing dense and homogenous elements which in turn can improve durability and robustness (8, 13). Further to these benefits, fiscal savings have also been identified, not only with labour and reduced site plant, but on a larger scale through the ability to speed up construction processes, thus reducing project time and creating significant savings over the project lifespan (5, 6).

Whilst these benefits alone should make a compelling case for the uptake of SCC there are several barriers in the market that could be responsible for low uptake. Most significant of these is cost, with SCCs typically being

twice as expensive as an equivalent conventional concrete; which makes its difficult for contractors to look past this headline cost (14). Ability to include SCC in projects has also been identified as a challenge based on the grounds of a lack of standards and guidelines to ease the material into specifications (7). While this was supposed to be addressed by the incumbent European Guidelines for Self-Compacting Concrete (15) and Concrete Society's and BRE's technical report 63 (14), this has been unsuccessful (9). Furthermore, contractors are thought to be unprepared with construction practices biased towards traditional construction methods and conventional concrete (1).

METHODOLOGY

The findings presented in this paper have been drawn from two distinct groups of participants, the first, members of the CONSTRUCT organisation, representing large nationally-operating contractors and the second, smaller locally based contractors. These two groups were targeted in order to give a comprehensive synopsis of the UK construction industry and their experiences of SCC. Of the CONSTRUCT members, those who are part of the Specialist Concrete Contractor (SpeCC) scheme were selected due to adherence to minimum quality standards, annual audits and the overarching modus operandi of 'improving the efficiency of building in-situ concrete frames'. The smaller contractors were chosen not only to broaden the participants, but as an attempt to counter act the aims of CONSTRUCT, which may have led to a majority of participants favouring innovative materials and methods of construction. The second group of participants were drawn from a database of customers who had been supplied with SCC by Lafarge, within the UK, with the focus on identifying non, occasional and regular users of SCC, to once again reduce potential bias and consisted primarily of general builders, house builders, ground workers, concrete frame contractors and screeders.

Interviews were chosen as the method of data capture due to their flexibility and their capability to derive a large amount of information. In the process of designing the interview protocol, semi-structured interviews were identified as most appropriate. This provides a basis of transferable questions, whilst retaining the option to explore responses and redirect questioning (15). Interviews were carried out through two approaches, either by telephone or face-to-face and participants were questioned on a range of subjects to obtain a full view of their experiences and opinions of SCC, with the primary focus on:

- The perceptions that are held of SCC as a construction material and option
- How the decision is made to use SCC and/or conventional concrete and any other construction innovations
- The influence of the timing of construction decisions on the choice of material and method
- The rationale for such decisions and the identification of those responsible

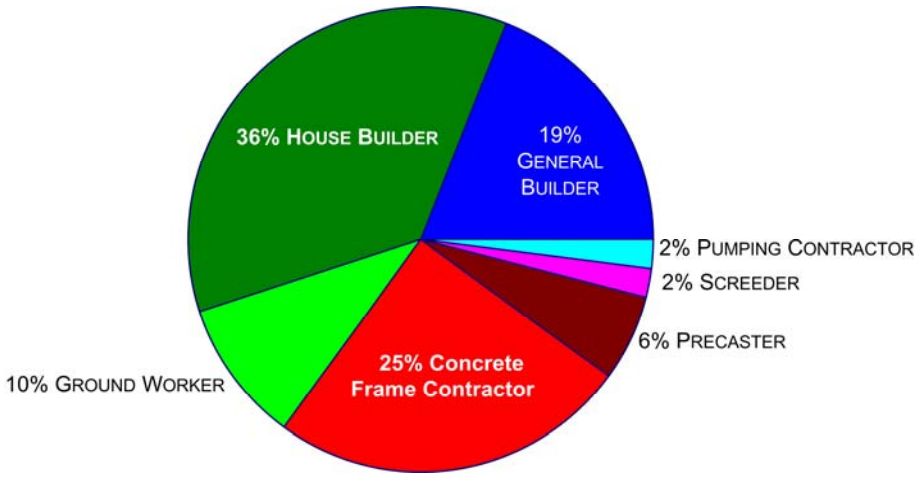

Figure 2. Breakdown of contractors interviewed

RESPONSE

Overall 82 participants were targeted from the two groups; 22 SpeCC frame contractors and 60 smaller contractors, in response to this, 10 of the SpecCC contractors were interviewed and 38 of the smaller contractors, giving an overall response rate of 59% (figure 2).

FINDINGS

Through the interviews a number of different aspects were considered and discussed, however it quickly became clear that two elements were most prevalent and needed to be considered in more detail. The first was the use of SCC in construction, regarding methods and the manner of implementation and its effects. The second factor was the decision making process for the selection of not only construction materials, but also construction methods.

Implementation of SCC

It should be noted that 83% of those interviewed as part of this study had experience of using SCC, however the range of applications was somewhat limited and can be said to be due to a lack of universal applications for SCC or a misunderstanding of its potential. The majority of use (53%) was in slab applications, principally with house builders, general builders and ground workers. Concrete frame contractors typically used SCC as a reaction to emergent problems or in situations where a conventional concrete could not achieve the desired results.

There was no consensus on ideal applications or opportunities for SCC where it particularly added value to a project. ‘It is difficult to see where you can actually making savings’ (house builder) or contradictorily costs ‘can be returned through time saved, reduced labour and removal of powerfloating’ (housebuilder), however generally the material was viewed positively.

With respect to these comments it is not surprising that 40% of participants stated that ‘cost is prohibitive to use’ and it is the ‘main problem with the material’ (house builder). In this respect cost is used to describe the headline cost of the material, which can fail to identify savings from other aspects of the construction process. ‘Construction is price driven’ said one concrete frame contractor more contractors ‘talk about value than actually consider it’, and that regardless of market buoyancy or economic downturn the cheapest option will always be chosen. Indeed, when participants were asked to consider project value rather than cost, 21% responded to say that they could also see no value in SCC. The concept of value requires participants to look further into construction practices and with this response it is clear that SCC is considered to be a material rather than a method, which would necessitate different approaches to planning and implementation. The particular concept that could be potentially vital for SCC relates to the process with which materials and methods are introduced into construction projects and programmes/schedules. Time to implement change and flexibility were identified as major factors in assessing the viability of new methods of working, where viability can be judged as an overall positive effect on the project. SCC has ‘made it possible to reduce both time and manpower’ (general builder), remove construction activities and ‘needs to be judged on its effects on the critical path’ (concrete frame contractor). In large projects reductions and realigning the critical path enables the greatest savings to be made, in respect of project duration and associated site overheads, so it is this aspect where SCC must demonstrate its potential to contractors.

Decision making

Any change in construction processes or practices requires the buy in of all parties involved in the project decision chain, the client, architect, engineer and contractor. In the case of SCC the decision to employ SCC typically arises from three circumstances:

1) A strategic change from conventional methods as part of a balanced assessment of the material and its effects on construction
2) Deliberate specification of the material, or it being taken on board as a preconceived construction option
3) Reactionary, in order to address a specific issue or problem

Overall, 14 interviewees referred to the decision to use SCC as a strategic one, with five stating that SCC was able to add value, but its use in this respect needed to be made on a job by job basis. Ten contractors had used SCC as a reactionary tool, stating that this is its only viable use and only two had had experience with the material being specified.

As has been established previously, irrespective of the circumstances surrounding use, project decision makers still need to be convinced about SCC. Typically, without specification, application is driven from site level upwards by the contractor, who need to believe 'the role SCC can have in construction and the reasons for inclusion' (concrete frame contractor) and convince those higher up the project hierarchy. As a reaction the case is relatively straight forward, SCC solves or removes an issue affecting continued construction, but the challenge remains to move towards more strategic implementation.

Indeed, strategic change requires decisions to be made based on the complete role of SCC in construction, not only as a change in material but also as an influence on current construction methods and processes. It requires SCC to be viewed on a job by job basis and not as a wholesale replacement for conventional concrete, but there is a problem. It is actually construction teams typically retain the most knowledge of construction materials and how these can potentially influence and effect construction and the project as a whole. However currently project organisation sees the contractor becoming involved, normally, once the design has been completed, at which point they are only able to 'make suggestions on materials' but generally can only give a 'best price and advise' (concrete frame contractor) on construction. For the contractor to have the opportunity to provide real input and change construction practice would require a lead time of '2-3 months rather than 4 weeks' (concrete frame constructor), which is rarely a desirable timetable in construction.

DISCUSSION

Not only as a result of opinions and views presented throughout this research but also in light of literature it is clear that there is no apparent consensus on the role for SCC in construction and there is a distinct lack of quantified information on its application. Literature identified two circumstances for use, as a problem solver (1, 9) or as an architectural tool (11), only one of these circumstances was explicitly identified but the latter can also fit into three new and clearly identified categories: as a strategic change, a problem solver or when specified. However SCC is still widely seen as a problem solver which signifies that perceptions have yet to change.

A large number of the initially identified benefits presented in literature have been confirmed during this study, relating to time, labour, workmanship and quality (3,4). However on cost there still remains a contradiction, literature clearly states that SCC can have a positive effect on cost (5,6) whilst within industry the situation is less than clear with responses ranging from it being prohibitive to savings being made on a balanced assessment.

The process of undertaking a balanced assessment dovetails with an understanding of SCC being approached as a construction method, implying more forethought, rather than a material. SCC as method requires change not only in on-site practices as referred to by literature (1), but throughout the whole project life and at all levels.

CONCLUSIONS

There has been little research carried out to date focused on establishing the role for SCC in construction. As a material it is clearly viable in projects, but its use is dictated by the type and scale of such projects, and whether it is perceived to offer value.

How, when and where to incorporate SCC into a project poses a major research question, with respect to decision making, process planning and timing of construction. The historical structure and organisation of the construction industry are as a cause for concern, i.e. management structures, project control and project implementation. All of these aspects influence the use (or not) of SCC, particularly the time at which contractors are involved in projects, those who are responsible for decisions, fiscal arrangements and project procurement.

Processes surrounding construction decisions, with regards to how a project is constructed, are focused (and correctly so) on selecting the 'best' method, with material choice usually a secondary consideration. SCC is currently considered as a material, which does not encourage the contractor to consider the wider effects and benefits of SCC. If SCC is considered as a method however, there is recognition that SCC needs and requires greater planning and understanding. In order for the material and its associated benefits to reach its full potential it is essential that the material is viewed and considered in this regard, rather than as a simple like-for-like material.

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