

Education and Skills Committee
School Infrastructure
Submission from Prof John Cole CBE

6 June 2017

Brief Analysis of the Findings of the Report into the Construction of Edinburgh Schools for the Education and Skills Committee.

1. The Inquiry was commissioned by the City of Edinburgh Council (CEC). In undertaking this work, I enjoyed the full cooperation of the Council in relation to accessing all information and material that was available both in respect of the original construction of the 17 Edinburgh schools in 2002 -2005 and the remedial works undertaken between February 2016 and the end of January 2017.
2. However, the remit and authority of the Report was limited. Access to information relating to Authorities outside Edinburgh depended on the willingness of those Authorities to share relevant information. Some Authorities were extremely cooperative in sharing information, others were so to a lesser extent.
3. It was also evident from the responses provided by the various Authorities that the level of investigation that they or their Private Sector Partners had carried out on their buildings, as a result of the information they had been provided with following the Oxfangs School incident, varied significantly from simple desk-top reviews to purely visual inspections to more intrusive inspections.
4. In relation to the 17 Edinburgh schools, I can confirm, as I have in my report, that the remedial work undertaken in relation to the defective construction of brick panels was comprehensive, thorough and professional in its implementation. The Inquiry was satisfied as to its effectiveness in dealing with the external wall issues identified in the report.
5. In relation to other Council buildings in Edinburgh, the Inquiry recommended that CEC undertake a risk-based assessment and appropriate investigations of those buildings, including other school projects, that had used similar construction methodologies and that were built in relatively recent years. I have asked CEC for an update on these investigations and have been advised that they would hope to be in a position to provide such an update shortly.
6. There was widespread recurrence of the same range of fundamental faults impacting on the structural safety of the external walls across the 17 schools in Edinburgh despite the fact that they were constructed in 2 phases by 6 different main contractors, each using different firms of brick-laying sub-contractors, in turn using different squads of brick-layers. The report sets out very specifically the number and similarity of defects found across the 17 schools.

7. These defects included;

- the frequent omission or mispositioning of wall ties to such an extent that there was inadequate tying of the two leaves of the external walls together thus reducing the structural performance of the brick panels;
- the omission in many cases of bed joint reinforcement layers shown on the engineer's drawings, the proper inclusion of which was necessary to enable the wall panels to resist high winds as set down in the building codes
- the omission in many cases of header ties and in some cases lateral ties which were required to tie the external walls back to the main structural frame of the building thus failing to provide the essential structural stability to the wall panels
- variation beyond accepted tolerances in the width of the cavity between the leaves of the external walls thus exacerbating the lack of embedment of the wall ties and leading to in some cases no embedment of wall ties at all
- the occasional omission of wind-posts, which would have been required to strengthen larger or inadequately supported smaller panels

8. Of great concern to the Inquiry was the factual evidence of multiple repetition of these defects by different firms. This evidence was provided in the reports of the structural investigations undertaken. There was no logical explanation other than to conclude that there was a considerable risk that this level of poor quality construction and supervision could equally be found to be present in the work of other construction companies across the Industry in Scotland, if not further afield in the UK, and therefore could be present in a significant number of projects built over recent years.

9. Additionally, up to that time the defective wall-construction had been largely seen by many external observers as pertaining specifically to the construction of schools, to which building type current investigations up to then had been largely restricted. However, the Inquiry concluded that the defects were **non-building-type-specific**, and were potentially liable to occur with the same frequency in other building types in which large masonry panels, which otherwise would be free-standing masonry panels, were required to be tied back to a structural frame. This arrangement would be a normal requirement in many other building types.

10. In light of the Inquiry's concerns as to the potentially endemic nature and extent of these problems within the Industry, the Inquiry sought information from all Local Authorities in Scotland on the nature of any investigations, findings or incidents that would be relevant to the safety of external walls, particularly in relation to schools.

11. Many of the reports of investigations undertaken by other Authorities in schools across Scotland provided evidence of the presence to greater or lesser degrees of the same underlying construction defects.
12. Evidence given to the Inquiry from experienced construction professionals also confirmed that these same building defects and quality issues were also regularly encountered in the non-school sectors they represented.
13. As the Inquiry Report confirms, there were at least 4 incidents involving the collapse of masonry panels in schools in Scotland during the 4 years prior to the collapse at Oxgangs School in Edinburgh. On the basis of the information provided to the Inquiry by the relevant Local Authorities, it was clear that the primary cause of these collapses was consistent with that which caused the collapse at the Oxgangs School.
14. Fortunately, none of these incidents resulted in injuries to persons, however, any such fall of heavy brick masonry panels from a building could easily have led to injuries including fatalities
15. The conclusion of the Inquiry was that there was potentially a major issue in relation to construction quality within the Industry that could impact on the safety of building users and the general public. It is important that the poor quality construction practices which have caused these failures are eradicated from the Industry.
16. The underlying causes of this lack of quality were seen as; poor workmanship at a tradesman level; inadequate supervision at a sub-contractor level; failure to have or implement adequate quality assurances processes at a contractor level; lack of site inspection by professional design team members; and inadequate independent scrutiny of the work of contractors by client representatives.
17. These particular failures were associated with an aspect of construction which is closed up and difficult to inspect after completion. During the period of the Inquiry it came to light that significant safety-related defects had also been discovered in the critical area of fire-stopping in the 17 schools, another aspect of the construction that would have been difficult to inspect after completion. This reinforced the concerns of the Inquiry as to the effectiveness of and reliance that can be placed on what has become a virtual self-certification by contractors of the quality of their own work.

18. Factors contributing to the unacceptable level of occurrence of poor quality workmanship in relation to the construction of external walls were seen to include;

- Reduced opportunities for longer-term apprenticeship positions with sufficient range of types of experience
- Lack of awareness by some tradesmen of the importance of brick accessories in ensuring the structural performance of wall panels
- Inability to recruit sufficient numbers of high-quality experienced bricklayers in times of demand
- Lack of assured continuity of employment as a bricklayer and impact of seasonal factor reducing the availability of skilled tradesmen in maintaining Scotland
- Loss of experience and skills in the Industry following major boom and bust cycles
- Inadequate checking by contractors of trade credentials of individual bricklayers appearing on site
- Payment mechanisms that encourage the maximisation of the number of bricks laid in a day by a bricklayer rather than ensuring the quality of brickwork and the proper incorporation of required brickwork accessories
- The potentially incomplete or confusing format of project information provided to individual bricklayers on site
- Lack of specific training by bricklayers in the fixing of accessories, such as that provided by manufacturers of brickwork accessories,

19. Factors contributing to occurrences of lack of supervision on site were seen to include;

- Focus on reducing time and cost often to the detriment of quality
- Insufficient allocation of properly experienced/specialist resource by sub-contractors and contractors to supervision or regular inspection of work
- Increasing difficulty in finding experienced tradesmen to act in supervisory or quality assurance roles
- Design and Build contractors frequently not keen to appoint and pay for their design team to regularly inspect the works
- Potential conflict of interest for contractors over commercial impact of delay and cost of redoing any identified sub-standard work
- Difficulty in inspecting work that has been allowed to be closed up without inspection
- A misplaced over-reliance on the degree to which Contractors should be allowed to mark their own homework given the irrefutable evidence over

many years of the importance of appropriate independent scrutiny or third-party certification of construction

- Quality assurance systems not implemented properly on site

20. Factors contributing to the increasing occurrences of lack of independent scrutiny by public sector clients of the work of contractors were seen to include;

- The deskilling and increasing loss of in-house professional expertise in public bodies impacting on their ability to properly fulfil the essential role of intelligent customer
- The false economy of seeking to reduce the cost to the client of projects by reducing investment in resources and processes designed to protect the quality of projects
- Procurement models which have tended to prevent the design team from having a direct responsibility and duty to or relationship with the client thus failing to optimise their value as professionals in the pursuit and protection of the client's objectives
- Public Sector clients being persuaded to reduce the possibility of their contributory negligence in the case of defective construction by becoming increasingly risk-averse and seeking through choice of procurement models to delegate all responsibility for the quality of construction to contractors.
- The use of inadequate and poorly defined contract conditions for the employment of Independent Certifiers which have been inappropriately interpreted by clients to provide certified assurance as to the quality of all aspects of the construction
- Lack of awareness or interest by clients in the terms of appointment and the scope of work of design teams when appointed directly by contractors, particularly in relation to the extent, if any, of site inspections they are required/allowed/paid to carry out.
- A naïve assumption that design team members appointed by and acting for a contractor are also necessarily acting in the best interests of the client and the project
- Increasing tendency for the failure of Public Bodies to do away with in-house clerks of works who would previously have carried out site inspections of their projects
- Failure to appoint external clerks of works to provide a properly resourced and appropriately experienced detailed independent scrutiny of the construction,

21. Issues relating to skill shortages

- Building Contractors giving evidence to the Inquiry repeatedly reported the increasing difficulty in the Industry in Scotland of recruiting / procuring high quality reliable and sufficiently experienced bricklayers
- A series of informed witnesses to the Inquiry reported the increasing difficulty in recruiting experienced clerks of works, when they were required, due to both the reduced opportunities in this occupation as a result of the diminution in the use of clerks of works by Public Bodies and as a direct result of the lack of availability of necessary training courses to provide routes to a recognised qualification in the profession
- It was also reported to the Inquiry by several experienced witnesses that it was increasingly difficult to recruit experienced building inspectors with the requisite skills to undertake the duties required of Building Control Officers and that, similar to the plight of clerk of works, there was no longer the previous level of availability of structured training courses for this specialist and essential role.
- Concern was also expressed to the Inquiry by a significant number of senior architects and engineers in relation to the increasingly prevalent choice of procurement models using the design and build approach and the already mentioned associated decreasing level of attendance on site by design team professionals due to their terms of appointment as set by contractors. This change from the more traditional arrangement was seen by many as contributing to a potentially damaging deskilling of younger members of the design professions by failing to provide them with the essential site experience to inform their construction knowledge and related design ability.

22. Essentially, to sum up, over recent decades the Government's increasingly risk-averse approach to procurement has led to a situation whereby to a large degree there is no longer the necessary level of independent scrutiny of the work of building contractors and a currently misplaced over-reliance on the Industry policing itself. This gap has to be addressed.

23. Finally, on a positive note, I have been encouraged by the interest generated by the Report, by the widespread acknowledgement by sectors across the Industry of the issues identified and by a seemingly proactive response by Government bodies, other public sector bodies and significant elements of the construction industry in seeking to address these issues and the implementation of the recommendations of the Report.