



## Report of the Independent Inquiry into the Construction of Edinburgh Schools

February 2017



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## **SECTION 1 – PURPOSE AND SCOPE OF THE INQUIRY**

This section sets out the formal remit for this Inquiry as agreed between the City of Edinburgh Council and the appointed Chair of the Inquiry. It was:

To inquire into and report on the following matters:

1. The rationale for the Council entering into the PPP1 contract for schools and the effect this financing arrangement may have had on the construction process;
2. The contractual arrangements between the Edinburgh Schools Partnership and Edinburgh Council;
3. Establish the reasons(s) for, and necessity of, the school closures, including a review of the reasons for the Oxbgangs Primary School wall collapse;
4. The role of the Council with regard to the quality assurance of the construction of the buildings, including the granting of completion certificates to allow the buildings to be occupied and to become operational, the management of risks to the Council; and if standard practice regarding quality assurance provided adequate checks and balances for all parties to the contract;
5. The management and maintenance of the buildings since construction, including advising on whether the current defects should have been found earlier;
6. The management of the contract by the relevant parties since construction; and the quality of the contract undertaken.
7. A review of Edinburgh Council's handling of the incident from January 2016 to the reopening of the schools in Summer 2016; and
8. Provide advice and recommendations on any specific or wider lessons which can be learned from these unfortunate events for Edinburgh Council and any other bodies;
9. Any further matters the Chair of the Inquiry wishes to pursue relevant to this matter.

## **SECTION 2 - BACKGROUND**

### **2.1 INTRODUCTION**

2.1.1 This Report presents the findings of an independent Inquiry commissioned by the Chief Executive of the City of Edinburgh Council. The holding of the Inquiry followed the collapse of part of an external wall at Oxfangs Primary School Edinburgh on 29<sup>th</sup> January 2016 in the hours prior to the normal school opening time, and the discovery in the subsequent investigative surveys of defects in the construction of the external walls of 16 other schools in Edinburgh, resulting in the enforced closure of all 17 schools (in addition to a Secure Unit and a Community Centre) for a period of several months. All these buildings had been built as part of the same Public Private Partnership contract ("**PPP1**") with Edinburgh Schools Partnership Limited ("**ESP**").

2.1.2 The Report has been compiled by the appointed Chair of the Inquiry, Professor John Cole CBE, an architect and retired senior civil servant. In undertaking the Inquiry, and in the production of the Report, the Chair was supported by Mr. Stewart Macartney, a structural engineer and a director in a multi-disciplinary engineering consultancy and by Mr Chris Phillips, a lawyer and a partner in an established legal practice. This panel of three members was provided with administrative support and office accommodation by the City of Edinburgh Council.

### **2.2 METHODOLOGY**

2.2.1 The methodology adopted by the Inquiry followed the standard stages of an Inquiry of this type namely:

- Agreement by the Chair with the commissioner of the Inquiry to a final formal remit for the Inquiry. The final remit is presented in full in Section 1 of this Report.
- Selection and appointment of panel members and administrative support.
- Information gathering including all key documentation available.
- Familiarisation with all documentation, the chronology of events and establishment of the emerging issues.
- Visits to inspect the properties in question.
- Development of a protocol for the Inquiry.



- Identification of a list of desired witnesses and issue of invitations to attend the Inquiry.
- The holding of interviews with witnesses, the transcription of evidence taken, the issue of same to the witness in question for comment and any necessary amendment, and the finalisation and signing of witness statements.
- The analysis and professional scrutiny of information and evidence collected.
- A review by the panel of the preliminary findings and recommendations of the Inquiry.
- The preparation and submission of the Report of the Inquiry to the commissioner of the Inquiry.

## 2.3 INFORMATION AND DOCUMENTS

2.3.1 Whilst the Inquiry was established as an Independent Inquiry, like many inquiries, it had to rely on the cooperation of organisations and individuals to carry out its work, not having had the authority to compel the production of documents or the attendance of witnesses for interview.

2.3.2 In this regard the Inquiry has enjoyed the full cooperation of the Councillors, the Chief Executive, the officers and the staff of the City of Edinburgh Council in an open and transparent manner throughout the course of the Inquiry in seeking to respond as fully as possible to the requests for information from the Inquiry. In so doing the essential independence of the Inquiry in undertaking its work was acknowledged and respected at all times.

2.3.3 The information, on which the analysis of the period of the procurement, design and construction of the projects from 1998 to 2005 has been based, is limited to that which was made available to the Inquiry by the Council or provided by other participants involved in the project.

2.3.4 Unfortunately, some of the information dating from the 2000 to 2005 period, which would have been of benefit to the Inquiry, had either not been retained, could not be discovered within the archives, or was not offered to the Inquiry by those organisations that may still hold relevant information in their possession. This fact will be referred to in the recommendations of this Report.

2.3.5 The Inquiry Team would like to express our thanks to those many organisations and individuals who gave of their time to attend as witnesses or make submissions to the Inquiry.

2.3.6 A small number of individuals or representatives of organisations, involved in the project or in possession of information relevant to the Inquiry, and from whom the Inquiry would have wished to take evidence, had deceased, had retired, were no longer traceable, or, when invited, were unwilling to appear before or cooperate with the Inquiry.

## 2.4 WITNESSES

2.4.1 It was important that the Inquiry had the maximum possible access to all available knowledge and information relevant to the remit of the Inquiry that was held. This required the cooperation of a wide range of organisations that had been directly involved in both the original development and the subsequent necessary remediation of the PPP1 projects and other bodies engaged in or with experience and expertise in the various relevant aspects of similar projects.

2.4.2 The list of organisations and individuals invited to provide witnesses or attend as witnesses and their willingness or otherwise to do so, or alternatively to provide written submissions to the Inquiry is provided in Appendix 1 to this Report.

2.4.3 In relation to the procedural arrangements to be adopted at the interview sessions, potential witnesses were advised as follows in the letter of invitation to give evidence to the Inquiry:

*"The evidence-taking sessions will not be open to the public. Each witness will be seen on their own and questions relating to their involvement in or knowledge of the project or knowledge of equivalent project processes will be addressed directly to them. If you so wish, you can be accompanied by a friend, colleague or legal representative of your choice but any costs incurred as a result would not be reimbursed.*

*It is intended that during the interview a recording will be made of the proceedings so that a statement accurately reflecting the evidence provided by each witness can be drawn up. Once drafted this statement will be forwarded to the relevant witness so that they can advise of any amendments and/or clarifications they may feel are required. These statements will be used to help inform the writing and conclusions of the final report of the Inquiry."*

2.4.4 In writing the Report it is not proposed to name individuals but rather to refer to the organisation they represented, the position they held in that organisation and/or the role that they played in terms of its relevance to this Inquiry.

**SECTION 3 - EXECUTIVE SUMMARY**

- This Executive Summary will briefly address in turn each item of the remit set for the Inquiry and provide an overview of the related findings of the Inquiry. It will not seek to repeat the chronology of events which is detailed in Section 5 or repeat the more in-depth analysis behind the findings as contained in the relevant sections of this Report. Only the more significant findings will be presented here. The full list of recommendations emanating from this Report is provided in Section 13.
- Before presenting the Executive Summary on the remit items, the Inquiry would wish to emphasise the importance of the subject matter underlying this Inquiry and of the need for the matters raised by it to be properly addressed by the construction industry itself, by public sector and other clients of the construction industry, by regulatory authorities and by actions of Governments as necessary.
- This Report has addressed the remit set for it, which did not extend to a wider investigation of the potential prevalence of the defects that led to the collapse of the Oxfangs School wall in all buildings or building types recently constructed in Scotland. It is impossible to draw definitive conclusions as to the answer to this question without relevant evidence. However, it would be naïve to assume that the lack of quality control evidenced in the construction of the walls of the Edinburgh schools is limited either to Edinburgh or to school buildings.
- The fact that no injuries or fatalities to children resulted from the collapse of the gable wall at Oxfangs School was a matter of timing and luck. Approximately 9 tons of masonry fell on an area where children could easily have been standing or passing through. One does not require much imagination to think of what the consequences might have been if it had happened an hour or so later.
- The Inquiry has become aware that this was one of five avoidable incidents of external masonry panels failing in strong winds at Scottish schools in the last few years. Five may seem a relatively modest number but, given the potential implications of failures of this type, one such collapse is one too many. The reason that the incidents are described as avoidable is that in all cases it would appear that proper quality control at the time of building could have identified and have rectified the basic defects in construction that led to the failures.
- As will be seen in this Report, in addition to the 17 schools in Edinburgh, evidence has been provided on the discovery at a number of other schools in Scotland of panels of brick or blockwork, located at high levels in school buildings, that were not securely fixed. Similar construction defects to those discovered in the Edinburgh schools were also found at these schools.

- The underlying faults that gave rise to this Inquiry occurred during the original period of procurement, design and construction of the PPP1 schools between 2000 and 2005.
- The remediation of all 17 PPP1 schools, undertaken in the first half of 2016, while it should not have been required and unquestionably caused very considerable disruption to pupils, parents and teachers, was completed to a good standard within a comparatively short period of time through the combined and significant efforts of the City of Edinburgh Council, ESP, Galliford Try, Amey and their professional advisers. For this they should be commended.

### 3.1 **REMIT ITEM 1**

3.1.1 **Remit Item 1** asked the Inquiry to consider the decision by the Council to use the Public Private Partnership ("**PPP**") methodology and whether this procurement methodology had an impact on the level of defective construction discovered in the PPP1 schools.

3.1.2 In 1998, when the project was first being considered, there was a pressing need to address the condition, configuration, efficiency and capacity of the school estate in Edinburgh, which had suffered from a lack of investment in both maintenance and new infrastructure. Action to address these problems could not have been reasonably delayed for any significant period, other than to the detriment of the educational achievement of school-children in Edinburgh.

#### **The use of PPP for the Schools**

3.1.3 The on-going availability of public sector capital funding was at an inadequate level to facilitate the required level of investment and no further funding of this type was available from central Government. At the time, the U.K. Government and subsequently the Scottish Executive, were actively promoting PPP as their favoured route and were implementing a scheme called 'Levelling the Playing Field' under which they were offering the City of Edinburgh Council an ongoing contribution of £6.2m towards the annual revenue cost of the PPP1 project. This contribution made the PPP scheme affordable to the Council.

3.1.4 In making their decision to use PPP, the Council were aware that this procurement model had recently been successfully used by other Local Authorities in Scotland to replace worn out school infrastructure.

3.1.5 An Outline and Final Business Case had been prepared by the City of Edinburgh Council in accordance with the required procedural guidance, which demonstrated that the PPP1 process represented value-for-money. These business cases received formal approval from the Council itself, Audit Scotland and the Scottish Government.

- 3.1.6 The comparison of the PPP option with a public sector funded option (the Public Sector Comparator or "**PSC**") was a mandatory aspect of this business case process. However, Local Authorities knew in advance that, even if the publicly funded option was found to be better value-for-money, this was not a realistic option due to the non-availability of public sector funding. It is perhaps not surprising therefore, that following the risk adjustments required by the process, the PPP option frequently became less (rather than more) expensive than the public sector option.
- 3.1.7 The following is an extract from a 2002 Report produced by Audit Scotland entitled, 'Taking the Initiative – Using PFI Contracts to Renew Council Schools'. (For the purpose of this Inquiry, the terms Private Finance Initiative ("**PFI**") and PPP are used interchangeably). It read:
- "Audit Scotland's analysis is that, in most cases, the main costs underlying the PFI option are not significantly different from or are higher than the equivalent forecast costs under the PSC. In most cases the risk adjustment tipped the balance back in favour of the PFI option.*
- A further consideration is the inevitable subjectivity that surrounds judgements on which the PSC costings are based and wider decisions regarding the respective merits of the PFI and any alternative solution to providing new schools. Under the terms of the competition for financial support from the Scottish Executive for PFI projects, no funding for the PSC was available. Consequently, if the PSC had suggested that the PFI was not economic it would have proved fatal to the project (no PFI schools project has so far failed this test)."*
- 3.1.8 From the evidence provided to the Inquiry, it would appear that an objective and professional approach was taken by the Council, with the support of their external consultants, to the assessment of the value of the risk being transferred to the PPP company. The Inquiry has not sought to rerun that somewhat complicated process.
- 3.1.9 In the case of the PPP1 Project, the fact that the costs, associated with the remedial works arising from the collapse of the wall at Oxfords and the discovery of defective construction in all 17 schools, and the responsibility for implementation of the necessary remedial works have been borne by ESP, demonstrates the application of risk transfer to the Private Sector.
- 3.1.10 The conclusion of the Inquiry on this first part of Remit Item 1 is that, given the above context, the City of Edinburgh Council had a sound rationale for their decision to adopt the PPP methodology for the funding and procurement of the PPP1 schools and acted both appropriately and pragmatically in making this decision.

### **Impact of the financing on project quality**

- 3.1.11 The second part of Remit Item 1 whether the PPP financing method had impacted on the quality of construction.
- 3.1.12 It is the view of the Inquiry that while the financing method was not responsible for the defective construction, aspects of the way in which the PPP methodology was implemented on these projects did increase the risk of poor quality design and construction. In this regard, however, the approach adopted on the Edinburgh scheme was quite typical of that adopted generally at the time.
- 3.1.13 The Inquiry is of the view that a fundamental weakness of the process adopted was the lack of properly resourced and structured scrutiny of the building work at an appropriate level of detail by the external appointment or direct employment of those with requisite experience acting on behalf of the City of Edinburgh Council. There was an over-reliance on the part of the Council, without adequate evidence, that others in the project structure, including those building the schools would comprehensively fulfil this essential role.
- 3.1.14 However, the method of financing the project, per se, did not negatively influence the quality of construction in the Edinburgh schools. There is no reason why properly managed privately financed public sector buildings should not be capable of delivering buildings constructed to a very high standard, if best practice approaches to ensuring the quality of design and construction are properly incorporated. There does however need to be a greater understanding amongst clients and those advising them as to what does represent best practice in this regard.

## **3.2 REMIT ITEM 2**

- 3.2.1 Remit **Item 2** asked the Inquiry to consider the adequacy of the contractual arrangements between the Council and ESP.

### **The quality of the contract**

- 3.2.2 It is the view of the Inquiry that while there are several areas within the PPP1 Contract that could have been strengthened to provide additional assurance for the Council, the Contract was generally adequate for its purpose. The incorporation of a number of additional provisions, such as were found by the Inquiry in examining typical contemporaneous contracts, while perhaps beneficial, would have been unlikely to have prevented the occurrence of the defective construction subsequently identified in the completed schools.
- 3.2.3 The omission of collateral warranties in favour of the Council from principal building subcontractors and members of the professional teams appointed by the building contractor was somewhat surprising, as even then this was a

common provision. However, this was not directly relevant to the issue of the defective construction at the schools.

### **The role of the Independent Certifiers**

- 3.2.4 A stronger contract in relation to the definition of the responsibilities of the Independent Certifier in terms of the actual level of inspection of construction required may however have had a positive impact. The evidence to the Inquiry indicated that quite different approaches were adopted in the practical exercise of these responsibilities by the different Independent Certifiers for Phase 1 and Phase 2 of the construction of the PPP1 schools despite the use of the same terms of appointment, although in their roles as Independent Certifier neither approach succeeded in identifying the defects in the construction of the external walls.
- 3.2.5 It is the view of the Inquiry that there should be greater clarity for clients as to the level of scrutiny that Independent Certifiers are required to carry out and the degree of reliance they can reasonably place on the issue of Availability Certificates as evidence that the quality of construction is fully compliant with the Project Requirements. In this regard the Contract was considered to be less than totally clear.

### **Failure to prepare or maintain appropriate as-installed records**

- 3.2.6 The PPP1 Contract contained a requirement for the preparation, provision to the Council and maintenance of as-installed drawings and related documentation. This provision has not been adequately complied with as evidenced to the Inquiry by the main organisations involved in the remediation process.
- 3.2.7 This omission was particularly surprising as the concession period for this contract has still more than 15 years to run and reference to these documents will inevitably be required by the various parties over this period. In addition to the limited number of drawings able to be made available, the Inquiry found difficulty in the course of its work in accessing some of the key contract documents from the records of the Council.
- 3.2.8 The Inquiry is of the view that insufficient attention was paid by ESP and its relevant sub-contractors to the accurate documenting, storage and maintenance of as-installed drawings and related records of the schools. The absence or inaccessibility of these led to a more prolonged and probably more extensive remediation process than would have been required had this documentation been readily available as required under the Contract.

### 3.3 **REMIT ITEM 3**

3.3.1 **Remit Item 3** required the Inquiry to establish the reasons for, and necessity of, the school closures, including a review of the reasons for the Oxgangs Primary School wall collapse.

#### **The cause of the wall collapse**

3.3.2 The response to this question from a technical perspective is reasonably straightforward.

3.3.3 It is the view of the Inquiry that the primary cause of the collapse of the wall at Oxgangs school was poor quality construction in the building of the wall which failed to achieve the required minimum embedment of 50mm for the wall ties, particularly in the outer leaf of the cavity wall. The poor quality relates to all three of the following aspects:

- the direct laying of the bricks and the positioning of the wall ties;
- the direct supervision of the laying of the bricks and the positioning of the wall ties; and
- the quality assurance processes used by the sub- contractor and main contractor to confirm the quality of the construction of the walls.

3.3.4 All three issues were ultimately the responsibility of the design and build contractor in charge of the site.

3.3.5 It is also reasonable to conclude, based on the information in the meteorological records provided, that if the wall had been designed and built to the required appropriate standard it would have been able to withstand the level of wind loading to which it was subjected. The limited embedment of the wall ties in the outer leaf meant that the outer face of brick was simply pulled away from the inner leaf of blockwork due to the action of the wind.

3.3.6 Other factors that may have contributed to the poor quality of bricklaying are discussed in later sections of this Report.

#### **The necessity for closure of the schools**

3.3.7 Given the position that the Council found itself facing on 8<sup>th</sup> April 2016, it is the view of the Inquiry that the only practical and safe course of action in these circumstances was to close the schools in question and commence an immediate programme of remediation. The factors that made this the only sensible decision were:



- the already identified significant problem of poor embedment across the schools;
- the nature of the letter received from ESP on 8<sup>th</sup> April 2016 withdrawing their previous confirmation of 5<sup>th</sup> April 2016 that the schools were safe to occupy;
- the significant reduction in the effective capacity of the brick panels to withstand wind-loading as a result of the reported omission of head restraints;
- the increased risk of an internal as well as external collapse of wall panels;
- the fact that there were only two days remaining before the schools were due to open, leaving no time for any alternative action (if such was available); and
- the unacceptability of the continuity of teaching time over the remaining three months being dependent on the weather.

### 3.4 **REMIT ITEM 4**

3.4.1 **Remit Item 4** relates to the role of the Council with regard to the quality assurance of the construction of the buildings, including the granting of completion certificates to allow the buildings to be occupied.

#### **Lack of adequate independent scrutiny**

3.4.2 It is the unequivocally held view of the Inquiry that there were fundamental and widespread failures of the quality assurance processes of the various contractors and sub-contractors, who built or oversaw the building of the PPP1 schools, to identify and rectify both defective construction of the cavity walls and the omission of the proper incorporation of required masonry restraints and secondary steelwork.

3.4.3 Given the widespread nature of the presence of the same defective construction which was the primary cause of the collapse of the wall at Oxfords school, in terms of varying cavity width and lack of embedment of wall ties, the Inquiry can only conclude that those responsible for the supervision and quality assurance of this work either did not inspect the work adequately or did inspect it and failed to take appropriate action to have it removed or remedied.

3.4.4 The significant number of defects reported in the surveys of fire-stopping in the PPP1 schools, which surveys were undertaken during the period of this Inquiry, raise further concerns as to the degree of scrutiny applied to the quality of construction, particularly in relation to such a critical aspect of construction.

- 3.4.5 The Inquiry is of the view that it was insufficient for public sector clients, with a responsibility to protect the safety of the communities they serve, to so largely rely on the quality assurance processes of contractors for confirmation that key aspects of the building impacting on the safety of users have been properly constructed. An appropriate level of independent scrutiny was missing.
- 3.4.6 It is completely possible and practical for appropriate levels of independent scrutiny, provided by a range of professionals, especially the use of Clerks of Works, to be incorporated into the more recent procurement methodologies used to procure public buildings. As will be expanded upon further, the role of Independent Certifier, certainly as undertaken on the PPP1 projects, did not provide the level of independent scrutiny of the quality of construction that this Inquiry considers both appropriate and prudent for clients to require.
- 3.4.7 From evidence provided to the Inquiry, it was clear, however, that misplaced assumptions were made by the Council and other parties regarding the level of assurance one could place on the quality of construction as a result of the role undertaken by the Independent Certifiers.
- 3.4.8 The appointment of the Independent Certifiers is a joint appointment between the parties to the Contract. How this role is undertaken in practice can vary significantly from project to project but as generally practised it in no way replicates the level of close on-going independent scrutiny or inspection of construction that is provided by a Clerk of Works service which, as circumstances would indicate, was required on these sites. Visits by Independent Certifiers to site and time spent by them on site are much less frequent and shorter than that provided by a project Clerk of Works and do not have the same detailed focus on the quality of construction.
- 3.4.9 Information provided by several Local Authorities in Scotland indicated that they had retained Clerks of Works to provide independent inspection of their PPP programmes for new schools. Several of those organisations who used Clerks of Works on their school building programmes expressed the benefits of doing so in their responses to the Inquiry. Edinburgh Council, in common with probably a significant majority of public sector clients undertaking PPP projects, did not appoint Clerks of Works to provide inspection services on the PPP1 schools.
- 3.4.10 While the presence of Clerks of Works cannot guarantee the absence of defects in building construction, there is no doubt in the view of the Inquiry that the use of experienced and properly resourced high quality Clerks of Works results in a much greater likelihood of defective work being identified before it is closed in. Secondly, the Inquiry is also of the opinion that the awareness by site operatives of the presence of Clerks of Works on site can impact positively on their approach to the quality of their work.

### **Council resourcing of the project**

- 3.4.11 The Inquiry had access to two internal reviews undertaken by the Council in 2002 and 2004 respectively, for doing which they are to be applauded, that examined the lessons to be learnt from both their involvement in the procurement stages of the project and their feedback after the completion of the Phase 1 schools.
- 3.4.12 It is clear from these reviews that the Council itself recognised that it had failed to appreciate the demands of the PPP process in terms of the requirement for adequate internal resources and external support for internal resources, and that as a result had under-resourced the team that represented or advised the Council as client in the relationship with the Consortium.
- 3.4.13 Equally, and with some justification in the opinion of the Inquiry given the complexity of the project and the time within which it was delivered, the Council's review concluded that:

*"Overall it is recognised that the Council team and project manager, in conjunction with advisers did an excellent job in delivering PPP1."*

- 3.4.14 However, at the time of these reviews by the Council, there was no knowledge of the hidden fundamental flaws in the construction of the external walls that were yet to be discovered.

### **The role of Building Standards and the certification of the schools**

- 3.4.15 The Inquiry formed the view that there was a common misconception, even among some Council officers, as to the extent of the reliance that can be placed on the quality of construction of a building because it had successfully gone through the statutory Buildings Standards process.
- 3.4.16 The resource available within the Building Standards section of the Council tended to be focused on the approval of warrant drawings but with limited effective follow up in terms of checking the compliance to the same level of detail of what was actually built on site with what was shown on the approved drawings.
- 3.4.17 The issue of a limited resource of qualified staff within the Buildings Standards Department was raised with the Inquiry on several occasions in terms of how this translated into a limited allocation of time for inspections of the quality and compliance of the construction of projects on site. From the information and evidence of witnesses provided to the Inquiry, it was clear that a preponderance of those visits made to the school sites related to checks on drainage rather than to the compliance of other aspects of the construction.

- 3.4.18 The Inquiry was informed that the issues of lack of embedment of wall ties or the failure to include head restraints in walls were not areas that would normally be inspected on visits to site by the Council's building inspectors. It was the view of the Inquiry that it was not reasonable to expect the level and frequency of inspection visits by Building Control required to identify failures of this type on such large buildings from the visits of building inspectors.
- 3.4.19 If the inspections undertaken by the Independent Certifier are also not at this level, then this represents a gap in the level of assurance provided to the public sector client, unless a separate resource is put in place to undertake this level of scrutiny on behalf of the client.
- 3.4.20 The responsibility to ensure the compliance of the building with the required standards lies with the builder who should have in place proper inspection of the works, however by definition such self-managed inspections cannot be independent of the builder.
- 3.4.21 In relation to the submission, processing and certification of the schools in compliance with the Building Standards system in Scotland, the information, which was provided to the Inquiry by the Building Standards Department, raised concerns as to the appropriate application of the statutory requirements.
- 3.4.22 The analysis of this information suggests that issues of non-compliance, each occurring in the case of several schools, included: failures to submit notifications of intention to start work; starting work without approved warrants; failures to submit requests for amended warrants; and occupying schools in advance of the issue of a temporary occupation or completion certificate.
- 3.4.23 Two of the Phase 1 schools, Craigmount High School and Royal High School, have never received approved completion certificates. In the case of a third school, Gracemount High school, the Certificate of Completion was applied for on 18<sup>th</sup> May 2010 and issued by Building Standards on 7<sup>th</sup> June 2010, some seven years after the school was occupied.
- 3.4.24 It should be noted that to occupy a new building without the issue of a Completion Certificate is a breach of both the original Building (Scotland) Act 1959 and the amended Building (Scotland) Act 2003.
- 3.4.25 The Inquiry had a further concern in relation to this issue. Completed Certificates of Availability signed by the Independent Certifier, as well as certifying that a school was available for occupation and that Council payments for that school were due from that date, were also required to confirm that all Building Standards certificates had been issued. From an analysis of the information available to the Inquiry, it would appear that some of these certificates in fact predated the issue of Temporary Occupancy Certificates or Completion

Certificates by Building Standards. It is, however, recognised that in a number of cases the required certificates were issued shortly thereafter.

### **Discovery of defective fire-stopping in the schools**

- 3.4.26 The final concern of the Inquiry, in relation to the certification and Inspection processes, is the level of recorded breaches in the fire-stopping of the schools that were identified in surveys carried out during the last few months. Fire-stopping is the process of sealing any spaces or holes in fire-rated walls or enclosures with approved fire resistant materials in order to protect means of evacuation, and prevent the spread of smoke or flame from one area to another that could otherwise lead to avoidable risk to life and unnecessary damage to property. From the photographs provided in the survey reports, it would appear that a proportion of these breaches are likely to have dated from the time of the original construction but they had not been detected until the recent surveys.
- 3.4.27 At the time of writing this Report, the Council have been advised by ESP that the necessary fire-stopping remedial work is complete or nearing completion. It has been agreed that this work will be subject to inspection by a fire-safety expert jointly appointed by the Council and ESP to confirm that all necessary remedial work has been done and that it has been done to the required standards.
- 3.4.28 The mandatory provision of prescribed fire-stopping is an aspect of construction that must be treated with the importance that it deserves, due to the potential implications for the safety of building users and the protection of property as a result of defects in this area. On the evidence of the surveys of the PPP1 project, it is the view of the Inquiry that the Council should review its approach in terms of the degree of reassurance provided on fire-safety aspects of the construction of all their facilities.
- 3.4.29 Given that, for some considerable time, there has been relatively widespread knowledge within the PFI industry that defective fire-stopping had been discovered to be a potentially problematic issue in PPP schools and hospitals, it is surprising that ESP had not taken a more proactive approach at an earlier stage to establish the condition of fire-stopping in the PPP1 schools.

## **3.5 REMIT ITEMS 5 AND 6**

- 3.5.1 **Remit Item 5** asked the Inquiry to consider the management and maintenance of the buildings since construction, including advising on whether the current defects should have been found earlier. **Remit Item 6**, also briefly discussed here, relates to the management of the contract by the relevant parties since construction.

### **The management and maintenance of the school buildings**

- 3.5.2 Those members of staff or parents of children who gave or submitted evidence to the Inquiry were generally very positive in their opinions on the quality of maintenance of the buildings as undertaken by Amey Facilities Management ("**Amey FM**", now known as "**Amey Communities**") since construction. The level of planned and response maintenance was regularly compared positively with their experience of that provided in the schools directly owned and maintained by the Council.
- 3.5.3 It should be noted that the City of Edinburgh Council are under a contractual obligation to pay for the provision of the maintenance and upkeep of the PPP1 schools to the specified standard and at the level of cost built into the unitary charge as agreed in the PPP1 Project Agreement. Unfortunately, there is no similar obligation in relation to the Council-owned schools, which do not receive the same level of budgetary allowance from the City of Edinburgh Council for their maintenance.
- 3.5.4 In relation to the issue of whether the defective wall construction should have been found earlier by Amey FM, the Inquiry were advised that in the period immediately following the collapse of the wall at Oxfangs School, several firms of professional structural consultants undertook visual surveys of the external walls of all 17 schools without reporting any visible signs that would suggest defective construction. Without any such outwards signs of distress, the only time that this defect could and should have been found was at the time that the schools were being constructed through a process of proper supervision and inspection of the work in question.
- 3.5.5 The view of the Inquiry in relation to whether the breaches of fire-stopping in the schools as described in the survey reports should have been discovered earlier is quite different. These breaches, if originating from the construction stage, should have been identified either by the original contractors or by Building Standards inspectors at final inspection stages, and if not then they should have been identified by Amey FM acting in their facilities management role through regular inspections of the integrity of the fire-stopping in the building.

### **The management of the PPP1 contract**

- 3.5.6 In relation to the ongoing management of the Contract, the level of deductions for non-availability or non-performance of satisfactory services since completion has been low. Provided that the contract is being applied with the appropriate degree of rigour, this would reflect a generally good standard of service, confirming the opinion already expressed by teachers and parents.

3.5.7 The one area where there was a unanimous degree of frustration expressed in relation to the management of the contract by all those same teachers and parents, was on the level of difficulty they encountered in seeking to implement even minor improvements in the facilities of the schools due to what they perceived as overly complicated administrative processes and inflated costings of the work. The explanation from ESP that these costings were higher because they had to price to cover the maintenance and replacement as necessary of the additional or upgraded items over the period of the 30-year concession although legitimate was not generally well accepted by teachers and parents.

### 3.6 **REMIT ITEM 7**

3.6.1 **Remit Item 7** asks the Inquiry to review the City of Edinburgh Council's handling of the incident from January 2016 to the reopening of the schools in Summer 2016.

#### **The quality of the Council's response to the incident**

3.6.2 It is the view of the Inquiry that, despite the unavoidable disruption and inconvenience caused to pupils, parents and teachers, the response to the initial collapse of the wall on 29<sup>th</sup> January 2016 by the Council in relation to their decision to immediately close Oxfords School was prompt, effective and appropriate in the known circumstances at the time. The reopening of the School on 2<sup>nd</sup> February 2016 was also appropriate based on the actions that had been taken and the information then available to the Council.

3.6.3 The decision on 8<sup>th</sup> April 2016 to close all 17 PPP1 schools had much more significant implications for the Council, in terms of dealing with the sudden requirement to relocate within the shortest possible time 3,198 primary school children, 4,327 secondary school pupils, 107 children with additional support needs and 738 nursery children; a total of 8,371 pupils.

3.6.4 The Inquiry was advised that alternative teaching accommodation, alternative transport and alternative catering arrangements had been put in place for most pupils by Thursday 14<sup>th</sup> April 2016 and for all pupils by Wednesday 20<sup>th</sup> April 2016.

3.6.5 It is the view of the Inquiry that this was quite a remarkable feat to have achieved within an extremely short time, especially without the benefit of any lead-in period and within only a few days of the unexpected announcement that the schools would have to close.

3.6.6 The evidence suggests that it was an excellent example of collaboration by many diverse organisations, groups and individuals working towards an immensely difficult but shared goal. To succeed, as it did, required clear leadership, rapid

but effective decision-making and a total commitment on the part of all involved. Many staff, from throughout the wide range of organisations and schools involved, remained working late into many evenings and over weekends to help put all the necessary and complex arrangements in place. For this they should be strongly complimented.

### **Communications with parents**

- 3.6.7 Having given due praise for this logistical achievement of providing a place for every pupil, the impact of the enforced arrangements also caused significant additional concern, inconvenience and disruption to the lives of many pupils and parents. Some of the parents expressed the view that the level of anxiety caused by the uncertainty and disruption to their daily arrangements was not fully appreciated by the Council.
- 3.6.8 There was little that the Council, itself a victim of circumstances, could do to mitigate this negative impact but a complaint made by several parents who gave evidence or made submissions to the Inquiry, was in relation to the lack of clear information from the Council at the early stages of the process. In a number of circumstances, it is evident that this led to a degree of frustration on the part of some parents.
- 3.6.9 On the Council's part, particularly at the early stages of the closures, the reason for the somewhat limited content in their communication with parents was that they in turn were unable to get the information they needed from ESP to allow them to give firm information to teachers and parents on the extent of the defects, the level of remedial works required, and most importantly, dates for the completion of remedial works and the reopening of schools.
- 3.6.10 ESP, also in turn experienced difficulty, particularly in the initial weeks, in getting firm information from their supply chain.
- 3.6.11 A very much more positive view was expressed by those parents interviewed on the quality of communication by the Council during the later stages of the decant, once clearer information had been made available to the Council.
- 3.6.12 Despite this initial problem, there was also extensive praise expressed to the Inquiry for the many individual contributions made by a wide range of individuals and teams from within the Council and the schools. There was also a major appreciation of the pressures that heads and teachers had been put under and the level of resilience and positivity they were able to maintain throughout the process.



### **Impact on pupils' educational attainment**

- 3.6.13 The implications for the daily length of time spent travelling to and from their new school base were very significant for some pupils, particularly for some of those requiring special support. This resulted in considerable reductions for some pupils in the time they actually spent in class or in related activities.
- 3.6.14 Information provided to the Inquiry by the Council indicates that the average daily teaching time lost per pupil in secondary schools was approximately 12 minutes, whereas in the primary schools it was much higher at 71 minutes per pupil per day.
- 3.6.15 It is difficult to determine, and it will subsequently be difficult to prove, whether the closure and decant of the schools has had any longer-term negative impact on the educational attainment of the pupils affected. However, based on the opinions provided by the head teachers consulted and on the good results achieved by the exam classes affected, the Inquiry is of the view that any negative impact is likely to have been relatively limited. This impact may also have been offset to some extent in certain instances by unexpected positive impacts of the experience (as evidenced by several witnesses to the Inquiry).

### **Effectiveness of remedial work to school walls**

- 3.6.16 A key objective of the Council was of course to ensure that the remedial works were undertaken properly and permanently resolved any issues relating to the structural integrity of the defectively constructed walls. The Council was particularly and correctly insistent that they received a comprehensive set of specified documentation providing the required level of assurance from both contractors, from the two firms of structural engineers acting for Galliford Try and ESP respectively, from ESP themselves and from the Council's own independent structural engineering advisor.
- 3.6.17 Following the technical review of the information provided to it, the Inquiry concluded that a satisfactorily robust approach had been adopted to the process of structural assessments of the buildings following the identification of defects relating to lack of head restraints, poor wall tie embedment, and missing or inconsistent bed joint reinforcement and windposts.
- 3.6.18 The Inquiry found that the design process for the remedial works was thorough and comprehensive, resulting in a high level of confidence that the risk of structural failure arising from the defects uncovered on the buildings has been properly addressed.
- 3.6.19 Based on the above, the Inquiry has concluded that the safety factors required within the relevant design standards, as specified in the Building Regulations,

have been satisfactorily reinstated in the masonry wall panels through the implementation of the programme of remedial works.

### 3.7 **REMIT ITEM 8**

3.7.1 **Remit Item 8** sought advice and recommendations on any specific or wider lessons which can be learnt from these unfortunate events for the City of Edinburgh Council and any other bodies.

3.7.2 These recommendations are included in the various sections of the Report addressing a particular Remit Item and are then brought together in a comprehensive list in Section 13 of this Report.

### 3.8 **CONCLUSIONS**

3.8.1 In conclusion, the City of Edinburgh Council were faced with a totally unexpected problem, which they have managed extremely well despite the very significant challenges which they had to address. For this they are to be complimented. The problems they have had to face were fundamentally the result of poor quality construction and poor quality supervision of construction, which in slightly different circumstances, could have resulted in the injury or loss of the lives of school children.

3.8.2 This Edinburgh Schools problem has a greater significance than it otherwise might have had, due to the fact that the same set of fundamental defects, impacting on the structural integrity of the external walls of the schools, were found across 17 schools built by a range of different main contractors, bricklaying subcontractors, and bricklaying squads. This was not the result of the isolated incompetence of a rogue sub-contractor or bricklaying squad.

3.8.3 Similar defects have been identified across other school buildings in Scotland. Some of these, predating the collapse in Edinburgh, also resulted in the collapse of brickwork panels. Again, fortuitously, these did not cause injury to school children.

3.8.4 Following the Report of the extent of defective construction found at the Edinburgh Schools, the Scottish Government requested all local authorities in Scotland to undertake a review of their school buildings. This sensible step resulted in the identification of the need for remedial work to a number of schools.

3.8.5 It would, however, be naive to suggest that this is a problem only relating to the construction of schools and that contractors apply a better standard of quality assurance on other building types. If these defects are present in school buildings, there is also a likelihood that they are present with similar frequency

in other buildings that contain large masonry panels or where masonry panels are required to be tied back to a structural frame.

- 3.8.6 What is also significant about the Edinburgh situation is that highly professional and competent teams of structural engineers were unable to identify, through detailed visual inspections, the existence of serious defects in the construction of the walls they examined. **This point is worthy of wider consideration by those who may have relied on visual inspections as a form of assurance that the underlying construction of walls are sound.** Any such inadequacies in the construction of masonry panels, must therefore, be detected prior to walls being closed-up or there is no easy practical way of ensuring they have been built properly. This requires effective quality assurance and scrutiny during construction.
- 3.8.7 It is incumbent upon the construction industry to develop and promulgate best practice methods that can be relied upon to provide the necessary level of assurance in relation to those areas of construction that become quickly closed-up to inspection, the failure of which could impact on the safety of the users of buildings. In addition to the construction of masonry panels, fire-stopping has been identified in the Report as another such area deserving of special attention.
- 3.8.8 It is also clear that clients, particularly public sector clients with statutory duties in relation to the communities they serve, cannot simply delegate away from themselves the responsibility of putting in place an appropriate level of informed, independent scrutiny to ensure the safety of the public buildings they procure. By independent scrutiny the Inquiry is referring to inspection by individuals or organisations appointed by or directly employed by the client who are independent of the project company or contractor undertaking the project.
- 3.8.9 The exact nature and effectiveness of the role of Building Standards in this regard is also worthy of further review and consideration. The potential extension of the current requirement for formal certification of parts of the work by qualified individuals, as is the case for electrical and plumbing installations, may offer a possible solution to the lack of inspections that Building Standards can practically carry out in relation to elements of the structure or fabric of buildings that could cause injury if not constructed properly.
- 3.8.10 Despite the significant increasing reliance being placed on the quality assurance by contractors of their own work, there is no formal requirement for the personnel within contracting organisations charged with undertaking this role to have undergone any recognised test of competency to do so.
- 3.8.11 It is the view of the Inquiry that the problem associated with the PPP1 schools has raised issues that are of considerable significance in relation to ensuring that

the quality and safety of buildings produced by the construction industry in Scotland (and potentially the rest of the UK) are delivered to the required standards.

- 3.8.12 The construction industry is a part of our economy that suffers greatly from the boom and bust syndrome, resulting in difficulty in maintaining the availability of highly skilled tradesmen because of the lack of a guaranteed continuity of work. The traditional and hugely valuable concept of building contractors employing and training tradesmen such as bricklayers and joiners through apprenticeships within their own workforce has also largely disappeared. Additionally, the image of the construction industry is one that currently does not appear to be attractive to young people.
- 3.8.13 The quality of a building is ultimately dependent on the quality of the individual tradesmen who build it. Across all of the witnesses who expressed an opinion on this issue to the Inquiry, there was a common concern that this is a growing problem which the construction industry must address.
- 3.8.14 The level of inspection required in any manufacturing pursuit should be designed to reflect the risk or the level of occurrence of defective work. To those with experience of the building industry, and as evidenced in these projects and many more, that risk unfortunately remains real and until evidence demonstrates otherwise, appropriate independent inspection will be a sensible provision by clients.
- 3.8.15 Recent changes to models of procurement of public building, driven by a desire for greater efficiency, and an unachievable desire to transfer all risk away from the client, have unfortunately not appreciated the need to build into these models the essential provision of an appropriate level of independent scrutiny.
- 3.8.16 Frequently clients under such arrangements have limited direct access to the architects and engineers who design their projects or to any reports they may produce other than through the contractor. Not only does this inevitably impact on the overall design quality achieved, but with these changes the presence of architects and engineers on site has reduced. Increasingly, Clerks of Works and resident engineers are also not being employed to assist in the protection of the quality of construction.
- 3.8.17 A number of witnesses to the Inquiry identified a desire to reduce the cost of fees as a major factor in deciding the level of provision of effective inspection of construction, rather than a serious assessment of the risks of not providing for adequate independent scrutiny.
- 3.8.18 A review of the drivers that have resulted in the virtual removal of appropriate independent scrutiny is required to bring the pendulum back to a more realistic

position in this regard. As stated before, best practice methods are available, and could be incorporated into all models of procurement to address what is clearly emerging as a shortcoming in the way the construction industry currently operates. The procurers of buildings need to consider whether the drive for faster, lower cost construction may be being achieved to the detriment of its quality and safety.

## SECTION 4 – PPP1 SCHOOLS – DEVELOPMENT AND CONSTRUCTION RESPONSIBILITIES

- This section of the Report will set out a list of the school projects delivered as part of the PPP1 project and describe the various organisational structures and the allocation of responsibilities in relation to the management, procurement, funding, design, construction and operation of the PPP1 schools. The project structure is shown in Diagram 1 below.
- Between 2002 and 2005, 17 new or refurbished and extended schools in Edinburgh were completed as part of a public private partnership arrangement, PPP1, between the City of Edinburgh Council and ESP, the special purpose private sector company formed to deliver the project. Oxfords School was one of a second phase of four PPP1 projects following a first phase of 13 projects, making up the total of 17 projects.
- The initial submission from ESP in relation to the PPP1 schools project was headed by **Amey Ventures**. This organisation acted as the consortium sponsor that put together the various members of the consortium and their supply chain members.

### 4.1 LIST OF PPP1 SCHOOLS

4.1.1 The first phase (which was complete by the end of 2003) consisted of the following 13 projects: 11 school projects (providing 13 schools due to the co-location of Pirniehall and St. David's Primary Schools, and Broomhouse and St. Joseph's RC Primary Schools) and two non-school projects.

1. Pirniehall and St. David's Primary Schools
2. Craigmount Primary School
3. Broomhouse and St. Joseph's RC Primary Schools
4. Craigmour Park Primary School
5. Forthview Primary School
6. Castleview Primary School
7. Drummond Community High School
8. Craigmount High School
9. Gracemount High School
10. Royal High School (Refurbishment and Extension)
11. Rowanfield Special School
12. Goodtrees Neighbourhood Centre
13. Howdenhall Secure Unit

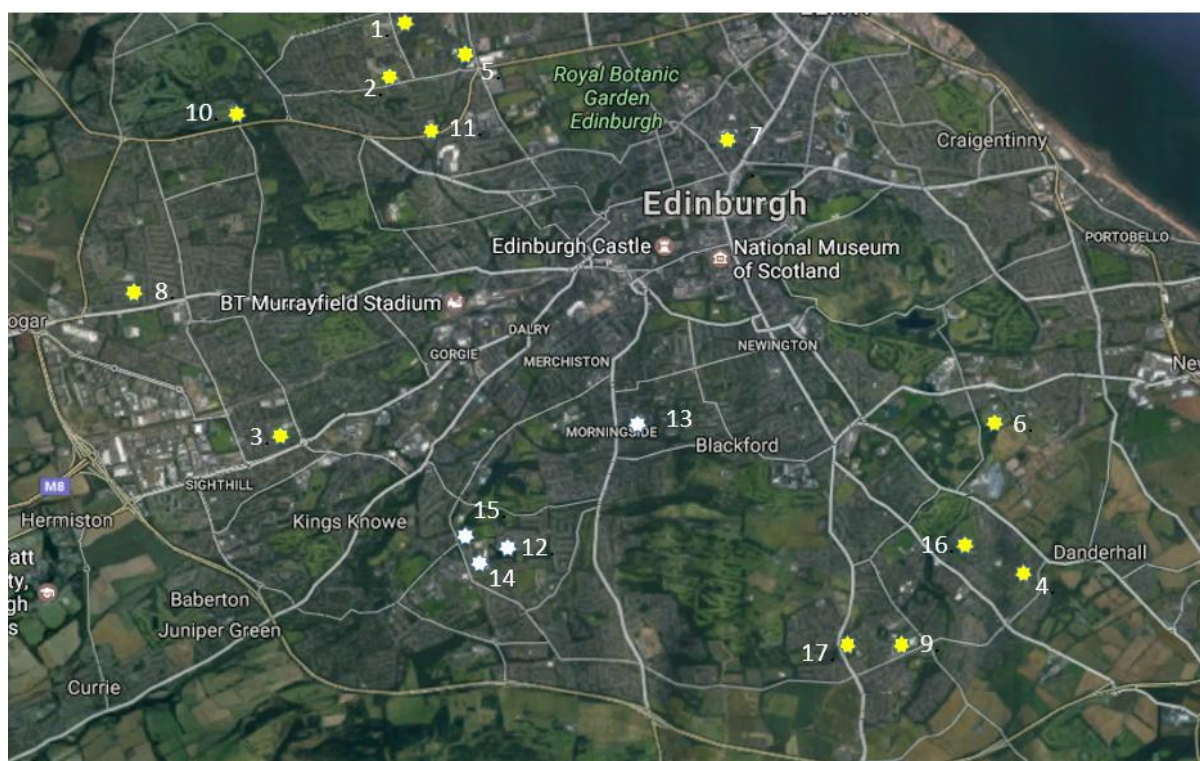
4.1.2 The final makeup of the second phase, referred to as the '2004 schools', was determined following issues with site availability and other unforeseen factors such as a fire at the original Oxfords Primary School. The implementation of the required changes was undertaken using the 'change procedure' as laid down in

the contract and was subject to a new full business case approval from the Scottish Executive. The four '2004 schools' projects which were completed in 2005 were as follows:

1. Oxfangs Primary School
2. St. Peter's RC Primary School
3. Braidburn Special School
4. Firrhill High School

4.1.3 The map on the following page (Image 1) shows the locations of the schools across Edinburgh. The school and non-school projects in Phase 1 are marked in yellow, and the Phase 2 schools in white.

**Image 1:** Map showing location of the PPP1 schools across Edinburgh.



**Key**

**PHASE 1 SCHOOLS**

1. Pirniehall and St. David's Primary Schools
2. Craigmount Primary School
3. Broomhouse and St. Joseph's RC Primary Schools
4. Craigour Park Primary School
5. Forthview Primary School
6. Castleview Primary School
7. Drummond Community High School
8. Craigmount High School
9. Gracemount High School
10. Royal High School
11. Rowanfield Special School

**PHASE 2 SCHOOLS**

12. Oxgangs Primary School
13. St. Peter's RC Primary School
14. Braidburn Special School
15. Firrhill High School

**OTHER FACILITIES (PHASE 1)**

16. Goodtrees Neighbourhood Centre
17. Howdenhall Secure Unit

4.1.4 The Council undertook a second PPP project for a further eight schools (referred to as the PPP2 schools) which were completed in 2010. This contract was undertaken by a different organisation to that involved in the PPP1 schools. PPP2 is not included in and nor should it be confused with the subject of this Inquiry.



## 4.2 ORIGINAL AND CURRENT OWNERSHIP OF SHARES IN ESP

4.2.1 The equity funding represented 11% of the total funding for the project. In 2001, at the time the PPP1 project was signed, the shares in ESP (Holdings) Ltd were held by the following companies:

- (i) Amey Ventures Limited;
- (ii) Miller Construction (UK) Limited;
- (iii) Quayle Munro PFI Fund Limited Partnership; and
- (iv) Uberior Infrastructure Investments Limited

4.2.2 According to filings at Companies House, the original shareholders disposed of their shares as follows:

(i) **Disposal of shares of Amey Ventures Limited ("AMV"):**

- Prior to completion of the second phase of PPP1, AMV disposed of all its shares to Equion Plc in 2004;
- In 2008 Equion Plc changed its name to John Laing Social Infrastructure Limited;
- John Laing Social Infrastructure Limited disposed of half its shareholding to John Laing Pension Trust in 2010, followed by the remainder of its shareholding in 2012; and
- John Laing Pension Trust disposed of its shares to **Palio (No.19) Limited** between May 2013 and May 2014.

(ii) **Disposal of shares of Miller Construction (UK) Limited ("Miller Construction"):**

- In 2005, about the time of completion of the second phase of PPP1, Miller Construction disposed of all its shares to SMIF UK Limited;
- SMIF UK Limited disposed of all its shares in May 2008 to Trillium PPP Investment Partners No. 2 Limited, which changed its name to **Semperian PPP Investment Partners No. 2 Limited** in February 2009.

(iii) **Disposal of shares of Quayle Munro PFI Fund Limited Partnership ("QM"):**

- QM disposed of its shares in May 2008 to **PFI Infrastructure Finance Ltd.**

(iv) **Disposal of shares of Uberior Infrastructure Investments Limited ("Uberior")**

- Uberior disposed of all its shares in May 2009 to Uberior Infrastructure (No.3) Limited, which later changed its name to **Aberdeen Infrastructure (No.3) Limited**.

4.2.3 The current shareholders in ESP (Holdings) Ltd are therefore:

- (i) Palio (No.19) Limited;
- (ii) Semperian PPP Investment Partners No. 2 Limited;
- (iii) PFI Infrastructure Finance Limited; and
- (iv) Aberdeen Infrastructure (No.3) Limited.

4.2.4 The original lending institutions that provided 89% of the funding (debt) for the project to ESP were:

- The Bank of Scotland; and
- The European Investment Bank.

4.3 **RESPONSIBILITY FOR DESIGN AND CONSTRUCTION**

4.3.1 Responsibility for the design and construction of the schools was sub-contracted by ESP to a joint venture, ("**AMJV**") between Amey Asset Services Limited (now known as Amey Programme Management Ltd.) and Miller Construction.

4.4 **DESIGN TEAM**

4.4.1 Two firms of architects were appointed by AMJV, each to act separately as lead consultant and designers for a number of the schools as follows:

- (i) Holmes Architects of Edinburgh (since renamed Holmes Miller) were appointed for:
  - eight Primary Schools in Phase 1 PPP1;
  - two Primary Schools in Phase 2 PPP1 (including Oxfords Primary School);
  - Rowanfield Special School in Phase 1 PPP1;
  - Braidburn Special School in Phase 2 PPP1; and
  - Howdenhall Secure Unit in Phase 1 PPP1.

(ii) 3D Architects of Edinburgh (since renamed 3DReid) in collaboration with Hickton Madeley Architects of Telford England (since dissolved as a company) were appointed for:

- four High Schools in Phase 1 PPP1; and
- one High School in Phase 2 PPP1.

(It should be noted that 3DReid after originally agreeing to attend the Inquiry subsequently decided they did not wish to do so. The Inquiry was therefore unable to examine how 3DReid undertook their responsibilities, their relationships with contractors or their views on the inspection of the quality of construction in relation to the five High Schools listed above nor was this information able to be provided by other witnesses who did attend. The same construction defects that were found in the ten Primary Schools and two Special Schools undertaken by Holmes Architects were also found to be present in the five High schools designed by 3D Architects).

4.4.2 WSP Parsons Brinckerhoff ("**WSP**"), a large international multi-disciplinary consultancy was separately appointed by AMJV to undertake responsibility for the civil and engineering structural design of all 17 projects, working as part of the separate design teams led by the two architectural practices respectively but not answerable to them.

#### 4.5 **CONSTRUCTION TEAM**

4.5.1 The approach adopted by AMJV in relation to the construction of the first phase (13 projects) of PPP1, was to take overall responsibility for the management of both design and construction and enter a series of separate construction contracts with individual construction companies for the construction of each of the schools. The Tier 2 contractors, including Miller Construction, effectively became sub-contractors to AMJV, of which Miller Construction was itself one of the two parties. The Tier 2 sub-contractors are listed in the following table with the school(s) they built and the date they were completed.

<b>Tier 2 sub-contractor</b>	<b>School</b>	<b>Date completed</b>
<b>Miller Construction:</b>	Forthview PS	June 2003
	Castleview PS	Sept. 2003
	Rowanfield Special School	Oct. 2002
	Howdenhall Secure Unit	Oct. 2003
	Goodtrees Comm. Centre	July 2003
	Craigmount HS	July 2003
	Gracemount HS	July 2003
<b>Dickie Construction</b> (Commenced by Dickie – <b>completed by Miller)</b>	Drummond Community HS	July 2003
<b>Robertson Construction</b> (Commenced by Robertson – <b>completed by Miller Construction)</b>	Royal High School	Aug. 2003
<b>Lilley Construction</b>	Pirniehall/St David's PS	Aug. 2002
	Broomhouse/St Joseph's PS	Oct. 2002
<b>Tulloch Construction</b>	Craigroyston PS	Nov. 2002
<b>Ogilvie Construction</b>	Craigour Park PS	Dec. 2002

- 4.5.2 The architects and engineers on the Phase 1 PPP1 schools were not novated to the individual Tier 2 contractors and had no direct contractual relationship with them. They continued to be employed by, take instruction from, and report to AMJV.
- 4.5.3 All formal communication to the Tier 2 contractors from the design team members in relation to the design and construction of the Phase 1 PPP1 schools, including drawings, specifications and technical requirements was required to be channelled through, approved and issued by design managers and project managers directly employed by AMJV.
- 4.5.4 The strategy adopted on Phase 1 PPP1 by AMJV, of subcontracting the construction of individual schools to local contractors, was not followed on the four Phase 2 PPP1 schools, all of which it was decided should be constructed by **Miller Construction**, acting in the role of a Design and Build contractor.
- 4.5.5 In the case of the four Phase 2 schools listed below, with the dates they were completed, Miller Construction did not further sub-contract out the building work. The design team members had a direct contractual relationship with the building contractor Miller Construction, thus facilitating more direct communication.

School	Date Completed
Oxgangs Primary School	Feb. 2005
St. Peter's RC Primary School	Oct. 2005
Braidburn Special School	June 2005
Firrhill High School	June 2005

4.5.6 In 2004, prior to the completion of the construction of the Phase 2 schools, Amey disposed of their shares in ESP (Holdings) Ltd. Amey BPO Services Ltd, (Amey FM, now known as Amey Communities), had been appointed as the service provider of facilities management services to the Phase 1 schools, and were subsequently also appointed to undertake the same role in relation to the Phase 2 schools, thus maintaining an ongoing involvement of Amey in the project.

#### 4.6 RESPONSIBILITY FOR INDEPENDENT CERTIFICATION

4.6.1 A standard requirement of the PFI process is the appointment of a consultant to act in the role of what is referred to as the Independent Certifier or Independent Tester. The Independent Certifier is required to act independently between the public sector client and the private sector consortium in determining when the consortium has achieved full compliance with the contractual requirements and then certifying that that the facilities are completed and available for use.

4.6.2 It should be noted that this certification role is completely different to and separate from that undertaken by the Building Standards Department of the City of Edinburgh Council, which is responsible for implementing the statutory process of building control. This subject will be addressed in Section 10 of this Report.

4.6.3 Mouchel (previously Mouchel Parkman), a large international multi-disciplinary consultancy with its UK headquarters in Woking was appointed to act as Independent Certifier for the 13 projects undertaken as Phase 1 of PPP1. This work was undertaken from their Edinburgh office. This company was acquired by the Kier Group in April 2015 and subsequently acquired from the Kier Group by WSP Parsons Brinckerhoff in October 2016.

4.6.4 Ove Arup and Partners Scotland Limited ("**Arup (Scotland)**"), also part of a large multi-disciplinary consultancy with its UK headquarters in London, was appointed to act as Independent Certifier for the four projects undertaken as Phase 2 of PPP1. It also did so through its Edinburgh office.

4.6.5 The appointments for both Independent Certifiers were joint appointments between the respective companies providing the Independent Certifier services

and ESP, the City of Edinburgh Council and The Governor and Company of the Bank of Scotland.

#### 4.7 **COUNCIL MANAGEMENT STRUCTURE FOR OVERSEEING THE PPP1 DEVELOPMENT**

4.7.1 An internal organisational structure was put in place by the City of Edinburgh Council to provide governance and management of the project during the business case preparation, procurement and preferred bidder stages leading up to financial close of the deal with ESP for the PPP1 schools in Nov 2001. The City of Edinburgh Council structure is described below.

4.7.2 A **Project Board**, chaired by the Director of Education, acted as the internal sponsor body and provided strategic direction to the project. Its membership included representation at a senior level from relevant areas of the Council as follows:

- Director of Education (Chair);
- Head of Support Services (Education);
- Head of Corporate Finance (Finance);
- PPP Project Manager (Education);
- Personnel and Management Services Manager (Corporate Services);
- Head Teacher Representatives (Education);
- Head of Property Management (City Development);
- Head of Architectural Services (Corporate Services); and
- Head of Support Services (Social Work).

4.7.3 A **Project Team** composed of Council officers reported to this Project Board and took responsibility for the day to day management activities. The membership of the Project Team consisted of:

- PPP Project Manager (Education) (Chair);
- PPP Project Development Manager (Education);
- PPP Head Teacher Liaison Officer (Education);
- Strategic Structure Planning Manager (Education);
- Finance Manager Education Department (Education);

- Principal Accountant (Finance);
- Principal Solicitor (Corporate Services); and
- External Advisers

4.7.4 Legal, financial and technical External Advisers were appointed to support the Council officers and augment in-house expertise in these areas. They reported through the Project Manager to the Project Board. They included:

- Turner and Townsend Project Management (Lead Adviser);
- Turner and Townsend Project management (Technical);
- Dundas and Wilson (Legal); and
- Arthur Andersen (Financial).

4.7.5 There was a significant change in the structure and resourcing of the client team representing the City of Edinburgh Council in their dealings with ESP immediately following financial close of the PPP1 deal in November 2001 and in the period thereafter.

4.7.6 The stages after financial close included user client liaison and consultation; detailed design development; assessment and approval of all reviewable data including design and content changes; cost management of variations; and the subsequent construction, equipping, commissioning, certification and occupation of the schools.

4.7.7 At its largest, post-financial close, the City of Edinburgh Council team allocated to the project on a full-time basis consisted of four members of the staff of the Council. The Project Manager who had acted for the Council up to financial close remained in post for a short time thereafter before leaving for another position.

4.7.8 On the departure of the Project Manager, the person who took over as the main interface with ESP was the Council officer who up to then had reported to the previous Project Manager as the senior adviser on facilities management issues associated with PPP1.

4.7.9 After some six months, an administrative assistant was appointed to support the acting Project Manager/facilities management adviser who until then had become effectively the only full-time member of the Project Team.

4.7.10 At the same time as the appointment of the administrative assistant, another officer of the Council was appointed to act as the main interface with ESP in relation to the design and construction of the school buildings, with the acting Project Manager retaining responsibility for facilities management issues. This

new appointment was given the slightly misleading title of Construction Project Manager, a term more appropriately used to describe an executive role in a construction company.

4.7.11 The 'Construction Project Manager' was subsequently supported by the appointment of a Quantity Surveyor to the PPP1 Project Team making a full complement of four staff allocated by the Council to the oversight of the implementation of these post-contract stages of the PPP1 project.

4.7.12 Additionally, this small team had access to the support of other staff, including professional/technical staff, working in the Council, who had been returned to their normal full-time duties after contract signing had been achieved.

#### 4.8 **MANAGEMENT OF THE OPERATIONAL PHASE OF THE PPP1 SCHOOLS AFTER OCCUPANCY**

4.8.1 For the operational phase the City of Edinburgh Council put in place a small Contract Management Team as the interface for ESP in relation to all operational matters associated with the on-going implementation of the 30-year concession.

4.8.2 The responsibilities of the Contract Management Team include:

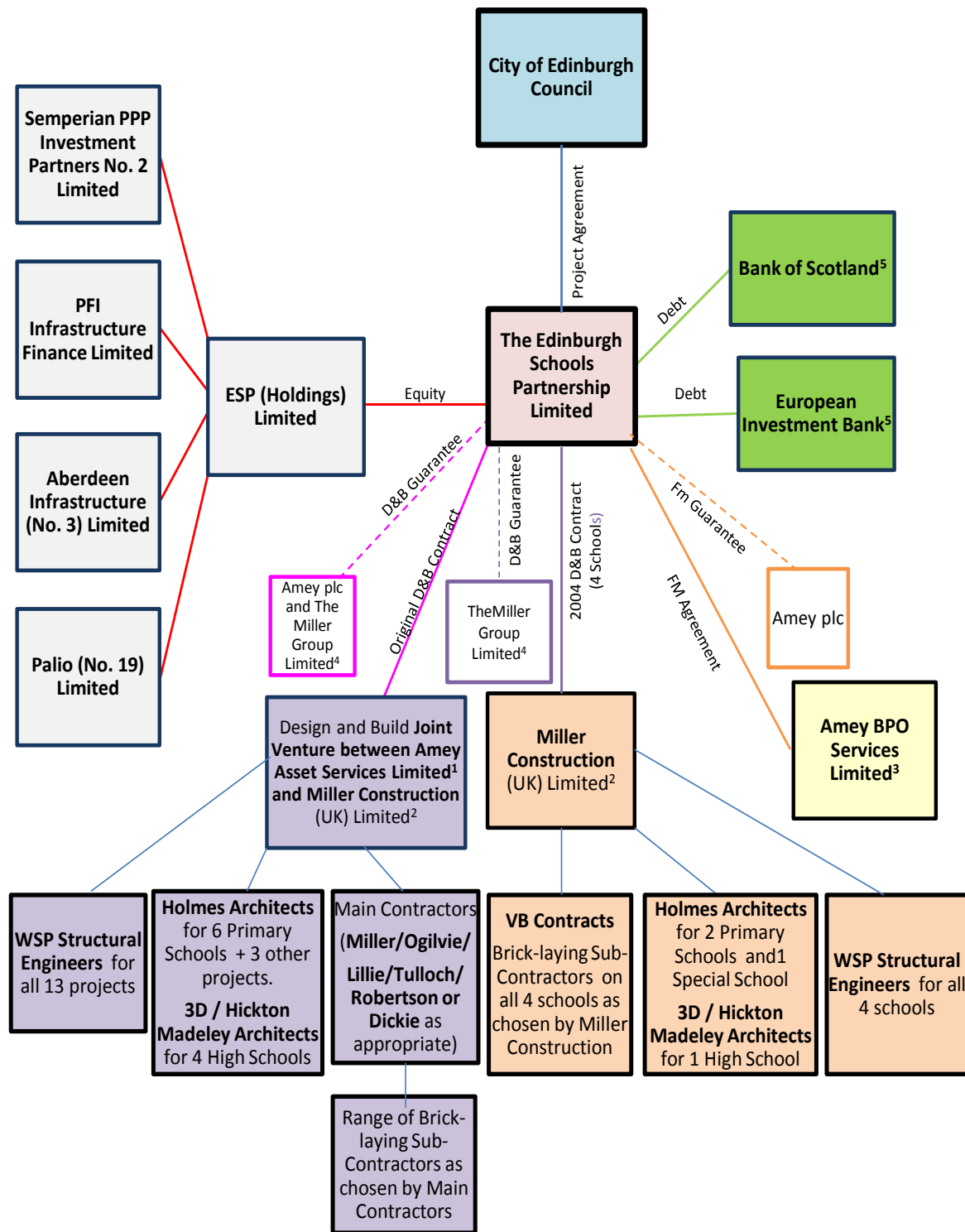
- ensuring that the City of Edinburgh Council's contractual position is protected and the agreed allocation of risk is maintained;
- direct liaison on behalf of the City of Edinburgh Council with both the Schools and with ESP in relation to all issues impacting on the execution of the contract;
- effective monitoring of the service provider's performance against that specified in the Project Agreement;
- ensuring that in the event of failure to perform by ESP, appropriate action is taken both in relation to addressing the performance issues and the application of the financial implications of failures as provided for in the Agreement; and
- managing requests for variations to buildings, equipment or services provided under the contract, and negotiation and implementation to manage in accordance with the provisions of the contract.

4.8.3 Under the PPP1 contract ESP was responsible for Designing, Building, Financing and Operating (DBFO) the schools for a 30-year concession period for which they are paid a unitary charge.



- 4.8.4 Currently the payment for accommodation and related services made by the Council to ESP (the unitary charge) amounts to approximately £1.5 million per month. The contract entitles the City of Edinburgh Council to make deductions from this payment for any of a range of specified failures to deliver the contracted services including the non-availability for use of school areas or failures in the performance of contracted services.

**Diagram 1: Edinburgh Schools PPP1 Project – Current Structure:**



1 Now called Amey Programme Management Limited  
 2 Now called Galliford Try Construction (UK) Limited  
 3 Now called Amey Community Limited

4 Now known as GT TMGL Limited  
 5 These were the original lenders and may not reflect the current position

## SECTION 5 – CHRONOLOGY

- This section of the Report will set out in chronological order the sequence of related events from the collapse of a wall at Oxgangs School in January 2016 up to the reoccupation of all the PPP1 schools in August 2016. In doing so it is intended to be as far as possible an accurate statement of the facts, reliant as it is on the Inquiry's interpretation of the information provided as evidence or submissions, together with that contained in records and reports made available to the Inquiry.
- In so doing there has been an assumption by the Inquiry that documents provided to it can generally be taken as accurate in relation to the recording and description of the sequence of events over the period in question.
- This section will not include the findings of the Inquiry in relation to these facts. A separate section of this Report deals with each remit item in which the Inquiry's analysis of those elements of these facts relevant to that remit item will be provided.

### 5.1 COLLAPSE OF THE GABLE WALL AT OXGANGS PRIMARY SCHOOL

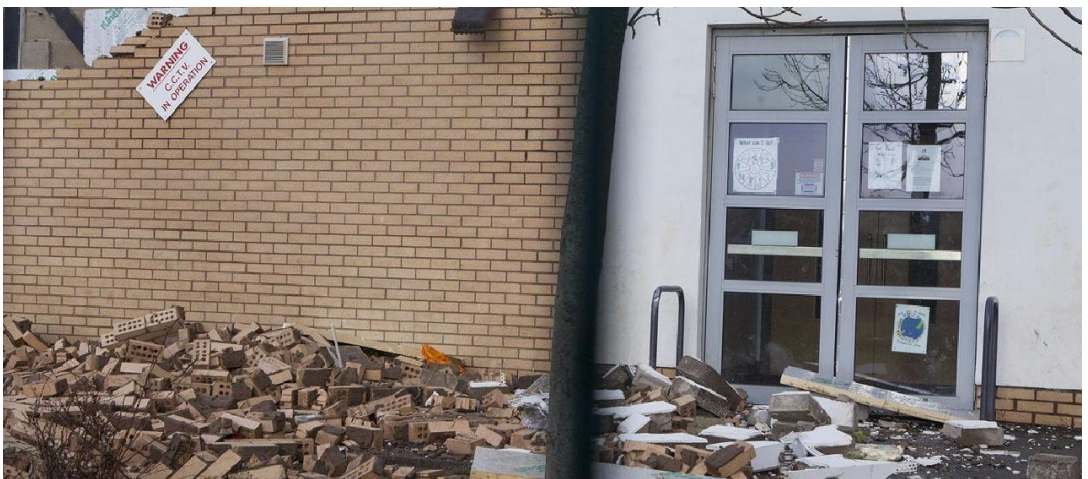
- 5.1.1 On the evening of the 28<sup>th</sup> January 2016 and on the following day Scotland and the North of England suffered significant disruption as a result of Storm Gertrude sweeping across the country. The storm resulted in schools being shut, homes losing power, and trains, flights and ferries being cancelled across Scotland.
- 5.1.2 On the morning of **Friday 29<sup>th</sup> January 2016**, in the hours prior to the normal opening time of Oxgangs Primary School, a substantial section of the upper level of the external brickwork face of a non-structural cavity wall to a two-storey gable of the school, weighing approximately 9 tons, collapsed onto the pathway below.
- 5.1.3 Fortunately, due to the early hour, no one was in the vicinity of the wall that collapsed and no injuries resulted. However, the Inquiry was advised that the area onto which the significant amount of masonry had fallen was one where shortly later children could easily have been standing waiting to go in to school or walking past. In slightly different circumstances this event could have resulted in considerable injury or even fatalities to staff and children.
- 5.1.4 The following photographs (Images 2, 3 and 4) are of the gable wall at Oxgangs School taken after the collapse.



*Image 2: Photograph taken at Oxgangs School of the gable wall after the collapse.*



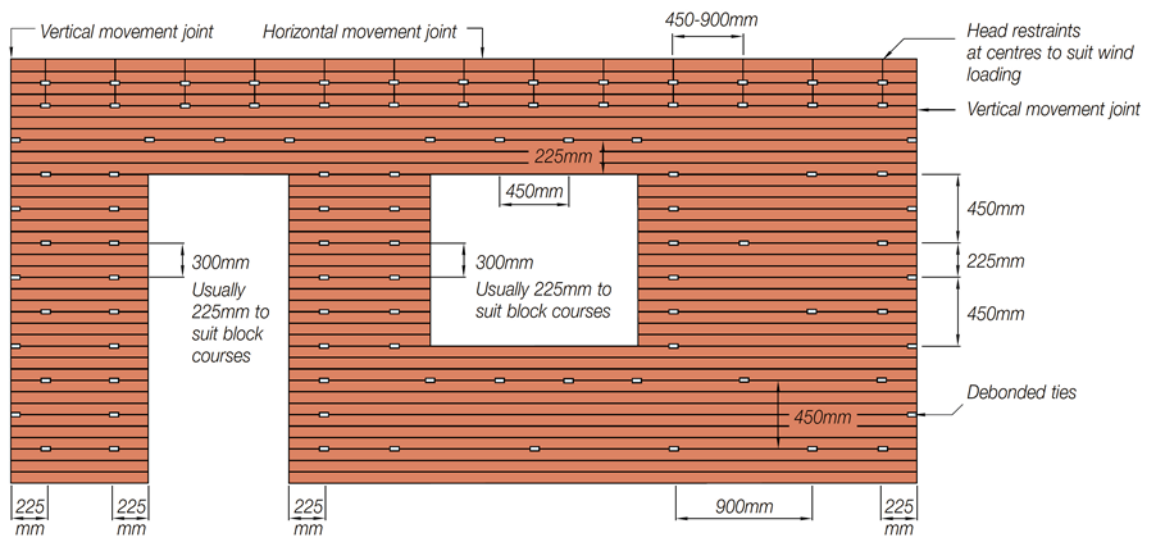
*Image 3: Photograph taken at Oxgangs School of the gable wall after the collapse.*



*Image 4: Photograph taken at Oxgangs School of the gable wall after the collapse.*

- 5.1.5 A Capitals Programme Senior Manager from the Council, who will be referred to for the purposes of this Report as the Council's Project Manager ("**CPM**"), took charge of the incident and was subsequently appointed to act throughout the following months as the main interface on all technical matters between ESP and the Council's senior management team.
- 5.1.6 Following an early morning visit by the CPM and other staff of the Council, it was decided that the school should be closed with immediate effect until more information was available. The priority of the Council officers was to have those remaining areas of the damaged wall that were clearly unstable, and could easily fall, removed and to arrange for immediate temporary repairs to render the wall structurally safe.
- 5.1.7 That morning the CPM requested Will Rudd Davidson ("**WRD**"), a firm of Edinburgh-based structural engineers, to provide them with advice on both any further risks to safety that might be associated with the collapse and the nature of remedial work required to render the building safe for use.
- 5.1.8 The CPM also instructed WRD to undertake a precautionary visual inspection of the external walls of the three other Phase 2 PPP1 schools built at the same time and by the same contractor, Miller Construction, as Oxgangs School. These were St. Peter's RC Primary School, Firrhill High School and Braidburn School. This visual inspection did not raise any concerns.
- 5.1.9 Temporary works were undertaken over the next three days by Amey FM and their appointed sub-contractor to render the gable wall at Oxgangs school safe from risk of any further collapse. These works involved removing all remaining parts of the damaged wall that were at risk of falling, installing a bracing structure to the internal face of the inner leaf of the cavity wall and applying a temporary external cladding to protect it from the elements. Additionally, the area around the wall was fenced off to prevent access to it by pupils.
- 5.1.10 On Sunday 31<sup>st</sup> January ESP, in recognition of the relative responsibilities of the parties as established under the PPP1 contract, formally took over from the City of Edinburgh Council the appointment of WRD as structural engineering consultants to advise them directly in relation to the collapse. The school remained closed on Monday 1<sup>st</sup> February, thereby causing pupils to miss a total of two days of school attendance.
- 5.1.11 Prior to re-opening on Tuesday 2<sup>nd</sup> February, the City of Edinburgh Council required a letter from the structural engineers, WRD, confirming that it was safe to occupy the school provided the area around the wall remained securely cordoned off. The letter also advised ESP that further intrusive investigations would be necessary to understand the cause of the failure of the wall.

- 5.1.12 On 3<sup>rd</sup> February 2016, prior to the undertaking of the comprehensive investigations of the Oxfangs wall collapse, as a precautionary measure ESP commissioned WRD to visually inspect the external walls of all 17 PPP1 projects and provide a Report by the week ending 12<sup>th</sup> February.
- 5.1.13 These reports, based on visual inspections by WRD, indicated no apparent problems and advised that the schools remained safe to occupy.
- 5.2 **RELEVANT TECHNICAL TERMS**
- 5.2.1 Prior to presenting the information provided to the Inquiry in relation to the investigations into the collapse of the wall at Oxfangs, a brief explanation of some of the key building components that will subsequently be referred to, may prove beneficial to some readers of this Report.
- 5.2.2 **Wall ties** are important to the stability of cavity walls in that they are used to tie the inner and outer leaves together, enabling them to act as a single structural element thereby increasing the stiffness of the wall and its resistance to lateral wind-loading. Failure to install wall ties correctly may lead to cracking or collapse of walls.
- 5.2.3 The requirement for a minimum embedment of 50mm by wall ties into the bed joints of both inner and outer faces of masonry cavity walls was clearly stated in the specification produced by the design team for the PPP1 schools. This requirement is in accordance with both recognised standards within the construction industry at the time and with the guidance that currently applies. For walls with a designed cavity width of 120mm, as in the case of the PPP1 schools, a wall tie with a minimum length of 250mm is required.
- 5.2.4 It is also recommended that ties should be evenly distributed over the area of a wall to provide a minimum of 2.5 ties per square metre (900mm horizontal x 450mm vertical centres). Additionally, at vertical edges of openings or at unbonded edges, wall ties should be placed at 300mm centres vertically at a maximum 225mm from the open edge.
- 5.2.5 Diagram 2 which follows shows the generic arrangement and minimum spacing required for wall ties on a cavity wall including door and window openings.

**Diagram 2:****Typical Layout of Wall Ties Indicating Maximum Spacing**

Standard spacing for cavity brickwork 900mm x 450mm centres in a staggered pattern (2.5 ties per square metre)

- 5.2.6 A structural engineer designing the structure of a building is required to consider the stability of masonry wall panels to ensure that they can withstand wind-loadings arising from wind-speeds and loadings as currently prescribed in British Standard BS EN 1991-1-4: 2005 for use with PD 6697 2010, (BS 6399 applied at the time of the design of the PPP1 schools). Both standards take account of location, topographical exposure and orientation.
- 5.2.7 In so doing, a critical element is the size of the masonry panel in terms of its breadth and height. The larger the panel, the greater will be its requirement to be stiffened or restrained by tying it back to core structural elements of the building. The more sides on which a masonry panel is restrained, the greater its resistance to lateral wind-loading, although even if restrained on all four sides, additional reinforcement of the panel may be required to satisfy the mandatory wind-loading requirements.
- 5.2.8 Structural engineers, having tested the wind resistance of masonry panels through calculations, will therefore frequently be required to incorporate into their design solutions components including wall head restraints, bed joint reinforcement or secondary steelwork such as windposts, to achieve the required structural resistance, particularly in the case of larger panels.
- 5.2.9 These three types of component can be used either in isolation or in conjunction with each other depending on the customary practice and design intent of the structural engineer responsible for their specification. However, all three may be required for certain size and orientation of panels and geographical locations of buildings. A brief explanation of each of these elements is provided below.

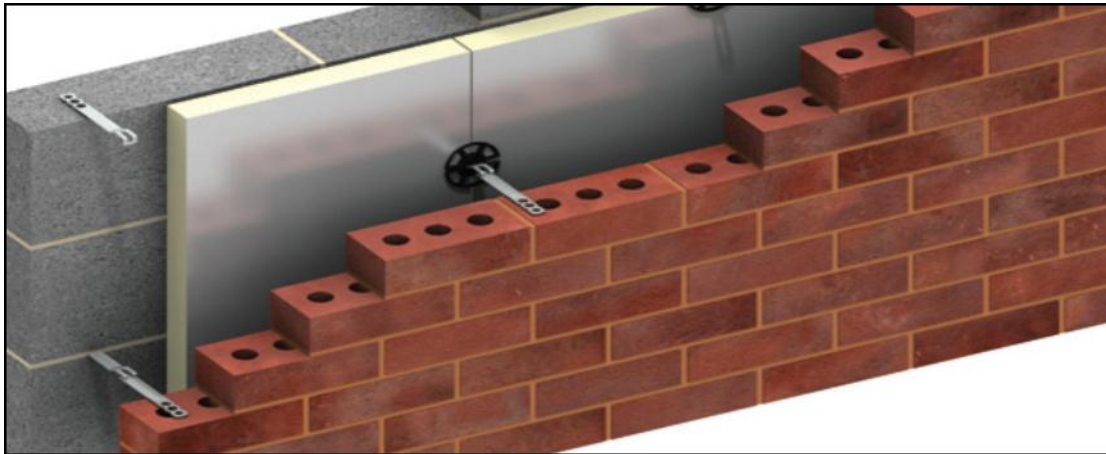
- 5.2.10 **Wall head restraints** are used to connect the top of a cavity wall at either intermediate floor or roof level to the structural concrete floors or steel or concrete horizontal beams that are part of the structural frame of the building and run immediately adjacent and parallel to the top of the wall panels. Their installation, usually at around 900mm centres, increases the ability of the panel of masonry to resist wind or other lateral loading. They are built into the mortar joints at the top of brick or blockwork walls and, if it is a steel-framed building, are fixed to the steel beam using either bolted screws fitted into holes drilled in the steel or self-drilling 'Tek' screws. Some contractors still use shot-firing to fix the head restraints to the steel beams but this is no longer viewed as good practice.
- 5.2.11 Head restraints are normally built into the mortar joints on the inner leaf of cavity walls but versions are also used that are built into both inner and outer leaves. (See Diagram 3 below) This was the type specified for the PPP1 schools.
- 5.2.12 **It should be noted that the absence of head restraints per se is not necessarily a fault as structural analysis may show that they are not required on some narrower horizontal wall panels. However, the strength of wider panels to resist wind loads is dramatically reduced if they are not properly restrained at their head.** It is generally easier for design teams to specify them throughout buildings so that there should be no doubt on the part of the bricklayers fitting them as to whether or not to include them in a particular panel.
- 5.2.13 Lateral restraint fixings are similar to and as important as head restraints in that they are used at regular intervals to tie masonry panels to the vertical columns or stanchions to either side of masonry panels also in order to increase the resistance to wind-loading of the masonry panels.
- 5.2.14 **Bed joint reinforcement** is used to improve the structural performance of masonry walls by providing additional resistance to lateral loads such as wind. It consists of stainless steel wires, normally two, joined at intervals by welded steel cross-wires to form standard lengths (2 to 3 metres long normally) of a ladder form open steel mesh of a width that is less than that of the brick or block on which it will sit. For a standard 102.5mm wide brick the normal width would be approximately 60mm. These lengths of mesh are placed longitudinally in the mortar bed on top of the brick or block courses at vertical centres as specified by the structural engineer. (See Diagram 3 below)
- 5.2.15 **Windposts** are designed either to span vertically between floors or between floors and structural beams or to act as vertical cantilevers to provide additional lateral support for otherwise inadequately restrained masonry panels. They can be constructed using a range of different structural steel sections, including



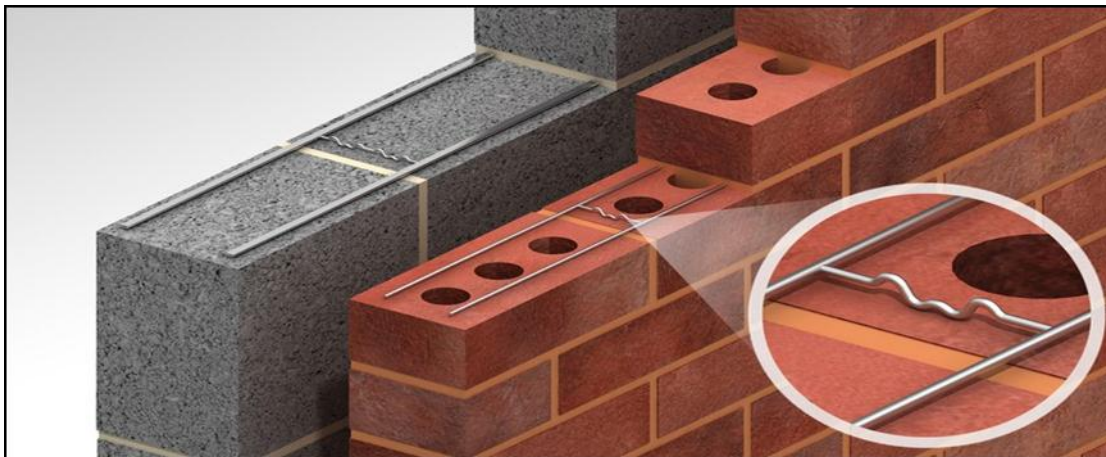
channels and angles, to suit different design situations in cavity walls. (See Diagram 4 below)

- 5.2.16 The design specification for the external cavity wall that collapsed at Oxgangs Primary School was the same specification as that used for most of the external walls throughout the 17 projects constructed under both phases of PPP1.
- 5.2.17 The standardised design for the cavity walls in the PPP1 schools consisted of an internal leaf built of 140mm wide blockwork, a 120mm cavity consisting of 70mm wide insulation slabs clipped to the inner face of the inner blockwork leaf and a 50mm wide air space, and an outer leaf of either 102.5mm wide facing brick or 100mm wide blockwork with a rendered finish. Diagram 3 (below) shows a representation of this type of construction.

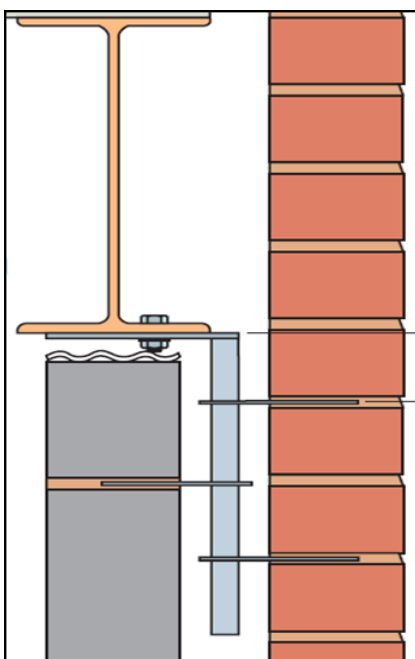
**Diagram 3:** Representation of the standardised design for cavity walls in PPP1 Schools:



**Above:** Example of cavity wall construction including insulation slabs installed in a similar fashion to that specified for the PPP1 schools.



**Above:** Example of bed joint reinforcement similar to that specified for the PPP1 schools.



**Left:** Example of a head restraint attaching both inner and outer leaves of a cavity wall to a steel beam similar to that specified for the PPP1 schools.

**Diagram 4: Windposts**



*Typical connection of windpost to steel beam at head of wall.*



*Typical arrangement for tying inner leaf of blockwork and outer leaf of brickwork to a windpost.*



*Examples of how windposts are connected to concrete slabs at base.*

Diagrams 2, 3 and 4 have been reproduced with the kind permission of Ancon Ltd.

### 5.3 INVESTIGATIONS AS TO THE CAUSE OF THE COLLAPSE AT OXGANGS SCHOOL

- 5.3.1 Following a series of investigations of the wall in question undertaken in February by WRD, they produced a structural report, setting out their views as to the reason for the wall failure at Oxgangs. The Report was dated **29<sup>th</sup> February 2016**.
- 5.3.2 Their Report concluded that the wind strength of Storm Gertrude at the time of the collapse, as advised by the Met Office, should alone not have been sufficient to lead to the failure of the brickwork panels if the panels had been designed and constructed correctly. The Claim Check Service of the Met Office recorded gusts of up to 69 mph around the time of the collapse of the wall, which were at a level 20% lower than the design requirements as specified in the British Standard BS 6399 on wind loadings, for which the walls should have been designed and constructed to be capable of resisting.
- 5.3.3 The graph presented at the end of this section shows a representation of the wind speed over the period during which the wall collapsed. This indicates that the strongest gusts recorded occurred at 7.00 am on the morning of 29<sup>th</sup> January 2016. It was thought that the collapse occurred sometime around this period although no one is recorded as actually witnessing it. This would only be shortly before children would have started to arrive at the school.
- 5.3.4 The WRD Report, the remit for which at the time did not extend to other parts of the external walls of Oxgangs School, identified the primary contributory factor for the collapse of the wall to be insufficient embedment of many of the wall ties in the external leaf of brickwork, as a result of incorrect construction and/or installation.
- 5.3.5 On receipt of the Report ESP instructed its lawyers to issue what is called a 'defect notice' to the main contractor, originally Miller Construction, now Galliford Try, inviting them to remediate the defects at Oxgangs and encouraging them to investigate the other Phase 2 schools to ensure similar defects did not exist. The defects liability period had not expired for the four Phase 2 schools and so the original contractor was still contractually bound to make any defects good.
- 5.3.6 The conclusions of the WRD Report on the Oxgangs wall included the following statements:

*"Cavity width is variable in width and would not consistently allow the minimum 50mm of embedment of wall tie to be achieved with the specified 250mm wall ties"*

*"Wall ties not being positioned central to the cavity, thus not consistently allowing the 50mm embedment into the outer leaf"*

*"A combination of excessive cavity width, related non-verticality, incorrectly constructed wall ties, has resulted in a cavity wall construction which in many of the ties had insufficient embedment of the wall ties in the outer leaf. This in our view was the primary contributory factor."*

5.3.7 The following are some of the more specific findings of the WRD Report based on site investigations and measurements undertaken by WRD:

- wall ties were generally found to be spaced at 450mm vertically and 900mm horizontally in accordance with standard guidance;
- WRD assessed the width of the cavity to the collapsed wall to have ranged from between 15mm to 40mm wider than the width specified in the design of 120mm;
- measurements of the projecting length of 19 wall ties left in the inner leaf after the collapse showed that over 50% of these would have been insufficiently long to have provided the required minimum embedment of 50mm in the outer face assuming a cavity width of 120mm; and
- in one of the structural bays in the gable wall containing additional diagonal flat bar steel bracing, the blockwork to the inner leaf had been reduced from 140mm to 100mm locally around the steel bracing effectively increasing the cavity width to 160mm at these locations.

5.3.8 The WRD Report contained the following four recommendations:

1. *"The gable wall is rebuilt to match the existing with particular attention paid to cavity widths, wall tie specifications and connections to the steelwork."*
2. *"Strengthening to the 100mm blockwork areas around the cross-bracing should be provided."*
3. *"The results of this investigation may be indicative of generic defects by the same build team. An intrusive investigation into all other similar external walls in the school should therefore be carried out to determine cavity widths and wall tie embedment at other locations. As we have a sample wall tie that has distinctive markings it may be possible to achieve this investigation by borescope survey, as opposed to removing areas of outer leaf masonry. We would recommend that this is carried out within the next three-month period."*

4. *"Ensure management plan is in place with regard to Meteorological Office advice and 'Take Action' recommendations."*

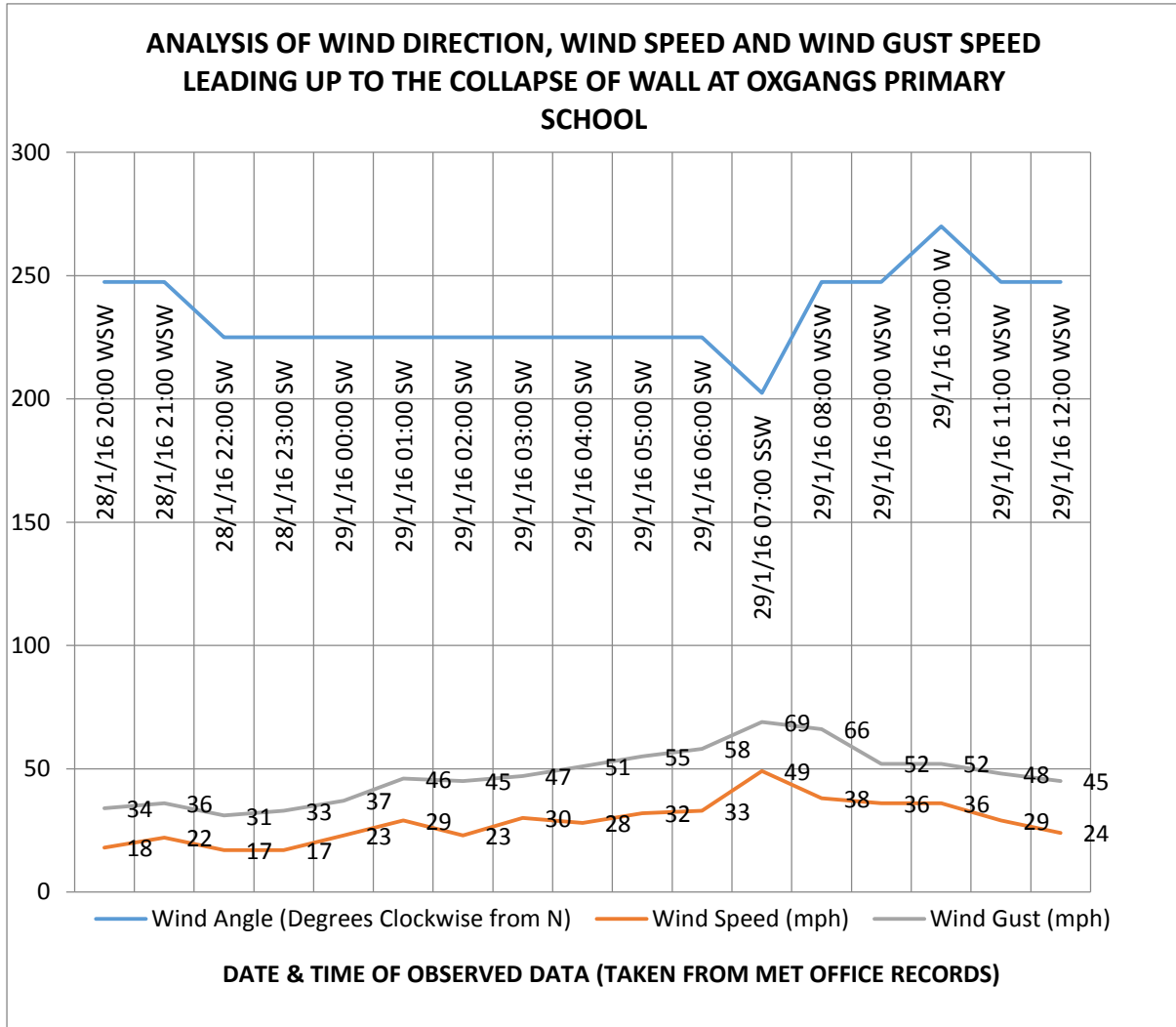
5.3.9 The last of these four recommendations related to the view previously expressed by WRD in their Report that the school should check to ensure that it had a management plan in place for any re-occurrence of severe weather events.

5.3.10 The "'Take Action' recommendations", mentioned in recommendation 4, refers to the advice given by the Meteorological Office as to how people should respond when that office issues 'Red' level warnings. This advice includes the following recommendations:

- *"Stay indoors as much as possible"; and*
- *"If you do go out, try not to walk or shelter close to buildings or trees."*



**Image 5:** *Photograph of exposed inner blockwork leaf of gable after removal of insulation demonstrating the recessed blockwork in the braced bay which resulted in extending the width of the cavity.*



**Figure 1:** Graph showing an analysis of wind direction, wind speed and wind gust speed leading up to the collapse of the gable wall at Oxgangs Primary School.

#### 5.4 EXTENSION OF STRUCTURAL SURVEYS TO THE REST OF THE PPP1 SCHOOL ESTATE

- 5.4.1 ESP had reserved the right within their letter to Galliford Try to undertake their own investigations. After a short delay, ESP proceeded to instruct WRD to undertake cavity wall tie inspections on all 17 projects, including the four Phase 2 schools that Galliford Try was responsible for making good.
- 5.4.2 On **9<sup>th</sup> March 2016**, following consideration of the 29<sup>th</sup> February Report, the appointment of WRD was extended by ESP to undertake a series of appropriate **intrusive surveys**, i.e. opening holes in the walls at appropriate intervals so they could determine whether there was any presence of similar defects associated with the lack of wall tie embedment in the other external walls of Oxfangs School and in the external walls of **any of the remaining 16 schools that had been completed as part of the PPP1 schools** programme. Initial **visual inspections** at these schools had previously failed to identify any areas of concern.
- 5.4.3 The City of Edinburgh Council advised ESP that the three-month period they were proposing for undertaking structural surveys was not acceptable to the Council and that these should be completed much sooner than this so as to more quickly identify any further risks. This requirement for acceleration of the surveys was agreed as appropriate by ESP who anticipated that these surveys could be completed over the following two to three weeks. A letter was sent by the City of Edinburgh Council to the schools and to parents of school pupils advising them that surveys of the schools would be commencing.
- 5.4.4 In recognition of the potential significance of the findings of the WRD Report, the Chief Executive of the City of Edinburgh Council on 18<sup>th</sup> March 2016 initiated regular meetings of a Corporate Incident Management Team ("**CIMT**") with membership, including himself, of senior members of staff from all relevant Departments within the Council.
- 5.4.5 The remit for the CIMT was to assist the Chief Executive in the overall strategic management of and operational response to the issues that would emerge from the discovery of defective construction at the schools.
- 5.4.6 Over the next ten weeks up to 20<sup>th</sup> May 2016, a meeting of this team was held almost daily and from that date on at very regular intervals until all pupils had returned to their own schools. The Inquiry was provided with minutes of these meetings, which have proved useful in assisting the Inquiry in the formulation of this chronology of events.
- 5.4.7 In mid-March 2016, due to the requirement for a more rapid completion of this work, WRD augmented the size of the engineering inspections team by



appointing Harley Haddow, another Edinburgh-based structural engineering firm, to assist them with the undertaking of the structural surveys on behalf of ESP.

5.4.8 The undertaking of these investigations was made significantly more difficult than it might have been by the reported inability of ESP, Amey, Galliford Try or the City of Edinburgh Council to provide access to sets of good quality as-built drawings of the original construction of the PPP1 schools.

## 5.5 RESULTS OF EXTENDED SURVEYS AND DECISION TO CLOSE PHASE 2 PPP1 SCHOOLS

5.5.1 Preliminary information on the results of the wider surveys of Oxfangs Primary School was communicated by WRD to the City of Edinburgh Council on **15<sup>th</sup> March 2016**. It indicated a wider presence of inadequate wall tie embedment to the perimeter walls of Oxfangs School.

5.5.2 The initial analysis by WRD suggested that up to 50% of the wall ties might not be sufficiently embedded. On receipt of this Report a decision was made by Council Officers to close Oxfangs School from the following day, **Wednesday 16<sup>th</sup> March 2016**. The following explanation of their approach to this decision was expressed in communications from the City of Edinburgh Council:

*"Whilst the structural engineer has indicated that the building could continue to operate safely, a more precautionary approach has been taken to close the school to allow remedial work to be undertaken. The extent of the issue around the building renders the provision of an exclusion zone impractical"*

5.5.3 Following the receipt of further structural reports containing indications of evidence of similarly inadequate embedment of wall ties to the external walls of all three of the remaining Phase 2 schools, it was decided at a meeting, held on **17<sup>th</sup> March**, between Council elected members and senior Council officers that Braidburn School and St. Peter's Primary, two of the three remaining Phase 2 PPP1 schools, should also be closed with immediate effect from **Friday 18<sup>th</sup> March 2016**.

5.5.4 In so doing there was the expectation that the necessary remedial works to these schools would be completed in time to allow the schools to be safely re-opened on Monday 11<sup>th</sup> April, the day that pupils were due to return from their Easter break.

5.5.5 It was also decided that the fourth Phase 2 school, Firrhill High School, would close from the **18<sup>th</sup> March 2016** to allow the undertaking of detailed structural surveys but re-open again on **21<sup>st</sup> March 2016**, which was what occurred.

- 5.5.6 The meeting also decided that, pending the results of the on-going surveys, the 13 Phase 1 projects should remain open until the commencement of the Easter school holidays on **24<sup>th</sup> March 2016**.
- 5.5.7 The Inquiry was advised that this decision was based on a risk assessment using the information available to the City of Edinburgh Council at the time. Until information from the surveys would subsequently unfortunately indicate otherwise, the Council considered it to be a reasonable assumption that the defects relating to the wall-ties were confined to the four Phase 2 schools, all having been built at the same time in a separate phase by the one contractor, Miller Construction.
- 5.5.8 **However, over the following days, the information from the on-going surveys of the Phase 1 schools indicated that similar problems of varying cavity width and lack of wall tie embedment had been identified across the PPP1 schools and it was recognised that the remedial programme would also have to be expanded to cover defective construction in these schools as well as in the four Phase 2 schools.**
- 5.5.9 The following are examples of photographs taken from these survey reports showing the embedment of wall ties below the 50mm minimum requirement.



Photo 0185  
Location 61A – Embedment 0mm



Photo 0187  
Location 61B – Embedment 24mm

**Images 6 and 7:** Photographs from survey reports showing the lack of embedment. These are two examples from Craigmount High School, showing embedment of 0mm and embedment of 24mm.



**Image 8:** Photograph from the survey reports showing the lack of embedment. This is an example of no embedment of a wall tie at Howdenhall Centre.



**Image 9:** Photograph from the survey reports. This photograph shows very limited embedment of a wall tie at Forthview Primary School.



**Photo 15.23.45**  
**Location 40 – 35mm embedded**

***Image 10:** An example of poor embedment at  
Gracemount High School*



***Images 11 and 12:** Examples of virtually no embedment at Drummond High  
School (taken with borescope camera).*

5.5.10 Following the novation of the appointment of WRD from the Council to ESP in light of the emerging information on the extent of structural defects, the Council appointed a structural engineer to act solely on their behalf. A Director from the Glasgow office of Scott Bennett Associates, a structural engineering consultancy, was appointed to provide direct advice to the City of Edinburgh Council on how ESP and ESP's consultants and sub-contractors were addressing the on-going issues and to undertake a peer review of the nature and outcomes of the ongoing surveys and the emerging design proposals and methodologies for remediation of the schools.

5.5.11 Despite the contractual issues that the collapse of the Oxfangs School wall had given rise to between ESP and the City of Edinburgh Council, the Inquiry has been advised by those giving evidence to it that throughout this part of the process there appeared to be an open and transparent sharing of technical and survey information between ESP, WRD and the City of Edinburgh Council.

## 5.6 PROPOSED STRATEGY FOR AN EARLY REOPENING

5.6.1 In the period leading up to the commencement on 24<sup>th</sup> March 2016 of the Easter holidays, proposals were developed by ESP in conjunction with officers from the City of Edinburgh Council and their advisers for the implementation of a strategy to facilitate the early reopening of the schools.

5.6.2 The strategy relied upon a combination of:

- immediate remediation over the holiday period by the installation of remedial wall ties to **all areas of wall identified as high risk** including at entrances and means of escape;
- the erection of protective fencing to create **exclusion zones around all other areas assessed by the surveys as carrying risk**, these areas to be remediated in the summer holiday period; and
- the implementation of a strict management protocol for ensuring the safety of children should there be any further periods of high wind.

5.6.3 The last part of the strategy was based on a proposal that either the schools would be closed or pupils in schools would be restricted from going outside the school buildings in periods of high winds, based on close and regular monitoring of meteorological forecasts and severe weather warnings.

5.6.4 It was proposed that once satisfactory completion of this work had been achieved over the Easter holiday period, the currently closed PPP1 schools i.e. Oxfangs, St. Peter's, Firrhill and Braidburn, could reopen on 11<sup>th</sup> April 2016, whilst any remedial work that remained outstanding on these schools at this date could be completed during the summer months of the school holiday

period. This proposal was supported as being an acceptable approach from a structural safety perspective by the structural engineers representing both ESP and the City of Edinburgh Council.

- 5.6.5 In the case of the 13 Phase 1 PPP1 projects, the contractual period for which the original contractors remained liable for latent construction defects had expired prior to the collapse of the Oxfords School wall. Following completion of the surveys and the preparation of the design and specification for the required remedial work, the remedial construction work would therefore be undertaken by sub-contractors appointed under the management of Amey Communities.
- 5.6.6 However, the Phase 2 schools had been completed in 2005 under a contract which had a limitation period of 12 years during which the responsibility for making good latent construction defects remains with the original contractor. This period had not yet expired.
- 5.6.7 ESP had therefore requested that Galliford Try comply with their contractual responsibilities for undertaking all remedial works required to the four Phase 2 schools. This large national construction company had acquired Miller Construction in 2014 and thereby assumed their contractual liabilities.
- 5.6.8 Following further consideration by the City of Edinburgh Council, the strategy to facilitate the reopening of the schools on 11<sup>th</sup> April 2016 was accepted as the best way to proceed. At a meeting of the Corporate Incident Management Team on the 21<sup>st</sup> March 2016 the following points were discussed:
- The intention was that all closed schools would re-open after the Easter break
  - All remedial measures to the schools were required to be fully complete by the start of August 2016
  - Confirmation should be issued to school staff and parents of pupils that the schools were safe and that pupils were being taught in a secure environment
  - The necessary mitigation measures in the event of severe weather would be required to be fully operational in all schools prior to the return to schools on 11<sup>th</sup> April 2016.
- 5.6.9 In relation to the introduction of the severe weather protocol, it had been agreed at the CIMT on the previous day, Sunday 20<sup>th</sup> March, that Meteorological Office weather warnings would be monitored by the Corporate Resilience Unit of the City of Edinburgh Council four times a day until 25<sup>th</sup> March, the start of the Easter break, and any warnings would be issued immediately to all concerned.

- 5.6.10 It was also reported at the meeting that Galliford Try would begin a programme of remedial works for the Phase 2 projects on the day following the meeting, 22<sup>nd</sup> March 2016, starting at Oxgangs School which had already been closed.
- 5.6.11 Galliford Try had appointed the Edinburgh-based firm of structural engineers, Goodson Associates Ltd., to advise them directly on the extent and nature of remediation works that would be required on the Phase 2 schools. This was not a shared appointment so in relation to this work Goodson Associates only reported to Galliford Try.
- 5.6.12 Goodson Associates had been provided with a copy of the 29<sup>th</sup> February WRD Report on the gable wall collapse at Oxgangs School and were addressing the recommendations therein as their initial brief together with any specific instructions from Galliford Try. Galliford Try did not at this time seek clearance from ESP, the City of Edinburgh Council or their respective structural engineering advisers on the nature or extent of the work they planned to carry out. In order to fulfil their contractual obligations, they intended simply to repair the defective work and report to ESP when the work was complete.
- 5.6.13 At the commencement of the Easter school holiday period on Friday 25<sup>th</sup> March, Amey commenced work on the wall tie remediation to the areas around entrances and exits at the 13 Phase 1 projects. Work also started on the erection of Heras fencing to create exclusion zones around those areas of wall which were not designated high risk areas and for which the remedial works would be undertaken during the period when the schools had closed for the summer holidays.
- 5.7 **TECHNICAL SOLUTION TO RESOLVE INADEQUATE EMBEDMENT OF WALL TIES**
- 5.7.1 As more results of the on-going intrusive structural surveys continued to show evidence of defective construction, it had become increasingly apparent that the lack of embedment of wall ties was present throughout the PPP1 school buildings. A more extensive scheme of wall tie remediation than was originally envisaged would be required.
- 5.7.2 At a relatively early stage following discovery of the extent of the problem associated with the wall ties, it was acknowledged by ESP, Galliford Try and Amey that it would prove impractical to locate and replace the required quantity of defective wall ties through opening up and rebuilding the walls. Accordingly, both Galliford Try and Amey had proposed to undertake a process of installing retrofitted proprietary remedial wall ties to all suspect areas of the external masonry walls of the schools.
- 5.7.3 This type of tie is installed from the outside of the building by drilling holes through the outer leaf and into the inner leaf of the cavity wall to the necessary



depth to allow satisfactory embedment. The use of such ties had the advantage of being much less disruptive to existing brickwork and being very significantly quicker to complete than an approach based on locating and repairing defective ties.

- 5.7.4 A variety of resin-grouted ties, mechanically-fixed ties or helical screw-in ties are manufactured for this use. To ensure their effectiveness, it is a requirement of the manufacturers of these products that either specialist sub-contractors approved by them are employed to undertake the work or that any other tradesmen employed to do so have relevant experience and expertise, and have received specific training in the use of their product. There is also a requirement for sample testing of the suitability of the retrofitted ties using a specialist testing machine to undertake 'pull tests' to establish that the strength of the installed ties is satisfactory. The wall ties were satisfactorily installed in accordance with these requirements.
- 5.7.5 The installation of the wall ties was undertaken by sub-contractors overseen respectively by qualified staff from within Amey for Phase 1 schools and from within Galliford Try for Phase 2 schools. The design and specification for this work and the subsequent inspection thereof was undertaken respectively by WRD for the Phase 1 schools and Goodson Associates for the Phase 2 schools.
- 5.7.6 The use of the retrofitted wall ties had been agreed as an appropriate design solution by Scott Bennett Associates, acting on behalf of the City of Edinburgh Council.
- 5.7.7 On the 5<sup>th</sup> April 2016, ESP confirmed by letter to the Chief Executive of the City of Edinburgh Council that the schools could be safely reopened for the summer term as normal on Monday 11<sup>th</sup> April as they predicted that all the specified provisions, including wall tie remediation to the high-risk areas, would then be in place.
- 5.7.8 It was intended that a letter with this information would be made available to the staff and parents of children at the affected schools to reassure them that it was safe to re-occupy the schools. The key sentence within the letter from ESP to the City of Edinburgh Council was:
- "The purpose of this letter is to confirm that, as we discussed at our meeting of 21<sup>st</sup> March, these buildings are safe for occupancy, and have been at every stage since the incident of 29 January 2016."*
- 5.7.9 This letter from ESP was supported by a letter written on 4<sup>th</sup> April to ESP by WRD, their structural engineering advisers, advising them that in their opinion, as a consequence of the various remedial works undertaken and the creation of

exclusion zones in all other necessary areas that all schools 'could continue to be normally utilised'.

## 5.8 **DISCOVERY OF MISSING OR INADEQUATELY SPACED HEAD RESTRAINTS**

- 5.8.1 In the same week as the above letter of 5<sup>th</sup> April 2016 was written by ESP, the supervising structural engineering consultants Goodson Associates were advised by the contractor on the Phase 2 Schools, Galliford Try, that during the reconstruction of the collapsed gable wall at Oxgangs Primary School, members of staff of the contractor had reported to Galliford Try the discovery of an apparent lack of expected head restraints at the top of the walls.
- 5.8.2 At this stage, in early April, the Inquiry have been advised that Galliford Try had succeeded in acquiring a number of construction drawings for the four Phase 2 schools from WSP, the original design team structural engineers for the PPP1 schools.
- 5.8.3 Further investigations were undertaken by Galliford Try to establish the presence and form of any head restraints. The investigations undertaken established that in several situations head restraints had either not been installed or were inadequately spaced.
- 5.8.4 In response to this situation, a structural review to establish the capacity of a range of the masonry panels at Oxgangs School was undertaken by Goodson Associates, involving calculating the strengths of the panels on the assumption that head restraints had not been fitted. This review concluded that in the case of the majority of the external masonry panels assessed, it would be necessary to retrofit head restraints to achieve the necessary resistance to wind loading.
- 5.8.5 From the information provided to the Inquiry, it would appear that as early as 23<sup>rd</sup> March, the day after Galliford Try commenced their remedial work at Oxgangs School, Goodson Associates had already on behalf of Galliford Try carried out calculations on the brickwork panels in the Oxgangs School gable wall that had collapsed. These calculations, which predated the discovery of the missing head restraints, had assumed that the panels in question were restrained on all four sides i.e. that head restraints had been fitted.
- 5.8.6 The calculations completed by Goodson Associates on 23<sup>rd</sup> March 2016 showed that given the size, location and orientation of the largest panel, and assuming that head restraints were present in accordance with the original specification, which was subsequently found not to be the case, additional bed joint reinforcement or secondary steelwork in the form of windposts would still have been necessary to satisfy the required wind-loadings.

- 5.8.7 The Inquiry has been advised that this information, which demonstrated a requirement for not only head restraints but windposts to be installed, was not conveyed by Galliford Try to ESP or to the City of Edinburgh Council.
- 5.8.8 From an examination of photographs taken after the collapse of the wall, it is clear that neither windposts nor bed joint reinforcement had been installed in the wall.
- 5.8.9 An emergency meeting of the Council's Corporate Incident Management Team was convened at 12.30 pm on Friday 8<sup>th</sup> April 2016 following a request from ESP for a meeting. The information on this newly emerging issue was shared with the Council officers present. In addition to the Council officers this meeting was attended by a representative of ESP from the Edinburgh-based consultancy Infrastructure Management Limited ("IML") which oversees the implementation of the contract on behalf of ESP, and representatives of WRD, Goodson Associates, Amey and Galliford Try.
- 5.8.10 The record of the meeting states:
- "...a further serious issue had been identified with regard to Oxgangs Primary School. Support at the head restraints was missing in some places and sparse in others offering insufficient support at wall heads which now posed an unacceptable risk and could cause internal walls to collapse. 21 panels had been checked at Oxgangs Primary School which had failed the accepted standard – equates to 20%. As a result of these findings it was deemed necessary that the school be closed until further investigation and remedial works had been undertaken."*
- 5.8.11 The Inquiry was advised by Council officers as part of their evidence that the nature of the defective construction newly reported at this meeting was considered to be of major significance and the cause of great concern on the part of the Council officers present.
- 5.8.12 Under the proposed strategy for reopening the schools on 11<sup>th</sup> April 2016, it had been assumed that any further failure of the outside leaf due to poor embedment of wall ties would result in a collapse of masonry into an unoccupied exterior exclusion zone in the school grounds, an area inaccessible to schoolchildren and others.
- 5.8.13 However, the Council officers were now advised that a failure of the inner leaf of the cavity wall to resist wind-loading, as a result of the reported absence of or inadequacy of head restraints, could result in an inward collapse of masonry into a classroom or other area occupied by children, teachers or staff. The Council officers considered this to be an unacceptable risk.

5.8.14 The Inquiry was informed by officers of the Council who had attended this meeting that, whilst they understood the technical and causal issues were somewhat different, they were all inevitably aware of the recent fatal injuries caused to a pupil at Liberton School in Edinburgh through the collapse of an internal free-standing masonry partition wall on 1<sup>st</sup> April 2014. Although the cause of the collapse of the internal free-standing wall at Liberton School was quite different and in no way linked to the Oxfangs failure, the memory of it reinforced the determination on the part of Council officers that they were not prepared to take any risks which might have compromised the safety of the school population.

5.8.15 It was agreed by the Council officers present at the meeting that the Leadership of the Council should be advised immediately of the situation and of the recommendations of the officers that all 17 PPP1 projects be closed with effect from the following **Monday 11<sup>th</sup> April 2016**.

## 5.9 **DECISION TO CLOSE ALL PPP1 SCHOOLS**

5.9.1 Later on the same day of this meeting, 8<sup>th</sup> April 2016, a representative of ESP wrote to the Chief Executive of the City of Edinburgh Council formally confirming the information that they had previously provided at the meeting. The key paragraphs of this letter read as follows:

*"Shortly before noon today we were advised by the design and build contractor who is executing the remedial works at Oxfangs Primary and St. Peter's Primary that it had discovered serious defects **as a result of which it has advised that these schools are no longer safe to occupy**. Representatives of the Council were advised of the position this afternoon at a meeting with ourselves and the design and build contractor."*

*"At present, it is impossible to confirm whether the same defect may exist at the other Estate (PPP1) buildings. In these circumstances, we are afraid that we have no option but to withdraw the confirmation contained in our letter of 5 April 2016 that the Estate buildings identified in the letter are safe for occupancy."*

(The list of buildings identified in the letter of 5 April included all the PPP1 schools).

5.9.2 The Leader of the Council told the Inquiry in evidence that, when he inquired as to whether closure of the schools was the only course of action available, he was advised that there were no alternative options to the decision to close all schools. This decision was then ratified by the Leader of the Council.

5.9.3 Due to the legal implications for moving vulnerable young people, priority was given to the carrying out of further inspections of Howdenhall Secure Unit. These inquiries identified the fact that it was generally of a different construction to the schools and was considered safe for occupancy apart from the gymnasium, which would require similar remedial work to that required on the schools in relation to wall ties. The gymnasium was closed and isolated until the remedial work had been completed so that no residents were put at risk.

#### 5.10 **DECANTING AND RELOCATION OF PUPILS AND STAFF**

5.10.1 The enforced closure of the 17 projects with immediate effect set in train a huge, logistical task of a scale that normal emergency planning processes could not reasonably have been expected to deal with. It involved putting in place as quickly as possible alternative accommodation for the education of approximately 7,600 primary and secondary pupils, 740 nursery pupils and the relocation of 655 teachers.

5.10.2 To do so required the coordinated and concentrated input of:

- all the Senior Management Team and most of the Departments, teams and staff within the Council;
- ESP and Amey Communities in relation to their on-going responsibility for providing facility management services to the schools;
- the head teachers, teaching and related staff who worked in the buildings affected;
- the head teachers and staff of other schools who would be required to assist in accommodating the decanted pupils; and
- many other agencies from both the public sector and private sector willing to offer available resources and/or expertise required.

5.10.3 It also required significant effort, inconvenience and time on the part of many parents and pupils in helping to make the alternative arrangements work effectively.

5.10.4 On the evening of 10<sup>th</sup> April 2016, the Communities and Families Directorate of the City of Edinburgh Council invited the Head Teachers of the schools affected to attend a meeting on Monday 11<sup>th</sup> April 2016, the day the schools had been due to return from the Easter break. The Heads were given a better understanding of the issues and the benefit of their experience and expertise was sought in assisting with the development of proposals for the alternative arrangements required.

- 5.10.5 A communications strategy managed by the City of Edinburgh Council, using a range of media, was put in place to provide schools, parents and children with essential information in relation to the closures and alternative arrangements. This was an area throughout the period of the decant that the Council constantly sought to focus on, recognising the importance of information to concerned parents and teachers. In the earlier stages of the process the Council were somewhat frustrated in these good intentions by the on-going lack of clear information from ESP as to a programme for the completion of the remedial works and the reopening of the schools that could be relied upon.
- 5.10.6 The Inquiry was advised that a key part of the relocation strategy adopted by the City of Edinburgh Council was to give priority to those pupils at the High Schools, particularly pupils in S4 – S6 who would be sitting examinations. This situation was helped by the fact that in the case of Firrhill, Royal High and Drummond High Schools, significant parts of the original schools had been retained under the original PPP1 development and would be safe to continue occupying if appropriate arrangements were put in place to prevent access by pupils to the parts built under the PPP1 contract.
- 5.10.7 Priority was also attached to the relocation of pupils from Rowanfield and Braidburn Special Schools for which some of the logistics were more complicated than for the other schools due to the special requirements of some of the pupils.
- 5.10.8 The emergency arrangements succeeded in having alternative accommodation in place for most pupils by **Thursday 14<sup>th</sup> April 2016**, with all affected pupils having access to alternative arrangements by **Wednesday 20<sup>th</sup> April 2016**. Monday 18<sup>th</sup> April had been a public holiday.
- 5.10.9 To achieve this required the daily use of over 70 coaches for pupils and the facilities of 61 alternative schools (including nurseries and Early Years Centres).
- 5.10.10 In order to accommodate the number of additional places required at the alternative school locations, the Council had to hire and relocate 24 temporary classrooms many of which had to be transported significant distances from around the country. School furniture and equipment also had to be transferred from the existing schools to the new locations.
- 5.10.11 Over the following days and weeks, seeking to be responsive to concerns raised by groups of parents or teachers, the City of Edinburgh Council implemented a number of adjustments to the locations of some groups of pupils. As an example of such relocations, following complaints from some parents about the perceived quality of the temporary accommodation their children had been allocated at Wester Hailes Education Centre, the City of Edinburgh Council

arranged to relocate 90 Oxfords Primary School pupils to Niddrie Mill Primary School.

5.10.12 The following table demonstrates the complexity of the logistics required in terms of the number of receiving schools that were required.

### PPP1 Secondary Schools

Name of PPP1 Secondary School	Classes	Receiving Establishment	Pupil Nos.	Expected re-opening date	Walking /Bus	Time lost due to travel mins/day
Craigmount HS	S1	Forrester/ St Augustine's HS	174	17/08/2016	Walking /Bus	40
Craigmount HS	S2	James Gillespie's HS Darroch Annexe	176	17/08/2016	Bus	90
Craigmount HS	S3	Forrester/ St Augustine's HS	220	17/08/2016	Walking /Bus	40
Craigmount HS	S4-6	Tynecastle HS	509	17/08/2016	Public Trans.	N/A
Gracemount HS	S1-3	WHEC	351	17/08/2016	Bus	60
Gracemount HS	S4-6	Liberton HS	235	17/08/2016	Walking	N/A
Firrhill HS	S1-6	N/A	1123	06/06/2016		N/A
The Royal High	S1-6	N/A	1231	20/06/2016		N/A
Drummond HS	S1-6	N/A	460	20/06/2016		N/A

## PPP1 Primary Schools

<b>Name of PPP1 Primary School</b>	<b>Classes</b>	<b>Receiving Establishment</b>	<b>Pupil Nos.</b>	<b>Expected re-opening date</b>	<b>Walking /Bus</b>	<b>Time lost due to travel in mins/day</b>
<b><i>Broomhouse Nursery</i></b>		Canal View Primary	58	w/c 27 June	Bus	20
<b>Broomhouse Primary</b>	P2/3,P3/4	Carricknowe Primary	79	w/c 27 June	Walking	40
<b>Broomhouse Primary</b>	P1-2	Clermiston Primary	68	w/c 27 June	Bus	40
<b>Broomhouse Primary</b>	P5-7	Gylemuir Primary	68	w/c 27 June	Walking	40
<b>Castleview Primary</b>	P1-7	Castlebrae High	318	17/08/2016	Walking	N/A
<b><i>Craigour Park Nursery</i></b>		Craigmillar EYC	33	17/08/2016	Bus	60
<b><i>Craigour Park Nursery</i></b>		Greengables Nursery	60	17/08/2016	Bus	60
<b>Craigour Park Primary</b>	P1-2, P5A	Brunstane Primary	171	17/08/2016	Bus	120
<b>Craigour Park Primary</b>	P3-4	Craigour Park Primary	151	17/08/2016	As Normal	N/A
<b>Craigour Park Primary</b>	P5-6	Gilmerton Primary	90	17/08/2016	Walking	N/A
<b>Craigour Park Primary</b>	P7	Liberton Primary	44	17/08/2016	Bus	100
<b>Craigroyston Primary</b>	P1-7	Craigroyston CHS	233	17/08/2016	Walking	N/A
<b><i>Craigroyston Nursery</i></b>		Cramond Primary School	83	17/08/2016	Bus	60
<b><i>Craigroyston Nursery</i></b>		Queensferry Primary		17/08/2016	Bus	85
<b><i>Forthview Nursery</i></b>		Clovenstone Nursery	32	17/08/2016	Bus	40
<b><i>Forthview Nursery</i></b>		WHEC	60	17/08/2016	Bus	40
<b>Forthview Primary</b>	P2	Canal View Primary	54	17/08/2016	Bus	70
<b>Forthview Primary</b>	P5	Fox Covert Primary	91	17/08/2016	Bus	60
<b>Forthview Primary</b>	P5/6	Fox Covert RC Primary	25	17/08/2016	Bus	60
<b>Forthview Primary</b>	P1	Granton Primary	49	17/08/2016	Bus	60



Name of PPP1 Primary School	Classes	Receiving Establishment	Pupil Nos.	Expected re-opening date	Walking /Bus	Time lost due to travel in mins/day
<b>Forthview Primary</b>	P6-7	Leith Primary	58	17/08/2016	Bus	60
<b>Forthview Primary</b>	P3-4	Leith Walk Primary	115	17/08/2016	Bus	60
<b>Oxgangs Nursery</b>		Hailesland EYC	8	24/05/2016	Bus	40
<b>Oxgangs Nursery</b>		Moffat EYC	79	24/05/2016	Bus	40
<b>Oxgangs Primary</b>	P4-5	Bonaly Primary	58	24/05/2016	Bus	40
<b>Oxgangs Primary</b>	P5, P5/6	Clovenstone Primary	54	24/05/2016	Bus	60
<b>Oxgangs Primary</b>	P3, P3/4	Colinton Primary	49	24/05/2016	Walking	N/A
<b>Oxgangs Primary</b>	P1	Pentland Community Centre	60	24/05/2016	Bus	60
<b>Oxgangs Primary</b>	P2-3	Pentland Primary	84	24/05/2016	Bus	60
<b>Oxgangs Primary</b>	P4	St Marks Primary	27	24/05/2016	Walking	N/A
<b>Oxgangs Primary</b>	P6-7	Niddrie Mill Primary	84	24/05/2016	Bus	80
<b>Pirniehall Nursery</b>		Brunstane Primary	40	17/08/2016	Bus	50
<b>Pirniehall Primary</b>	P4, P5/6, P6	Davidson Mains Primary	71	17/08/2016	Bus	30
<b>Pirniehall Primary</b>	P2, P7	Flora Stevenson Primary	56	17/08/2016	Bus	30
<b>Pirniehall Primary</b>	P2, P4, P5	Wardie Primary	67	17/08/2016	Bus	30
<b>St David's Nursery</b>		Lochrin EYC	14	17/08/2016	Bus	60
<b>St David's Nursery</b>		Viewforth EYC	40	17/08/2016	Bus	60
<b>St David's Primary</b>	P3, P7	Hermitage Park Primary	59	17/08/2016	Bus	100
<b>St David's Primary</b>	P5-6	St Davids Primary	76	17/08/2016	As Normal	N/A
<b>St David's Primary</b>	P3/4, P4	St Francis Primary	58	17/08/2016	Bus	100

Name of PPP1 Primary School	Classes	Receiving Establishment	Pupil Nos.	Expected re-opening date	Walking /Bus	Time lost due to travel in mins/day
St David's Primary	P2	St Mary's Edinburgh Primary	27	17/08/2016	Bus	100
St David's Primary	P1	St Ninians Primary	50	17/08/2016	Bus	100
<i>St Joseph's Nursery</i>		Dalry Primary	62	w/c 27 June	Bus	30
<i>St Joseph's Nursery</i>		Sighthill EYC	14	w/c 27 June	Bus	30
St Joseph's Primary	P1, P2, P3/2	Blackhall Primary	101	w/c 27 June	Bus	40
St Joseph's Primary	P3, P4/3	Holycross Primary	51	w/c 27 June	Bus	60
St Joseph's Primary	P4-5	St Johns Primary	62	w/c 27 June	Bus	60
St Joseph's Primary	P6-7	Trinity Primary	78	w/c 27 June	Bus	60
<i>St Peter's Nursery</i>		St Leonards Nursery	60	24/05/2016	Bus	60
St Peter's Primary	P7	Broughton Primary	54	24/05/2016	Bus	60
St Peter's Primary	P5-6	Dalry Primary	55	24/05/2016	Bus	60
St Peter's Primary	P2	James Gillespies Primary	58	24/05/2016	Bus	60
St Peter's Primary	P6	Preston St Primary	29	24/05/2016	Bus	60
St Peter's Primary	P1	Deanbank Annexe	59	24/05/2016	Walking	N/A
St Peter's Primary	P3	Gracemount Primary	59	24/05/2016	Bus	60
St Peter's Primary	P5	South Morningside Primary	28	24/05/2016	Walking	N/A
St Peter's Primary	P4	Tollcross Primary	61	24/05/2016	Bus	90

5.10.13 An assessment of the City of Edinburgh Council's overall response in managing the situation in relation to its impact on schools, pupils and their parents will be provided in Section 12 of this Report.

**5.11 COUNCIL MANAGEMENT OF THE CONTRACTUAL ISSUES**

- 5.11.1 The City of Edinburgh Council wrote to ESP on the 14<sup>th</sup> April 2016 advising ESP that it intended to exercise its right under the provisions of the PPP1 Project Agreement to make deductions from the unitary charge as a result of the service failures at all schools from the 8<sup>th</sup> April 2016, when ESP withdrew its previous confirmation that the schools were safe for occupancy.
- 5.11.2 The Council also confirmed that it reserved its right to apply contractual deductions due to the service failures resulting from defects that may have been present and/or materialised in respect of the period prior to 8<sup>th</sup> April 2016.
- 5.11.3 The Council subsequently commenced making deductions, in accordance with their assessment of the contractual provision for deductions, from their payment of the unitary charge to ESP. They continued to make such calculated deductions over the following months to reflect the periods of unavailability for each school until satisfactory remedial works had been completed and each school was available for re-occupation.
- 5.11.4 The Council also advised ESP in a letter sent on 27<sup>th</sup> April 2016 that, as a result of the closure of the schools, it had incurred significant additional expenditure under a range of headings including accommodation, transport, meals, deployment of staff and procurement of external advice and would require reimbursement of all additional costs so incurred.

**5.12 INABILITY TO ACCESS ORIGINAL STRUCTURAL DESIGN DRAWINGS AND OTHER RELEVANT INFORMATION**

- 5.12.1 On the 18<sup>th</sup> April 2016, it was reported at a meeting of the CIMT that the ability of the engineers to draw conclusions in relation to the Phase 1 schools, particularly in relation to the need or otherwise for wall head restraints, was being hampered by the unavailability of as-built or as-designed drawings. Without access to the appropriate structural design drawings, it would be necessary for the teams of structural engineers to undertake calculations from first principles as to whether individual brick panels had sufficient structural strength to resist the required wind-loadings.
- 5.12.2 If these calculations demonstrated the need for head restraints, bed joint reinforcement or windposts and there was insufficient evidence from their on-site surveys of the presence of such restraints, then the only option would be to assume they were not present and design and fit the required elements as part of the programme of remedial works.

- 5.12.3 This necessitated significant design work by the structural engineers employed by ESP and a commensurate delay to the implementation of the remedial works on the Phase 1 buildings.
- 5.12.4 In this regard, on 14<sup>th</sup> April 2016, the City of Edinburgh Council had contacted, by phone and email, WSP, the consultancy firm that had been responsible for the original structural design of the 17 PPP1 projects, to seek copies of the original design and construction drawings for the Phase 1 schools. The requests from the City of Edinburgh Council pointed out that access to these documents could greatly assist ESP's team by reducing the amount of work and time that would otherwise be necessary to finalise the design and specification of remedial work required on the Phase 1 schools.
- 5.12.5 As explained above, the liability period on the Phase 1 schools under the original design and build contract between ESP and AMJV had expired.
- 5.12.6 In a reply by email on 18<sup>th</sup> April 2016, WSP advised the City of Edinburgh Council that the appropriate route for seeking these drawings was through their client for the schools, AMJV. The email also stated that, to date, AMJV had not contacted WSP on the matter.
- 5.12.7 While this statement may have been correct, the evidence provided to the Inquiry showed that, in respect of the four Phase 2 schools, Galliford Try had received copies of at least some of the structural drawings from WSP in the first week of April 2016. According to written evidence provided by Galliford Try, these drawing had only been provided by WSP following Galliford Try raising Court proceedings to compel them to release these drawings which WSP had been unwilling to do on a voluntary basis.
- 5.12.8 Over the next weeks, there followed a series of email communications all of which failed to result in the information requested being provided by WSP. ESP on several occasions sought the release of the drawings for the Phase 1 schools from WSP, whose approach was to restate that they could only release them with the approval of their original clients AMJV, or the component parts of AMJV, i.e. Amey and Galliford Try. From the email evidence provided to the Inquiry, despite both these latter parties having given their agreement to WSP to release the information to ESP, none of the requested information was released to ESP, to their professional advisors or to the City of Edinburgh Council.
- 5.12.9 While some of the Phase 2 information had clearly been retained by WSP in their archive, their responses ultimately, as seen below in the emails below, suggest that the drawings for the Phase 1 schools had not been retained by them, however their email correspondence was in this regard initially confusing to the City of Edinburgh Council.

5.12.10 The Council's Project Manager on 2<sup>nd</sup> June 2016, in an attempt to help a frustrated ESP to get access to drawings that would have been very helpful, in an email to WSP specifically requested design information on one of the Phase 1 schools, Drummond High School.

5.12.11 WSP replied as follows:

*"We do not want to appear unhelpful but as you will understand from your conversation with -----, we are constrained by our contractual relationship with Amey/Miller JV and are not in a position to provide information directly to a third party until we are instructed to do so. May we respectfully request that you raise any further requests for information directly with Amey/Miller JV.*

*We can however, advise you that we have relayed your request to Amey/Miller and have provided them with such information as we are able in relation to Drummond High School."*

5.12.12 On 6<sup>th</sup> June 2016, an email from WSP, replied to a follow up question by email from the City of Edinburgh Council as to what information WSP had on Drummond High School, with the following response:

*"We would confirm that we have advised Amey/Galliford Try that following a review of the information we retain in our archive we do not have any information relating to Drummond High School."*

### 5.13 RESULTS OF THE SURVEYS OF CAVITY WALLS

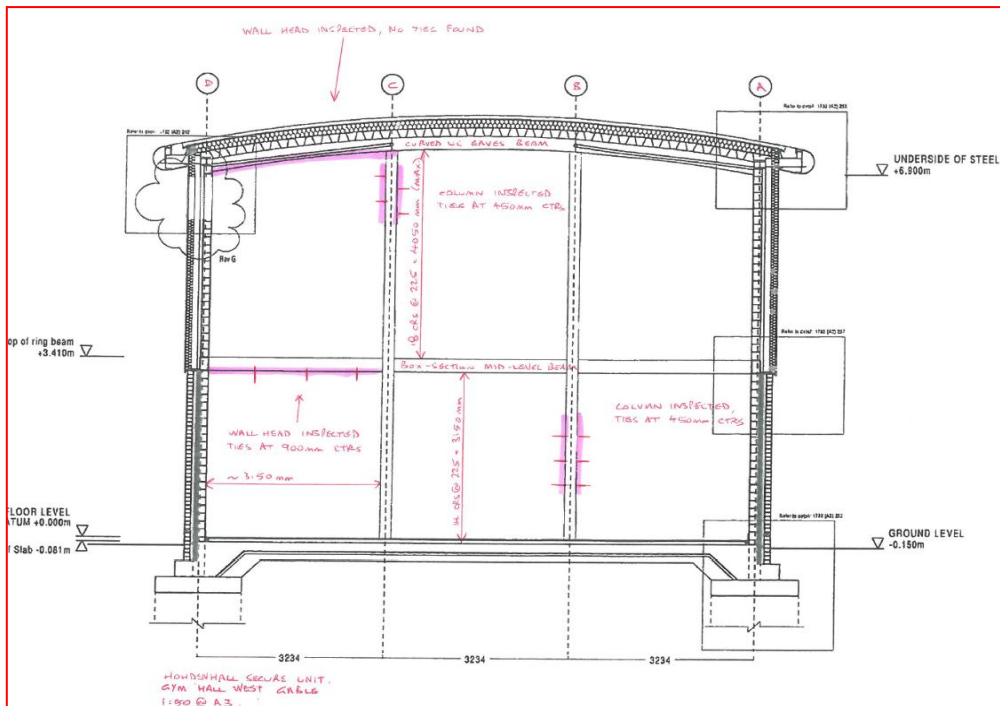
5.13.1 In the period following the Report on the 8<sup>th</sup> April 2016 of the missing head restraints, a series of comprehensive exercises was undertaken by a combination of the structural engineering firms appointed by ESP which sought to establish the position in relation to the actual detailed construction of the cavity walls. The structural engineering firms involved were Will Rudd Davidson, supported by Harley Haddow, and Goodson Associates. Harley Haddow, also structural engineers, had been appointed by WRD as their sub-contractor to assist them in the surveys of the Phase 1 schools.

5.13.2 For clarity, while Galliford Try had appointed Goodson Associates in March 2016 to act directly for them in relation to the design and inspection of the remedial works to the four Phase 2 schools, ESP subsequently also appointed them, under a completely separate appointment, to assist WRD in undertaking some of the surveys, reports and remedial design work for the Phase 1 schools.

5.13.3 As previously stated in the Report, despite certain of the Phase 1 schools having been built by Miller Construction as construction sub-contractor (see the table at paragraph 4.5.1), Galliford Try did not become involved in any aspect of their

remediation due to the contractual 12-year liability period under the original contract with AMJV having expired prior to the date of collapse of the wall and the discovery of the defective construction on the Phase 1 schools.

- 5.13.4 On the Phase 1 schools Amey were asked to provide or arrange for the provision of the necessary building work support to open sections of the external walls so that the consultant engineers could undertake the level of intrusive investigations required.
- 5.13.5 Extensive structural surveys, resulting in comprehensive survey reports, were ultimately undertaken for all the Phase 1 schools. As much information as possible had already been extracted from the very limited construction drawings that had been located from various archives. The walls of the schools were then checked to establish to what degree they had been built in accordance with these drawings.
- 5.13.6 Based on the analysis of these findings, calculations were undertaken, firstly to establish whether the original design solutions would have provided the required strength of panel, and secondly to establish if what had been found to be built or could reasonably be assumed to have been built would meet the structural requirements for the panels.
- 5.13.7 The structural engineers were then required, in the case of any panels that were found to be inadequate, to produce remedial design proposals based on fresh calculations from first principles.
- 5.13.8 The results of these surveys and subsequent calculations identified, in addition to the lack of embedment of wall ties and the absence or inadequate spacing of head restraints, a wider range of inadequate implementation of the structural design in relation to the lack of inclusion of necessary or specified bed joint reinforcement or secondary steelwork in the cavity walls.
- 5.13.9 It was found that in many of the schools the bed joint reinforcement that had been calculated as necessary and specified was either totally missing or not installed at the required spacing.
- 5.13.10 In certain areas, it was found that panels of brickwork, even if head restraints had been fitted, would still have required the installation of windposts to provide the required resistance to wind-loading. In other areas, it was found that necessary lateral and corner restraints to the masonry panels were not present.
- 5.13.11 Below are some examples from the surveys of some of the Phase 1 schools.



**Image 13:** Marked up survey drawing of the gym at Howdenhall Centre. The note to the top on the left-hand side of this drawing says: 'WALL HEAD INSPECTED, NO TIES FOUND'.



**Image 14:** Survey photographs demonstrating failure to find head restraints at Goodtrees Neighbourhood Centre.



Room 059 – South Side (a)



Room 059 – South Side (b)

**Images 15 and 16:** Examples at Craigour School where remedial head restraints have been fitted to connect the inner leaf of the cavity wall to the steel beam.



- 5.13.12 Whilst varying in degree from school to school, the results of the surveys showed consistent failures across the schools in relation to the quality of construction of the walls or omissions of specified reinforcement or secondary steelwork in the construction of the walls.
- 5.13.13 In evidence, a Director of WRD, who had acted as structural engineering advisors for ESP stated;
- "Bed joint reinforcement was specified in these constructions but again it was inconsistently applied. We instructed Amey to drill and find the reinforcement. Sometimes they did but quite often they did not. The same was true of windposts. They were found in some locations but not in others. On some occasions, they were found but not in the locations one would expect. As we came across these types of problems our confidence in the integrity of the construction began to drop further and further."*
- 5.13.14 The approach adopted by Galliford Try in relation to the remedial works for the Phase 2 schools was significantly at variance with that adopted by ESP and Amey.
- 5.13.15 Although the City of Edinburgh Council had expressed an urgency to have the remedial work completed as quickly as possible, Amey had decided that they would first seek to establish as much information as possible about the structural design of the schools, what had actually been built at the different schools and what was required to rectify defective panels on a largely panel by panel basis.
- 5.13.16 The approach taken by Galliford Try was to seek to get the remedial works completed as soon as possible to allow the schools to be reopened. They had already determined that they would install remedial wall ties to 100% of the external walls. Having established definitively in early April the absence of head restraints, following some limited further intrusive investigations, Galliford Try decided to proceed immediately with the installation of head restraints in the Stage 2 schools in accordance with the remedial design solutions prepared by Goodson Associates.
- 5.13.17 As a result, the Phase 2 schools were not subjected to the same level of detailed surveys prior to commencement of construction as those undertaken in relation to the Phase 1 schools and the Inquiry did not receive the same level of detailed information as to the omission or otherwise of specified or required head restraints, bed joint reinforcement or windposts.
- 5.13.18 An analysis, undertaken by the Inquiry of the results of the information contained in the surveys and from subsequent records taken during the construction process, is presented in the following table. This summary table has

been prepared using data contained in the investigation and remedial works reports prepared by WRD, Goodson Associates, Harley Haddow, Amey and Galliford Try.

- 5.13.19 The table seeks to illustrate the extent of investigations undertaken and extent of remedial works carried out. It should be noted that in some cases the extent of investigations were limited but that those limited investigations consistently recorded a sizeable percentage of non-compliance or defects from the small sample rate.
- 5.13.20 It can clearly be seen from the tables that across all the PPP1 schools, in both Phase 1 and Phase 2, there were significant failures on the part of those responsible for their construction. Where information was not contained in the reports made available to the Inquiry or was not made available to the Inquiry, this has been noted in the tables.

Name of School and (Contractor)	Number of Masonry Panels tested	Percentage of Cavities checked that were <u>outside</u> Permitted Tolerances	Percentage of Ties exposed that had Inadequate Embedment	Percentage of Wall Panels that had Remedial Wall Ties installed	Percentage of Panels investigated for Head Restraints which had no Head Restraints found	Percentage of Wall Panels that had Remedial Wall Head Restraints installed	Percentage of Panels investigated that had missing Bed Joint Reinforcement
<b>PHASE 1 SCHOOLS</b>							
Broomhouse/ St. Joseph's PS (Lilley Construction)	38%	11%	33%	34% <sup>1</sup>	Information not available	13%	21%
Pirniehall/ St. David's PS (Lilley Construction)	45%	18%	50%	35% <sup>2</sup>	39%	39%	68%
Craigour Park PS (Ogilvie Construction)	30%	11%	67%	59% <sup>3</sup>	Information not available	100%	83%
Craigroyston PS (Tulloch Construct)	43%	4%	25%	65%	46 panels were investigated; survey results insufficient to derive percentage	100%	None shown on warrant drawings
Castleview PS (Miller Construction)	31%	64%	50%	100%	Information not available	100%	67%
Forthview PS (Miller Construction)	57%	25%	25%	57%	6 panels were investigated; survey results insufficient to derive percentage	96%	29%
Goodtrees NC (Miller Construction)	35%	0%	67%	25% <sup>4</sup>	7 panels were investigated Survey results insufficient to derive percentage	4%	100%

<sup>1</sup> Remedial wall ties installed to gable wall panels and critical corner panels. Wind posts and head restraints added.

<sup>2</sup> Remedial wall ties installed to gable wall panels and critical corner panels. Wind posts and head restraints added.

<sup>3</sup> Remedial wall ties installed to gable wall panels and critical corner panels; some panels on the main elevations also treated. Additional wind posts and head restraints added.

<sup>4</sup> Remedial wall ties installed to gable wall panels and critical corner panels and some other wall panels. Additional wind posts and head restraints added.

Name of School and (Contractor)	Number of Masonry Panels tested	Percentage of Cavities checked that were <u>outside</u> Permitted Tolerances	Percentage of Ties exposed that had Inadequate Embedment	Percentage of Wall Panels that had Remedial Wall Ties installed	Percentage of Panels investigated for Head Restraints which had no Head Restraints found	Percentage of Wall Panels that had Remedial Wall Head Restraints installed	Percentage of Panels investigated that had missing Bed Joint Reinforcement
Howdenhall Centre (Miller Construction)	22%	5%	40%	78%	59% Plans for main building show 100% missing at attic level in gym hall. Elsewhere Head Restraints inconsistent.	34% <sup>5</sup>	Information not available
Rowanfield SS (Miller Construction)	42%	25%	67%	42% <sup>6</sup>	50%	74%	50%
Craigmount HS (Miller Construction)	40%	14%	60%	45% <sup>7</sup>	16%	8% <sup>8</sup>	100%
Drummond HS (Dickie Construction) (Completed By Miller)	32%	11%	63%	86%	100%	63% <sup>9</sup>	57%
Gracemount High School (Miller Construction)	34%	40%	75%	68%	Information not available	19%	100%
The Royal HS (Robertson Construction) (Completed By Miller)	22%	14%	33%	40%	67%	59% <sup>10</sup>	Information not available

<sup>5</sup> Where no Head Restraints were found, WRD undertook panel assessments for each panel to determine where new head restraints should be added. WRD note *“The wall panel designs are based on the edge support conditions and panel geometry required to yield a design ‘PASS’.* Where this required the provision of edge restraint that was found not to be present by the exploratory investigations, the requirement for additional edge restraint ties is shown on the remedial works drawings.”

<sup>6</sup> Remedial wall ties installed to gable wall panels and critical corner panels. Wind posts and head restraints added.

<sup>7</sup> Remedial wall ties installed to gable wall panels and critical corner panels. Wind posts and head restraints added.

<sup>8</sup> A detailed panel assessment was undertaken by Goodson Associates for each masonry panel where head restraints were found to be missing. The design capacity to the panels was reinstated by the installation of new head restraints or the addition of wind posts to sub-divide the panel, or both.

<sup>9</sup> A detailed panel assessment was undertaken by Goodson Associates for each masonry panel where head restraints were found to be missing. The design capacity to the panels was reinstated by the installation of new head restraints or the addition of wind posts to sub-divide the panel, or both.

<sup>10</sup> A detailed panel assessment was undertaken by Goodson Associates for each masonry panel where head restraints were found to be missing. The design capacity to the panels was reinstated by the installation of new head restraints or the addition of wind posts to sub-divide the panel, or both.

Name of School and (Contractor)	Number of Masonry Panels tested	Percentage of Cavities checked that were <u>outside</u> Permitted Tolerances	Percentage of Ties exposed that had Inadequate Embedment	Percentage of Wall Panels that had Remedial Wall Ties installed	Percentage of Panels investigated for Head Restraints which had no Head Restraints found	Percentage of Wall Panels that had Remedial Wall Head Restraints installed	Percentage of Panels investigated that had missing Bed Joint Reinforcement
<b>PHASE 2 SCHOOLS</b>							
Oxgangs PS (Miller Construction)	13%	92%	92%	100%	Information not available	55%	Information not available
Braidburn School (Miller Construction)	35%	50%	0% 4 locations were opened. All ties were found to have adequate embedment	100%	Information not available	10%	Information not available
St Peters (Miller Construction)	13%	100%	29%	100%	Information not available	50%	Information not available
Firrhill HS (Miller Construction)	11%	23%	75%	100%	Information not available	75%	Information not available

5.13.21 The very significant extent of defective work and omission of components across the PPP schools is very evident from the above table as is the consistency of the presence of defects across the 17 projects.

- The percentage of checks on the width of cavities that were outside permitted tolerances ranged from 0% in Goodtrees Neighbourhood Centre up to 100 % in St. Peter's Primary School, averaging 29% across all 17 projects.
- The percentage of wall ties exposed that had inadequate embedment (less than 50mm) ranged from 0% to 92%, averaging 47% across the 17 projects.
- The percentage of panels that required to have remedial wall ties installed varied from 34% to 100% across all 17 projects.
- The percentage of all the wall panels in all the schools that had remedial wall head restraints installed ranged from 8% to 100% with an average of 52% across the 17 schools.
- The percentage of wall panels inspected that were found to have specified bed joint reinforcement missing ranged from 21% to 100%, averaging 67%.

5.13.22 It should be noted that the full detail as to the level of missing head restraints and bed joint reinforcement was not available to the Inquiry, particularly in relation to the Phase 2 schools repaired by Galliford Try.

5.13.23 The nature of the remedial work undertaken was fourfold:

- The retrofitting of wall ties to all panels, where it was determined that embedment was inadequate, by drilling through the outer leaf of the cavity wall into the required depth in the inner leaf and installing proprietary wall ties designed for this purpose.
- The installation of bolted folded steel plate head restraints connecting the steel beams of the structural frame to the blockwork inner leaf at specified centres on those panels where they were found to be necessary and the occasional incorporation of lateral and corner ties where they were also found to be missing.
- The installation of stainless steel windposts on those panels where required bed joint reinforcement had been omitted (as this cannot be retrofitted) or where the design requirements demonstrated that windposts were necessary to reduce the span of larger panels. These were, other than in the case of one school where they were fitted

externally, fitted to the inside face of the cavity wall spanning vertically between steel beams and floor slabs or spanning horizontally between steel columns. They serve to tie the blockwork inner leaf to the structural frame.

- As the area of the collapsed panels in the gable wall at Oxfangs School had to be completely rebuilt, it was possible in that one location to install the required bed joint reinforcement as the wall was built.

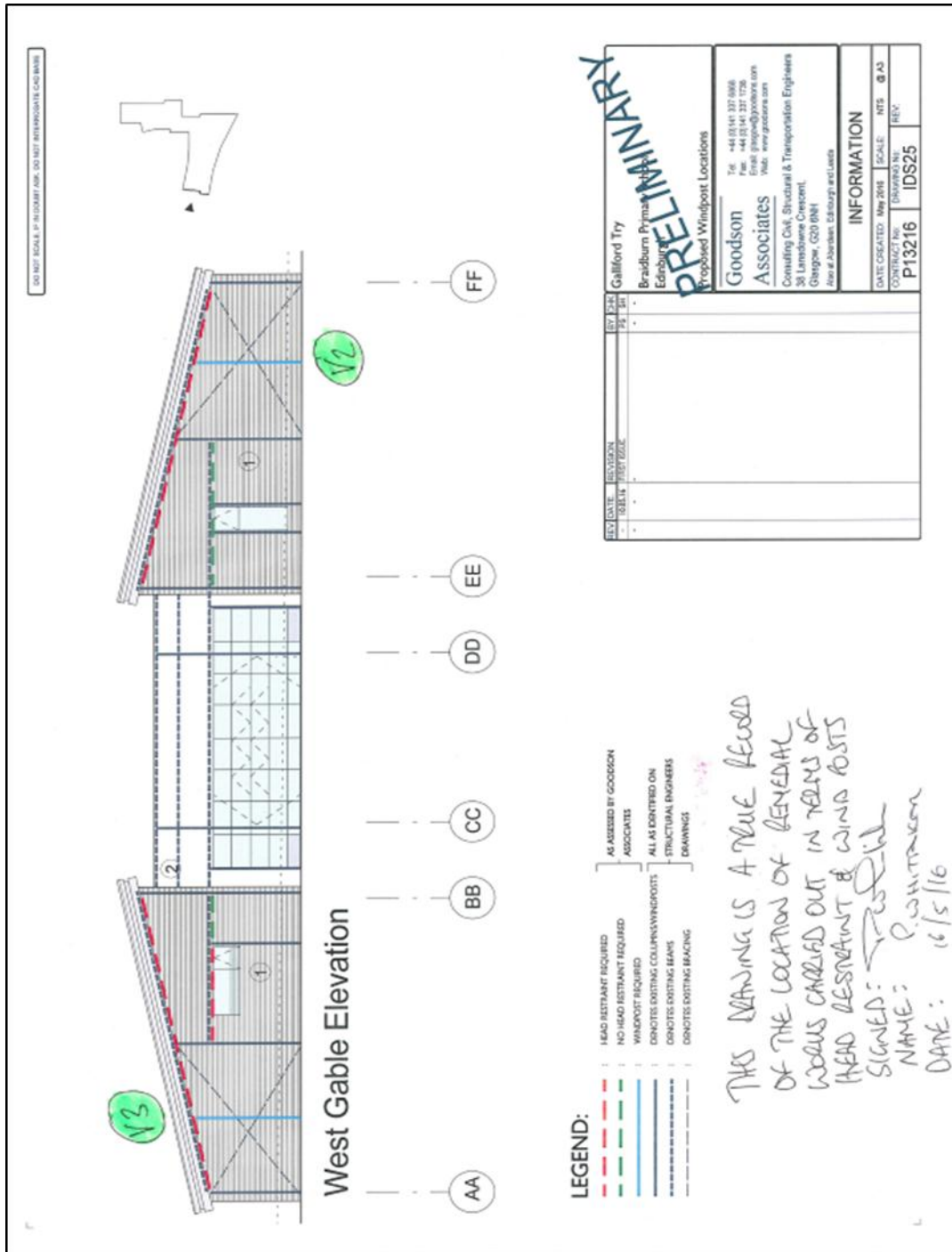
5.13.24 The size of the problem of inadequate construction is demonstrated when one considers that approximately 440 heavy steel wind posts were required to be retro-installed across the 17 PPP1 schools to provide the required structural integrity to the wall panels.

5.13.25 The drawing below (Image 17) is a typical drawing of those produced to instruct the contractors undertaking the remedial works as to the remedial installations required on the various elevations of the schools in addition of course to the retrofitting of the wall ties.

5.13.26 The elevation shown is of the West facing gable of Braidburn School.

5.13.27 The dotted red lines on the drawing indicates where wall head restraints were required to be fitted, in this case along both sloping gable end steel beams and over one window.

5.13.28 The lighter blue upright lines on the elevation indicate the locations for additional windposts. The photograph below the drawing (Image 18) shows a typical example of retro-installed windposts and wall head restraints (to both intermediate and roof level beams) in Oxfangs School.



**Image 17:** A typical drawing of those produced to instruct the contractors undertaking the remedial works as to the remedial installations required on the various elevations of the schools in addition of course to the retrofitting of the wall ties.





**Image 18:** Vertical windpost spanning from intermediate horizontal beam to roof beam and wall head restraints fitted to both beams as installed prior to boxing in and painting at Oxfangs School.

#### 5.14 EXTENT OF WORKS REQUIRED BEFORE SCHOOLS COULD BE SAFELY REOPENED

- 5.14.1 Following the discovery of the lack of adequate head restraints, there had been significant discussion and some difference of opinion between ESP and the City of Edinburgh Council as to whether some of the schools could be re-occupied **prior to completion of all the remediation work** that had been identified as necessary by the intrusive surveys, which were still ongoing.
- 5.14.2 WRD, the structural engineers advising ESP, had analysed the wide range of masonry panels that made up the perimeter walls of the PPP1 school buildings and designated them using a **Red, Amber and Green** classification.
- 5.14.3 The **red** classification was allocated to areas of the perimeter of the buildings that would represent high risk and which would require full remediation prior to occupancy of the school buildings.
- 5.14.4 The **amber** classification was allocated to areas of the perimeter of the buildings that would require remediation but which, combined with the introduction of agreed mitigation measures and protocols, it was proposed could allow for the safe use of the buildings, either whilst the remediation work was being carried out, or until a natural period of closure of the schools such as the summer break during which period the work could be implemented.
- 5.14.5 The **green** classification was allocated to those areas which either had been assessed as not requiring remediation or for which the remedial work had already been completed.
- 5.14.6 The mitigation measures and protocols proposed in relation to the areas classified as **amber** were as follows:
- the erection of secure protective fencing to create exclusion zones in the school grounds around the areas of wall classified as amber into which only approved personnel would be allowed to enter; and
  - the implementation of a strict management protocol for ensuring the safety of children should there be any further periods of high wind prior to remediation of the areas designated amber. In such situations, based on regular monitoring of meteorological forecasts, weather warning notifications would be issued following which either the schools would be closed for the periods of high wind or pupils already inside schools would be restricted from going outside the buildings.
- 5.14.7 The Inquiry was advised that the rationale behind this proposal, that the schools could be occupied before completion of the remedial works to the areas of wall designated amber, included consideration of the fact that there was a reduced likelihood of the occurrence of severe storms similar to Storm Gertrude during

the late Spring and Summer months. ESP felt that this should significantly reduce the risk of having to implement either of the two courses of action set out in the proposed severe weather protocols. Further it was intended by ESP that all remedial work would be complete before the end of August 2016 and thus before the subsequent increased potential for severe storms in the following autumn and winter months.

### **26<sup>th</sup> April 2016**

- 5.14.8 At a meeting of the CIMT on the morning of 26<sup>th</sup> April, the City of Edinburgh Council expressed some concern as to the visibility of ESP, as all dealings on the issues arising from the collapse at Oxfords had been carried out with representatives from IML, the consultancy acting on ESP's behalf. Questions were raised as to the adequacy of the resources, particularly from a technical perspective, that were being applied by ESP to the resolution of the problems. The meeting notes referred to a sense of frustration on the part of the Council that the pace of action was not adequate, particularly in relation to receiving firm programmes for the remediation works and potential reopening dates of the closed schools.
- 5.14.9 Amey Communities' expressed position in relation to the Phase 1 schools was that they were awaiting the outcome of the full structural reports and the final designs for the required remedial work before they would be able to produce a programme for this work. These designs were being prepared by WRD for ESP. ESP had accordingly advised representatives of the City of Edinburgh Council that they were not yet in a position to provide a programme for the Phase 1 schools remediation.
- 5.14.10 In relation to the Phase 2 schools it was reported that Galliford Try had moved construction teams on site and proceeded with a programme of remedial work aimed at addressing the identified absence of head restraints, bed joint reinforcement and secondary steelwork at the Phase 2 schools.
- 5.14.11 The CPM and Scott Bennett Associates had previously and appropriately advised the CIMT that the wall tie remediation, referred to as Stage 1 work, had required a relatively simple fix, the retrofitting of new remedial wall ties to those walls where the surveys had identified them as necessary. This was a generic solution not requiring structural calculations. The key aspects in carrying out the retrofitting of wall ties was the quality assurance of the installation of the remedial wall ties, including pull-tests, and confirming that this work had been undertaken to all the areas identified as requiring it.
- 5.14.12 However, the issue in relation to the remedial works required to deal with inadequate provision of wall restraints and bed joint reinforcement, referred to as Stage 2 work, was more complex. There was a continued absence of the

original drawings or calculations that had been produced by WSP, the structural engineers who had been responsible for the structural design of the PPP1 projects. This was making it very difficult for WRD and Goodson Associates to understand the original design intent and the reliance of that design solution on the various possible combinations of different brickwork accessories and elements of secondary steelwork in individual cavity wall panels.

- 5.14.13 Also, whilst the surveys undertaken had been sufficient to identify the extent of the problems, it was practically impossible, without taking down a significant proportion of the external walls of the schools, to be definitive as to what structural components had or had not been built into the walls at each panel location.
- 5.14.14 In order to provide the necessary reassurance of the structural integrity of the remedial works, the design of the Stage 2 work for the Phase 1 schools, being undertaken by WRD, and the design of the Stage 2 work for the Phase 2 schools, being undertaken by Goodson Associates, would in both cases be required to be based on a combination of calculations from first principles and any available survey information that was definitive.
- 5.14.15 Scott Bennett Associates, acting in the role of peer reviewer on the part of the City of Edinburgh Council had sought to have sight of this design work so that it could be independently verified by them as presenting satisfactory solutions prior to its implementation on site.
- 5.14.16 However, the Inquiry were advised by representatives of the City of Edinburgh Council and ESP that, at what was now a relatively advanced stage of the remedial works that were being undertaken to the Phase 2 schools, no information had been provided to either organisation or to Scott Bennett Associates by Galliford Try as to the nature and extent of the remedial work that they had undertaken or intended to undertake on the Phase 2 schools.
- 5.14.17 Galliford Try, in evidence on this point, stated that they had provided all information that was requested of them by ESP and that they did not have a contractual route to provide this information directly to the City of Edinburgh Council.
- 5.14.18 Galliford Try would still be required to demonstrate to Scott Bennett that the processes they had implemented and the work they had carried out was to the satisfaction of the Council in terms of both design and implementation. To do so would require the submission of both appropriate documentation by the contractors and their advisers, including structural calculations, and post-completion inspections to be undertaken jointly by Scott Bennett Associates and the Clerk of Works subsequently appointed by the City of Edinburgh Council.

- 5.14.19 The Scottish Futures Trust ("**SFT**") had been in contact with the City of Edinburgh Council and advised them that, should the Council require it, they were prepared to provide assistance with any legal issues that may arise relating to these issues.
- 5.14.20 The City of Edinburgh Council felt that it was important to express their concerns about the construction failures and the remedying of them directly with the Directors of ESP and the large lending organisations that had provided the majority of the funding for the PPP1 projects.
- 5.14.21 A meeting was held on the afternoon of **26<sup>th</sup> April 2016** attended by the Chief Executive of the City of Edinburgh Council and other senior Council officials, the shareholders of ESP and representatives of the banks behind the PPP1 development. The dissatisfaction of the Council with the way in which matters were being handled was expressed at this meeting.
- 5.14.22 The Chief Executive advised those attending the meeting that the Council's strongly preferred course of action was the '**green**' solution, i.e. the completion of all required remedial works prior to reopening of the schools and that they would no longer be content with the 'amber' or two-stage approach.
- 5.14.23 In the series of meetings with the ESP representative, the Council officers had expressed the requirement that, given the circumstances leading up to the closures, head teachers, members of staff and particularly the parents of pupils would all require an acceptable level of assurance of the safety of each remediated school before that school building was reoccupied. There was considerable debate as to the required final form and content of such assurances and which organisations would be required to provide it.
- 27<sup>th</sup> April 2016**
- 5.14.24 At the CIMT meeting on the **27<sup>th</sup> April**, it was reported that the remedial work by Galliford Try to Oxfords and St. Peter's Primary Schools could be complete by the next day, **28<sup>th</sup> April 2016**, followed shortly by the teaching wing at Braidburn Special School and after a further short period, Firrhill High School. This was considerably faster than had been expected.
- 5.14.25 The structural engineers employed to advise the City of Edinburgh Council, Scott Bennett Associates, stated at the meeting that at this stage they had not yet received sufficient information to allow them to verify the design process and construction methodology in relation to the work that was being undertaken by Galliford Try on these projects. Whilst this work had been carried out very quickly, there was reportedly a lack of knowledge on the part of ESP and the City of Edinburgh Council as to what had been done and how comprehensive or otherwise it had been.

5.14.26 The meeting then discussed the range of documents that would be required by the City of Edinburgh Council to be shown to parents in order to assure them as to the safety of each school once the remedial work had been completed. The following list of documents was itemised:

- a letter from ESP stating that the school was safe to occupy;
- a letter from the structural engineer responsible for the design of the remedial works to the school;
- a letter from the relevant contractor, Amey or Galliford Try, confirming they had carried out the works prescribed by the engineers;
- a risk assessment of the structural integrity of the walls; and
- a letter verifying the design and construction of the remedial work as appropriate from the independent engineer employed by the Council.

#### **28<sup>th</sup> April 2016**

5.14.27 At the CIMT meeting on **28<sup>th</sup> April 2016** it was reported that the four Stage 2 schools would be reoccupied on Tuesday 24<sup>th</sup> May 2016, subject to all remedial work being complete and the resolution of the issues in relation to the production of satisfactory documentation to provide the required assurances.

5.14.28 In this regard, it was reported that the first of the several structural reports that were required by the City of Edinburgh Council, that for Oxfords School, had been provided by Galliford Try. It was noted at the meeting that the first three paragraphs within the Report were confidentiality clauses. This was irrespective of the fact that, besides the fundamental requirement to provide evidence to the City of Edinburgh Council of the adequacy of the work undertaken, one of the main reasons for the urgency in seeking the reports was to be able to publish them to parents in advance of reoccupation of the schools.

5.14.29 It was also reported at the meeting that during the previous week, the Chief Executive of the City of Edinburgh Council had attended a meeting with Directors of the Scottish Office who had asked if the UK Government required to be advised of the nature and extent of the defects that had been discovered. The Chief Executive had explained that whilst the information currently available was insufficient for him to be definitive, the evidence would suggest that the problems identified could be generic in nature and that this fact would be explored as part of an Independent Inquiry.

5.14.30 On **28<sup>th</sup> April 2016**, ESP wrote to the City of Edinburgh Council in relation to their proposed approach to the resolution of the reported defective wall construction

aimed at achieving early re-occupancy of some of the Phase 1 schools. The letter contained the following paragraphs:

*"In seeking to fulfil that aim, (the resolution of the issues that had arisen following the Oxfords wall failure) Will Rudd Davidson have been liaising with Harley Haddow, Goodson Associates and the Council's engineers, Scott Bennett Associates to obtain assurances as to the structural integrity of the Project Schools.*

*We are pleased to report that following a robust risk-based assessment of the Project Schools, Will Rudd Davidson have now confirmed that, subject to agreed exclusion zones being put in place, the following Project Schools are from a structural perspective safe for normal occupation until up to the end of August 2016:*

*Craigour Park Primary School  
Pirniehall Primary School  
Broomhouse Primary School & St. Joseph's Primary  
Craigmount High School  
Rowanfield Special School  
Forthview Primary School  
Craigroyston Primary School  
Goodtrees Neighbourhood Centre*

*We understand that your engineers, Scott Bennett Associates, agree with the foregoing assessments. In the circumstances, we should be grateful if you would confirm that pupils of the above Project Schools will be returning to their own schools as soon as possible."*

- 5.14.31 A construction programme provided by ESP with this letter was based on the adoption and implementation of the '**amber**' rather than the '**green**' solution that had been requested by the City of Edinburgh Council.

**29<sup>th</sup> April 2016**

- 5.14.32 On **29<sup>th</sup> April 2016**, the Chief Executive of the City of Edinburgh Council replied to this letter. He reiterated that he had previously made it clear that he was requiring ESP to propose and implement a '**green**' only solution and that he had thought that this had already been accepted by them. His letter contained the following sentence;

*"The notion that the schools are safe to re-occupy other than in strong winds only has to be put down on paper to be seen as absurd and unacceptable..."*

- 5.14.33 At the CIMT meeting on **29<sup>th</sup> April 2016**, it was confirmed that structural reports had now been provided for all the Phase 1 schools but had not yet been received for all the Phase 2 schools. However, Galliford Try had indicated that they would be willing to provide the list of documentation set as a pre-requisite by the Council before any of the Phase 2 schools could re-open.
- 5.14.34 It was confirmed at the meeting that a Clerk of Works had been appointed by the City of Edinburgh Council to undertake, on behalf of the Council, inspections of the remedial work. The Clerk of Works would report through the structural engineers, Scott Bennett Associates, appointed to advise the Council.
- 5.14.35 As the work was already virtually complete on the Phase 2 schools, site inspections of the work done at these schools could only be in relation to what was visible of the additional secondary steelwork added. However, as the required work arising from the absence of the head restraints had not commenced on the Phase 1 schools by Amey, the Clerk of Works would be able to carry out more comprehensive site inspections as this work proceeded.
- 5.14.36 It was further reported that an issue had arisen in relation to the required structural reports on the remedial works. There had not been up to that point a written agreement on the part of the structural engineering firms as to the level of assurances they were being asked to provide in the required assurance documents and the wording thereof. In further meetings between the various parties the debate was subsequently resolved with agreement to a standard wording that was acceptable to both the City of Edinburgh Council and the structural engineering firms.
- 5.14.37 A set of the standard documentation, required to provide assurance as to the adequacy of the remedial works and the safety of the schools, including letters from the structural engineers involved, was ultimately provided for both the Phase 1 and Phase 2 schools after considerable legal analysis by the various parties. A set of this documentation as provided for the Oxbgangs School, typical of those provided for all the schools, is attached as Appendix 2 to this Report.

### **3<sup>rd</sup> May 2016**

- 5.14.38 On the 3<sup>rd</sup> May 2016 Scott Bennett reported to the City of Edinburgh Council that they had visited the Phase 2 schools the previous day and that he was impressed with the work that was being carried out, describing it as 'belt and braces'. It was reported that they had received some of the requested reports on these schools and, while still in the process of checking these through, believed more work was required on the design considerations submitted.
- 5.14.39 The City of Edinburgh Council had produced a draft letter setting out the level of assurances that they would require from ESP in relation to both the safety and



the compliance of the schools with the requirements of the PPP1 Project Agreement.

#### 4<sup>th</sup> May 2016

- 5.14.40 On 4<sup>th</sup> May 2016, an email received by the City of Edinburgh Council from ESP confirmed the commitment of ESP to complete a fully **green** solution prior to re-opening of the schools and not to pursue further their proposed **amber** solution in relation to the Phase 1 schools. It stated:

*"Finally, to be clear ESP is now working solely to a fully green solution and it is my understanding that Rudd's (WRD) are meeting with Scott Bennett Engineers today and will clearly define the 'finish line' in that regard (in terms of what assurances, method statements etc. can/will be provided). It is our intention to outline this agreed package when we write to the Chief Executive next week."*

(See extract from this letter sent to the Chief Executive on 11<sup>th</sup> May at paragraph 5.14.56).

- 5.14.41 In the same email, ESP reported that Galliford Try had already adopted the approach of full remediation, the '**green**' solution in relation to the Phase 2 schools and had advised ESP that all work on these schools would be complete by 9<sup>th</sup> May 2016.
- 5.14.42 Galliford Try were still required to demonstrate to Scott Bennett, the advisers to the Council, that the work to the Phase 2 schools had been done to their satisfaction and hence the satisfaction of the Council.
- 5.14.43 In relation to the programme of work for the Phase 1 schools, ESP reported that Amey had now commenced work at each of:
- Broomhouse/St. Josephs;
  - Pirniehall/St. David's;
  - Forthview Primary;
  - Craigour Park Primary; and
  - Goodtrees neighbourhood centre.
- 5.14.44 ESP further reported that it was planned that work would commence at Rowanfield on the next day, 5<sup>th</sup> May 2016, and at Gracemount High School on or before Monday 9<sup>th</sup> May. It was noted that work had already been undertaken at these schools by Amey in relation to that element of the remedial work to the

wall ties that had been completed prior to the end of the Easter break on 11<sup>th</sup> April 2016 in expectation of the schools reopening on that date.

- 5.14.45 The extent and detailed specification of the works to be undertaken on the Phase 1 schools was currently being established as part of their design process by WRD, the structural engineers appointed by ESP. This work was based on the information provided by the surveys as contained in the then recently completed structural reports on the existing schools and the limited information that had been made available to them in relation to the original design.
- 5.14.46 Amey were reported as being unwilling to commit to the production of a detailed programme for the completion of this work until more information was available to them as to the construction requirements being specified for the remedial work by WRD. They were however proposing to allocate more construction teams than they had originally planned for so that they could work in parallel across the various sites and shorten the time otherwise required to complete all of the work.
- 5.14.47 To supply the design information to this increased number of teams would require the simultaneous rapid development of design solutions across the 13 projects by WRD. ESP viewed this as placing a very heavy demand on the already fully committed resources of WRD.
- 5.14.48 To counter any potential delay that might arise from design information not being ready, ESP appointed Goodson Associates to undertake the design element for those of the Phase 1 schools for which they had undertaken the structural surveys and reports. This was done with the full support and involvement of WRD. This was treated by all parties as a totally discrete service from that Goodson Associates were providing for Galliford Try on the Phase 2 schools.

#### **10<sup>th</sup> May 2016**

- 5.14.49 At a meeting of the CIMT on 10<sup>th</sup> May 2016 it was noted that the date scheduled for the re-opening of three of the Phase 2 schools, Oxgangs, St. Peter's and Braidburn Schools had already been publicised to parents as Tuesday 24<sup>th</sup> May. The work to these schools would have to be completed by 17<sup>th</sup> May 2016 and the required documentation submitted on the same day if this was to be achieved.
- 5.14.50 The meeting was however informed that as a result of the level of assurances required, Goodson Associates had advised Galliford Try that additional windposts were required in the Phase 2 schools. Therefore, despite previous statements that all work to the Phase 2 schools would be completed by 9<sup>th</sup> May 2016, the installation of more than 30 windposts was currently underway at St.

Peter's Primary School and at the other Phase 2 schools. This would delay the completion beyond 9<sup>th</sup> May 2016. The contractor, Galliford Try, still expected to deliver the schools by the 17<sup>th</sup> May 2016.

- 5.14.51 The original windposts specified for the schools were generally to have been in the form of steel angles that were to be built into the inner blockwork leaf of the cavity so that they would not have been visible from either inside or outside the building.
- 5.14.52 Where the results of the surveys and structural calculations identified the need for windposts to be retrofitted to achieve the required strength in some of the masonry panels, it had been determined that the least disruptive and quickest methodology of fitting them was to attach them on the internal face of the blockwork walls.
- 5.14.53 As a result, the retrofitted windposts, of which many more than originally envisaged were required across both Phase 1 and Phase 2 schools, would be highly visible from within the school and also intrude slightly into the internal rooms and spaces. To reduce the visual impact, it was proposed that they should be boxed in and painted to match the walls to which they were fixed.
- 5.14.54 Representative photographs (Images 19 and 20) of the results of the application of the boxed in retrofitted windposts in the gymnasium at Drummond High School are shown below.



**Images 19 and 20:** Boxed in retrofitted windposts, Drummond High School.

- 5.14.55 The meeting of the 10<sup>th</sup> May was also advised that the Leader of the Council had announced that an Independent Inquiry into the closure of the schools would be held. However, it was intended that the main work of the Inquiry would not commence until after the schools were occupied.

**11<sup>th</sup> May 2016**

5.14.56 On **11<sup>th</sup> May 2016** ESP responded to the letter of 29<sup>th</sup> April 2016 from the Chief Executive of the City of Edinburgh Council, stating:

*"...we have not declared the schools to be not safe"; and*

*"...this approach (the 'amber' solution) has been signed off as appropriate and reasonable by all four sets of structural engineers." (Will Rudd Davidson, Goodson Associates, Harley Haddow and Scott Bennett Associates).*

5.14.57 The letter from ESP however went on to state:

*"...notwithstanding the foregoing, we have now provided you with a remediation programme which implements the 'Green' solution. This has been provided without prejudice..."*

5.14.58 In giving evidence to the Inquiry, several senior officers of the Council expanded on their analysis at the time that only a 'green' solution was acceptable. Having gone through the disruptive exercise of decanting and re-accommodating some 8,340 pupils and nursery children, they had considered that it would be unacceptable to move them back to their original schools prior to full remediation if, as a result, there was the risk of the schools having to be closed in the event of an unseasonal storm.

5.14.59 The officers of the Council had also formed the opinion that, as the schools were now vacated, this would allow for unrestricted access by the various construction teams to undertake the remedial works in the quickest possible time and without creating additional risk to pupils who otherwise could have been in close proximity to these works.

**17<sup>th</sup> May 2016**

5.14.60 On the 17<sup>th</sup> May 2016, it was reported that the Chief Executive of the City of Edinburgh Council had met with ESP and Galliford Try on the previous evening. The discussions had been positive with both parties acknowledging that they understood the Council's requirement for a clear audit trail of the process of remediation. They had agreed to provide a programme of all outstanding work and the required documentation, including CDs of technical details and photographs of the works.

5.14.61 On the evening of the 17<sup>th</sup> May 2016, Galliford Try had advised the City of Edinburgh Council that the work to the schools due to reopen on 24<sup>th</sup> May 2016 had been completed. On the 18<sup>th</sup> May 2016, Scott Bennett Associates confirmed that they had that day received CDs of the calculations and remedial work

undertaken for these schools and that it would take two to three days to assess them, making it just possible to achieve sign off before the due date.

### **18<sup>th</sup> May 2016**

- 5.14.62 In relation to the Phase 1 schools, it was reported at a meeting of the CIMT on 18<sup>th</sup> May 2016, that despite having been advised by Amey that additional teams to the previously planned four teams would be made available, only four Phase 1 schools were currently being worked on.

### **19<sup>th</sup> May 2016**

- 5.14.63 On 19<sup>th</sup> May 2016, the City of Edinburgh Council was concerned that the re-openings for those Phase 2 schools due for the 24<sup>th</sup> May 2016 might not be achieved. The meeting of the CIMT was advised that Galliford Try had discovered they had to do some additional work to the schools which had delayed them slightly longer than expected, however, during the meeting an email was received from Galliford Try confirming that the work was now complete.
- 5.14.64 In relation to the provision of the required reports, Scott Bennett Associates advised that they had received full reports for Braidburn and St. Peter's but had had to ask for further information. Scott Bennett Associates had confidence in the professionalism of the structural engineers who had undertaken the work and had received sufficient information to know what was done and that it had been recorded properly. However, they had not been provided with the required calculations to show that the remedial measures applied to each panel of masonry had been properly designed.
- 5.14.65 Scott Bennett Associates reported that the paperwork for the third school due to open on 24<sup>th</sup> May 2016, Oxfangs School, had been delivered to their office at 1.00 am that morning.
- 5.14.66 It was agreed at the meeting that due to the need to give adequate notice if the schools were not to open as planned, that ESP should be advised that, if all requirements had not been satisfied by 4.00 pm [that day, 19<sup>th</sup> May,] the openings could not go ahead on 24<sup>th</sup> May 2016 and the public would be notified accordingly.
- 5.14.67 Later that day in relation to the Phase 2 schools, Scott Bennett reported that they had received that morning the final information required in relation to St. Peter's and already had cleared the documentation for Oxfangs and Braidburn Schools. Final cleaning of the schools would be completed in time and accordingly, based on this information, the Council gave the go-ahead for the necessary packing and relocation of equipment and materials so that these three schools could reopen on **Tuesday 24<sup>th</sup> May 2016.**

5.14.68 It was agreed that the required dossiers of information providing assurances as to the safety of the schools would be available for parents and others to see on the Council's web-site from the morning of Monday 23<sup>rd</sup> May.

5.14.69 The three Phase 2 schools were subsequently re-opened successfully on 24<sup>th</sup> May 2016 with no complaints or adverse comments being received from teachers on the extent of the steel windposts now visible inside the schoolrooms.

#### **20<sup>th</sup> May 2016**

5.14.70 On the morning of 20<sup>th</sup> May 2016, the Chief Executive of the City of Edinburgh Council met with ESP to discuss their ability to deliver the required dates for reoccupation of the Phase 1 schools. Amey advised that they would submit a revised programme in the following week.

#### **24<sup>th</sup> May 2016**

5.14.71 On 24<sup>th</sup> May 2016, the City of Edinburgh Council was advised that it was now unlikely that either Drummond or Royal High Schools (both Phase 1 schools) would be able to reopen in line with their previously advised date of 20<sup>th</sup> June 2016. This was as a result of the structural analysis which had been undertaken, which demonstrated the need for up to 80 retrofitted windposts in just one of the schools.

5.14.72 There was however some positive news in that it was being predicted that several schools could possibly reopen ahead of their scheduled date. The schools in question were:

- Pirniehall/St. David's (Phase 1).
- Broomhouse/St. Joseph's (Phase 1).
- Rowanfield (Phase 1).
- Howdenhall (Phase 1).
- Firrhill (Phase 2).

5.14.73 In order that Amey would have a better idea of the scale and nature of the work that was required to be undertaken by them on the Phase 1 schools, ESP had taken Amey to see the completed remedial work at Oxbgangs School. It was confirmed by ESP that Amey would use the same sub-contractors employed by Galliford Try to benefit from their familiarity with the nature of the work.

5.14.74 The proposal previously put forward by Amey to increase the size of their workforce had not yet taken place.

**26<sup>th</sup> May 2016**

- 5.14.75 On 26<sup>th</sup> May 2016, it was confirmed that Drummond and Royal High Schools would not reopen on 20<sup>th</sup> June 2016. The delay was in part due to the ongoing further investigations that were being carried out at the schools. These had raised questions as to whether the windposts intended to be installed as part of the original structural design and construction of the schools had been installed.

**31<sup>st</sup> May 2016**

- 5.14.76 On 31<sup>st</sup> May 2016, a further meeting was organised by the City of Edinburgh Council with ESP and Amey to discuss the revised programme they had submitted. The programme showed Pirniehall/St. David's, Broomhouse/St. Joseph's Primary Schools, Rowanfield Special School and the work to the gymnasium at Howdenhall finishing prior to the end of the current term with the remaining Phase 1 schools being completed prior to the date in August that the schools were due to reopen after the summer holidays.
- 5.14.77 The meeting was advised that Amey were still awaiting a set of the original construction drawings from WSP, which was delaying progress on finalising the design for the remedial solution for Drummond High School. The City of Edinburgh Council was subsequently advised by WSP that they had not retained any of their design information on this school.
- 5.14.78 At that point the CPM from the Council did not have a direct contact point within Amey in relation to the management of the remedial works on Phase 1 schools and were finding it difficult to understand who in Amey was taking responsibility for the project.
- 5.14.79 Subsequently, Amey put in place a highly experienced and effective construction manager, who acted as a point of liaison with ESP and the City of Edinburgh Council and who oversaw the remedial works on the Phase 1 schools.
- 5.14.80 A small delay had been caused to the projected completion of the work to Firrhill School in that ESP and Galliford Try had not been aware that one of the extensions to the school had been built under the PPP1 scheme and as a result had only recently commenced work on it. However, it was agreed that Firrhill High School, the only Phase 2 school still currently closed, would reopen on **6<sup>th</sup> June 2016** subject to the standard requirements in relation to assurances being met by Galliford Try.

**7<sup>th</sup> June 2016**

- 5.14.81 On 7<sup>th</sup> June, it was reported at a CIMT meeting that a further revised programme would be submitted by ESP in relation to the Phase 1 schools on Thursday 9<sup>th</sup> June 2016.

- 5.14.82 Amey had recently identified a further problem with the wall-tie solution in relation to the need to check expansion joints at the corners but they felt this could be dealt with without affecting their current programme dates. On review of whether this might equally be a problem on the Phase 2 schools, it was confirmed that the issue of the corner details had been dealt with and certified as acceptable.
- 5.14.83 Amey were still encountering problems getting any original drawings for Drummond High School. The currently proposed solution would require installing windposts to the walls within the main gymnasium hall but doing so would effectively reduce the free space in the gym to below that specified as required in the PPP1 Project Agreement. An alternative solution of attaching the windposts to the exterior of the gymnasium walls was being explored.
- 5.14.84 It was reported that Amey were working from 7.00 am to 7.00 pm and had now 90 workers and three steelwork teams engaged across the schools.

#### **9<sup>th</sup> June 2016**

- 5.14.85 On 9<sup>th</sup> June, it was reported that Amey were now in possession of a set of drawings for Drummond High School, which had been discovered in further searches of the ESP archive (not provided by WSP), and Goodson Associates had developed a solution in which the only protrusion of the necessary additional windposts would be to the outside of the building, thereby preserving the internal dimensions of the clear space in the gymnasium. Subsequent liaison with the Planning Department of the City of Edinburgh Council confirmed that this would not be treated as a material change and would therefore not require planning consent.

#### **16<sup>th</sup> June 2016**

- 5.14.86 On 16<sup>th</sup> June 2016, it was reported that significant progress had been made and there was now greater clarity on the position in relation to the programme for the Phase 1 schools.
- 5.14.87 The situation was reported as follows:
- Broomhouse/St Joseph's Primary Schools would reopen on Monday 20<sup>th</sup> June 2016 (Subsequently achieved).
  - Pirniehall/St. David's Primary Schools would reopen on Monday 20<sup>th</sup> June 2016 (Subsequently achieved).
  - The gymnasium at Howdenhall would be available for reuse by 23<sup>rd</sup> June 2016 (Subsequently achieved).



- Rowanfield Special School would reopen on 27<sup>th</sup> June 2016 (subsequently reopened on 24<sup>th</sup> June 2016).
- The required information dossiers on assurances were being received by Scott Bennett for processing and approval prior to the reopening of the schools.

### **21<sup>st</sup> June 2016**

5.14.88 An update on progress on 21<sup>st</sup> June 2016 showed that:

- Forthview Primary School was undergoing minor adjustments to the steelwork, however it was hoped to be complete by 26<sup>th</sup> June 2016 (Subsequently delayed until 30<sup>th</sup> June 2016 due to the steelwork issue);
- Craighour Park Primary School was expected to be complete by the end of June;
- Craigroyston Primary School was expected to be complete in mid-July;
- Craigmount High School was on target for completion on 6<sup>th</sup> July 2016 (Subsequently delayed until 11<sup>th</sup> July 2016);
- Goodtrees Community Centre would reopen on 8<sup>th</sup> July;
- Castlevie Primary School was expected to be complete by mid-July;
- Drummond High School was in the process of having significant steelwork installed in but it was still on schedule to complete by the end of July;
- Gracemount High School was due to complete by the end of July; and
- The Royal High School was also due to complete by the end of July.

### **August 2016**

5.14.89 The final remedial works and documentation were in fact completed for the final school, the Royal High School, on 11<sup>th</sup> Aug 2016 thus enabling the reopening of all the PPP1 schools for the return of the pupils after the summer holidays on 17<sup>th</sup> August.

5.14.90 The following is a consolidated list of the dates on which each of the PPP1 schools were handed back to the council with all works and documentation satisfactorily completed.

<b>School</b>	<b>Hand back date</b>
Braidburn School	20 May 2016
Oxgangs Primary School	
St Peters RC Primary School	
Firrhill High School	2 June 2016
Pirniehall and St David's Primary Schools	15 June 2016
Broomhouse and St Joseph's Primary Schools	
Rowanfield School	22 June 2016
Howdenhall Centre	
Forthview Primary School	29 June 2016
Goodtrees Neighbourhood Centre	8 July 2016
Craigour Park Primary School	20 July 2016
Castleview Primary School	
Craigroyston Primary School	22 July 2016
Craigmount High School	27 July 2016
Gracemount High School	5 August 2016
Drummond Community HS	10 August 2016
Royal High School	11 August 2016

## **SECTION 6 – ACTIONS FOLLOWING THE OXFANGS SCHOOL WALL COLLAPSE**

- This section of the Report will consider precautionary actions taken by the City of Edinburgh Council in relation to more general concerns created as a result of the extent of defective construction that was discovered in the PPP1 schools.

### **6.1 REASSURANCE IN RESPECT OF OTHER AREAS OF THE COUNCIL ESTATE**

- 6.1.1 Following the evidence, provided by the comprehensive surveys of masonry panels in the PPP1 schools, of the widespread presence of non-compliant or defective construction, there was a natural concern on the part of the City of Edinburgh Council that similar defects might be present in other buildings in the ownership or under the management of the Council. The concerns were essentially about seeking to ensure that these buildings provided appropriately safe environments for all occupants, users or members of the public visiting them. There was a clear understanding by the Council of the need to undertake an appropriate course of action to demonstrate due diligence on its part in this regard.
- 6.1.2 On 28<sup>th</sup> June 2016, a paper, produced by the CPM, was presented to a meeting of the CIMT proposing a risk-based assessment of the estate to determine the level of requirement for and the prioritisation of an extension of intrusive investigations across the Council's estate.
- 6.1.3 The paper made the point that there was currently no reason to believe that the City of Edinburgh Council estate was at any greater risk of having similar defects to those found in the PPP1 schools than any other property across the United Kingdom.
- 6.1.4 The view had been expressed by the CPM and the structural engineers advising the City of Edinburgh Council that the likelihood of the occurrence of similar defects would be greatest in buildings constructed during the last 20 years, as a result of the introduction during that period of the practice of increasing cavity widths to facilitate the incorporation of insulation slabs in cavity wall construction.
- 6.1.5 Accordingly, it was recommended that the proposed risk-based assessment, if adopted, would prioritise buildings constructed during this period and would start with those of a similar construction to the PPP1 schools. Other risk factors, including the usage category of the buildings, the procurement method used for the building, if design and build had been used and the presence of large masonry panels such as those found in the school buildings, would each be considered in a systematically applied process undertaken by a professional team.

- 6.1.6 On the 17<sup>th</sup> August 2016, the Corporate Incident Management Team formally requested that consideration be given to a proportionate and structured approach to investigating the wider estate, specifically regarding the issues identified on the PPP1 Estate (wall tie embedment and head restraint provision). The recorded recommendations of the meeting were that the Council Leadership Team should do as follows:
- Review the full Council's Estate (Operational, Non-Operational, Housing, Edinburgh Leisure) specifically about wall tie embedment and masonry panel restraint in response to the defects addressed on the PPP1 new build estate.
  - Approve the proposed methodology to delivering a risk based approach to prioritising, delivering investigations and any associated remedial works.
  - Note the PPP1 inspections were limited to the new build PPP1 estate.
  - Note that a technical working group had been established consisting of structural engineers with direct experience of the investigations and remedial works delivered on the PPP1 estate.
  - Note that it was not possible to estimate the costs of the works as the scope was undefined at this time. An initial working budget had been identified by the Finance Department. As part of the programme reporting there will be monthly cost reporting would be put in place.
- 6.1.7 It was subsequently agreed, following consultation with elected members, that this approach should be developed and implemented. Approval was also given for the appointment of Scott Bennett Associates and Will Rudd Davidson (WRD) to provide the professional and technical structural engineering support for this work. In relation to this decision, although it was considered that there may be a minor potential conflict of interest with the involvement of WRD (due to their appointment by ESP in relation to the PPP1 schools), the benefit of their hands-on experience in the PPP1 schools was viewed as outweighing any such concern.
- 6.1.8 In undertaking these inspections, it was appreciated that access for intrusive investigations, particularly in relation to establishing the presence or otherwise of head restraints, could prove logistically difficult to facilitate without disruption and the possibility of raising potentially undue concern on the part of the building users.
- 6.1.9 The Chair of this Inquiry recommended that other recent schools buildings of broadly similar design and construction should be amongst the first to undergo testing and asked that the Inquiry be provided with early feedback on this exercise.

6.1.10 **At the time of writing this Report, the initial risk-assessment process is progressing on those buildings where good quality record information is available. The process of instructing intrusive investigations has also commenced where a desk-top analysis and associated peer review has identified potentially higher risk items.**

6.1.11 **Until the results of this process are available, it will be impossible to confirm whether other buildings in the estate of the City of Edinburgh Council contain similar defects and for the Council to implement appropriate and proportionate responses to any such findings.**

6.1.12 **Equally, this information could be highly relevant in helping to establish the extent of the type of defective construction encountered in the PPP1 schools and the likelihood or not of it being more generally present in the work of the construction industry in Scotland.**

## 6.2 **REPORTS OF DEFECTIVE FIRE-STOPPING PPP PROJECTS**

6.2.1 During the period of the closure of the PPP1 schools the City of Edinburgh Council had sought and received assurances from ESP as to the on-going safety of the schools and their compliance with all statutory requirements in this regard in accordance with the contract.

6.2.2 In April 2016, the City of Edinburgh Council had become aware of a number of projects in the UK that had been procured using similar Public Private Partnership arrangements, for which reports had indicated the discovery of significant incidents of inadequate fire-stopping. Following the discovery of the issue of the lack of head restraints, the City of Edinburgh Council wrote to ESP on 14<sup>th</sup> April 2016 seeking confirmation from them that they had no concerns as to defects other than that relating to the wall ties and head restraints.

6.2.3 For readers of this Report, fire-stopping is the process of sealing any spaces or holes in fire-rated walls or enclosures with approved fire resistant materials in order to protect means of evacuation and prevent the spread of smoke or flame from one area to another that could otherwise lead to avoidable risk to life and unnecessary damage to property. Proper implementation of fire-stopping to fire compartment enclosures is a mandatory requirement of the Scottish Building Standards.

6.2.4 The concerns of the City of Edinburgh Council were further raised following a programme on BBC Radio 4 broadcast on the 5<sup>th</sup> July 2016 called 'The Price of PFI'.

6.2.5 The programme, as well as discussing the problems being experienced by the City of Edinburgh Council in relation to the Edinburgh Schools, identified

problems with fire-stopping in PFI schools and hospitals around the United Kingdom, particularly in regard to the required provision of proper compartmentation in the spaces above ceilings.

6.2.6 Amongst those school buildings reported on was a group of eight schools provided as part of a PPP project in Knowsley, Merseyside. Following a kitchen fire at one of the schools in 2015, in which smoke had penetrated to an adjoining protected staircase, a review of fireproofing was undertaken at all eight schools. In every case, the fireproofing was reported to have been found to be sub-standard. This was particularly problematic in relation to the absence or condition of fire-dampers in ducts passing through fire-walls. The programme also stated that similar defective fire-stopping had been reported by fire-brigades in schools from all parts of the country and that the problem was widespread. It also pointed out that these problems were not restricted to schools.

6.2.7 Peterborough Hospital, a hospital acquired using PFI, was specifically identified as having seriously inadequate fire-stopping. It was estimated that the required remedial work would not be completed until 2019. The programme also identified that the Chief Fire Officers Association had advised them that this was one of ten NHS PFI Hospitals that had experienced similar defects. It was estimated that some millions of pounds would be needed to undertake the required remedial work to the defective fire-stopping.

6.2.8 Having been alerted by the information provided in this programme, the City of Edinburgh Council wrote a further letter to ESP on 14<sup>th</sup> July 2016 stating:

*"In our letter to you dated 14<sup>th</sup> April we asked you for confirmation that neither ESP nor its officers were aware of or had any concerns about defects at the schools other than the issues with wall ties and head restraints.*

*In the light of the publicity about fire safety in PFI buildings, including schools, we should be grateful for your assurance as to the fire stopping and fire alarm position in the schools, in particular that ESP is satisfied that each school is fully compliant with all applicable laws and regulations and is safe from a fire safety perspective. Please can you revert to me on this within 7 days."*

6.2.9 These issues were subsequently discussed at monthly liaison meetings with the Council representatives. At one such meeting, held on 18<sup>th</sup> August 2016, it was reported that Amey had commissioned a specialist firm to undertake surveys of the PPP1 schools to establish the adequacy or otherwise of the fire-stopping within the schools. ESP subsequently confirmed in an email to the City of Edinburgh Council that Amey had advised the meeting that:

*"There were a number of remediation measures required across the estate but these were considered to be minor in nature and, importantly, did not impact on the safe operating of the sites or any requirement to revisit the fire exit strategies for any of the sites."*

6.2.10 On becoming aware at the end of October 2016 of the existence of these surveys, this Inquiry requested that it receive copies of the fire-stopping surveys from ESP.

6.2.11 On 4<sup>th</sup> November 2016 ESP confirmed the following by email:

*"I am pleased to confirm that AMEY has advised that the majority of works (circa 95%) were completed on or before the October break and the remaining outstanding works should be completed before the end of the month."*

6.2.12 Following a further request from the Inquiry, copies of the fire-stopping surveys were received on 18<sup>th</sup> November 2016.

6.2.13 The survey reports identified a significant number of, what were described in the reports as, breaches of fire-stopping across all 17 PPP1 projects ranging from minor gaps around pipes and cables to some larger holes or gaps in what were described as fire compartmentation. Most of these reported breaches occurred in the roof spaces of the schools.

6.2.14 Photographs had been taken during the surveys of each breach identified, however the survey reports also stated that due to the limitations of access they could not guarantee that all breaches had been spotted and recorded. Photographs of examples of these breaches of fire compartmentation taken from the reports of the surveys together with the extracted related comment in the reports are shown below.



**Image 21:** Example of a breach of fire compartmentation from fire-stopping survey of Oxgangs School, dated 22<sup>nd</sup> August 2016: "there is no plasterboard above the fire door, therefore creating a large breach in the compartment. the area is not fire stopped and a breach exists."



**Image 22:** Example of a breach of fire compartmentation from the fire-stopping survey of Royal High School, dated 22<sup>nd</sup> August 2016 : "the pipe has not been fire stopped and a breach exists."



- 6.2.15 It was difficult to determine from the photographs how many of these breaches dated from inadequacies in the original construction or had happened as a result of any subsequent alterations carried out to the premises in the intervening years. However, from the nature of many of the breaches shown in the photographs, it would appear that a significant number are more likely to have resulted from the time of the original construction of the schools than from any subsequent work carried out in the roof spaces since the opening of the schools.
- 6.2.16 Despite the reference by ESP, in the above email to the City of Edinburgh Council, that these breaches had been considered by Amey to be "*of a minor nature*", the Inquiry was surprised at the extent and nature of the breaches indicated in the surveys. It was also surprised that these breaches had not been identified through a process of regular inspections of the integrity of fire-stopping in the buildings.
- 6.2.17 Finally, it was surprised that the results of these surveys had not been shared by ESP earlier in the process with the City of Edinburgh Council and that Council representatives had not been offered the opportunity to inspect these defects before they were fixed.
- 6.2.18 On receiving the survey reports, the Chair of this Inquiry felt it necessary to bring this matter to the attention of the Chief Executive of the Council, with a recommendation that the remedial work, required to ensure the integrity of the fire-stopping, should be subjected to independent scrutiny by appropriately qualified personnel appointed by the City of Edinburgh Council. Further it was recommended that an inspection be undertaken of any fire-dampers within the schools to ensure that they were in place and operating effectively, as these had not been specifically referred to in the reports, yet represented a significant element of the type of breaches that had been reported in the BBC programme.
- 6.2.19 It was also suggested that, in light of the evidence from the PPP1 school surveys, it might be appropriate to undertake a series of reviews of the comprehensiveness of fire-proofing and fire safety provision in other school projects in Edinburgh, including those procured through the later and completely separate PPP2 contract for schools in Edinburgh.
- 6.2.20 In early December, the City of Edinburgh Council appointed an independent specialist to undertake a review of the PPP1 schools, which process is still underway at the time of writing. While the final outcome of this process is not finalised, on the basis of the examination of two of the schools by the Council-appointed specialist, a number of further examples of defective fire-stopping to compartment walls were identified. This specialist also pointed out that not all of the gaps and holes that had been repaired in walls on the basis of the earlier

ESP surveys appeared to be in compartment walls and that some of the repairs already carried out might not have been required.

- 6.2.21 In January 2017, as the writing of this Report was nearing completion, the Inquiry was advised by a representative of ESP that they had just undertaken a review of the findings of the fire-stopping surveys that had originally been provided by themselves, ESP, to the City of Edinburgh Council in November 2016. Following this second review they too were of the opinion that not all of the defects reported, despite the fact that they had already undergone remedial work, had been located in fire-compartment walls or enclosures. However, they did fully accept that there had been defects present.
- 6.2.22 It would appear, from the information currently available to the Inquiry, that the two photographs above, taken as examples from the original ESP surveys provided to the City of Edinburgh Council in November, are in compartment walls and would have required the remedial action undertaken.
- 6.2.23 As a consequence of ongoing discussions in relation to this issue, ESP has agreed to the joint appointment with the Council of a further independent fire safety expert to undertake a full review of all the PPP1 schools to determine the overall position in relation to fire safety matters (whether relating to fire compartmentation or otherwise) and to identify any aspects of fire safety in the buildings that may remain to be remedied. This is being progressed as a matter of urgency at the Council's insistence and rectification and/or other fire safety measures will be implemented as matters progress.
- 6.2.24 The Council is also undertaking an appropriate fire safety review in relation to the wider Council estate, including the PPP2 schools.
- 6.2.25 The ultimate responsibility for the safety of pupils, staff and members of the public who may be present in their buildings must lie with the City of Edinburgh Council. Any delegation by the Council of responsibility for ensuring an appropriately safe environment to commercial organisations must include the provision of appropriate mechanisms to ensure that these companies are fulfilling all their obligations.
- 6.2.26 The application of financial penalties after the fact, as provided for in PPP contracts across the United Kingdom, has clearly not been a sufficient mechanism in the reported cases to ensure the prevention of such defects in the original provision and maintenance of compliant fire safety installations.
- 6.2.27 A best practice guide on the subject of fire-stopping, published in February 2015 by the British Research Establishment, contained the following comments:

*"The fire protection of concealed spaces is of prime importance because any deficiencies in installation and materials are not readily apparent and may quickly be covered over. Any inadequacies in such fire protection cannot be observed by the building users and, unlike other engineering provisions within the building, will not be directly apparent by its impact on every-day life. Any inadequacies in the fire protection of concealed spaces will only become apparent during the very time that their effectiveness is required – during a fire."*

*Compartmentation in roof voids is a particular issue with respect to hidden fire spread. The biggest issue remains that of quality of construction. The research presented here and supported by the case studies shows that poor workmanship with inappropriate materials are the main reasons for the inadequate protection of concealed spaces.*

*There is a clear and demonstrable need to ensure that buildings are designed and constructed so that the unseen spread of fire and smoke within concealed spaces within its structure and fabric is inhibited, as required by the Building Regulations. There is adequate guidance available in the public domain to allow this to be achieved."*

- 6.2.28 The discovery of the significant number of defects in fire-stopping across the 17 PPP1 projects coupled with the reports from other parts of the United Kingdom raises a further question mark as to the level of reliance that can be placed on the current arrangements under PPP schemes for the proper inspection and quality assurance of projects. This is clearly at its most important in relation to aspects of the construction of buildings that can have an impact on the safety of occupants.
- 6.2.29 **The final position in relation to the fire safety aspects of the construction of the PPP1 schools and of other schools in Edinburgh, including the PPP2 schools, will not be known until the appropriate independent investigations are carried out.**
- 6.2.30 **In relation to the current estate, this Report recommends:**
- **that the Council reviews its current arrangements in terms of ensuring the adequacy of fire-stopping in the buildings it owns or operates based on a sound fire strategy for each building;**
  - **that in relation to the completed surveys or those currently being undertaken of the schools, the Council seek confirmation that the presence and condition of any fire-dampers in ducts penetrating fire compartments is satisfactory;**

- **that a risk-prioritised programme of remedial work is established to address any further defective installation or absence of fire-stopping identified; and**
- **that once remedied, an appropriate protocol for the checking of the effective maintenance of fire-stopping through the life of buildings is implemented.**

6.2.31 Amey advised the Inquiry that Amey FM are required to carry out visual inspections of fire-stopping materials annually and that records of inspections are maintained by Amey FM.

6.2.32 The issues in relation to the proper installation and inspection of fire-stopping in the construction of new buildings is addressed in the wider recommendations of this Report.

### 6.3 **CONTRACTUAL ENTITLEMENT TO DEDUCTIONS FOR CLOSURES OF THE PPP1 SCHOOLS**

6.3.1 As previously stated in this Report, in accordance with the conditions set down in the PPP1 Project Agreement, the City of Edinburgh Council is entitled to make deductions from the unitary payments, to which ESP would otherwise be entitled, for certain failures of performance of the contracted services or non-availability for use of the accommodation provided under the contract.

6.3.2 The City of Edinburgh Council commenced the implementation of this provision of the contract following the collapse of the wall at Oxfangs and as the need for further closure of schools was identified the level of deductions was appropriately increased.

6.3.3 Following the discovery of the missing head restraints and the decision to close all schools from 11<sup>th</sup> April, in accordance with the requirements of the contract, the City of Edinburgh Council formally wrote to ESP on 14<sup>th</sup> April 2016 informing them of these extensive service failures on the part of ESP and listing the relevant clauses relating to availability of the facilities and the maintaining of the facilities to the appropriate compliant standards.

6.3.4 The City of Edinburgh Council confirmed its intentions to continue to exercise its rights to make deductions in relation to service failures arising from the non-availability of the schools as from 8<sup>th</sup> April 2016 and advised ESP that it also reserved its rights to apply deductions for service failures in relation to defects that may have been present prior to 8<sup>th</sup> April 2016.

6.3.5 There followed several exchanges of letters expressing disagreement between the two parties in relation to the quantum of deductions being applied. The City of Edinburgh Council were convinced of the appropriateness of their

methodology for calculating the deductions they proposed and proceeded to apply them in relation to the closures that commenced on 8<sup>th</sup> April 2016. The provisions of the contract were such that deductions became due to be made in the second month after a service failure. Accordingly, the first of these significant larger monthly deductions was due to be made in June 2016, two months after the closure decision taken in April.

- 6.3.6 In a letter dated the 27<sup>th</sup> April 2016 from the City of Edinburgh Council to IML, in respect of their role as representatives of ESP, it was stated that, in addition to the deductions made by the Council from the payments due to ESP as part of the Unitary Charge, the Council would require reimbursement of all expenses and losses caused by the closure of the schools.
- 6.3.7 In so doing they stated that they were differentiating between deductions, being a contractual adjustment to the payment stream, and damages for breach of contract.
- 6.3.8 The payment schedule below reflects the fact that a payment is not made in July due to the holiday closure and that the last remedial works, **in relation to the problems associated with the structure of the external walls** to the schools, finished on 12<sup>th</sup> August 2016 on which day the last of the schools was handed back as available for use.

#### DEDUCTIONS from PPP1 UNITARY CHARGE

Month	Deduction (£)	Deduction Period
Jan-16	£424.79	Deduction for November 15
Feb-16	£495.59	Deduction for December 15
Mar-16	£778.78	Deduction for January 16
Apr-16	£54,235.71	Deduction for February 16
May-16	£862,325.71	Deduction for March 16
Jun-16	£1,369,483.39	Deduction for April 16
Jul-16	£1,416,017.36	Deduction for May 16
Aug-16	£1,416,017.36	Deduction for June 16
Sep-16	£251.19	Deduction for July 2016
Oct-16	£1,238.84	Deduction for August 2016
Nov-16	£13,965.84	Deduction for September 2016
Dec-16	£1,229.28	Deduction for October 2016
<b>Total deductions 2016</b>	<b>£5,136,463.84</b>	

- 6.3.9 **The Inquiry is satisfied that, as provided for in the contract, the Council took appropriate steps, including seeking legal advice, in relation to the application of deductions from payments otherwise due to ESP.**

- 6.3.10 It is not, however, the intention of this Inquiry to comment on the precise amount of deductions made and any subsequent separate pursuit of compensation by the Council.

## SECTION 7 - REMIT ITEM 1: PPP FINANCING – RATIONALE AND IMPACT

### Remit Item 1:

*"The rationale for the council entering into the PPP1 contract for schools and the effect this financing arrangement may have had on the construction process."*

#### 7.1 POLITICAL CONTEXT FOR PROCUREMENT IN THE 1990S

7.1.1 On 11<sup>th</sup> December 1992, the Private Finance Initiative (PFI) was introduced as a new procurement method by the Chancellor of the Exchequer, the Conservative MP Norman Lamont. In his Autumn Statement, he called for *"ways to increase the scope for private financing of capital projects."* Projects in Scotland were to feature significantly in the subsequent roll-out of this new policy.

7.1.2 In October 1995, the Skye Bridge, the first PFI-funded public infrastructure in the UK was opened. The bridge, which crosses over Loch Alsh in Scotland, had an initial estimated cost of around £15 million.

7.1.3 Also in Scotland on 31<sup>st</sup> October 1996, the first PFI hospital, Ferryfield House, a £32 million community hospital for the treatment of patients with dementia was opened. It was the first of many NHS facilities across the UK to be provided through the PFI model over the following decade.

7.1.4 In 1997 New Labour took power and the newly-elected Government gave fresh impetus to the Private Finance Initiative. Two months after taking office the Health Minister Alan Milburn made clear to public servants that PFI was increasingly to be the primary choice for the procurement of major public sector projects. *"When there is a limited amount of public-sector capital available, as there is,"* he said, *"it's PFI or bust."*

7.1.5 In July 1997, the Labour Government established a PFI Taskforce within the Treasury. Its aim was to provide central co-ordination for a large-scale roll-out of PFI. By the end of its first term in power New Labour had signed 210 PFI contracts with a total capital value of £11.6 bn. In their second term a further 206 PFI Contracts with a total capital value of £12.7bn were signed between 2001 and 2005.

7.1.6 By the late 1990s the general strategy being adopted by the UK Government was that public bodies undertaking major construction projects adopt as their procurement methodology in order of preference either (1) the Private Finance Initiative, (2) Design and Build, or (3) Prime Contracting. These routes involve contracting with an integrated supply team to design, construct and sometimes finance, operate and maintain the development. It was also increasingly the view from Government Procurement Agencies that the more traditional procurement route of separate contracts for design and construction, that up to

then had been the pre-dominant model, should not be used unless it could clearly be demonstrated that its use would offer better value.

## 7.2 PFI IN THE PROCUREMENT OF SCHOOLS IN SCOTLAND

7.2.1 The terms PFI and PPP are largely interchangeable. The first refers to the Private Finance Initiative, which introduced private finance into the funding of public sector projects, and the second refers to Public Private Partnerships, which describes the relationship between public and private sector organisations using private finance to fund public sector projects.

7.2.2 The Scottish Government subsequently introduced the Non-Profit Distributing (NPD) model to describe a variant of the PFI arrangement to be used in Scotland.

7.2.3 The first PFI schools programme in Scotland commenced in 1998 prior to Scottish devolution in 1999. It involved ten local authorities, 75 schools and represented investment worth over £500m. The first schools were delivered in 2000 and the last school under this first scheme was completed in 2005.

7.2.4 The Scottish Government provided financial support for this programme as a means of encouraging participation by Local Authorities. The programme was known as **Level Playing Field Support (LPFS)**. By 2010 the amount of annual revenue support from the Scottish Executive for LPFS amounted to £44.4m.

7.2.5 The ESP PPP1 project for 17 schools was one of those that received support under this programme.

7.2.6 The second schools PFI/NPD programme in Scotland commenced in 2002. It involved 30 local authorities, 200+ schools and represented investment in the school estate worth around £2.8 billion. The first schools under this programme were delivered in 2004.

7.2.7 In 2006, under this programme and following a separate PPP procurement process, Edinburgh Council signed a second PPP contract ("**PPP2**") for a further eight schools which were completed in 2010.

## 7.3 APPLICATION FOR GOVERNMENT FUNDING FOR EDINBURGH SCHOOLS REDEVELOPMENT

7.3.1 In June 1998, the City of Edinburgh Council submitted an Outline Business Case (OBC) to the Scottish Office (now Scottish Government) in support of a bid for revenue funding for a proposal to upgrade its Schools Estate through a Public Private Partnership model under an initiative of the City of Edinburgh Council called 'Investing for Education'.



- 7.3.2 The OBC stated that, in many areas of Edinburgh, school communities were having to make considerable efforts to cope in less than satisfactory environments in schools that were overcrowded, unsuitable for their intended purpose, inefficiently used or suffering from serious infrastructure deficiencies.
- 7.3.3 As at August 2000, 32% of Edinburgh's primary schools and 35% of Edinburgh's secondary schools were operating at levels in excess of 100% occupancy whilst 43% of primary schools and 25% of secondary schools were operating at between 40% and 80% occupancy.
- 7.3.4 The stated principal objectives of the 'Investing for Education' initiative were to ensure that the Council's school and related buildings could both fully comply with legislative requirements and would be capable of responding to the significant list of new Government and Council educational and community-related initiatives.
- 7.3.5 The OBC stated that the demand of these national and local initiatives had not been matched with sufficient resources to address them. Additionally, it argued that the Council's capital budgets had been insufficient to address the backlog of repairs and maintenance in school and community buildings.
- 7.3.6 An independent property survey undertaken in 1998 calculated that within the following 5-year period there would be a repairs and maintenance requirement of £53m for the school estate which would still not address the need for an additional £51m to bring schools up to current building regulations standards.
- 7.3.7 'Investing for Education' was seen by the Council as a plan to address much more of its priority school infrastructure issues than would be possible under the constraints of traditional capital funding models. The proposed alternative funding model could attract support from the Scottish Executive under the 'Level Playing Field Support' of up to a maximum of £6.62m per annum revenue funding based on a 30-year concession period.
- 7.3.8 The desired outcomes of the overall proposal as stated in the Outline Business Case included:
- alleviation of accommodation pressures in key areas of the City;
  - resolution of inefficiencies in the delivery of education in terms of the utilisation of facilities;
  - upgrading environments that were no longer suitable for modern teaching;

- reconfiguration of provision to address the special needs of children in terms of their integration into mainstream education and the creation of Centres of Excellence; and
- contribution to the overall regeneration of deprived areas of the City.

7.3.9 In terms of affordability the financial analysis produced by the City of Edinburgh Council with the support of external advisors, used a PPP shadow financial model to establish a baseline affordability target for the Council of £12m for the Year 1 Unitary Charge. This figure was set as the initial affordability target for the bidders in the Invitation to Negotiate (ITN) process but would be subject to some revision as the process developed and additional requirements were identified.

7.3.10 The determination of this initial level of affordability assumed that the sale of surplus sites created, as a consequence of the rationalisation of the schools, could deliver a capital contribution of £15.4m towards the cost of the project. This valuation was independently verified as an appropriate professional assessment of the development value of the sites.

7.3.11 The funding by the City of Edinburgh Council of the Unitary Charge was planned to be made up from a combination of the Scottish Executive's contribution of £6.62m per annum and the transfer of existing Council annual budgets for those services which would now be provided as part of the scope of the PPP project, i.e. maintenance, cleaning, catering etc.

#### 7.4 **PROCUREMENT OF THE PPP1 EDINBURGH SCHOOLS PROJECT**

7.4.1 Following the commencement of a formal procurement process by the City of Edinburgh Council in October 1999 by way of an OJEC Notice, an initial list of eight potential bidders was reduced to four pre-qualified bidders, leading subsequently to the request for Best and Final Offers (BAFO) from two bidders; these latter two being (1) Capital Schools and (2) ESP.

7.4.2 Following formal and systematic evaluation of these BAFO bids it was recommended that ESP be nominated as 'preferred bidder' and Capital Schools be nominated as 'reserve bidder' until preferred bidder negotiations be successfully negotiated. The ESP consortium was headed by Amey Ventures/Amey plc.

7.4.3 The BAFO bid received from ESP equated to a first-year Unitary Charge of £11.695m which fell within the Council's initial affordability target of £12.0m.

7.4.4 It was a requirement of the PPP approval process that, as part of their Full Business Case submission, the City of Edinburgh Council undertook an Economic Appraisal which included the development of a Public Sector Comparator (PSC)

to test that the PPP deal represented equal or better value-for-money than a publicly funded model.

7.4.5 This analysis by the City of Edinburgh Council and their advisors calculated the basic Net Present Value of the PSC to be £116.52m as at 1 April 2000 compared to a Net Present Value of £122.342m for the ESP bid.

7.4.6 The established Treasury PFI process, however, required that a realistic assessment of the value of the risks associated with the delivery and life-cycle operation of the buildings that were being transferred to ESP under the contract be added to the PSC for a more appropriate comparison of Net Present Values.

7.4.7 A sub-group of the City of Edinburgh Council PPP Project Team, consisting of representatives of the Council staff, financial advisers and technical advisers, undertook an exercise to quantify these risks. This resulted in an assessed construction risk of £5.043m and an assessed operational phase risk of £8.381m, a total of £13.424m being added to the basic PSC net profit value, making a total adjusted PSC of £129.944m or £7.602m (6%) more than the net profit value of the ESP bid.

7.4.8 The Full Business Case presented this analysis as evidence that the proposed PPP solution represented better value-for-money than the publicly-funded option. The Full Business Case was approved by the City of Edinburgh Council on 23<sup>rd</sup> August 2001 and subsequently, prior to signing, was also approved by both Audit Scotland and the Scottish Executive.

7.4.9 A Project Agreement was signed between the City of Edinburgh Council and ESP on **8<sup>th</sup> November 2001** in relation to the design, building, finance and maintenance of a programme of 13 new or refurbished/extended schools and related projects (Phase 1).

7.4.10 This was subsequently amended by supplemental agreements in **2003** and **2004** to include a further four projects, known as the 2004 schools (Phase 2).

7.4.11 These contracts required ESP to undertake the provision of maintenance, cleaning, catering and associated facility management requirements of all the accommodation and facilities provided under the PPP1 Project Agreement and Supplemental Agreements for a period of 30 years.

## 7.5 **CONCLUSIONS – RATIONALE FOR USING PPP**

7.5.1 This first item in the remit of the Inquiry is to inquire into and report on 'The rationale for the City of Edinburgh Council entering into the PPP1 contract for schools and the effect this financing arrangement may have had on the construction process'.

- 7.5.2 This remit item needs to be broken down into two distinct questions, the first in relation to whether there was a sustainable rationale for the Council to use access to private finance through the Private Public Partnerships arrangements that were being promoted at the time as a means of upgrading the schools' infrastructure, the second in relation to the potential impact of this decision on the quality of the construction of the completed schools.
- 7.5.3 There has been considerable political debate and various reports produced over many years since the emergence of the Private Finance Initiative in the early 1990s. The debate and the content of reports have tended to focus on whether the model provided 'value-for-money' and much less on assessing the quality of the buildings, produced under this methodology from either an aesthetic, functional or construction perspective.
- 7.5.4 The access to private finance offered by the PFI was used across a wide range of public sector organisations to replace or provide necessary new infrastructure, for which public sector capital funding was not being made available. Major programmes were initiated for investment in infrastructure for transport, hospitals, schools and prisons.
- 7.5.5 Most commentaries suggest that a key underlying factor in the requirement set by Governments to consider PFI as the first procurement option for virtually all schemes of a reasonable size was to facilitate what was effectively a significant increase in Government borrowing but presented in a manner which allowed it, or was at the time interpreted as allowing it, to be treated as 'off balance sheet'. Over time there was an increased awareness in the official guidance of the need to ensure the quality of the product.
- 7.5.6 The following is an extract from a Report published by the Scrutiny Unit of the House of Commons in June 2008.

*"In the past, some advocates of PFI have argued that PFI projects have allowed more investment than would have been possible through conventional procurement methods. Other supporters argue that PFI projects are generally more efficient than projects undertaken through conventional procurement because they enable private sector innovation, and because they allow some risks to be better managed by transferring them to the private sector."*

*"In 2000 the Treasury Committee reported that "the original justification for PFI in the Autumn Statement of 1992 was that it would enable more investment to take place." The Treasury saw it as a way of tackling past capital under-investment. Later, government announcements tended to focus on PFI generating 'value for money.'"*

*"Treasury guidance on PFI, published in November 2006, highlighted value for money as the condition for choosing PFI as a procurement option: "PFI should only be pursued where it represents VfM in procurement. VfM is defined as the optimum combination of whole-of-life costs and quality (or fitness for purpose) of the good or service to meet the user's requirements. VfM is not the choice of goods and services based on the lowest cost bid."*

7.5.7 In relation to the funding of projects, this Report is not seeking to form or provide an opinion as to the overall advantages or disadvantages of using private finance as a means of enabling the delivery of public sector projects. Rather its remit is to examine the rationale of the City of Edinburgh Council, in the circumstances that prevailed at the time of the PPP1 project, of adopting it in their programme for the renewal of their schools' infrastructure.

7.5.8 In June 2002, just six months after the contract for Phase 1 PPP1 schools had been signed, this issue was addressed in an Audit Scotland Report examining the growing use of PFI for Scottish schools, which had as part of their exercise used information from PPP programmes for the replacement of schools in six Scottish Council areas including the Edinburgh PPP1 schools.

7.5.9 The Report was entitled 'Taking the Initiative – Using PFI Contracts to Renew Council Schools'. The Report includes the following extracts:

*"The single most important driver of PFI as the procurement route for new schools has been the opportunity to obtain substantial additional investment.*

*There was clear evidence of a high priority for renewal of inadequate, redundant or dilapidated school buildings in each PFI schools project that Audit Scotland examined. **But financial considerations were dominant regarding the selection of the PFI procurement route.** In practice the Scottish Executive has determined the level of investment in each case as well as the financing/procurement route. Alternative traditionally funded procurement routes have not been a viable option within the financial framework in operation."*

7.5.10 The substance of this analysis was repeated in the evidence given to the Inquiry by those witnesses who were involved in the process from the Council or had acted as advisors to the Council at the time of the decision to use PPP.

7.5.11 Since the introduction of PFI, it has been a requirement of Government that prior to approval to PFI funding it is necessary to compare the PFI option with a publicly funded option to demonstrate that it represents value-for-money. This is required to be carried out even though in many, if not most cases, no such public funding is available or likely to become available.

7.5.12 The Audit Scotland Report also noted that the centrally imposed process to be used in forming this comparison between the PSC (publicly funded) and the PPP options did not allow the calculations to reflect in the PSC the significantly lower cost of financing available to Local Authorities. It read:

*"The cost of private finance is higher than in the public sector. In any project requiring financial investment there is a cost for capital. Where borrowing is the chosen source of funding the cost will be the financing charges made by the lender. Where there is also equity investment, shareholders will seek dividends. In PFI schools projects the overall financing cost incurred by the PFI provider is part of the project costs and adds to the level of charge the council pays in return for the service.*

*For the six PFI school projects (including Edinburgh) Audit Scotland examined the overall financing cost for the private sector. This cost generally varied in the range of 8% to 10% a year, 2.5% to 4% higher than a council would pay if it borrowed money on its own account for a similar project. This higher cost of capital adds costs of between £0.2 million and £0.3 million a year for each £10 million invested in a project.*

*This difference has not been reflected in the costings which councils have prepared when comparing the forecast cost of each PFI schools deal with a hypothetical publicly funded alternative (the public sector comparator)*

*And, despite extensive technical and professional work and input to the costings in each case, there is an emphasis on the bottom line and a perception of the PSC as a simple pass/fail test. The analysis for PFI school projects most often resulted in a set of costings, which indicated the PFI solution was more economic but without an analysis of the reasons. Audit Scotland's analysis is that, in most cases, the main costs underlying the PFI option are not significantly different from or are higher than the equivalent forecast costs under the PSC. In most cases the risk adjustment tipped the balance back in favour of the PFI option.*

*A further consideration is the inevitable subjectivity that surrounds judgements on which the PSC costings are based and wider decisions regarding the respective merits of the PFI and any alternative solution to providing new schools. Under the terms of the competition for financial support from the Scottish Executive for PFI projects, no funding for the PSC was available. Consequently, if the PSC had suggested that the PFI was not economic it would have proved fatal to the project (no PFI schools project has so far failed this test).*

*A great deal therefore hangs on professional and technical judgements underpinning the PSC costings. Although the costings invariably involve a*

*significant degree of subjectivity and inherent uncertainty, reliance on them is critical to the decision whether a project will proceed or not. It is important, too, to understand how council borrowing rates, that are typically below actual PFI financing costs in individual school projects, affect the relative costs of the PSC compared to the PFI option. But the method of constructing the PSC means that this important difference in financing costs is not included in the comparison. Audit Scotland considers that, for local authorities, the actual costs of debt financing are a relevant if not necessarily decisive factor in testing the economy and ultimately the value for money of a PFI schools contract."*

7.5.13 There have been significant changes in the way such considerations are currently undertaken, however the remit of this Report is to look at the rationale of decisions taken by the City of Edinburgh Council in 2001.

7.5.14 The facts, as stated above in relation to the specifics of the Edinburgh Outline Business Case and procurement process, and the contemporaneous findings by Audit Scotland regarding the political, procedural and economic context at the time the decision was made to use PPP, are relatively clear.

7.5.15 Accordingly, this Inquiry's findings in relation to the first part of the Remit Item 1 are:

1. There was a pressing need to address the condition, configuration, efficiency and capacity of the school estate in Edinburgh, which had suffered from a lack of investment in both maintenance and new infrastructure. This could not reasonably be delayed for any significant period, other than to the detriment of the educational achievement of school-children in Edinburgh.
2. The on-going availability of public sector capital funding was at a totally inadequate level to facilitate the required level of investment and no further funding of this type was available from central Government.
3. The U.K. Government and subsequently the Scottish Executive were actively promoting PPP as their favoured route and were implementing a scheme called 'Levelling the Playing Field' under which they were offering the City of Edinburgh Council an ongoing contribution of £6.2m towards the annual revenue cost of the PPP1 project. This contribution made the PPP scheme affordable to the Council.
4. This model had recently been successfully used by other Local Authorities in Scotland.

5. The Outline and Final Business Cases, as prepared by the City of Edinburgh Council in accordance with the required procedural guidance, demonstrated that the PPP1 process represented value-for-money.
6. The Full Business Case was approved by the Council, Audit Scotland and the Scottish Government.

7.5.16 **Based on this analysis the conclusion of the Inquiry on this first point of Remit Item 1 is that, given the above context and circumstances, the City of Edinburgh Council had a sound rationale for their decision to adopt the PPP methodology for the funding and procurement of the PPP1 schools and acted both appropriately and pragmatically in making this decision.**

## 7.6 CONCLUSIONS - EFFECT ON THE QUALITY OF CONSTRUCTION

7.6.1 The second part of Remit Item 1 asks the question if this financing method had an effect on the quality of construction.

7.6.2 In this question, there is an implication that there might have been a direct relationship between the method of financing and the poor quality of construction that was discovered in the exterior walls of the schools.

7.6.3 **It is the view of this Inquiry that the financing method per se did not have such a direct relationship with the presence of defective aspects of the construction in the Edinburgh schools. There is no reason why properly managed privately financed public sector buildings, using best practice approaches, should not be capable of delivering buildings constructed to a very high standard.**

7.6.4 **The Inquiry is concerned however that some elements of best practice associated with more traditional models of procurement failed to be consistently incorporated into the implementation of PPP projects.**

7.6.5 Remit Item 3 asks this Inquiry to establish the reasons(s) for, and necessity of, the school closures, including a review of the reasons for the Oxbgangs Primary School wall collapse. This will be dealt with in full in Section 9 of this Report.

7.6.6 Unfortunately, the findings of the Inquiry will show that there were multiple factors which contributed to the defective construction of the wall in question and of the walls to all the schools. These factors included the nature of the organisation, governance and incentives of the approach to the delivery of the scheme.

7.6.7 **So, while the financing method, in itself, is not to blame, it is the view of the Inquiry that aspects of the way in which the PPP methodology was implemented on these projects, in common with many other PPP projects, in**



**terms of how it addressed the design and construction processes, did increase the risk of poor quality design and construction.**

- 7.6.8 **The Inquiry is of the view, the reasons for which will be expanded on later in the Report, that a fundamental weakness of the process adopted was the lack of properly resourced and structured independent scrutiny of the construction and an over-reliance on the part of the City of Edinburgh Council, without adequate evidence, that others in the project structure would comprehensively fulfil this essential role.**

## SECTION 8 - REMIT ITEM 2: CONTRACTUAL ARRANGEMENTS WITH ESP

### Remit Item 2:

*"The contractual arrangements between the Edinburgh Schools Partnership and Edinburgh Council."*

- This section will briefly examine the contract documentation used for the PPP1 project in terms of the key relevant provisions of the contract arrangements in relation to the responsibilities of the parties.
- The Inquiry is not intending to provide an in-depth analysis of the legal form used but to highlight issues that may have had a significance in terms of the quality assurance of the design, construction and operation of the PPP1 schools.

### 8.1 COUNCIL REVIEW OF DRAWINGS PRIOR TO CONSTRUCTION

8.1.1 A fundamental aspect of the intention behind the Private Finance Initiative was to transfer responsibility for the risks associated with the design, construction and some aspects of the operation of public sector facilities from the public sector to private sector providers. Other than in respect of the form, content and overall quality of the design and construction of buildings, there has been a precautionary tendency on the part of many public sector bodies causing them to be hesitant about examining to any depth the technical design of projects in case any resulting interventions served to reduce this intended transfer of risk. Equally to do so, for example in terms of structural calculations etc., would require a replication of a significant element of the input of the private sector and the related professional consultancy costs.

8.1.2 During the design development stage after the appointment of the preferred bidder, in order to ensure that the facilities meet all the requirements of the public sector client, there is a process for the client to review specifically prescribed elements of design data, referred to as Reviewable Design Data ("**RDD**"), as normally listed in a schedule to PPP contracts. These provisions were incorporated into the PPP1 Contract. Under these provisions, no construction work relating to these aspects of the work is supposed to commence until the requirements of RDD have been satisfied in accordance with the process laid down.

8.1.3 This schedule, included as Appendix A to Part 7 of the Contract, did not require the submission of detailed design and construction information for the cavity walls of the schools for approval by the client.

8.1.4 However, in addition to the requirement to submit the specific RDD for review by the client, there was a provision within Schedule 11 of the Contract that required ESP to provide additional information to the City of Edinburgh Council

that is not included with that to be dealt with under the reviewable data process. The following extracts from the clauses in this schedule provided the client with the opportunity to undertake a more detailed scrutiny of the detailed design of a number of aspects of the design including the construction and structural integrity of the walls.

*"SCHEDULE PART 11 (Information Specification)*

(a) *Architectural*

*The Service Company (ESP) will prepare the following **information for the Council's professional advisors to check compliance with defined standards.***

*Scheme design drawings, plans (including full room layout information, sections) (scale) and elevations at a scale appropriate for design review and construction.*

*Detailed design drawings covering the following:*

- ***Wall sections** of typical locations at a scale appropriate for design review and construction indicating **sectional details and constructional arrangements.***

(b) *Structural Engineering*

*Structural drawings for all floor levels and roofs at a scale appropriate for design review and construction to show the proposed structural form and the principal features including:*

- *Stability*
- *Provisions for structural movement*
- *Column positions*
- *Plantrooms and basements*
- *Foundation layouts*
- *Retaining wall layouts*
- *Roof layouts*

*Sections and layouts at a scale appropriate for design review and construction showing floor slab construction, type, retaining walls, **typical edge beam arrangements** and junctions with existing buildings.....*

- *Structural key plans marked up to show design loading throughout the building*
- *Summary sheets of assumptions used in the design*
- *Reinforcement drawings as and when required.*
- *Design specifications for structural elements"*

8.1.5 It is notable that sub-clause '(a) Architectural' above specifically requires that:

*"The Service Company will prepare the following information for the Council's professional advisors **to check compliance with defined standards.**"*

8.1.6 Sub-clause (c) (Structural Engineering) above, while requiring detailed information on aspects of the structure, either intentionally or through oversight, failed to include a similar mention as to the purpose of the structural engineering information, although there would be little point in a requirement to provide the information unless there was an intention to examine it.

8.1.7 Examination of the required submission of '**sectional details and constructional arrangements**' of walls under 'Architectural' and issues associated with '**stability**' under 'Structural engineering' would have facilitated a focus on the areas of the building that subsequently failed to comply with requirements.

8.1.8 The Inquiry are of the view that while the '**defined standards**' referred to are not specified in the Contract, it would be reasonable to assume that these standards would include those set down in British Standard Codes of Practice, such as those referring to wind-loading and/or referred to in the Building Regulations, which are a mandatory requirement of the Building Warrant approval process.

8.1.9 No evidence was provided to the Inquiry to demonstrate that the specific 'Architectural' or 'Structural Engineering' information referred to was either submitted to the Council by ESP or checked by the Council's professional advisors. For public sector clients to undertake the scrutiny of technical design documentation to a high degree of detail would, in the experience of the Inquiry, be unusual in PPP projects. Despite the provision for doing so in the Contract, should the Council not have undertaken or arranged for such checks of compliance, this would in no way have reduced the responsibility of ESP for any subsequent failures in design or construction. Clause 4.4 states:

*"The submission of documentation to the Council Representative, its examination by or on behalf of the Council and the making of any comments thereon (including any approvals) shall in no way relieve the Service Company of any of its obligations under this Agreement or of its duty to ensure the*

*accuracy, correctness or suitability of the matter or thing which is the subject of the submission, review or comment."*

8.1.10 The general view offered by witnesses to the Inquiry was that the Council took a very much 'hands-off' approach once the Project Agreement was signed and would have been unlikely to have taken up the provision to examine the structural engineering proposals in relation to the 'stability' of the external walls although 'stability' of the structure was specifically identified in the clause.

8.1.11 The Project Manager at the time said in evidence,

*"With regard to build quality assurance issues, the team we had was quite small. There were 3 Council architects, a couple of quantity surveyors as well as some education staff."*

*"The team put forward by the Council to deal with the Special Purpose Vehicle (ESP) included a construction manager, two head teacher liaison staff but no real structural technicians. The approval of room layouts would have been done by the single construction manager. I would accept that this was a very small team for what was a very large batch school project."*

8.1.12 **It is the view of the Inquiry that there was facility built into the contract for the Council and its professional consultants to undertake more in-depth examination specifically of the structural design than they appear to have undertaken. However, failure to apply this requirement by the Council would not have been inconsistent with general practice of PPP at the time, and in this case, would have been unlikely to have prevented the occurrence of the defects subsequently identified.**

## 8.2 THE REQUIREMENT FOR AS-CONSTRUCTED DRAWINGS

8.2.1 There was much evidence provided to the Inquiry as to the significant additional complexity that both ESP, the City of Edinburgh Council, their professional advisors and the building contractors faced following the collapse of the wall at Oxbgangs in dealing with the issues of the structural design of the walls of the school due to the absence of 'as-constructed' drawings.

8.2.2 The requirement for ESP and for the Design and Build Contractor, AMJV, to issue sets of 'as-installed' or 'as-constructed' drawings is clearly spelt out in Clauses 9.6.5 of both the Project Agreement and the Design and Build Contract.

8.2.3 In evidence to the Inquiry, several representatives of professional consultancy firms, said that as a point of policy then and now, they are only willing to provide 'final issue construction' drawings as opposed to 'as-installed' drawings. This is as a result of their inability without a significant site presence to confirm the

detail of what the contractor actually builds, as changes on site are not always notified to them, particularly under Design and Build arrangements.

- 8.2.4 It was a generally expressed view, that while contractors may seek to include this requirement into the appointment of design teams, only the contractor was in a position to mark-up drawings showing accurately what, if anything, had changed on site from the drawings issued by the design team members.
- 8.2.5 Irrespective of how the 'as-installed' drawings are produced, there is a clear requirement in the Contract to supply two copies of 'as-installed drawings' to the Council "...on or before the Certificate date for any project school..." and "to periodically update (these) in accordance with Good Industry Practice."
- 8.2.6 The Inquiry were unable to establish if properly comprehensive 'as-constructed' drawings had ever been produced, although it would appear from the evidence to the Inquiry, that if they had been, they were not regularly updated.
- 8.2.7 The absence of accurate as-built record drawings proved to be a major problem after the collapse of the wall and caused significant delay to the teams that undertook the analysis of the existing school buildings and the design of the necessary remedial works. As a result of the non-availability of this documentation, it is likely that some of the remedial work that was undertaken might have been avoided.
- 8.2.8 As will subsequently become clear further into this Report, there were significant differences between the design details on the limited number of 'final issue construction drawings' that were eventually made available to the Inquiry and what had been actually been constructed in relation to the external walls of many of the schools.
- 8.2.9 The failure by the contractor, if aware of these changes, to record amendments to the structural reinforcement of the walls on properly produced 'as-installed' drawings or to instruct the design team to do so, would have reduced the usefulness of this information even had it been properly maintained for access.
- 8.2.10 The Chief Operating Officer of Galliford Try stated in evidence to the Inquiry in relation to the inability to access this information that:
- "... these records had been incomplete, inconsistent, and the quality of information relating to each of the schools was so poor that it was felt it could not be relied upon"*
- 8.2.11 It can be seen in a response dated 6<sup>th</sup> June 2016 to the request for drawings by the Council, that WSP, the structural engineers who had designed the PPP1 schools, had advised the Council that they had not retained a comprehensive record of their information in relation to the schools. They had however

ultimately provided some information to Galliford Try in relation to the Phase 2 schools only.

8.2.12 The Inquiry was particularly surprised at the absence of this key information, as one of the main arguments put forward in support of the use of the PPP procurement methodology is the focus on the whole life management of the buildings by the companies concerned. It would seem reasonable to assume that to do so effectively would require the well-organised maintenance and management of accurate records as to the detailed construction of the buildings and that the production and retention of accurate as-built drawings would have been a key objective and requirement of ESP and Amey.

8.2.13 **The Inquiry is of the view that insufficient attention was paid by the ESP and its relevant sub-contractors to the accurate documenting, storage and maintenance of 'as-constructed' drawings and related records of the school and that the absence of these led to a more prolonged and probably more extensive remediation process than would have been required had this documentation been readily available as required under the Contract. The primary responsibility for the maintenance of the records lies with ESP.**

### 8.3 THE CONTRACTUAL ROLE OF THE INDEPENDENT CERTIFIER

8.3.1 The Contract sets down specific responsibilities to be undertaken by the Independent Certifier. The Appointment Document for the Independent Certifier uses the terminology 'Completion Services' as the heading for the list of services which the appointment requires to be undertaken. This terminology conveys the view that these services are largely undertaken as the individual school projects near completion.

8.3.2 However, in addition to the core responsibility of issuing 'Availability Certificates', which should certify that all availability criteria have been met, Clause 6 (iv) of the relevant schedule of services requires the Independent Certifier to;

*"Observe and monitor mock-ups, fabrication, construction and installation works so as to **satisfy itself** that the Project complies with the requirements of the Project Agreement, and any subsequent compliant design development."*

8.3.3 This would appear to imply an on-going comprehensive inspection during the construction of the schools, otherwise how could Independent Certifiers satisfy themselves that this was the case in relation to those many areas of the building that will no longer be visible once closed up as part of the on-going building process.

- 8.3.4 Whilst this is the wording in the Contract, it is suggested that the service as frequently delivered in the construction industry would tend to reflect more closely the implication that one might attach to the terminology, 'Completion Services'.
- 8.3.5 However, from the evidence given to the Inquiry, it was clear that there was a belief amongst some of the client representatives that the certification they received more greatly reflected Clause 6 (iv) and provided confirmation of the quality of construction, not just the completion of the building and the provision of the required accommodation, services and equipment.
- 8.3.6 The Inquiry is of the view that there appears to be a lack of clarity and definition in respect of the specific nature of the requirements placed on the Independent Certifier by the Contract and how these duties are performed. This lack of clarity was repeated in the evidence of several witnesses to the Inquiry.
- 8.3.7 Whilst the appointment of Independent Certifier is a joint appointment between public and private sector parties to the Contract, the view was expressed on more than one occasion that there was significantly less understanding of the role in the public than private sector in terms of the quite limited level of detailed scrutiny that as a norm is actually applied by the Independent Certifier to ensuring the quality of the main elements of the on-site construction.
- 8.3.8 Several witnesses suggested that the role needs better definition and consistency of application. The variation in how the role is delivered was evident in the different approaches taken by the two Independent Certifiers, Mouchel and Arup (Scotland) used respectively on Phase 1 and Phase 2 of the PPP1 schools project.
- 8.3.9 The Independent Certifier on the 13 Phase 1 projects was Mouchel, whose contract provided for a total of 611 man days over 26 months, being the equivalent of only approximately 1.8 man days per school per month if averaged out. While the work was inevitably focussed more towards the end of the project, there was still a proportion of time allocated throughout the period of construction. However, this time provision included for the significant administrative element attached to the role, allowing even less than this period of time to be allocated for inspection visits to the 13 sites.
- 8.3.10 The Inquiry was advised in evidence however, as will be discussed later in the Report, that the Independent Certifier for Phase 1, when on these sites, did regularly raise issues with the Contractor and sought to inspect the quality of the construction in so far as he could within the time constraints he was working to.
- 8.3.11 Arup (Scotland) were appointed as Independent Certifiers for the four Phase 2 schools. In contrast to the approach of Mouchel on Phase 1, a Project Director



from Arup (Scotland), who had overseen the delivery of the Independent Certifier service on these schools, said that they had understood their role in the case of the Phase 2 schools as not requiring on-going inspection of the works. He stated that their Independent Certifier:

*"..... had not inspected the construction works beyond general site walk arounds ... to monitor general progress"*

8.3.12 He advised that the focus of the service as delivered by Arup (Scotland) on the Phase 2 schools were:

*"..... pre-availability, shadow sign-off and availability inspections that had taken place shortly before the buildings were completed."*

and that:

*"In principle, the documentation comprising the 'Availability Criteria' reflected that construction complied with the 'Council Requirements'."*

8.3.13 The Inquiry was advised that the contract of appointment of the Independent Certifier for both phases of the PPP1 schools was the same. The Inquiry was unable to get confirmation from the Council that there had been any agreement with ESP and Arup (Scotland) that the role of the Independent Certifier on Phase 2 was to be focused on completion of the project and had not required on-going inspection of the construction process other than in relation to general progress.

8.3.14 A separate witness to the Inquiry, currently involved at a senior level with projects for which Independent Certifiers have been appointed, referred to what he perceived as an ongoing pressure to reduce the level of fees paid for this service, as a result of which companies are forced to reduce the amount of time they can afford to spend undertaking the work.

8.3.15 **It is the view of the Inquiry that the nature of such a fundamental service should not be determined by the level of fees that the client is prepared to pay but that the fees should reflect the level of service required to be provided, which should be made explicit in the conditions of appointment.**

8.3.16 The wording of the Contract states that the Independent Certifier shall:

*"satisfy itself that the Project complies with the requirements of the Project Agreement"*

but there is no clarity as to what degree of self-satisfaction is required in relation to the quality of construction. In the case of the PPP1 schools, unfortunately neither the somewhat more intensive approach taken on Phase 1 nor the somewhat less intensive approach taken on Phase 2 to site inspection was

sufficient to identify significant defective construction throughout the external walls of the various schools, despite which the Independent Certifiers did each certify the buildings as compliant with the requirements of the Project Agreement.

8.3.17 There is clearly a problem if clients believe they are getting a more comprehensive service than they may in reality be getting, particularly if it is mistakenly viewed as giving them reassurance in relation to the level of scrutiny being applied to ensuring the quality of construction. This may also have the adverse result of causing some clients to feel that they do not need to put in place more effective mechanisms in order to obtain the required level of reassurance.

8.3.18 Despite the fundamental importance of the issue of the Certificate of Availability by the Independent Certifier in confirming that the design and construction of each school had reached the point where it complied with the requirements of the Project Agreement, the Inquiry was surprised at the limited period of liability required of the Independent Certifiers for the PPP1 schools. Clause 10.1 of their appointments states:

*"The liability of the Independent Certifier in respect of all matters certified by any or all of the availability certificates shall expire 5 years after the date of issue of the Project Availability Certificate...."*

8.3.19 This is significantly less than the 12 years which will normally apply to most of the contractors and design team members employed on the project who have signed their contracts of appointment under deed. The level of Professional Indemnity required to be provided by the Independent Certifier was £2 million.

8.3.20 **It is the view of the Inquiry that there should be greater clarity for clients as to the level of scrutiny that Independent Certifiers are required to carry out and the degree of reliance that clients can reasonably place on the issue of Availability Certificates as evidence that the quality of construction is fully compliant with the Project Requirements. In this regard the Contract was considered to be less than totally clear.**

#### 8.4 **QUALITY ASSURANCE UNDER THE PPP1 CONTRACT**

8.4.1 This section focuses on how the Edinburgh PPP1 Contract deals with provisions aimed at seeking to ensure the quality of the project and in particular opportunities for the supervision and scrutiny of the construction works.

##### (i) Supervision of the Works

The Contract does not include an express obligation on ESP to supervise the works, although such an obligation might be implied by other

obligations such as the requirement to comply with Good Industry Practice. The Inquiry notes that an express obligation to supervise the construction works is often imposed on other project companies by the terms of comparable contracts.

(ii) Quality Plan

The Contract refers expressly to the need for a Quality Plan and requires ESP to appoint a Project Quality Manager, who was to be 'independent from the Project Management Team' to ensure the effective operation of the quality systems and to review and audit them together with the Council Representative. This would seem a positive attempt to provide a focus on the quality of the project however, no evidence was provided to the Inquiry as to the degree to which this requirement was implemented and whether an independent Project Quality Manager was ever appointed.

(iii) Inspection of the works by the Council

Under the Contract, the Council has a right of access to the Works for the purposes of inspection and attending and tests and investigations.

However, the Contract does not contain a right for the Council to open up the Works where the Council reasonably believes that they may be defective nor does it have any increased monitoring rights in the event that its inspections reveal defects or other issues.

The inclusion of specific clauses of this nature would have strengthened the position of the Council in relation to their rights of inspections of the quality of construction, had there been concerns raised as to the quality of closed up areas such as the walls.

(iv) Collateral Warranties in favour of the Authority from Principal Building Sub-Contractors and Members of the Professional Teams

The Contract does not place an obligation on ESP to procure collateral warranties for principal subcontractors and members of the design team.

In the Inquiry's experience, this is an unusual omission as this was a relatively standard provision in most contracts of this type at the time and was also a standard approach in Design and Build contracts.

Further, there is nothing in the Contract terms that requires details of the appointments of the individual members of the design teams to be provided to the Council. Accordingly, there appears to have been no direct requirement on the part of the City of Edinburgh Council to be

informed as to the level of service that was to be provided by the key members of the design teams involved.

In the Inquiry's experience, the architect, structural engineer, etc. can through their undertaking of regular site inspections, and reporting thereof, provide an additional highly valuable check on the quality of construction but only if their appointment with the D&B Contractor provides for this. The inclusion of the provision for collateral warranties would, indirectly at least (as the relevant appointments would also need to have been provided to the Council) have informed the Council as to the level of service that these key members of the design team were required to perform, including any requirement for regular site inspections.

(v) Overview of relevant Contract provisions

In 2001, when the Contract for the PPP1 schools was signed, PPP was still a relatively recent development. A standard form of contract had not yet been produced so, while there was clearly significant replication of clauses from earlier project agreements, there was still significant variation between the finally negotiated terms for each project. In particular, it must be recognised that in the negotiation of any major contract there will be trade-offs and compromises made between the parties.

It should also be noted that the provisions referred to in this section are only beneficial if they are properly implemented and the Council has due processes and resources in place to ensure that this is the case. Unfortunately, due to the passage of time and the departure of many of those involved, it has been difficult for the Inquiry to establish how effectively the provisions of the Contract were actually implemented and the level of quality assurance in relation to these provisions undertaken by the Council during the design and construction processes.

## 8.5 CONCLUSIONS

- 8.5.1 **It is the view of the Inquiry that there are a number of areas within the PPP1 Contract that could have been strengthened in relation to the subject matter of this Report and which may have provided additional assurance for the Council. However, the incorporation of such provisions, while perhaps beneficial, would have been unlikely (in the case of most of these provisions) to have helped prevent the occurrence of the defective construction subsequently identified.**

8.5.2 **There is one area where a stronger contract may have had an impact and that is in relation to the definition of the responsibilities of the Independent Certifier in terms of the actual level of inspection of construction required.**

8.5.3 A contract form currently being used on a PPP project in Scotland to appoint Independent Certifiers is much more demanding in this regard than the Edinburgh Contract. It should also be noted that it refers to the additional role of the Authority's Clerk of Works, a role not provided for by the Council in the Edinburgh project.

8.5.4 It also specifically refers to the facility for arrangements to be made for the advanced inspection by the Independent Certifier of areas of the building that may be closed up, which provision could be seen to have a particular relevance to the case of the PPP1 projects.

8.5.5 The contract referred to includes the following requirement;

*"CONSTRUCTION REVIEW*

*The Independent Tester shall:*

*5.1 Visit the Site and monitor the Works for their compliance with the Authority's Construction Requirements, Project Co's Proposals and the Approved RDD. The frequency and timing of the Independent Tester's visits are dependent on the progress of construction on Site. The Contractor shall agree a programme with the Independent Tester for the inspection of key construction processes and the completed Works and shall give the Independent Tester advance notice of these Works being carried out on Site. **The Independent Tester shall identify any aspect of the Works which needs to be inspected before being covered over by subsequent activity so that he may satisfy himself that these have been constructed in accordance with the Contractor's Quality Plan without the need for opening up.***

*5.2 Randomly check that the Works are being undertaken in accordance with the Construction Quality Plan that has been agreed by the Authority and Project Co.*

*5.3 Liaise with the Authority's Clerk of Works on a regular basis and as a minimum prior to each monthly site meeting and raise any issues identified by the Authority Clerk of Works."*

8.5.6 Additionally, this contract sets the liability period and professional indemnity requirement at 12 years and £10 million respectively as opposed to the Edinburgh PPP1 Contract requirement of only five years and £2 million.

## SECTION 9 - REMIT ITEM 3: REASONS FOR WALL COLLAPSE AND SCHOOL CLOSURES

### Remit Item 3:

*"Establish the reasons(s) for, and necessity of, the school closures, including a review of the reasons for the Oxgangs Primary School wall collapse."*

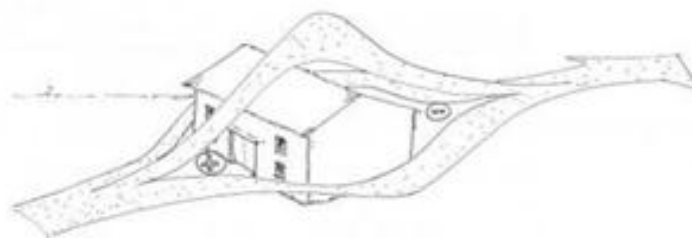
- This section of the Report will address the fundamental question asked in Remit Item 3 as to the reasons for the collapse of the wall and the subsequent closure of the schools.
- There are two distinct aspects to this Remit Item, which although connected, will be dealt with separately. The first of these is the reason for the collapse of the wall at Oxgangs School, the second is the reason for the enforced closures of the 17 PPP1 projects.
- The analysis of the Inquiry on these issues is based on the information set down previously in Section 5 which gave a detailed chronology of events from the collapse of the wall at Oxgangs School through to the reopening of the closed schools. It also relies on the accuracy of the observations made by the various teams of structural engineers in their written reports and in their evidence to the Inquiry.

### 9.1 BEHAVIOUR OF WIND AROUND BUILDINGS

9.1.1 Before addressing the specifics of the PPP1 schools it may be useful to demonstrate briefly how the wind behaves when a building is in its path.

9.1.2 The wind will flow around and over the building and will exert positive pressures on some parts of the building and negative pressures (suction) on other parts. The building acts as an obstruction to the flow of the wind, in the same way as a boulder in a river or stream, interrupting the flow of the water and causing turbulence around the boulder. Diagram 5 below illustrates the flow of air over and around a simple building.

**Diagram 5:** Wind related pressure around a building.

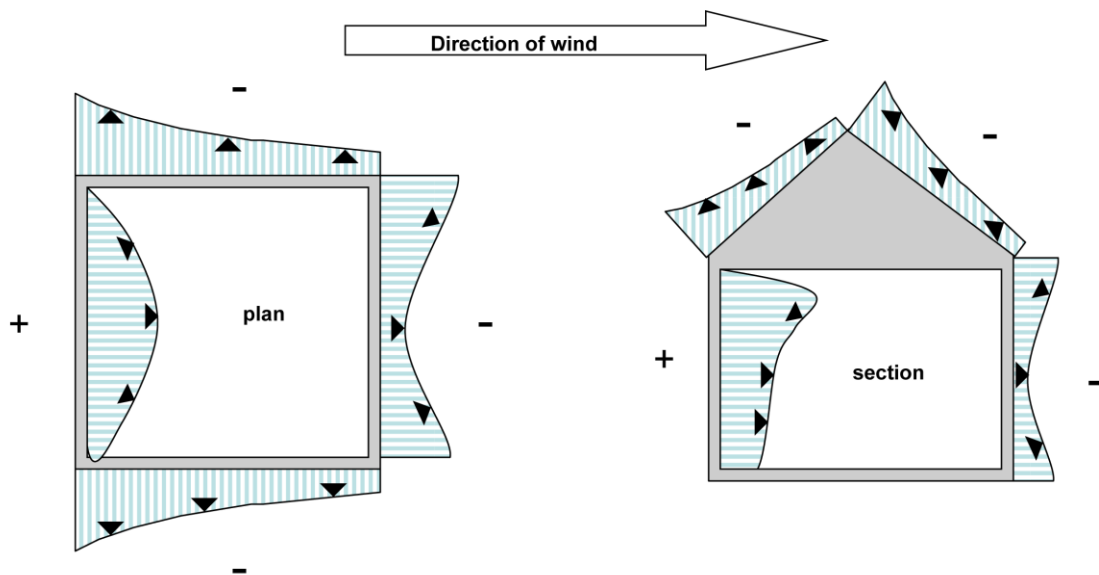


9.1.3 As the wind flows around and over the building it is forced to accelerate around the corners and over the ridge of the roof, causing high suction pressures to develop.

9.1.4 This is the reason ridge tiles are blown off buildings and why the leading edges of roof and the corners of buildings suffer the most damage in strong winds. It is also why in the case of Oxfangs Primary School the gable wall sustained damage.

9.1.5 Diagram 6 below illustrates where high pressure positive and low pressure negative zones are created around a simple rectangular structure.

**Diagram 6:**



9.1.6 If the wind was to blow in the opposite direction, then the areas that are subject to the high local pressures will change; likewise, if the wind turns through 90 degrees, then the pressure distribution around the building will change and areas that were previously subject to positive pressure will be subject to suction.

9.1.7 When the wind blows directly onto a wall panel it exerts a positive pressure, effectively trying to push the panel into the building. If the panel is at a corner then depending on the direction of the wind, the masonry panel may be subject to high local suction forces, which try to pull the wall away from the building.

The behaviour and strength of the panel is a direct function of:

- the way in which the panel is restrained at the top, sides and bottom;
- what the wall is constructed from;

- what reinforcement has been added to the panel to strengthen it, if any; and
- in the case of a cavity wall how well the inner and outer leaves are tied together.

## 9.2 REASON FOR THE COLLAPSE OF THE WALL AT OXGANGS SCHOOL

9.2.1 **It is the view of the Inquiry that the primary cause of the collapse of the wall at Oxgangs School was a direct result of poor quality construction, in the building of the external cavity wall which, in the case of a significant proportion of the wall ties failed to achieve the required minimum embedment of 50mm, particularly in the outer leaf of the cavity wall. The poor quality relates to all three of the following aspects:**

- **the direct laying of the bricks and the poor positioning of the wall ties in the mortar bed;**
- **inadequate supervision of the laying of the bricks and the positioning of the wall ties in the mortar beds; and**
- **the quality assurance processes as implemented by sub-contractors and main contractors to confirm the quality of the construction of the walls.**

9.2.2 **All three issues were ultimately the responsibility of the contractor in charge of the site.**

9.2.3 Based on the analysis presented in the 'Oxgangs Primary School: Report on the Gable Wall Failure' produced by Will Rudd Davidson, dated 29<sup>th</sup> February 2016, it is reasonable to conclude that the outer leaf of the gable wall was not sufficiently tied to the inner leaf to allow it to act together with the inner leaf to resist the combination of positive and negative pressures that were applied to the wall as a result of the strong wind associated with Storm Gertrude. It should be noted that this Report was produced by WRD who were acting as advisors to ESP at the time and that it was not commissioned or its findings influenced by the City of Edinburgh Council.

9.2.4 **It is also reasonable to conclude, based on the information in the meteorological records provided, that if the wall had been designed and built to the required appropriate standard it would have been able to withstand the level of wind loading to which it was subjected.**

9.2.5 The recognised construction industry standard at the time of the construction of the PPP1 schools required wall ties to be distributed broadly as shown in Diagram 2 at paragraph 5.2.5. In addition to the general requirement of at least 2.5 wall ties per square metre, a second key factor in determining the strength



of the tie of the outer leaf to the inner leaf is the depth of embedment of the wall ties, which according to the relevant British Standard should be a **minimum of 50mm**.

9.2.6 This 50mm requirement is considered very much a minimum figure. A leading manufacturer of wall ties recommends that embedment in the use of their wall ties should be between 62.5mm and 75mm. All competent building contractors and sub-contractors would be expected to be fully aware of the minimum requirement of 50mm whether or not it is specified in the project documentation.

9.2.7 **In line with the standard minimum requirements, the specification produced by the design team for the Oxfangs School did also specifically require a minimum embedment of 50mm into the bed joint of both inner and outer leaves of the cavity walls in accordance with the requirements of the relevant British Standard. Therefore, in this specific regard the issue was not as a result of any fault in the specification.**

9.2.8 The specification clauses provided in relation to the installation of the wall ties, as produced jointly by the architects for the Oxfangs School, Holmes Partnership, and the structural engineers, WSP were as follows:

*"233 FIXING TIES IN MASONRY WALLS WITH PARTIAL FILL CAVITY INSULATION*

- *Bed not less than 50mm into bed joint of each leaf.*
- *Slope downwards towards the outer leaf with drip centred in the cavity and pointing downwards. Do not bend ties to suit coursing.*
- *Evenly space in horizontal and vertical rows (i.e. not staggered) at 900 centres horizontally and 300mm centres vertically, unless otherwise specified.*
- *Provide additional ties within 225mm of reveals of unbonded opening."*

(It should be noted that the 300mm dimension specified above for vertical centres is not a practical spacing for blockwork and is most likely a typing error. This was probably intended to be 225mm, i.e. one blockwork course, as was indicated on several drawings produced by the design team).

9.2.9 The results of the structural survey undertaken by WRD, acting on behalf of ESP, led them to conclude in their Report dated 29<sup>th</sup> February 2016 as follows:

*"A combination of excessive cavity width, related non-verticality, and incorrectly constructed wall ties has resulted in a cavity wall construction which in many of the ties had insufficient embedment of the wall ties in the outer leaf. This in our view is the **primary** contributory factor."* (of the collapse of the wall)

- 9.2.10 **The Inquiry has no reason to disagree with this analysis.**
- 9.2.11 The fact that in further investigations a similar lack of adequate embedment of wall ties, to that reported in the survey of the gable wall at Oxfangs School, was subsequently discovered to be present throughout the rest of the external walls of Oxfangs School, and in a further series of investigations was found to be present throughout the remaining PPP1 schools, lends strong support to this being a realistic and accurate assessment of the condition of the wall and a prime cause of the collapse of the wall.
- 9.2.12 The reported variance in cavity width and the references to verticality issues in the blockwork inner leaf of the cavity wall are likely to have contributed to the lack of embedment of wall ties.
- 9.2.13 On the following photograph of the collapsed section of the Oxfangs gable wall, one can see against the remaining inner blockwork leaf, the use of diagonal flat steel bracing bars in one of the structural bays. In order to accommodate these bars, the blockwork in their vicinity had to be cut back or reduced to around 100mm thick in some locations as opposed to 140mm thick blockwork elsewhere. The staggered joint line of the reduced blockwork can be seen in the area encircled red.
- 9.2.14 The wall ties that were installed in this location can also be seen where they remained as the external leaf of brickwork was pulled outwards off the wall ties by the suction of the wind, the embedment of wall ties in the outer face being insufficient to resist this negative pressure.
- 9.2.15 Any wall ties in the reduced areas would have to span a cavity width of 160mm rather than 120mm. The specified **250mm** long wall ties used would therefore be unable to achieve the minimum required embedment of 50mm to both leaves at these locations, (i.e. 50mm + 160mm + 50mm = **260mm**), and any deficit in embedment would be exacerbated by any further occurrence of the defective construction that resulted in a widened cavity elsewhere in the wall or through greater than 50mm embedment in the inner leaf as the result of it being built first.



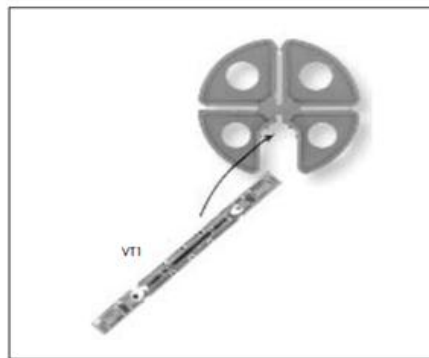
*Image 23: Photograph of the collapsed section of the Oxfangs gable wall.*

- 9.2.16 Part of the evidence provided to the Inquiry was information that **the inner blockwork leaf of the cavity wall had been built prior to the construction of the outer leaf of the wall.**
- 9.2.17 This has come to be a common approach adopted by builders anxious to quickly provide a dry enclosed envelope to the building so that internal trades can commence at an earlier stage of the construction process than they could otherwise do. Doing so, without taking appropriate additional quality protection measures, does however bring with it several risks to the quality of the construction, including specifically the lack of proper embedment of wall ties.
- 9.2.18 In the case of the PPP1 schools, the internal leaves of the panels of blockwork of the cavity walls were built between the steel columns of the structural frame of the building so that their internal face aligned with the internal face of the columns. If there had been any slight misalignment in the steelwork erected, as can occur and which, if within allowed tolerances, can be acceptable, then in order to ensure a consistent inner face of blockwork with the face of the columns, the bricklayers will have followed the line of the steelwork columns and beams rather than seeking to ensure that the walls were being built exactly plumb or in line. If the outside leaf is then completed later and is built plumb and to line, this can lead to variation in the width of the cavity between top and bottom of the wall and along its length, resulting in a possible widening of the cavity and reduction in the embedment of wall ties achieved.
- 9.2.19 A practical difficulty associated with constructing the inner blockwork leaf first, is that the wall ties are required to be built into the wet mortar bed of the inner

leaf as the wall is built and be left with sufficient length projecting out so that the other end of the wall tie can be built with the correct embedment into the outer leaf when it is eventually constructed.

- 9.2.20 As the outer leaf is not yet there when the inner leaf is being built and the bricklayer is not able to see the actual cavity, there is not the same visual reference and reassurance that the wall tie is being placed, as required, equidistantly between the two leaves.
- 9.2.21 There is also a risk that the protruding ties may fall out due to either overbalancing as the force of their cantilevered weight could be stronger than the restraining force of the grip of the still wet mortar or as a result of being knocked out before the outer leaf is built. As a result, bricklayers, seeking to prevent this, can tend to place the wall ties further into the mortar bed of the inner leaf than required, potentially leaving an inadequate length projecting to allow the achievement of the minimum 50mm embedment in the outer face.
- 9.2.22 The type of wall ties used in the construction of the Oxgangs gable wall was a 250mm heavy duty strip tie of the type produced by a company called Vista, an example of which is depicted below.

**Diagram 7:** A Vista VT1 heavy duty wall tie similar to those used in the Oxgangs gable wall and clip for retaining insulation against inner leaf.



- 9.2.23 The Inquiry received evidence from an experienced technical services engineer employed by Ancon, one of the leading manufacturers of wall ties in the UK. He was asked, when shown one of the wall ties that had been recovered from the collapsed Oxgangs wall, how easily and successfully he felt this type of wall tie could be installed in the situation where the leaves of a cavity wall are built separately. He responded:

*"Looking at the strip wall tie, this would be quite difficult to use if installing in the inner leaf first, before the outer leaf catches up. When placing one end of the tie in the mortar of the inner block, the tie would almost certainly overbalance before the mortar has had time to fully cure,*

*due to the weight and projection of the tie itself. Sometimes, a bricklayer will embed the tie more on the inner leaf to stop this from happening."*

9.2.24 To overcome the risk of ties falling before the mortar hardens, rather than embedding the wall ties in each joint as the wall is built, bricklayers have been known to push them into the still wet joints between blocks from the outside face. This is regarded as unacceptable practice, as the wall tie will create a void in the mortar as it is pushed in and as a result will not give the required degree of adhesion between wall tie and mortar to provide the required strength of connection between the inner and outer leaves of the wall.

9.2.25 A further risk, associated with building the leaves separately, is that as the leaves are built, potentially by different teams of bricklayers, the brick courses in the outer face may, as the wall rises, become out of alignment with those of the already built blockwork inner face. This makes the proper installation of the projecting wall ties into the outer leaf even more difficult. The heavy-duty ties which were used would prove particularly difficult to bend by bricklayers seeking to deal with any potential non-alignment of coursing between the two leaves.

9.2.26 In line with what was standard practice, the specification jointly produced by the architects and structural engineers on the original design team contained the following extracts from clauses:

*"535 Height of Lifts*

- Raise no portion of the work more than 1.2 m above another at any time*
- Do not carry up one leaf more than 1.5 m in any one day unless permitted by the CA*

*545 Levelling of Courses*

- Bring both leaves of cavity walls to the same level at every course containing vertical twist type ties or other rigid ties"*

9.2.27 The Inquiry were advised as part of the evidence given by the architects, the Holmes Partnership, that failure to comply with this requirement had been raised by them initially during the construction of the Phase 1 schools. They advised that the circulated notes of a visit to site showed that this issue had been brought to the attention of both AMJV and the Tier 2 contractor Lilley Construction, during the construction of Pirniehall Primary School, a Phase 1 school.

- 9.2.28 The following is an extract from a written statement relating to this issue offered in evidence to the Inquiry by The Holmes Partnership (now Holmes Miller). (References to "CJV" are to AMJV):

*"It appears Contractors, and the CJV, ignored this requirement, building the inner leaf first and following on building the outer leaf at a later date. The matter was highlighted in our Site Visit Notes from Pirniehall/St. David's on 5<sup>th</sup> April 2002, but was not acted upon and carried on through the course of the project. We had no power to instruct the CJV/Contractors to comply with our F10 specification; we could only highlight to the CJV/Contractors where there were deviations from the specifications"*

- 9.2.29 As part of their verbal evidence, a Director of The Holmes Partnership, who had been directly involved in the projects at the time as an architect and associate within the practice added:

*"...the Holmes Partnership had concerns due to worries about coursing and how the wall ties would be built in to avoid water being directed back towards the inner leaf"*

and that:

*"...it was not uncommon for the specification requirement to build both leaves in parallel to be ignored in D&B projects for programme reasons."*

- 9.2.30 Evidence given to the Inquiry identified the bricklaying sub-contractor who built the wall that failed at Oxgangs School as VB Contracts. Despite several attempts, the Inquiry failed to receive a response to an invitation to give evidence sent to what is thought to be the current address of the person who was Chief Executive of VB Contracts at the time of the construction of Oxgangs School. VB Contracts was appointed by Miller Construction to build the masonry walls for all four Phase 2 schools. The company is reported as having gone into liquidation in 2008.

- 9.2.31 The Chief Operating Officer of Galliford Try, the company that acquired Miller Construction, in his evidence to the Inquiry in relation to the construction of the wall said:

*"There is a reverse hierarchy of responsibility in regard to the way the wall had been built, and in my view the bricklayer who built the wall will have known that the wall had not been correctly built and that it had knowingly been left in an unsafe condition due to the embedment issues caused by the cavity variations."*

9.2.32 When asked how it was that the Quality Management Systems in place had failed to identify these defects, the Chief Operating Officer replied:

*"It was incumbent on each Main Contractor to ensure that the buildings had been built properly. It would be expected that a bricklayer should have brought the wall tie embedment issue to the attention of the main contractor. As a wall is closed up, then a supervisor would not always have the opportunity to inspect the cavity and the wall head restraints. There is always reliance on people doing what they are supposed to do."*

9.2.33 **The view of the Inquiry on these issues is that even though as stated every member of the construction team has a duty to carry out their responsibilities in an appropriate and conscientious manner, evidence would suggest, unfortunately, that this is sometimes not the case and cannot safely be relied upon to be the case.**

9.2.34 **Accordingly, systems must be employed by contractors that are able to provide the level of assurance required as to the quality of all aspects of the construction, especially in relation to those elements of construction the failure of which could result in injury to users of buildings.**

9.2.35 **It is the view of the Inquiry that the quality management systems, as implemented on the PPP1 projects, were insufficient to prevent the defective construction that could, in slightly different circumstances, have resulted in the fatalities of children.**

9.2.36 The structural engineers appointed to support this Inquiry undertook a structural analysis of all the panels in the Oxgangs gable wall, including the panels that collapsed. These calculations showed that to meet the required wind-loadings, the collapsed panels would not only have had required to be properly restrained on all four sides, including the use of the missing head restraints, but would also have required additional stiffening in the form of either bed joint reinforcement or windposts.

9.2.37 This confirmed the conclusion reached separately, following their analysis of these panels, by Goodson Associates, the structural engineers appointed by Galliford Try to undertake the design of the remedial work to Oxgangs School. To satisfy this requirement, Goodson Associates specified the incorporation of bed joint reinforcement at 225mm centres to the brickwork panels in the rebuilding of the external leaf of the collapsed gable wall.

9.2.38 WSP did not agree with these findings and advised the Inquiry that they:

*"have carried out our own calculations on the wall panels in the wall that collapsed. This was done for the wall construction as designed by WSP"*

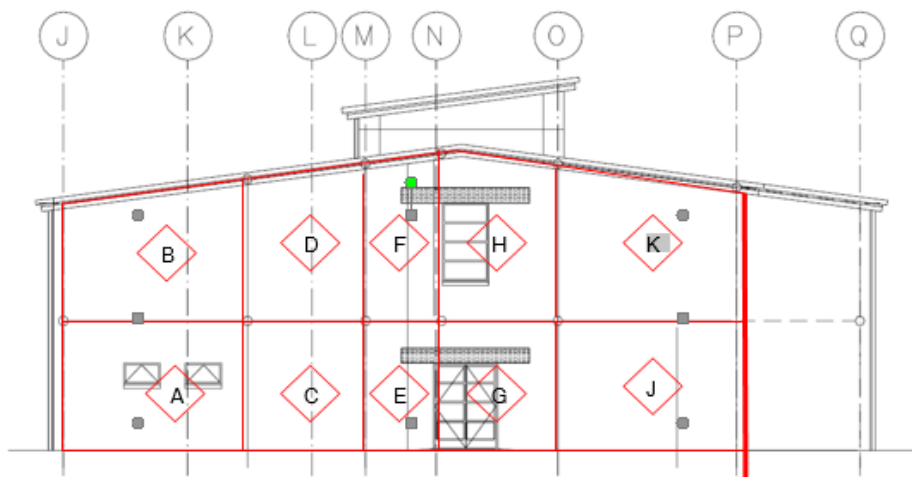
*and we can confirm that our calculations demonstrate that the panels provide suitable capacity.”*

- 9.2.39 The Inquiry requested sight of these calculations to allow the design parameters used and methodology adopted to be reviewed against the independent calculations, but WSP advised that were unable to release this information for contractual reasons.
- 9.2.40 In examining the original 'construction status' drawings for Oxgangs school, that were provided to the Inquiry by Galliford Try, the Inquiry established that while the drawings produced by structural engineers WSP, showed the requirement for bed joint reinforcement and windposts to be incorporated into other walls of the school, no requirement for either component was shown on the drawings for the panels that collapsed.
- 9.2.41 If bed joint reinforcement had been specified and built into the outer brick leaf of the gable wall, this would have stiffened the panel, helping to hold it together, and may have to some small degree compensated for the inadequate embedment of the wall ties, making the panel slightly more capable of resisting the suction force of the wind. However, the structural integrity of the wall and the contribution of the bed joint reinforcement to the two leaves of the wall acting as one single element, depends on the two leaves being adequately tied together by the wall ties, which due to the lack of embedment was not the case.
- 9.2.42 The discovery of the absence of the specified head restraints in this wall was made by Galliford Try as they were commencing their programme of installation of remedial wall ties. The type of head restraint that had been specified by the original design team required both inner and outer leaves of the cavity wall to be tied back to the steel beams at 900 centres along their length.
- 9.2.43 As well as tying the individual leaves to the beam, this type of head restraint would have also provided a row of additional wall ties connecting inner and outer leaf along the top of the wall panels. While the fundamental fault remains the lack of embedment of the general wall ties, the failure to install these restraints meant that, in the circumstances of the storm, a somewhat greater loading than would have otherwise been the case, was required to be borne by the inadequately embedded wall ties, thus again contributing to the cause of the collapse of the inadequately tied outer leaf.
- 9.2.44 The gable affected by the collapse is illustrated below. Panels A, B, C, D, F and H were affected by the collapse.
- 9.2.45 As previously mentioned, after being appointed by Galliford Try, Goodson Associates undertook calculations to check the design of the wall panels at Oxgangs School, including panel 'B' as shown on the drawing below. These



calculations together with some of the construction drawings for the Phase 2 that had been provided to Galliford Try by WSP were made available to the Inquiry. The calculations showed that panel 'B' would have failed the required wind loadings test, unless in addition to restraints on all four sides, additional strengthening of the panel was provided in the form of windposts or bed joint reinforcement.

- 9.2.46 This assessment found that the same issues, in relation to inadequacies in the structural design of panel 'B', applied to panel 'K' which would also fail to satisfy the required wind loading. Further calculations indicated that the design of panel 'H' would equally have failed.
- 9.2.47 The structural engineering advisor to this Inquiry undertook a similar detailed assessment of the panels in the same gable at Oxfangs using the "Construction" status drawings released to the Inquiry by Galliford Try and came to the same conclusions in relation to inadequacies in the design of panels 'B', 'K', and 'H'.
- 9.2.48 The remedial designs developed by Goodson Associates and implemented by Galliford Try satisfactorily addressed these issues.



**Image 24:** Structural construction drawing.

- 9.2.49 From the photographs of the bricks from the collapsed wall lying on the ground and of the exposed outer face of the inner blockwork leaf, it is reasonably apparent that neither bed joint reinforcement or wind posts were built in as part of the original construction of the wall. This was in accordance with the information on the structural 'construction drawings' as produced by WSP and provided to the Inquiry by Galliford Try, which showed no requirement for either.
- 9.2.50 **It is the conclusion of the Inquiry that in addition to the lack of embedment of wall ties, as the primary cause of the collapse, there was a failure to install the**

**head restraints as specified in the design documentation, the absence of which may have also contributed to the collapse of the panels.**

9.2.51 **It is also the conclusion of the Inquiry based on the calculations undertaken by Goodson Associates, and on the independently undertaken calculations by the structural engineering advisor to the Inquiry, that the structural design of panel B, the collapsed panel, would appear to be inadequate. (As previously stated, WSP have advised the Inquiry that they do not agree with this conclusion).**

9.2.52 **While this was not the primary cause of the collapse of the panel, the absence of bed joint reinforcement in this gable wall, despite being specified by WSP elsewhere in the exterior walls of Oxfangs School, may also have contributed to the failure of the panel.**

9.2.53 The following possible causes in construction projects in general, rather than specifically in the case of these schools, of failures to install specified components such as head restraints were put forward by a number of witnesses, in each case based on their considerable experience of working in the construction industry.

- The information provided by the design team may not have been clear as to what was required.
- The information provided to the sub-contractor by the main contractor may not have been complete either for pricing by the sub-contractor or for implementation on site.
- The information in relation to the head restraints provided by the sub-contractor to the specific brick-laying squad or bricklayer may not have been complete or sufficiently clear.
- The number of head restraints may have been intentionally reduced to reduce costs.
- The bricklayers, who were generally paid by the area of wall they completed in a day and not for the number of hours they had worked, may have omitted the head restraints as the installation of restraint fittings can significantly slow up the rate at which bricks can be laid and hence the amount the bricklayers could earn in a day.
- The bricklayers involved may not have had the requisite skills necessary to install the head restraints or were not aware of the implications of omitting them.

- 9.2.54 **The Inquiry would wish to emphasise that these potential reasons for the missing head restraints were offered by witnesses as examples of possible scenarios that could have led to their omission and there is no definitive evidence to support these possible causes as having occurred.**
- 9.2.55 However, some witnesses gave evidence which lent support to the list of possible reasons. This included evidence given to the Inquiry by a senior qualified structural engineer who advised that, at the time of the design and construction of the PPP1 schools, he had been the Technical Director of WSP responsible for the delivery of the structural engineering services in relation to the PPP1 schools. He is no longer a member of staff of WSP, having left the company some years ago.
- 9.2.56 In relation to the provision of secondary steelwork he advised the Inquiry that he thought:
- "At the time the sub-contractors were pricing the jobs, that only architects' drawings had been available, as the level of secondary steelwork had not been fully developed and therefore may not have been allowed for in the costs agreed."*
- 9.2.57 He added that he recalled:
- "As the design was developed there had been heated arguments regarding the extent of secondary steelwork needed on the project."*
- 9.2.58 However, he also expressed his confidence that the design had been undertaken very thoroughly and diligently. He specifically advised the Inquiry that in his opinion WSP had been particularly thorough in defining bed joint reinforcement requirements, although he did not know what had been given to the bricklayer. He added that a bricklayer may not think to ask for structural drawings.
- 9.2.59 When asked on whose drawings he thought that these types of restraint and reinforcement details should be shown, he noted that in his opinion there was a reluctance for architects to show these details on their drawings due to concerns about attracting liability.
- 9.2.60 This view concurred with the evidence provided by the current Director of Holmes Miller Architects, who had been involved in the projects and had advised the Inquiry that he would rely on the information in relation to the requirement for head restraints and bed joint reinforcement being properly provided on the structural engineers' drawings and in the specifications.
- 9.2.61 Further to this point, the ex-WSP Director advised the Inquiry that before qualifying as a structural engineer he had himself worked as a bricklayer for

about eight years and he could not recall having been given structural engineers' drawings, normally only having been provided with architects' elevations.

- 9.2.62 One of the two witnesses who attended the Inquiry as representatives of the Scottish Building Federation, who also was previously a bricklayer and is currently a Construction Director with a medium-sized construction company, echoed this view. He stated:

*"We would emphasize though that a bricklayer will generally just build walls. A foreman should normally have access to all the drawings and use those to brief the bricklayer. The bricklaying squad would usually be given general plans and elevation drawings but may not be provided with all the additional details that may be available to the managers and supervisors. The squad won't necessarily ask for copies of all the available drawings. So, for example, unless they and the bricklayers are made aware or told that bed joint reinforcement or wall head restraints for that matter are required, they won't automatically know that it should be there and build it in."*

- 9.2.63 **Given the wide extent of failure to incorporate elements of reinforcement and restraint to the brick panels that were shown on engineers' drawings across the PPP1 schools, and the fact that these schools were built by a range of different contractors and subcontractors, it is perhaps appropriate that the construction industry reviews how effectively information is produced, coordinated, presented and communicated to contractors and to tradesmen on site so that there is clarity at all levels as to the precise requirements of the design.**

- 9.2.64 Finally, in relation to identifying the cause of the collapse of the Oxfangs School wall, as several witnesses to the Inquiry stated, the quality of construction of a masonry wall is primarily determined by the competence of the bricklayer and the quality of the workmanship applied.

- 9.2.65 On this issue, there was virtual unanimity in the opinions expressed by witnesses from all sectors as regards the current parlous state of traditional skills such as bricklaying in today's construction industry and the lack of availability of high quality experienced bricklayers, many of whom have left the industry. Evidence suggested that, over at least the last twenty years, it has been increasingly difficult to attract young people to take up these trades, due to the nature of the work, the nature of the construction industry and the uncertainty of a continuity of employment.

- 9.2.66 In evidence to the Inquiry a Regional Manager of the Construction Training Board said:

*"Sub-contractors are not often seen to be part of the team due to the way they are treated and the short periods that they are often involved on a project. There is little interest in the follow-on activities or trades. Bricklayers are often enticed to move on through better rates which reduces their feeling of ownership on a project."*

9.2.67 **The Inquiry is of the view that, given the widespread nature of similar defective construction across the 17 PPP1 projects, undertaken by bricklayers from different sub-contracting companies, and from different squads within these companies, there is evidence of a problem in ensuring the appropriate quality in this fundamental area of construction. The construction industry needs to re-examine its approach to the recruitment, training, appointment, means of remuneration, vetting, supervision and quality assurance of bricklayers.**

### 9.3 **REASON FOR THE CLOSURES OF THE SCHOOLS**

9.3.1 Section 5 of this Report has set out the chronology of events which ultimately led up to the decision on 8<sup>th</sup> April 2016 to close all the schools with immediate effect.

9.3.2 There were in fact three separate occasions of closures of schools:

- the closure of Oxgangs School on 29<sup>th</sup> January 2016, the day of the collapse of the gable wall;
- the closure of the three remaining Phase 2 schools in the week commencing 14<sup>th</sup> March 2016, following initial survey reports of evidence of similar lack of embedment of wall ties in these schools; and
- the closure of all the PPP1 schools with effect from 11<sup>th</sup> April 2016 following the Council being advised that it had been discovered that required head restraints were missing.

9.3.3 **It is the view of the Inquiry that the decision to close Oxgangs School on the day of the collapse was entirely reasonable and appropriate. At this stage the Council did not know the cause of the collapse, other than an assumption that it was related to the strong winds associated with Storm Gertrude.**

9.3.4 Oxgangs School reopened on Tuesday 2<sup>nd</sup> February after temporary shoring was installed to prevent any potential further collapse of the now exposed remaining inner leaf of the gable cavity wall.

9.3.5 In early March, the Council were advised that the outcome of the investigation into the collapse of the gable wall, which investigation was at that time restricted to solely the wall in question, had determined that the primary cause

of the collapse was failure to properly embed many of the wall ties sufficiently into the bed joints of the outer brick face of the cavity wall.

- 9.3.6 During the week commencing 14<sup>th</sup> March 2016, decisions were taken to close all four Phase 2 schools at meetings of Council officers held to review information from the follow up intrusive surveys of the Phase 2 schools. The first survey received indicated the wide presence of inadequate wall tie embedment to the perimeter walls of Oxgangs School. The initial analysis of this information by WRD suggested that up to 50% of the wall ties in the School might not be sufficiently embedded.
- 9.3.7 The view of the Council officers was that the reported extent of potentially defective external brickwork wall panels around the complete perimeter of the school was such that it was impractical to seek to assure the safe operation of the school and grounds, even with the creation of exclusion zones. A decision was made to close Oxgangs School with effect from the next day, Wednesday 16<sup>th</sup> March 2016.
- 9.3.8 Information from further surveys advising of the presence of similar defects in the other three Phase 2 schools was received on 17<sup>th</sup> March. This quickly led to a decision to close all three of the other Phase 2 schools, Braidburn School, St. Peter's Primary and Firrhill High School with immediate effect from the morning of **Friday 18<sup>th</sup> March 2016**.
- 9.3.9 In the case of Firrhill High School, which had been an extension and refurbishment rather than a completely new school, it was decided that it would close from the **18<sup>th</sup> March 2016** to allow the undertaking of detailed structural surveys but re-open again on **21<sup>st</sup> March 2016** until **24<sup>th</sup> March 2016** when the Easter holiday period would commence.
- 9.3.10 The Inquiry was advised in evidence that the decision to close the schools was made purely as a result of the unwillingness of the Council to expose school children and staff to avoidable risk in light of the information provided as a result of the surveys. Effectively they had been advised that the same defect in construction, reported to have caused the collapse of the gable wall at Oxgangs, was also potentially widespread throughout the Phase 2 schools.
- 9.3.11 In a practical sense, it was also hoped that this short extension to the upcoming period of closure would allow the planned necessary remedial works to be completed prior to the end of the Easter holiday period and the reopening of the schools on 11<sup>th</sup> April 2016.
- 9.3.12 The Council also decided that, pending the results of the on-going surveys of the Phase 1 schools, these schools should remain open until the commencement of the Easter school holidays on 24<sup>th</sup> March 2016.

- 9.3.13 The Inquiry was advised that the logic behind the decision was that there was no evidence at that time to indicate that the defective installation of wall ties extended to the Phase 1 schools that had been built some two years before the Phase 2 schools. The fault was at this stage thought to be restricted to the four Phase 2 schools all of which had been built by the same contractor, Miller Construction. This reasonable assumption would be found to be incorrect within only a few days of this decision as the survey information on the Phase 1 schools began to emerge.
- 9.3.14 It should be noted that the perimeter walls of all the PPP1 schools had been subjected to a visual inspection undertaken by structural engineers immediately after the collapse of the Oxgangs wall. In no case had this led to concerns as to the presence of similar defects in the construction of the external walls of these schools as it was reported that there were no visible signs of structural distress in the masonry.
- 9.3.15 **The subsequent discovery of significant defects, following intrusive investigations, would suggest that visual inspections are not sufficient on their own to provide an informed opinion as to the existence or otherwise of defects of this type.**
- 9.3.16 **It is the view of the Inquiry that it was an appropriate decision by the Council to close the four Phase 2 schools following information from the structural engineering consultants, who were acting for ESP, which suggested that up to 50% of the wall ties in the schools could be inadequately embedded in the external walls of these schools; this having previously been identified by the same consultants as the primary cause for the collapse of the wall at the Oxgangs School.**
- 9.3.17 The last closure of the schools was the most significant, commencing on the 11<sup>th</sup> April 2016 and extending until it had been independently confirmed, in the case of each school, that the remedial works had rendered the buildings safe to reopen.
- 9.3.18 The circumstances leading up to the decision to close the schools were most unfortunate in terms of their timing. On 5<sup>th</sup> April 2016, ESP had presented letters of assurance as to the completion of all interim remedial measures previously agreed with the Council as necessary to provide a safe environment for pupils and staff due to return to school on 11<sup>th</sup> April 2016 after the Easter holiday period.
- 9.3.19 On 8<sup>th</sup> April 2016, after advising Council officers of the facts at a meeting that afternoon, ESP formally wrote to the Council confirming that the situation in relation to their ability to provide assurances as to the safety of the schools had changed. This had followed the discovery by Galliford Try employees, working on

the Oxgangs School, of the apparent absence or inadequate spacing of head restraints that were normally required to connect the head of external cavity wall panels to the structural frame of buildings. The key extract from the ESP letter is repeated here for convenience of the reader:

*"Shortly before noon today we were advised by the design and build contractor who is executing the remedial works at Oxgangs Primary and St. Peter's Primary that it had discovered serious defects **as a result of which it has advised that these schools are no longer safe to occupy.** Representatives of the Council were advised of the position this afternoon at a meeting with ourselves and the design and build contractor.*

*At present, it is impossible to confirm whether the same defect may exist at the other Estate buildings. In these circumstances, we are afraid that we have no option but to withdraw the confirmation contained in our letter of 5 April 2016 that the Estate buildings identified in the letter are safe for occupancy."*

- 9.3.20 The receipt of a letter stating categorically in relation to Oxgangs and St. Peter's Schools that the Contractor for the schools had advised that 'these schools are no longer safe to occupy' on the Friday before the Monday when all the schools were due to open left the Council with little option other than to close these two schools with immediate effect.
- 9.3.21 The statement by ESP that they would 'have no option but to withdraw the confirmation contained in our letter of 5 April 2016 that the Estate buildings identified in the letter are safe for occupancy' was equally concerning to the Council. The letter of 5<sup>th</sup> April 2016 had in fact listed all the PPP1 schools, so this statement effectively advised the Council that ESP could no longer confirm the safety of any of the 17 PPP1 projects. The inference in the letter from ESP was that there was a possibility of the same absence of head restraints in the rest of the school buildings. Accordingly, they could not continue to provide the Council with an assurance that the buildings were safe for occupancy.
- 9.3.22 Up to this point, when the only problem that had been identified to the Council was the lack of embedment of wall ties, the Council had, somewhat reluctantly, agreed to accept the 2-staged approach to the completion of the remedial works, with the second stage planned to be undertaken during the normal period of closure of the schools over the summer.
- 9.3.23 Their agreement to this approach had followed consideration of both the survey information and the expert opinion provided. This indicated that any further failure due to lack of embedment of the outer leaf would most likely result in a similar collapse to that experienced with the Oxgangs School; that is, a collapse of the outer leaf brickwork towards the exterior of the building. Mitigation



measures had been proposed that would ensure that any such collapses would be into exclusion zones which would be inaccessible to school children or members of the public.

- 9.3.24 The Report, on the 8<sup>th</sup> April, advising of the lack of head restraints in two of the Phase 2 schools and uncertainty as to whether it might be present in the Phase 1 schools, (subsequently found to be the case) changed the analysis of risk.
- 9.3.25 As will be explained further below, the information provided on 8<sup>th</sup> April 2016 to the Council suggested that the wall panels of the schools might not meet the requirements of the design codes. The absence of the head restraints meant that complete wall panels, both inner and outer leaves, may not have the necessary resistance to wind loading required to provide an assurance that the schools were safe.
- 9.3.26 If subjected to very strong winds of storm force, the absence of head restraints could contribute to the failure of both leaves of the cavity wall panels, not just the outer leaf. Both leaves of inadequately restrained wall panels, if exposed to strong wind pressure, could potentially collapse inwards as well as outwards. Such an eventuality could not be catered for by the proposed strategy that up to then had been accepted by the Council i.e. the creation of **external exclusion zones**.
- 9.3.27 The proposed strategy involved keeping pupils inside the buildings if they were already there when a wind warning was received. The adoption of this strategy would now have meant that those children, and the staff looking after them, could have been at risk from an inward collapse of masonry.
- 9.3.28 Also, if due to lack of embedment of wall ties there was to be a repetition of the collapse of only the external brickwork face of a wall panel in any re-occurrence of strong wind, the inner blockwork leaf, its structural integrity already significantly compromised by the lack of head restraints and loss of the contribution to overall structural capacity provided by the outer leaf, would now be fully exposed to further gusts, which it might then be unable to withstand.
- 9.3.29 Finally, the proposal from ESP that, if severe winds were expected and warnings were issued prior to the commencement of the school day, then pupils should remain at home, made the weather a determinant as to the provision or not of the essential continuity of access by pupils to education on designated schooldays. If the schools were not considered safe for pupils to enter during occasional periods of the high wind speeds that they had been required to be designed for, then the schools were effectively not fit for purpose.

9.3.30 **It is the view of the Inquiry given:**

- **the already identified significant problem of poor embedment;**
- **the nature of the letter received from ESP withdrawing their previous confirmation that the schools were safe to occupy;**
- **knowledge of the dramatically reduced effective capacity of the brick panels to withstand wind-loading as a result of the omission of head restraints;**
- **the new awareness of the increased risk of an internal as well as external collapse of the cavity wall panels;**
- **the fact that there were only two days remaining before the schools were due to open; and**
- **the unacceptability of the continuity of teaching time over the remaining months being dependent on the weather**

**that the only practical and safe course of action in these circumstances was to close the schools in question, decant teachers and pupils elsewhere and commence an immediate programme of remediation.**

9.3.31 The following provides a further explanation of the issues impacting on the necessity to close the schools.

9.3.32 The structural design of cavity wall panels is based upon the two leaves being held together by properly embedded wall ties to allow them to act as one in providing the required resistance to wind-loading. The capacity of the panel in this regard varies significantly depending on the number of sides on which the panels are effectively restrained. The overall general specification, which was applied to all the PPP1 schools, had required head restraints for connecting the cavity wall to the steel beams of the structural frame, and lateral restraints for fixing the cavity wall to the steel columns of the structural frame on either side of the panel. The wall panel is assumed to be restrained at its base.

9.3.33 The general specification document produced by the design team described the required centres at which restraints were to be fitted as 900mm. However, more detailed information on some of the limited number of construction drawings available to the Inquiry, indicated a requirement for head restraints to be fitted at 450mm centres rather than the 900mm centres in the specification.

9.3.34 It is a recognised convention, that where there is a difference between specification and drawing information, the contractor should seek confirmation

from the design team as to which requirement should take precedent. The Inquiry was unable to establish if this had happened.

- 9.3.35 Under the National Building Specification approach that was adopted by the original design team, head restraints are described under the general heading of 'Wall Ties'. The relevant clauses produced by the design team were:

*"211 WALL TIES*

*Fixing blockwork inner leaf to steel columns (1 required at alternate block course)*

- *To BS 1243, type MF2 Ties to be fitted with a de-bonding sleeve DBS2 by Metsec or equal where the blockwork panel between steel columns exceeds 6.0m in length*
- *Material/finish: Stainless steel*
- *Size: 75 x 40mm*

*212 WALL TIES*

*Fixing blockwork **Inner leaf and Brick leaf to Steel Eaves Beam***

- *To BS 1243, type SAW-1-130 with ties type TWT-275 and TWT-130 at 900mm centres by Metsec or equal*
- *Material/finish: Stainless steel"*

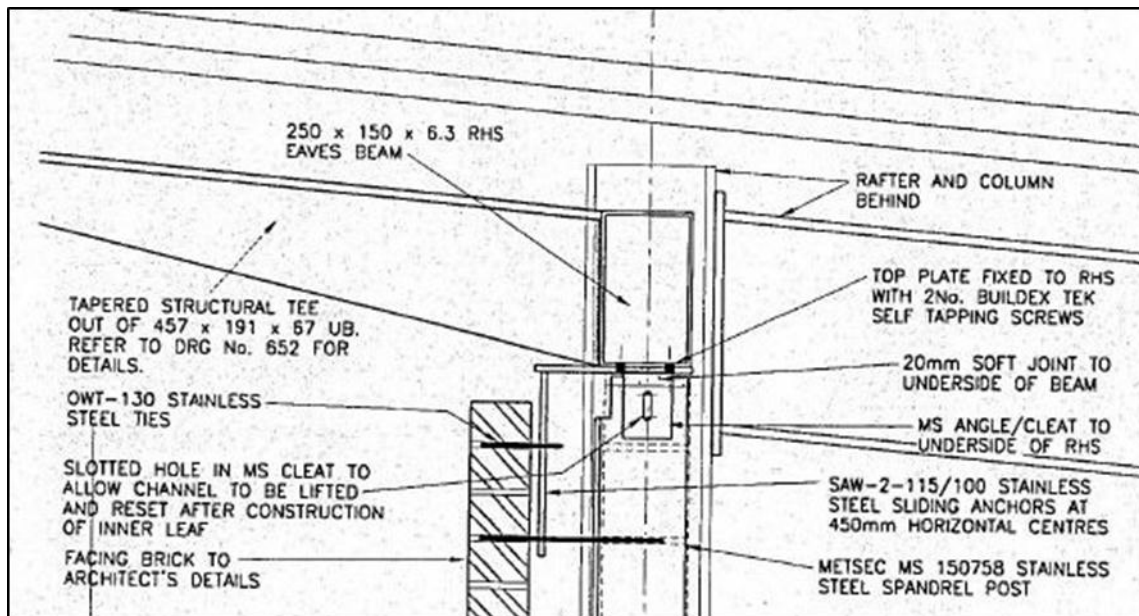
- 9.3.36 A drawing demonstrating the detailed application of the head restraint and its connections to the steel beam and the two leaves of the cavity wall is shown below in Diagram 8. This is an example of where the drawing shows a difference in the centres of the head restraints to that described in the general specification; 450mm centres as opposed to 900mm centres. This is one of the limited number of detailed drawings originally produced by WSP for use in the construction of the Royal High School, a Phase 1 PPP1 school, that ESP, Amey and the structural engineering advisers had access to. These copies of drawings were retrieved from the ESP archive. As previously stated in this Report they had not been provided by WSP to ESP.

- 9.3.37 The drawings below demonstrate the design team requirement for a three-part head restraint tie; the sliding anchors, SAW-2-115/100, of the head restraints to be fitted at 450mm centres to the underside of the steel beam with TEK screws; the one-way-tie, OWT-130, connecting the outer brickwork leaf to the sliding anchor; and the two-way-tie, TWT-275, (not notated but shown on the drawing) connecting both the outer brickwork leaf and the inner blockwork leaf to the sliding anchor. The 130 and 275 figures refer respectively to the lengths in

millimetres of the one-way and two-way ties that are built into either one leaf or both leaves and connected to the sliding anchor which in turn this drawing shows to be required to be fixed to the overhead steel beam at 450mm centres.

9.3.38 This drawing shows how this type of head restraint not only ties the leaves to the steel beam but also helps tie the leaves to one another.

**Diagram 8:** Structural drawings for the Royal High School showing the requirement for head restraints tying steel beam to both inner and outer leaves of cavity wall.



9.3.39 The reports written in April 2016 by Goodson Associates describing the outcome of the intrusive surveys of the cavity walls at the Royal High School Edinburgh, **which should have been built in accordance with the above drawing**, state that in their examination of 39 of the 102 panels of brickwork, no head restraints whatsoever were found to be present in 13 of the 39 panels opened up. In another 13 panels of the 39, head restraints were found but their installation was reported to be defective.

9.3.40 In a further nine of the 39 panels, the head restraints were built in at 900mm centres. Only the final four of the 39 panels had restraints built in at 450mm centres as shown on the drawing.

9.3.41 **If the wider spacing of the head restraints at 900mm centres is ignored, the results show that 67% of the panels tested would be defective. If we consider the wider spacing of 900mm as defective, then 90% rather than 67% of the panels tested would be rated defective.**

9.3.42 In relation to this last point, Ancon, a leading manufacturer of these fittings, advise in their technical literature that a similar type of head restraint

manufactured by them when fitted at 450mm centres provides a design resistance of 3429 Newtons/metre, whereas if it is fitted at 900 centres, the design resistance provided is halved to 1714 Newtons/metre.

- 9.3.43 The failure to install head restraints at all, would have reduced the capacity to resist wind-loading of one of the typical larger masonry panels found in schools by a factor of up to 45%. The results of the structural surveys, as previously shown, demonstrate the percentage of investigations which failed to find the required restraints in the various schools.
- 9.3.44 **The Inquiry is of the view that the disparity between what was built and what was designed, in relation to the lack of head restraints, must ultimately be the responsibility of the design and build contractors, AMJV for the Phase 1 schools and Miller Construction for the Phase 2 schools.**
- 9.3.45 Following the analysis by the Inquiry of the information provided in the survey reports and in the limited number of drawings and specifications made available to the Inquiry, a further concerning aspect of the construction of the schools was identified. This related to the issue of the incorporation or otherwise of bed joint reinforcement, an explanation of the typical use of which has already been provided in Section 5 of this Report.
- 9.3.46 The general specification produced by the design team for the PPP1 schools included a specification for the use of bed joint reinforcement. The relevant clause read as follows:

*"271 JOINT REINFORCEMENT FOR 365mm CAVITY WALLS*

- *Manufacturer and reference: BRC Brickforce SBF35-50*
- *Material: Stainless steel*
- *Width: Approximately 40-50mm less in width than wall or leaf*
- *Lay on an even bed of mortar in a continuous strip with 225mm laps at joints and full laps at angles. Keep back 20mm from face of external work, 12mm back from face of internal work and finish mortar join to normal thickness."*

- 9.3.47 This specification clause does not provide information as to the extent of bed joint reinforcement that is to be used in the cavity walls. This should be provided either in annotated drawings of the elevations of the walls or through a detailed descriptive schedule of the work required for each panel. This information would have to include details in terms of at what centres or number of courses the bed joint reinforcement was required to be installed in the case of both the blockwork inner and brick and blockwork outer leaves of each panel of the cavity

wall. Across many of the schools surveyed it was found on investigation that the bed joint reinforcement specified had either not been installed at all or had not been installed consistent with the requirements of the specification.

- 9.3.48 **It is the view of the Inquiry that, as in the case of the missing head restraints, the failure to incorporate the specified bed joint reinforcement in accordance with the design, impacted significantly on the capacity of the panels to resist the required levels of wind-loading and undermined the integrity of the structural design of the external walls of the schools.**



*Image 25: Example of bed joint reinforcement*

- 9.3.49 Amongst the design team structural engineers' drawings provided to the Inquiry, there are examples of drawings providing the additional information required by the bricklaying sub-contractor to properly locate where and to what extent the bed joint reinforcement was required. It is not however possible to confirm whether this information was comprehensively provided in all cases due to the limited receipt of this type of information by the Inquiry or, as a result, specifically to what extent the design engineer had specified it in all schools.
- 9.3.50 This does however show that the structural engineers had viewed the use of bed joint reinforcement as a key component of their design strategy in addressing the issue of the required capacity of panels to withstand wind-loadings.
- 9.3.51 **Unfortunately, from comparing the information provided and the results of the intrusive structural surveys, it is again evident that there were failures on the part of the construction teams to construct the buildings in accordance with the required designs.**

## **SECTION 10 - REMIT ITEM 4: QUALITY ASSURANCE PROCESSES:**

### **Remit Item 4:**

*"The role of the council with regard to the quality assurance of the construction of the buildings, including the granting of completion certificates to allow the buildings to become operational, the management of risks to the council; and if standard practice regarding quality assurance provided adequate checks and balances for all parties to the contract."*

- This section of the Report will consider the approach adopted in relation to the quality assurance of the design and construction of the PPP1 schools. However, before examining how these particular aspects were managed specifically in the case of the PPP1 project, it was considered useful to set out how the approach to quality assurance in the construction industry has changed over recent years with the advent of new procurement models.
- The final quality of a building is determined by many factors, including the focus given to design quality in the client brief and what weight is attached to this in the processes used for the assessment of bids. It is the responsibility of all informed clients to incorporate mechanisms that both clearly articulate the quality objectives for their projects and facilitate the proper assessment of bids before appointment to ensure that the stated quality objectives are being met. As will be read below, Council officers, in reviewing the PPP1 projects, came to the conclusion that insufficient attention had been paid to the issue of design quality. This would appear to have been an opportunity missed.
- Given the nature of the problems that gave rise to this Inquiry, this Report does not intend to focus on a detailed analysis of the overall design quality of the schools, but simply consider this briefly as part of the review of the approach of the Council to this stage of the project. The primary focus of this section of the Report will be in relation to the quality assurance of the construction processes used that ultimately failed to deliver the required standards of building construction.

### **10.1 INDEPENDENT SCRUTINY OF CONSTRUCTION QUALITY**

- 10.1.1 The traditional procurement process was not a panacea for Clients but there were many positive aspects of it that had been developed over years of construction experience to address real issues in the construction industry that could be incorporated into current procurement models to their benefit but appear to have been lost in the transition. Under the traditional model the client generally employs the design team to separately design the project and provide an independent scrutiny of the performance of the contractor selected to build it.

- 10.1.2 On medium to larger projects this would generally have also involved the employment of Clerks of Works or Resident Engineers, who would be the eyes and ears of the design team on site and undertake on-going inspections of all aspects of the works. Specialist Clerks of Works would be employed to provide this service in relation to areas such as the Mechanical and Electrical installations. For the largest projects, it would be normal that resident architects and engineers would be based on the site to inspect and report on the quality of work and to require the removal and replacement of any sub-standard construction.
- 10.1.3 This in no way removed the fundamental responsibility from contractors to undertake the detailed supervision of the work to ensure it was built to the right quality in accordance with that specified by the design team in the contract documents. Contractors, sub-contractors and even individual tradesmen, are of course expected to operate effective quality assurance processes in relation to their own work, however it is self-evident that clients receive an extra level of assurance through inspections not carried out by those organisations or individuals that have done the work.
- 10.1.4 With the increasing adoption over recent years by the public sector of other models of procurement under which the design team is employed, and their terms of employment determined, by the building contractors, the level of independent scrutiny of construction has been significantly reduced. This situation would generally be typical of the approach used in Public Private Partnership arrangements, as exemplified by the PPP1 schools.
- 10.1.5 All the architects, engineers, building control officers and other professional representatives of public sector client bodies, who gave evidence to the Inquiry, expressed concern as to the impact of the increasing lack of independent scrutiny on the quality of construction in the industry.
- 10.1.6 A strongly shared view, expressed to the Inquiry by many witnesses, was that the reduced requirement for visits by the design team to site was now an increasingly common feature in the conditions of appointment of design teams as set by the contractors employing them. Many saw this as preventing the designers of buildings playing an effective and necessary role in ensuring that the design intent behind their drawings and specifications is actually understood and implemented on site. This point, while generally applicable, has a particular significance in relation to the structural design and construction of masonry walls.
- 10.1.7 It was stated by many witnesses that, in their recent experience, it was now much rarer for public sector bodies either to employ in-house Clerks of Work or to recruit them from external agencies for projects. The increasing diminution in



the use of Clerks of Work by the public sector was considered by many witnesses to be a real risk to quality. A consultant structural engineer, whose evidence to the Inquiry typified the sentiments expressed by many other witnesses, said:

*"With regard to the role of the Clerk of Works, I am a big fan, particularly in public sector projects. They are usually tradesmen, who have come up through their trade and know the shortcuts that the tradesmen on site may try to take. Certainly, if you could re-introduce the Clerk of Works on-site more widely, that would go some way to restoring public confidence in the quality of buildings."*

- 10.1.8 Several of the representatives of contracting organisations who gave evidence to the Inquiry also stated that they saw benefit and value in having a properly qualified Clerk of Works as an extra pair of eyes on site.
- 10.1.9 As a result of the predominance of these new models of procurement for public sector projects, reliance is now increasingly being placed almost entirely on the internal quality assurance processes of contractors, effectively requiring them to police themselves.
- 10.1.10 For these essential arrangements to work effectively, requires the establishment of a wide range of detailed protocols for appropriate inspections by suitably qualified and trained personnel of the various elements of construction. However, such systems are only effective if what is contained within the written quality assurance files is actually implemented on site.
- 10.1.11 To do so contractors must invest in sufficient properly qualified management and supervisory staff, who are prepared to condemn without question sub-standard work undertaken by their own company and others, and are under no pressures in terms of the impact such condemnations may have on additional costs to their employer or resultant potentially expensive delays to programmes. Inevitably, there is the potential for conflicts of interest to arise in such circumstances.
- 10.1.12 There are many factors which can be seen as having potentially contributed to both the collapse of the wall and the failure to construct the masonry external walls in accordance with the required standards for resistance to wind-loading.
- 10.1.13 **However, it is the unequivocally held view of the Inquiry that there were fundamental and widespread failures of the quality assurance processes of the various contractors and sub-contractors, who built or oversaw the building of the PPP1 schools, to identify and rectify both defective construction of the cavity walls and the omission of the proper incorporation of secondary steelwork.**

- 10.1.14 **Given the widespread nature of the presence of defective construction in terms of varying cavity width and lack of embedment of wall ties, the Inquiry can only conclude that those responsible for the supervision and quality assurance of this work either did not inspect the work adequately or did inspect it and failed to take appropriate action to have it removed or remedied.**
- 10.1.15 It is of considerable concern to the Inquiry that the same defects and omissions were present to greater or lesser degrees in all 17 projects, even though they were constructed over a period of several years by a range of different contractors and bricklaying sub-contractors, each no doubt with their own quality assurance systems in place.
- 10.1.16 The reports on fire-stopping, which have just recently been completed, would equally appear to demonstrate a failure of quality assurance processes on the part of the various contractors and sub-contractors involved to ensure the satisfactory installation of building elements specifically designed to protect the safety of the users of buildings.
- 10.1.17 This inevitably raises the question as to whether these failures of quality assurance systems are restricted to the 17 PPP1 school buildings in Edinburgh or are likely to be found in other school buildings in Edinburgh and elsewhere in Scotland and the U.K., or are likely to be found in recent buildings generally.
- 10.1.18 In order to seek further information as to whether the primary cause of the collapse, the lack of embedment of wall ties, and the omissions of secondary steelwork were as a result of particular failings of the contractors engaged on the PPP1 schools, or whether the cause was related to more generic failings within the construction industry, the Inquiry sought information from all 32 Local Authorities in Scotland as to whether they had encountered or discovered evidence of similar defects in their buildings. The outcome of these inquiries revealed that similar faults had been identified in a number of schools throughout Scotland. Evidence provided to the Inquiry from these sources suggests that significant failings in quality assurance are still occurring in the present-day construction of buildings for Local Authorities and other public bodies.
- 10.1.19 The facts, as provided in evidence, show that the same recurring faults were discovered in buildings built by different contractors, different bricklaying sub-contractors and different bricklayers at different times. There is no doubt that the nature of these faults could result in serious consequences for users of the buildings.
- 10.1.20 **Accordingly, based on the evidence of defective construction provided, the Inquiry has come to the view that, it is insufficient for public sector clients with**

**a responsibility to protect the safety of the communities they serve, to rely solely on the quality assurance processes of contractors for confirmation that key aspects of the construction of buildings, impacting on the safety of users, have been properly constructed.**

10.1.21 **It is completely possible and practical for appropriate levels of independent scrutiny, provided by a range of professionals, especially the use of Clerks of Works, to be incorporated into the new procurement methodologies that are increasingly being used to procure public buildings.**

## 10.2 **EMPLOYMENT OF CLERKS OF WORKS TO PROTECT QUALITY**

10.2.1 Several witnesses to the Inquiry suggested that the principal reason that Clerks of Works have not tended to be included is related to both a lack of awareness on the part of those designing such models of the need for independent inspection and, perhaps more usually, a desire to drive down the cost of projects.

10.2.2 In the case of the PPP1 schools, the Inquiry was advised by witnesses that the approach adopted by the Council was that ESP was seen as being completely responsible for all aspects of the design and building process and that the Council saw itself as having a very limited role in relation to ensuring the quality of the construction.

10.2.3 As a result, the Council did not seek to employ, or have any of its agents employ, Clerks of Works to provide on-going independent inspection of the quality of construction of the schools and of compliance with the construction drawings. In this regard the Council was by no means out of step as this approach was that being generally promulgated and adopted across the country on PPP projects.

10.2.4 However, information provided by several other Local Authorities in Scotland indicated that they had retained Clerk of Works to provide independent inspection of their PPP programmes for new schools.

10.2.5 An argument that is frequently put forward, by those promoting a more hands-off approach by public sector clients, is that there is a single entity to sue if something goes wrong with the building and there are no complications as to whom is responsible for failures, leaving no direct liability with the public body.

10.2.6 This argument is probably acceptable if it were only ever to be found necessary to recover the cost of remedial construction and related disruption. It appears much less robust, if, because of unsafe construction, lives were lost or members of the public injured as could so easily have been the outcome in the case of Oxgangs Primary School.

10.2.7 **The fact that no injury or fatality occurred in the Oxgangs situation was a matter of timing and luck.**

10.2.8 **The Inquiry is strongly of the view that there should be a greater emphasis on providing the correct resources and mechanisms at the start of a project, to prevent things going wrong, rather than designing an approach to procurement which has as its focus, ease of litigation when matters do go wrong.**

### 10.3 **EFFECTIVENESS OF THE INDEPENDENT CERTIFIER IN PROTECTING QUALITY**

10.3.1 With the introduction and expansion of the PPP methodology, the role of Independent Tester or Independent Certifier was developed to provide a process for testing followed by formal certification that the respective obligations of each party are met and that service availability is achieved in accordance with the requirements of the contract.

10.3.2 There was evidence of a view amongst some Council Officers that this Independent Certifier function would provide the necessary quality assurance through its monitoring of the work.

10.3.3 The appointment of the Independent Certifiers is a joint appointment between the parties to the Contract. How this role is undertaken in practice can vary significantly from project to project but as generally practised it in no way replicates the level of close on-going independent scrutiny or inspection of construction that is provided by a Clerk of Works service. Visits by Independent Certifiers to site and time spent by them on site are much less frequent and rigorous than what is provided by a project Clerk of Works.

10.3.4 It is most unlikely that the nature of defects that have been discovered and which led to the collapse of the Oxgangs wall would have been identified at the level of scrutiny generally applied by Independent Certifiers. To discover such defects, the level of detailed inspection similar to that undertaken by a properly resourced and experienced Clerk of Works service would have been required.

10.3.5 From evidence provided to the Inquiry, it was clear, however, that false assumptions were made by the Council and other parties, including shareholders, regarding the level of assurance one could place on the quality of construction as a result of the role undertaken by the Independent Certifiers.

### 10.4 **IMPACT OF COUNCIL INTERNAL RESOURCING ON QUALITY ASSURANCE**

10.4.1 From the evidence provided to the Inquiry, it is clear that in the period prior to the signing of the PPP1 Project Agreement, the Council recognised the need for appropriate procedural compliance and sought to act in accordance with the central guidance on PPP. However, it was also clear that the Council itself had

few people within the organisation with significant knowledge and expertise in the delivery of major programmes of works undertaken through the PPP process.

10.4.2 This was the first time the Council had used the PPP methodology and perhaps explains why the organisational structure did not appear to have sufficient project experience and professional, technical or procurement skills in terms of the composition and resourcing of the project board and project team.

10.4.3 A project of this size and complexity would normally require a fully resourced, dedicated team on a full-time basis. Many of the inputs from the various essential skill sets across the Council were on a part-time basis, as most people were still required to undertake their normal day-to-day jobs. This deficit was helped by the recruitment of a professionally qualified project manager, who had been involved in the Glasgow Schools PPP project, but the Council was still extremely dependent on the input of external advisers.

10.4.4 Despite these limitations in expertise, resources and organisational arrangements, because of the combined and committed input of those involved, the programme for the new schools was delivered broadly on time, which, given these circumstances, was a considerable achievement.

#### 10.5 **COUNCIL INTERNAL REVIEW OF PERFORMANCE ON PPP1 PROJECT**

10.5.1 The Council officers must also be given credit for undertaking in February 2002, only three months after the signing of the Project Agreement, a structured workshop to review how they had managed the procurement of Phase 1 of the PPP1 project. It was attended by senior officers from the various departments of the Council who had been involved in the project up to that point.

10.5.2 The record of the workshop, being so close to the completion of this stage of the project, probably presents the best evidence to the Inquiry as to an accurate reflection of the perception of Council officers at the time of the success of the project in delivering a quality outcome.

10.5.3 The workshop acknowledged the success of the project in achieving handover dates that matched their initial projections. It was also felt by those attending that their process of consultation with stakeholders throughout the period had been thorough and effective. The following are extracts from the record of the workshop:

*"Overall it is recognised that the Council team and project manager, in conjunction with advisers did an excellent job in delivering PPP1."*

10.5.4 The conclusions from the workshop, however, also identified some key areas which would have benefitted from a greater focus in the stages leading up to the

signing of the Project Agreement. The following are extracts from the Council record of the review.

*"INADEQUATE INTERNAL RESOURCING OF THE PROJECT*

*"Resourcing is considered to be the biggest failing of this project. Due to project pressures, a number of unacceptable management practices were adopted by the Council whereby intolerable pressures were put on individuals to "get the job done." It is recommended that an appropriately staffed, dedicated, project team should be established for future projects."*

*PROJECT BOARD NOT CLOSE ENOUGH TO PROJECT*

*"It is noted on occasion that the full Project Board did not have an overall view of the important issues facing the project. It is recommended that the Project Board should be limited and consist of key representation only in order that they are close enough to the project to make truly informed decisions."*

*LACK OF INNOVATION*

*"The team noted that there was an element of disappointment from the technical teams in the lack of innovation seen in the bidders' responses. In future, the balance between innovative and prescriptive approaches to design should be agreed such that the Council objectives are understood and achieved."*

*DESIGN QUALITY*

*"It was considered that design as an issue did not get the priority it deserved."*

*"Design is considered OK and adequate, not outstanding in aesthetics, but functionally suitable."*

*"..... had wanted a parallel to the secondary schools in Leith..... where exciting and innovative design was achieved."*

*"Should have had a stronger idea of vision for the future, needed more time."*

- 10.5.5 In June 2004, after completion of the construction and a period of occupation of the Phase 1 PPP1 schools, the Executive Team of the Council undertook a second review of the PPP1 project to agree any further revisions required in their approach to the separate forth-coming PPP2 project for a further eight schools. This review involved significant consultation with stakeholders to seek their views on PPP1. The resultant paper listed the perceived successes of the PPP1

project and issues that should receive greater attention in PPP2. The successes were recorded as:

- *"Improved environment for students, staff and community users*
- *Modern P.E. facilities*
- *Bright, open and airy spaces*
- *Flexibility of teaching spaces in primary schools*
- *The valuing of school communities."*

10.5.6 Amongst the issues arising from PPP1 the following points were recorded:

- *"Planning and resources should be invested in ensuring that the external environment has high quality learning, social and play spaces and greater attention should be given to the aesthetic aspects of design of buildings...*
- *Specify precisely what is required in a new building at the beginning of the project thus avoiding the need for costly and time consuming changes."*

10.5.7 The view was expressed at both the 2002 and 2004 reviews of PPP1 that the design quality in terms of the experience of the spaces within the schools, whilst clearly providing a far superior environment compared to the schools they were replacing, did not fully satisfy the aspirations of those involved.

10.5.8 To the credit of the Council, it was determined that design would be given a much higher profile by the team involved in the PPP2 project and that this decision would be reflected in a greater weighting being given to design criteria in the assessment of the bids.

10.5.9 There was clearly a reinforced awareness on the part of the Council, both prior to the commencement and after the completion of the construction of the Phase 1 PPP1 schools, of the need as a client to proactively take steps to protect quality.

10.5.10 Despite the recognition by the Council in the 2002 review that the period up to the signing of the Project Agreement had suffered from insufficient resourcing, evidence to the Inquiry suggested that the Council team suffered from an even greater lack of resources for the important stages of the detailed development of the Phase 1 schools that followed.

10.5.11 Several witnesses strongly expressed the view to the Inquiry that there was an apparent assumption on the part of the Council, perhaps partly due to the lack of in-house experience in PPP, that the role required of the Council would be significantly reduced once the Project Agreement was signed and that all

responsibility then lay on the successful consortium, ESP, to go ahead and deliver the project, virtually on their own, in accordance with the signed agreement.

- 10.5.12 This assumption could be viewed as somewhat naive on the part of the Council, but advice from Government agencies at the time tended to support this approach. In fact, a statement still on the Scottish Government's website, dated as recently as 2009 on 'Non-Profit Distributing Public Private Partnerships' includes the following commentary:

*"The differences (between PPP and more conventional procurement models) are in the nature of the work undertaken at each stage, notably the need to focus on specification of outputs, and in the project management activity after a contract is signed. **The client is likely to be less engaged in monitoring the progress of the construction of any asset concerned**, but will take a close interest in overall progress towards the delivery of defined service outputs."*

- 10.5.13 As previously described in Section 4, the Council's main interface with the Consortium, during the demanding period of design development of the Phase 1 PPP1 schools, following the signing of the Project Agreement, was reduced for several months to virtually a single Council officer with no previous experience of major projects. This team was eventually only increased to a team of four Council officers.
- 10.5.14 The Inquiry was advised that insufficient funding had been put in place by the Council to provide a properly resourced internal team for this stage of the process and that the original team of technical advisers who provided support to the project from within the various Council departments, had been sent back to their substantive roles and were no longer associated with the project.
- 10.5.15 It is during this period that the more detailed design solutions for the schools evolved, including the frequent submission of developed or revised drawings for review by the client, the assessment and approval of room layouts, requests for changes, consultation with the schools, cost management and confirmation of materials, furniture, fittings and equipment being offered by the Consortium in relation to all 13 projects in Phase 1. These deliberations and negotiations are a fundamental element of the PPP process in terms of their potential impact on the final quality of the scheme and need a client team that is properly resourced and skilled to deal with them.
- 10.5.16 The Inquiry was advised that the small team, amongst all the other demands it faced, regularly struggled to cope with reviewing and approving large quantities of drawings, many hundreds in total, which would arrive in the Project Team's office requiring rapid turn-round by ESP. Despite the immense pressure placed



on the members of the small team that undertook this role, they succeeded in maintaining the required rate of progress for the project and in so doing showed great commitment to the success of the project.

10.5.17 The issue that subsequently arose in relation to the inadequate construction of the walls was not related to this particular lack of applied Council resources.

10.5.18 **It is clear to the Inquiry that the Council itself recognised that it had significantly failed to understand the demands of the PPP process in terms of providing adequate internal resources, and that as a result significantly under-resourced the in-house team that represented the Council as client in the relationship with the Consortium.**

10.5.19 **It is also clear to the Inquiry that Council officers were not satisfied that the process had optimised the opportunity for a higher overall design quality and acknowledged that insufficient focus and time had been allocated to this issue.**

## 10.6 COUNCIL ADMINISTRATION OF STATUTORY BUILDING STANDARDS

10.6.1 Building Standards within Edinburgh are administered by the City of Edinburgh Council. In so doing those Council staff responsible for undertaking this function are required to act in the same manner for building projects undertaken by the Council as for building projects undertaken by any other client. The evidence to the Inquiry would suggest that this was the case in relation to the PPP1 schools.

10.6.2 In a significant number of cases, witnesses to the Inquiry from both the Council and other bodies, commented that they had taken confidence in the build quality of the schools from the fact that they had all undergone independent scrutiny from the Independent Certifiers, jointly appointed by ESP and the City of Edinburgh Council, and had been subjected to the statutory Building Standards processes of design warrants, site inspections and completion certificates.

10.6.3 **The Inquiry formed the view that there was a common misconception, even among some Council officers, as to the extent of the reliance that can be placed on the quality of construction of a building that has gone through the statutory Buildings Standards process.**

10.6.4 Before describing specific issues associated with the processing of the building warrants and completion certificates for these projects, it would be useful to put into context the nature of the Building Standards process in terms of its underlying purpose and the level of inspection of design and construction generally undertaken to meet this requirement.

10.6.5 It should be noted that as the PPP1 schools were completed in 2005 they were processed under the previous Building Standards system as laid down in the

Building (Scotland) Act 1959. This was repealed and replaced by the Building Scotland (Act) 2003, facilitating the introduction of a new Building Standards system, which became effective on 1<sup>st</sup> May 2005.

10.6.6 The following is an extract from a paper provided to the Inquiry by the Building Standards Division of the Scottish Government explaining the core objective of the regulations.

*"The system is intended to ensure that building work on both new and existing buildings results in buildings that meet reasonable standards. The standards are set out in the building regulations, which in terms of the Act, include **securing the health, safety, welfare and convenience of persons in or about buildings and of others who may be affected by buildings** or matters connected with buildings.*

*The purpose of the building standards system is to protect the public interest. It is not intended to provide protection to a client in a contract with a builder. The system, therefore, does not so much control building but rather sets out the essential standards to be met when building work or a conversion takes place and only to the extent necessary to meet the building regulations.*

*The system is pre-emptive, designed to check that the proposed building work meets the standards. Inspections during construction and on completion are to protect the public interest in terms of compliance with the building regulations and to discourage avoidance of the legislation. The inspections do not provide a system to control work on site, that is a matter for the contracts and arrangements put in place between the client and builder."*

10.6.7 Despite the changes to the system introduced in 2005, the essential responsibilities of Building Standards Departments remained similar to those under the previous system. Under both the previous and present systems Building Standards Departments are:

- *"responsible for the independent checking of plans and specifications before a building warrant is approved, but only for the purposes of ensuring that the design complies with the building regulations; and*
- *are required to satisfy themselves that the construction meets the approved drawings and regulations."*

10.6.8 Under the older system, which applied to the PPP1 schools, the Building Standards Department would inspect the building during construction to ensure that the work was carried out in accordance with the drawings and

specifications included in the issued warrant. Visits to site were planned to allow monitoring of critical aspects of the construction but were at the discretion of the building control officer. There were only two notifications required to be made to building control; one at the start of the works and one on the completion of the works.

- 10.6.9 When the building work was complete, an application was required to be made for a completion certificate to the Building Standards Department, who were required to carry out a final inspection within 14 days. The final inspection was to ensure that the building complied with the approved drawings, including any subsequent amendments to them. Following a satisfactory final site inspection, a completion certificate would be issued. It should be noted that it was, and remains, an offence to occupy or use a new building for which a completion certificate had not been issued.
- 10.6.10 From the above it is evident that the Building Standards system is not designed or intended to give the level of assurance that a client may require in relation to the more detailed aspects of the construction of a building.
- 10.6.11 It was acknowledged by several of the professionally qualified witnesses who gave evidence to the Inquiry that the system tended to place a greater focus and allocate more of its resources on the approval of design drawings prior to the issue of a warrant than on the process of ensuring that buildings were actually constructed in accordance with the approved warrant.
- 10.6.12 This seems somewhat at odds with the focus of the Building (Scotland) Act of **"securing the health, safety, welfare and convenience of persons in or about buildings"**, as while it is essential to have design subjected to appropriate scrutiny to ensure that it is properly considered, safe and compliant with regulations, there is little point in doing so if there is not an equivalent rigour applied to ensuring that contractors actually comply with what is on the approved drawings and seek approval for any amendments they may make to these on site.
- 10.6.13 Prior to 1992 in relation to the design of the structure of buildings, all structural calculations and drawings had been required to be submitted to local authorities for checking as part of the warrant application. Regulations introduced in 1992 allowed self-certification of the structural design by chartered Civil or Structural Engineers. The Inquiry was advised by a senior Edinburgh building standards officer that, when this system of self-certification was adopted by the design teams, as was the case with the PPP1 schools, building control officers would:

*"check the certificates and do a brief review of the structural drawings. There were not usually any calculations submitted."*

10.6.14 Drawings submitted for building warrant approval are inevitably not as comprehensive or detailed as drawings required for actual construction. In this regard, it was stated:

*"We wouldn't see drawings and specifications of that kind. If there was a note regarding a particular specification that was fine, but ultimately, the applicant was self-certifying the quality of the structural design proposed. We wouldn't look beyond that."*

10.6.15 The Inquiry sought information on the level of detail in relation to the structural design of cavity walls, including the provision of secondary steelwork and components such as head-restraints, that the Edinburgh Building Control Officers would have expected to see or consider. The Inquiry was advised that:

*"The drawings produced would generally not be sufficient for a contractor to build from. Specification notes would be attached to the drawings but that would not give the detail they wanted."*

10.6.16 It was recognised, with the introduction of the new Building Standards system in 2005 that, unfortunately, the system of simply requiring signed certificates from qualified civil or structural engineers had been subject to abuse and was no longer considered sufficiently robust to ensure that the necessary design checks had been undertaken by those signing the certificates.

10.6.17 In 2005 a guidance note entitled 'A NEW BUILDING STANDARDS SYSTEM FOR SCOTLAND' was produced by the Scottish Buildings Standards Agency in collaboration with Structural Engineers Registration Ltd. It included the following statement in relation to the self-certification system that had been used up to then:

*"Those regulations, however, became widely regarded as inadequate to provide an acceptable level of public safety as the absence of a statutory checking requirement made the possibility of human error a serious risk. A further problem arose from a lack of common understanding as to how much of the development was "structure" and therefore covered by the certificate."*

10.6.18 This last issue, in relation to practice within the construction industry, as to what constituted structural detail as opposed to building or architectural detail was raised in interviews by several of the witnesses. This was principally in relation to which of the design team's documentation should include the information on the design and construction of the cavity walls: whether on architectural drawings, structural engineering drawings or on both; and whether necessary supporting information on items such as wall ties and other secondary

steelwork, that is normally included in specifications, should also be required to be fully incorporated on drawings.

10.6.19 A more standardised approach to this issue would assist the checking of information of this type by building control officers as part of the examination of documents submitted for warrant approval.

10.6.20 **The Inquiry is of the view that all relevant structural information, details and specifications impacting on the structural integrity of the building should be included on the structural engineers' drawings in a form which is fully integrated with the architectural design.**

10.6.21 It also emerged, in the evidence to the Inquiry, that the lack of accessibility by bricklayers on site to this information presented in a practical and manageable form was viewed by many as potentially contributing to quality issues of the type found in the PPP1 schools.

## 10.7 **BUILDING STANDARDS CERTIFICATION – PPP1 PHASE 1**

10.7.1 The building warrant process in Scotland is a pre-emptive system that seeks to ensure that buildings are designed and constructed to meet the standards set in the building regulations. It was an offence against the Building (Scotland) Act 1959, and still is against the current Building (Scotland) Act 2003, to start work without warrant, where one is required.

10.7.2 The process of submission of documents for warrant approval for the Phase 1 schools commenced with applications for three schools in June 2001, five months prior to the signing of the Project Agreement in November 2001. The warrant applications for the remaining Phase 1 schools, with the exception of Forthview and Castlevie primary schools which came later, were submitted in July and August 2001, also in advance of the signing of the Project Agreement.

10.7.3 Many of the warrant applications were made in stages to facilitate early starts on site. The records, provided to the Inquiry by the Building Standards Department of the Council, indicate that all the Phase 1 schools had received approved warrants, approved stage warrants or approved amendment to warrants.

10.7.4 However, in the case of at least six of these schools, the information provided by the Council would indicate that, in contravention of the requirement, work commenced on site prior to a warrant being approved. The periods by which construction preceded the issue of the required approved warrants varied from one to two months, up to more than a year.

10.7.5 The Building Standards system that applied at the time of these submissions was set down in the Building (Scotland) Act 1959. In relation to commencing work prior to issue of a warrant it states:

*"No person shall (a) in any place conduct any operations for the construction or demolition of a building of a class to which the building standards regulations apply, or (b) change the use of any building unless there has been obtained from the buildings authority a warrant for the construction, demolition or change of use, as the case may be, and any person who contravenes this subsection shall be guilty of an offence against this Act."*

10.7.6 The records also show that the initial warrant application for Gracemount High School, submitted for approval on 17<sup>th</sup> August 2001, was only approved on 20<sup>th</sup> May 2003, just several months before the school opened. An amendment to the warrant for the same school, applied for on 12<sup>th</sup> October 2001, was only approved on 31<sup>st</sup> March 2008, some five years after the school opened.

10.7.7 The information provided by Edinburgh Buildings Standards Department further show that the mandatory submission to Building Standards of notifications of commencement to start work, prior to the actual commencement of work, was only complied with by AMJV or its agents in the case of three of the 17 PPP1 projects. There is, however, a record of a sequence of visits during construction by Building Control officers to all the sites, which will be commented on later in this section.

10.7.8 In relation to the issue of the legally required Completion Certificates, the records provided to the Inquiry would suggest that a number of the school buildings were occupied for periods in advance of the issue of a Completion Certificate by Building Standards. The periods, in most cases, ranged from a few months to over two years.

10.7.9 This would represent a breach of the requirements of the relevant Act, unless as provided for in the Act, Temporary Occupation Certificates were issued in relation to these schools.

10.7.10 Sub-section 5 of Clause 9 of the Building (Scotland) Act 1959 states:

*".....no person shall occupy or use a building (being a building which has been constructed by virtue of a warrant granted under this Act) before a certificate of completion in respect of the building has been issued by the buildings authority, and any person who wilfully contravenes this subsection shall be guilty of an offence against this Act ....."*

- 10.7.11 Two of the Phase 1 schools, Craigmount High School and Royal High School, have never received Completion Certificates issued by Building Standards. In the case of a third school, Gracemount High school, the Completion Certificate was only applied for on 18<sup>th</sup> May 2010 and issued by Building Standards on 7<sup>th</sup> June 2010, some seven years after the school was occupied.
- 10.7.12 The Inquiry was advised that prior to the occupation of these latter three schools, Temporary Occupation Certificates were applied for by AMJV and granted by Building Standards.
- 10.7.13 The issue of Temporary Occupation Certificates indicated that Building Standards had been generally content with what they had seen on their final inspection of a school but required the submission of amended drawings so they could examine the detail of what had been changed in the design from the original approved drawings. The new drawings would then require approval to allow for the issue of an amendment to the warrant and a further visit to the site by Building Standards to check compliance of the amended areas of the building, prior to issue of a completion certificate.
- 10.7.14 The amendments to an original design can often be in relation to minor aspects of a project, but until the extent of changes is defined and shown by the re-submission of amended drawings, the necessary assurance that they are compliant with the regulations cannot be given.
- 10.7.15 A Temporary Occupation Certificate can be issued following an assessment of risk by the building inspector based on what can be seen on site and from any available documentation as to the level of completeness of the construction and safety systems to allow the building to be occupied. They do not give the same level of assurance as is provided by a Completion Certificate.
- 10.7.16 The Temporary Occupation Certificates that were issued for the three schools mentioned above, expired after the maximum allowed statutory period of three years, during which period there was no submission of the required drawings showing the amendments to the design, effectively leaving the continuing occupation of all three schools to be a contravention of the regulations administered by the Council itself.
- 10.7.17 Following the introduction of the new Building Standards system in 2005, there was a limited transitional period provided for, during which a building owner could retrospectively apply for a full Completion Certificate after the expiry date of a Temporary Occupation Certificate issued under the previous system.
- 10.7.18 Under this interim arrangement such an application was made and approved in respect of Gracemount High School. However, this was only done in June 2010 meaning that, for a period of approximately four years after the expiry of the

Temporary Occupation Certificate, Gracemount High School did not have a legitimate Completion Certificate.

- 10.7.19 No such application was made in respect of the two other High Schools named above which remain without Completion Certificates. The Inquiry was advised by Edinburgh Building Standards that the time limit allowed in the transitional period to apply retrospectively for Completion Certificates has now expired. As a result of this Inquiry, Edinburgh Building Standards is seeking to regularise the situation in relation to these schools.

**10.8 BUILDING STANDARDS CERTIFICATION – PPP1 PHASE 2**

- 10.8.1 In relation to the four Phase 2 schools, the records provided to the Inquiry indicate that both Oxfords and Braidburn Schools were occupied in the first half of 2005. Temporary Occupation certificates were issued for both prior to opening, however, the Completion Certificates for both these schools were not issued by Building Standards until July of 2006, a full year later.
- 10.8.2 In the case of Firrhill School the Completion Certificate was issued in June 2005 whereas the Availability Certificate was issued three months earlier in March 2005. The Council have confirmed to the Inquiry that a Temporary Occupancy Certificate was also issued in March 2005.
- 10.8.3 The Certificate of Completion for the fourth Phase 2 project, St. Peter's Primary School, was issued in November 2005, very shortly after the date the school was occupied.
- 10.8.4 The Inquiry asked why Edinburgh Buildings Standards had not pursued the failure by ESP, AMJV or their agents to apply for the legally required completion certificates, prior to the occupation of the schools or at all in two of the above examples.
- 10.8.5 In response, the Inquiry was advised that it was the legal responsibility of the building owner/developer, in these cases ESP, to ensure applications were made at the commencement of and on the completion of the construction of buildings and that it was not a responsibility, requirement or practice of the Building Standards Department to take the initiative in actively seeking such applications, including those for Completion Certificates.
- 10.8.6 The Inquiry was advised that unfortunately failures of building owners under the old system to apply for a Completion Certificate or now, under the new system, to submit an acceptable Completion Certificate to Building Standards for verification by them, are not unusual occurrences. Rarely, if ever, have proceedings been taken or sanctions applied to those who fail to do so.



- 10.8.7 The Inquiry then sought the views of the senior representative of Edinburgh Building Standards Department as to the effectiveness of these arrangements for ensuring the safety of buildings and their compliance with regulations in light of the described position.
- 10.8.8 The Inquiry was advised that there is no internal structured system to contact those contravening the law in this regard in circumstances where, after an approved warrant has been issued, either the applicant does not advise Building Standards of a date of commencement of work or, if Building Standards had been notified that work had started, the applicant does not apply for a Completion Certificate when the work is actually complete.
- 10.8.9 It would appear to the Inquiry that, in such circumstances, the safety of buildings, and the compliance of buildings with the regulations designed to protect users, cannot be assured to the degree intended by the Building (Scotland) Act 2003, unless a more systematic approach is adopted in the administration of the processes.
- 10.8.10 **It is the view of the Inquiry that there were significant failures on the part of those responsible for managing the process of ensuring compliance with the statutory Building Standards requirements for the PPP1 schools. The ultimate responsibility to make the necessary applications lay with the developer ESP.**
- 10.8.11 **It is also the view of the Inquiry that the effectiveness of the Building (Scotland) Act 2003 and its 1959 predecessor, in delivering the key stated policy objective of,**
- "securing the health, safety, welfare and convenience of persons in or about buildings"***
- could be severely compromised if the processes used to implement it do not include systematic administrative arrangements to identify, pursue and sanction those who fail to comply with its statutory requirements.**
- 10.8.12 Under the Building (Scotland) Act 1959, both the failure to have an approved warrant prior to the commencement of construction and, possibly more seriously, the failure to have an approved Completion Certificate prior to the occupation of a building constitute offences against the Act.
- 10.8.13 There is no evidence to suggest that the failure to comply with these mandatory legal requirements had any direct impact on the quality of the PPP1 buildings and the occurrences of defective construction subsequently identified.
- 10.8.14 However, the failure to do so does suggest a less than fully professional approach on the part of those involved in managing the delivery of the projects to fully comply with or observe standard procedural requirements.

**10.9 ISSUE OF AVAILABILITY CERTIFICATES BY INDEPENDENT CERTIFIERS**

- 10.9.1 A fundamental aspect of the PPP Project Agreement is the signing of the 'Availability Certificates' by the Independent Certifier. In the case of the Phase 1 schools this role was undertaken by Mouchel and in the case of the Phase 2 schools, by Arup (Scotland).
- 10.9.2 The signing of the Availability Certificates represents a statement by the Independent Certifier that the project has been completed in accordance with the requirements of the Project Agreement and is ready for occupation. On the completion of this form by the Independent Certifier for each school, the format of which is included in the Project Agreement, ESP were entitled to commence charging the Council for the provision of that school's facilities and the related services. Up until this form was signed, ESP were not entitled to any payment from the Council.
- 10.9.3 The Council was unable to locate or provide the Inquiry with copies of completed Availability Certificates for any of the Phase 1 schools. In relation to the Phase 2 schools the Council was only able to produce a copy of a completed Availability Certificate Type 2 (Project Agreement) issued in relation to Firrhill High School.
- 10.9.4 Given the fundamental importance of the issue of these certificates, both for declaring the buildings available for use and as the mechanism to entitle the commencement of the flow of payments to ESP by the Council, the Inquiry consider it reasonable to assume that all 17 were issued. However, considering their importance, the Inquiry finds it disappointing that the records and archives system of the Council was unable to produce them.
- 10.9.5 Following similar requests by the Inquiry to ESP and Galliford Try, the only further certificate made available to the Inquiry was a copy of a completed Availability Certificate Type 1 (Design and Build Contract) for Oxgangs, also a Phase 2 school, as provided by Galliford Try from their records.
- 10.9.6 The Project Agreement required a copy of both type 1 (D&B Contract) and type 2 (Main Project Agreement) Availability Certificates to be completed for each school. The five clauses that were the central element of the two forms were virtually identical. Clauses (2) and (3) of these five in both cases contained the following statements:

*"(2) all Required Consents for Oxgangs primary School have been obtained*

*(3) the certificates being (i) building control certificates and (ii) the relevant certificates referred to in Part 8 of the Schedule to the D&B*

*Contract and listed in the Appendix hereto, have been obtained and approved."*

- 10.9.7 From this, it is clear that a Completion Certificate, which is perhaps the most significant of the Building Control certificates, or at least a Temporary Occupation Certificate, would have already have had to be issued to allow the Independent Certifier to complete the Availability Certificate for each school.
- 10.9.8 The Inquiry has been unable to verify if the signed Availability Certificates were qualified to reflect the issue of only Temporary Occupation Certificates, or if such certificates were available at the time of the actual occupation of each school. There is no indication on the two Availability Certificates, for Oxgangs Primary School and Firrhill High School, that were provided to the Inquiry, that they had been issued only on the basis of a Temporary Occupation Certificate although that is clearly the case from the information provided by Edinburgh Building Standards.
- 10.9.9 Copies of the two completed availability certificates that were made available to the Inquiry are included in Appendix 3 to this Report.
- 10.9.10 The following table sets out an analysis of the information provided to the Inquiry in relation to the relative timing of key dates in relation to the application, approval and certification processes relating to compliance of the PPP1 schools with Building Standards requirements. In the absence of copies of all but two of the Availability Certificates, the dates of the issue of the remaining certificates were provided to the Inquiry from the available records.
- 10.9.11 The table also records the information provided by the Building Standards Department in relation to the number of inspection visits to sites that were undertaken and the number of these, which from an analysis of the records of the visits, appeared to be focused on drainage issues.

## ANALYSIS OF BUILDINGS STANDARDS (BS) CERTIFICATION OF PPP1 SCHOOLS

Name of School	Date of first approved warrant	Start Date of Construction or BS Initial Site Date	Number of Site Visits made by BS	Number of site visits to do with drainage	Date of last Temp. Occupancy Cert	Date of issue of Availability Certificate	Date of Building Standards Certificate of Completion
Pirniehall and St David's Primary Schools	30/11/01	21/12/01	34	27	20/08/02	12/08/02	05/03/03
Craigroyston Primary	08/01/02	22/02/02	27	25	07/11/02	11/10/02	14/11/03
Broomhouse and St. Joseph's Primary Schools	27/02/02	28/01/02	37	35	19/11/02	18/10/02	22/07/03
Rowanfield	20/02/02	18/02/02	18	16	31/10/02	18/10/02	14/11/02
Craigour Park Primary School	20/06/02	19/03/02	28	22	04/12/02	13/12/02	30/07/03
Castleview Primary School	02/09/02	24/09/02	35	27	06/05/03	02/05/03	11/09/03
Gracemount High School	20/05/03	22/04/02	38	37	27/06/03	04/07/03	07/06/10
Forthview Primary School	18/10/02	26/11/02	28	21	27/06/03	11/07/03	04/11/03
Drummond Community High School	12/04/02	19/03/02	18	Not Known	22/03/02 <sup>11</sup>	11/07/03	11/10/05
Craigmount High School	02/07/02	11/04/02	49	37	25/07/03	25/07/03	No BS Completion Certificate was ever issued
Goodtrees Neighbourhood Centre	26/03/03	05/03/03	12	8	25/07/03	25/07/03	31/10/03
The Royal High School	13/03/02	17/01/02	48	18	21/10/02 <sup>11</sup>	01/08/03	No BS Completion Certificate was ever issued
Howdenhall Children's Unit	12/07/02	19/07/02	31	24	17/10/03	13/10/03	29/10/03

11 Early Temporary Occupation Certificates were issued to allow completed phases of the building to be occupied whilst work elsewhere on the same site continued.

Name of School	Date of first approved warrant	Start Date of Construction or BS Initial Site Date	Number of Site Visits made by BS	Number of site visits to do with drainage	Date of last Temp. Occupancy Cert	Date of issue of Availability Certificate	Date of Building Standards Certificate of Completion
Oxgangs Primary School	27/03/03	09/06/04	21	20	08/02/05	01/03/05	21/07/06
Firrhill High School	19/06/02	28/08/02	3 <sup>12</sup>	Not Known	02/09/02 <sup>11</sup>	15/03/05	16/06/05
St Peter's Primary	25/05/04	09/06/04	17	11	30/04/05	08/04/05	04/11/05
Braidburn School	30/01/04	16/07/04	14	11	08/03/05	10/06/05	21/07/06

## 10.10 SITE INSPECTIONS BY EDINBURGH BUILDINGS STANDARDS DEPARTMENT

10.10.1 As previously stated it became apparent from the evidence provided to the Inquiry that there was a general misconception both on the part of some members of the staff of the Council and by others from external bodies, even those associated with the construction industry, as to the extent and purpose of site inspections undertaken as part of the Building Standards system.

10.10.2 The system that was in place in Scotland in 2003 was not dramatically different from the new system introduced in 2005 regarding site visits by building control officers. It required that occasional inspections were undertaken by building control officers to check that buildings as constructed were being built in accordance with approved warrant drawings and were, as far as could be established by their visits, compliant with the regulations.

10.10.3 However, this is in no way meant that Building Control officers were responsible for checking the quality of work done by builders or for supervising them in undertaking their work. Under the 2005 revised Building (Scotland) Act, which did not apply to the PPP1 schools, it is clear that responsibility for compliance with the regulations lies with the relevant person (the developer or owner) and any checks undertaken by Building Standards Departments as verifiers do not remove any responsibility from the relevant person who is required to certify all the completed work as being in accordance with the approved plans.

10.10.4 The Inquiry sought information on the quantum and purpose of site visits undertaken by Building Standards officers to the PPP1 schools during construction.

10.10.5 The table above presents an analysis of the information provided to the Inquiry by Edinburgh Building Standards Department. As one can see from the

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12 There is an overlap of Building Control records regarding Firrhill HS and Braidburn School as both schools are located within the same site but approved under different warrants and dual visits were undertaken.

information extracted from the reports made of the visits to the PPP1 schools undertaken by building officers, a preponderance of the effort of the inspections carried out appears to be related to checking the quality of the drainage installations, with very limited if any references in site visit notes to inspecting the main elements of the structure and external envelope of the buildings. The notes of some visits made reference to checking fire-safety aspects of the works.

10.10.6 The table above shows some variation in the number of visits paid by different building inspectors to the various schools but there is a reasonable consistency in this regard.

10.10.7 From this evidence, it is absolutely clear that the focus of the site inspections was not directed at checking the quality of construction of the external walls nor of the inclusion or otherwise of head restraints or secondary steelwork components. Even if this had been the case, given the limited extent of the detailed construction information that was provided by design teams, or required by Building Standards as part of the application for warrant, the inspectors while on site would have been unaware as to what specific design solutions were being employed to provide the required resistance to wind-loadings in any particular masonry panel.

10.10.8 The following statements were made as part of the evidence to the Inquiry in relation to the inspection role of Edinburgh Building Control officers:

*"At the time, as now, we focussed a lot on drainage. We undertook open testing and final testing on every line of drainage because it was a perennial issue."*

*"We would not necessarily be checking wall ties or the gauge of steel used or bolts used in the framework. It was simply not possible."*

*"There isn't any way of us ensuring that the structural elements specified are in fact present."*

*"However, it would be very unlikely for a building inspection to pick upon anything like a lack of wall head restraints or an issue of wall tie embedment. My role is very different to that of a Clerk of Works."*

10.10.9 Given the sporadic nature and limited frequency of visits to site, a significant amount of work will normally have been carried out between visits by building control officers and much of that work may no longer be capable of inspection other than through intrusive and disruptive investigations.

10.10.10 The wall ties in cavity walls are one of the main components of construction which, as the walls rapidly close in, become increasingly difficult to check. It is

equally difficult to retrospectively check the incorporation of head restraints, bed joint reinforcement and windposts.

- 10.10.11 From evidence provided to the Inquiry by the chair of the Local Authority Building Standards Scotland (LABSS) group, the position adopted by Edinburgh Building Standards in relation to inspection of wall construction was not inconsistent with the general approach of other Authorities. He stated:

*"Things like wall tie failures would not be picked up by a Construction Compliance Notification Plan. It is a risk-based inspection process. It would certainly look at things like foundations, fire-stopping and drainage which are higher risks. It would not necessarily focus on routine structural aspects. This is because we have to prioritise the available resources"*

*"We would only cover wall ties if we happened to be on site and see them going in, but not otherwise."*

- 10.10.12 Section 6 of this Report referred to the fact that a significant number of occurrences of defective fire-stopping were identified as a result of recent specialist surveys undertaken. These defects were found to create breaches to the integrity of fire-rated partitions or enclosures across the 17 PPP1 projects.
- 10.10.13 It is likely, given the nature and location of these breaches as recorded in the reports of these surveys, that a significant proportion had existed from the time of the original construction of the PPP1 schools.
- 10.10.14 This is an aspect of construction which should be treated with immense care, given the potential impact of failure of the integrity of fire compartmentation in the case of fire. The Inquiry was advised that for this reason it is one of the areas which, like drainage, receives greater attention from building control officers.
- 10.10.15 However, in-depth inspections of fire-stopping, like that of the internal construction quality of cavity walls, can be difficult to undertake as much of the required fire-stopping is generally located in relatively inaccessible areas of buildings, such as roof-spaces and vertical ducts.
- 10.10.16 The inspection of fire-stopping by building control officers as part of their normal pre-completion inspection of buildings could realistically only be expected to identify defects that are readily accessible and visible. This level of inspection could not and would not pretend to offer to clients the level of assurance required in relation to the integrity of fire compartmentation.
- 10.10.17 **Accordingly, it is the view of the Inquiry that it is inappropriate of clients to act on the assumption that they can rely solely on the visits to site by building**

**control officers to ensure the quality of the construction of their buildings. This is equally true of Local Authority clients even though one of their other functions may be to administer the Building Standards system.**

#### 10.11 EFFECTIVENESS OF THE BUILDING STANDARDS SYSTEM

10.11.1 It has already been stated in this Report that an underlying objective of the Building (Scotland) Act 2003 is:

*"to secure the health, safety, welfare and convenience of persons in or about buildings and of others who may be affected by buildings or matters connected with building."*

10.11.2 This Report has referred to two significant incidents of defective construction:

- the inadequate structural integrity of external masonry wall panels across 17 projects; and
- the widespread occurrence of defects in fire-stopping in the same buildings.

10.11.3 Both these faults represent risks to the users of these buildings, which is what the Building (Scotland) Act 2003 seeks to prevent. This would suggest that perhaps further steps may be necessary in relation to assuring the safety of buildings and assisting in the delivery of this core objective of Government policy.

10.11.4 The current process appears to focus resources on ensuring submitted design information is compliant with the regulations, yet as has been identified in the case of the PPP1 schools, a lesser focus appears to be applied to ensuring that what is built is compliant with the approved designs.

10.11.5 **It is the view of the Inquiry that it is not appropriate for Building Standards to be expected to undertake the type and level of detailed inspection that is necessary to identify in a comprehensive fashion the type of defects discussed in this Report, but that consideration should be given to requiring better practice methods of the construction industry that would in turn provide Buildings Standards with the proper level of assurance in these risk areas.**

10.11.6 The principle of certification by approved certifiers of areas of construction such as electrical and plumbing installations has already been established in the current Buildings Standards system for Scotland. The evidence provided in this Report would indicate that the two types of defective construction found in the PPP1 schools, wall construction and fire-stopping, could perhaps be quite common occurrences in new buildings but their presence is concealed due to a combination of the difficulty of access and inadequate inspection.



10.11.7 **In these circumstances, there may be benefit in considering the practicality of extending the concept of mandatory certification by approved certifiers to other elements of the building, such as the two areas covered in this Report, that could potentially pose significant risk to users if not constructed properly.**

## 10.12 **CERTIFICATION BY THE INDEPENDENT CERTIFIERS**

10.12.1 From the evidence provided to the Inquiry by several witnesses, including witnesses from both the Council and ESP, there was clearly a significant degree of reliance placed by the Council and others on the role of the Independent Certifiers in confirming that the projects were constructed fully in accordance with the requirements of the Project Agreement.

10.12.2 The specificity of the role has developed with the introduction of the Private Finance Initiative. It acts to provide under this model of procurement an independent expert opinion and certification that: the detailed design and construction of buildings have been carried out in accordance with the requirements of the Project Agreement; that the buildings in question are now available for use by the client; and effectively that the provider of the building is now entitled to payment in line with the agreed payment mechanism.

10.12.3 As previously stated in this Report, the role of the Independent Certifier in practice, and their time spent on site, tends to be focused towards the completion stages of projects. As a result, it would be unusual for Independent Certifiers to have inspected, to any significant level of detail, the build quality of the core elements of the structure, frame and external envelope of projects to confirm that the detailed construction of these elements is as required in the approved design documentation.

10.12.4 The evidence to the Inquiry indicated that some members of the Council staff did view the issue of the Availability Certificates by the Independent Certifier as the certification by an independent expert that full compliance with the requirements of the contract had been achieved, including the quality of construction and compliance with all requirements of Building Standards. In so doing they relied on the following clause of the Independent Certifier's appointment used on the PPP1 projects:

*"The Independent Certifier shall:*

*Observe and monitor mock-ups, fabrication, construction and installation works so as to satisfy itself that the Project complies with the requirements of the Project Agreement and any subsequent compliant design development."*

10.12.5 It is the stated responsibility under this clause that the Independent Tester, **through monitoring and observing construction, satisfy itself that the project complies with the requirements of the Project Agreement.** The most general of these requirements in relation to the construction of the schools, as specified in the Project Agreement under '*Council Requirements Section B.6.0 Accommodation Provisions*', reads:

*"All Project Schools to comply with applicable laws and statutory standards."*

10.12.6 The contract does not specify how an Independent Tester should satisfy itself in this regard. To do so effectively, would require an intensive regime of inspections and sign offs of all aspects of the construction where statutory standards were at risk of not being complied with. The Building Standards in Scotland come under the heading of statutory standards so it could be implied that under the terms of the contract the Independent Tester is required to monitor compliance with Building Standards throughout the project.

10.12.7 It can be argued that it would be unreasonable for a client to expect this level of assurance from this service, but it should therefore also be clear to the public sector client as to what the service does and does not provide in terms of reassurance as to the quality of construction.

10.12.8 The Inquiry was somewhat surprised, although perhaps this is a reflection of the perceived limited level of involvement of Independent Certifiers in the detail of projects, that neither of the two companies were approached by any of the key participants in the aftermath of the wall collapse at Oxfangs School, and at the subsequent discovery of the extent of defective construction, which under the general certification of the Independent Certifiers had been certified as compliant with the requirements of the Project Agreement.

10.12.9 The situation, as previously described in this Report in relation to the significant differences in the approaches adopted on the two Phases of PPP1 by the two different Independent Testers appointed under the same conditions of contract, reinforces the inconsistency in application and expectations of the role.

10.12.10 The Inquiry sought evidence from Mouchel as to the nature of their involvement and the level of inspections they had carried out as Independent Certifier for the Phase 1 schools. Unfortunately, the company was unable to provide any specific information or records as to the PPP1 project, advising the Inquiry that they no longer held any information on the project and that no one who worked on the project was still with their company. A Commercial Director from Kier, which company had acquired Mouchel (recently sold on again to WSP), agreed to meet with the Inquiry to discuss the nature of the current Independent Certifier role as delivered by his own company.

- 10.12.11 Speaking in a general sense he indicated that his team considered that a greater level of specification in the appointment of an independent certifier would be desirable to assist all parties in their understanding of what is to be delivered which could only be helpful for contracting parties. His experience was that original tender documents are often not terribly detailed in relation to the Independent Certifier's role.
- 10.12.12 The view expressed in evidence to the Inquiry by the Deputy Chief Executive of the Scottish Futures Trust (SFT) assumed a significant degree of reliance on the Independent Certifier's role.

*"If you accept that the Independent Certifier or tester has the job of certifying the work then it is also within their remit to certify that the construction has been done in compliance with the original specification. Of course, they cannot check each and every variation in the design which may have been implemented on site. Only those people who oversee things on a daily basis can do this and that would be the contractors."*

- 10.12.13 In relation to the benefit of the use of Clerks of Works to protect quality on the part of the public sector client, he stated:

*"I have seen no link between the use of Clerks of Works and quality issues. Overall I have seen no evidence that one approach is more or less quality conscious."*

- 10.12.14 While this was clearly the experience of the Deputy Chief executive of the SFT, this experience was very much at variance with those described by many of the witnesses to the Inquiry.

- 10.12.15 **Previous comments have been made in this Report by the Inquiry as to the need for greater clarity as to the level of scrutiny of construction that the Independent Certifier role should be required to undertake and as to the degree of reliance that can be placed on it by public sector clients in relation to assurance of build quality.**

- 10.12.16 **It is vital that this should be properly understood by staff in public sector client bodies who may only have a requirement to use these services once or twice in their careers and may have formed mistaken assumptions as to the nature of the Independent Certifier role as generally undertaken in practice.**

- 10.12.17 A further related aspect raised in the Inquiry was the nature of the process of selection and appointment of the Independent Certifiers. Clearly the word 'Independent' is of key importance in this context as the Independent Certifiers have to carry out a role which shows no favour to either party.

- 10.12.18 The Inquiry was informed that the nomination for the appointment of the Independent Certifiers for the PPP1 was made as a proposal of the private sector party to the Contract and that there was no process of public advertisement used to invite applications from interested professional firms, even though this was required to be a joint appointment with the Council. This approach would appear to have been in line with that adopted on other PPP projects at the time and would appear still to be the case in some current procurements.
- 10.12.19 **The Inquiry would suggest that it would be more appropriate if such appointments are made following compilation of an agreed scope of the service required and a properly convened public competition to reflect the independent nature of the role.**
- 10.12.20 **This is in no way intended to suggest that in the case of the PPP1 schools the service was undertaken with a less than total independence of approach.**

### 10.13 **RESPONSIBILITY FOR INSPECTION OF CONSTRUCTION QUALITY**

- 10.13.1 The fact that neither the building inspectors from Edinburgh Council nor either firm of Independent Certifiers, in line with their understandings of their own respective roles, carried out on-going inspections of the quality of construction at the level that is more normally undertaken by a Clerk of Works, meant that the Council were effectively totally reliant in this regard on the quality assurance procedures of ESP and their construction supply chain. In the case of the contractors this effectively meant marking their own homework. The amount of defective construction subsequently discovered demonstrates that unfortunately, any such reliance on self-marking by the construction supply chain was, at least in relation to quality of construction of the walls, on this occasion misplaced.
- 10.13.2 If one were to compare this procurement method with the more traditional model of public sector procurement, while not without its problems, the latter offers public sector clients a further level of assurance in that the architect and structural engineer, under that model directly employed by the public sector client, provide a degree of independent scrutiny of the quality of construction work throughout the construction process. This professional scrutiny would normally be supported, certainly on projects similar in size to the PPP1 projects, by the employment of experienced Clerks of Works and/or resident engineers, who would act as the permanent on-site eyes and ears of the design team.
- 10.13.3 In the PPP1 arrangement, as is the case in the Design and Build model that is increasingly the predominant model used by the public sector, the design team was employed by the construction joint venture, AMJV on Phase 1 or directly by Miller Construction on Phase 2. Under these arrangements, the primary contractual obligation of the members of the design team is to the contractor

and the scope of their service, including whether or how often they attend site, is also determined by the contractor.

- 10.13.4 Unless a separate team is appointed to do so, public sector clients in this situation do not enjoy the benefits of independent inspections of the quality of the construction work by members of the professional team representing the clients' interests. Also with the move to Design and Build and PPP types of procurement, where the role of the design team is largely determined by the contractor, the unwillingness for contractors to pay for the presence of architects and structural engineers on site to inspect the work of the contractors employing them, has been reflected by a significant reduction over recent years in the level of this crucial activity undertaken on these types of project.
- 10.13.5 Of equal concern is the reduction by public sector clients in the direct employment or external appointment of Clerks of Works whose essential role in public sector projects has been to protect the quality of construction which represents significant investments of public funds.
- 10.13.6 **It is the view of the Inquiry that such reductions in the core aspect of quality assurance on behalf of public sector clients is frequently a false economy.**
- 10.13.7 It was reported to the Inquiry in evidence, as previously advised in this Report, that the approach of Edinburgh Council was based on an assumption that quality assurance in the delivery of the project was essentially the responsibility of ESP and that the Council should have a very limited role in this regard.
- 10.13.8 On that basis, no Clerks of Works were appointed to act on behalf of the Council on the PPP1 projects.
- 10.13.9 The representatives from virtually all the public sector bodies and the large majority of private sector bodies interviewed by the Inquiry, expressed concern at the ongoing reduction in the use of Clerks of Works in the construction industry and saw this as a contributory factor to problems of quality in the industry as a whole.
- 10.13.10 Specific instances in relation to the current delivery of public buildings in Scotland by approved major contractors were referred to in evidence to the Inquiry. Examples were given in which the Clerk of Works played a central role in identifying major failures in the quality of the construction of both the structure and fabric in new school buildings. A senior estates manager from the Local Authority in question stated in evidence:

*"My experience has been that the level of inspection allowed for by the funders and the delivery company has been minimal. We have had to put*

*in place our own directly employed staff and clerks of works to ensure the quality of construction and level of supervision that we require."*

- 10.13.11 In the opinion of some of those who gave evidence to the Inquiry, rather than the increased use of 'Design and Build' leading to a better integration of these two fundamental aspects of the construction process, its use can lead to an artificial separation of design and construction and a potential deskilling of design team members as a result of their reduced exposure to experience on site. As one example of this, a Director of an established firm of structural engineers said in evidence to the Inquiry:

*"I would also add that the supervision element of the engineer on site has almost disappeared in construction projects. Historically, we would have resident engineers on site but this costs money. In the past, this would have altered the mentality and approach of the contractor on site as they knew that there was somebody appointed by the client on site either all the time or very regularly watching what they were doing.*

*Our view is that the workmanship issues found on the schools has little to do with PFI, it is an issue to do with the construction industry more widely."*

- 10.13.12 Similar views in relation to the impact of the reduced role of architects and engineers under the newer procurement models, in terms of their role in inspecting the quality of work on site, were expressed by the majority of professional consultants and professional client representatives who appeared before the Inquiry.

- 10.13.13 The Inquiry received a written submission from the Royal Incorporation of Architects in Scotland which included specific commentary on this issue. The following extracts were considered particularly relevant in relation to this issue by the Inquiry.

*"The traditional position on inspection has long been that supervision of construction by the parties responsible for it is an essential first line of defence. Independent inspection by persons experienced in construction inspection, combined with effective sanctions in the case of non-compliance with standards, were always essential safeguards. Non-traditional forms of construction, if they remove or dilute the independent inspection role and the sanctioning authority of the construction inspector from the construction process, cannot provide the assurance of quality sought in public sector guides."*

*"Traditionally the ultimate sanction of an architect finding defective work, was to refuse to issue sums on an interim certificate which was required*

*to authorise payment to the contractor. Where the architect is engaged by the contractor this is, of course, not possible."*

*"It is not uncommon for architects involved in alternative procurement projects to be advised that site inspection is not necessary, or that architects instructions, (by which contract works are varied traditionally) are not required."*

- 10.13.14 Perhaps naturally enough the issue of a perceived constant pressure on reducing professional fees was frequently raised in evidence. The following is one example from the evidence of a Director at another established firm of structural engineers.

*"With regard to the question of fees, inevitably your fee level determines how much time you are able to be on site. You want it to be done as best you can. Ideally, you would like to be there often, but fees remain tight. Nowadays, we are often encouraged to rely on emails or photos of the work being done and this type of shortcut does drive down fees.*

*When the fee is tight, things are compromised. Although our professional indemnity covers our design, we can't possibly guarantee the quality of workmanship on site."*

- 10.13.15 There is a fundamental difference between the traditional and alternative forms of procurement, in terms of the nature of the relationship between public sector clients and design team architects or structural engineers. Public sector clients may assume that the involvement of these professionals in the project provides the same level of assurance in Design and Build or PPP projects as under previous forms of contract. This is not the case. These consultants owe their direct contractual obligations to their employers the contractors, who will normally ensure that all key correspondence from the design team goes to them directly for a decision as to how that information should be processed.

- 10.13.16 In evidence a Director of WSP Parsons Brinckerhoff, a major international firm of consultants and also the structural engineers who were responsible for the structural design of the PPP1 schools, in response to a general question on this issue, and specifically not referring to any situation at the PPP1 schools, explained his view of the relationship stating:

*"If a structural engineer from our practice goes in and sees a lack of wall ties, under the terms of a Design and Build appointment, we would have discharged our responsibility if we were to inform the contractors. If we go back again and it still hasn't been done, then we would report it again. **Under the terms of our appointment we would not report it directly to the commissioning clients.** If it was a novation and a dual appointment*

*where we were also retained by the end client, we would have a duty to report beyond the contractor as our clients."*

10.13.17 A similar view was expressed by the Property Director from a Local Authority in Scotland;

*"In my experience, if an architect speaks out then they risk not getting more work from main contractors. They will be reluctant to speak out in this way so for that reason we find ourselves being much more proactive because we know that there is this conflict."*

10.13.18 The result of acting on a report of defective work from members of the D&B design team in such situations is likely to incur significant financial penalties for a contractor, either as a result of the cost of having to remove and rebuild the sub-standard work identified or as a result of the delay to completion this might cause. In such circumstances there is an inevitable conflict of interest which may impact on the judgement made by the contractor as to what actions are taken.

10.13.19 The experience of the Inquiry would strongly suggest that the majority of contractors will act with integrity in such circumstances and remove the defective work. However, evidence to the Inquiry has also suggested that there may be a resistance on the part of some contractors to have design team members inspecting the quality of the work on site for these reasons.

10.13.20 In the case of the PPP1 Projects the appointment of the architects, as provided in evidence to the Inquiry by Galliford Try, did require them to visit the site. It read:

*"Attend site to determine the quality of workmanship and materials are being executed generally in accordance with the Consultant's design. The Consultant shall provide a written Report to the Contractor where he finds a material deviation from the requirement of his design."*

10.13.21 Equally the appointment of the structural engineers had the following requirement.

*"Make such visits to the site as the Consulting Engineer shall consider necessary to satisfy himself that as to the performance of any site staff and that the Works are executed generally according to the designs and specifications and otherwise in accordance with good engineering practice."*

10.13.22 As previously mentioned in Section 9 of this Report, in the evidence from Holmes Miller, the architects for the PPP1 primary schools, it was stated that the architects had raised concerns with the contractor following site visits by them,



with the contractor in relation to failing to comply with the specification requirement that stated:

*"Raise no portion of the work more than 1.2 m above another at any time"*

and that, as they had no power to instruct the AMJV/contractors to comply, this approach was carried on throughout the course of the various school projects.

10.13.23 **The Inquiry is of the view that, if possible, there should be a mandatory provision built into such contracts that where a contractor fails to take appropriate action on issues that could impact on the subsequent safety of building users, the consultant in question should be required to inform the public sector client of the advice provided to the contractor.**

10.13.24 If the commissioning client is also made aware of concerns expressed by members of the design team, the dynamic of the situation is quite different.

10.13.25 **It is the view of the Inquiry that public sector clients should specify in their 'statement of client's requirements' any particular provisions they may wish to have incorporated into the scope of services to be provided by design teams in Design and Build arrangements, particularly in relation to the inspection of and reporting on the quality of construction and compliance with the approved design.**

10.13.26 **They should also require to see the conditions of appointment of the design team members to understand the comprehensiveness or otherwise of the services that the design team are being required to provide by the contractor.**

10.13.27 The Inquiry was advised that in the case of the PPP1 projects as far as it was possible to say, the conditions of appointment and range of services to be provided by the design team were not requested by or provided to the Council Project Team.

#### 10.14 **QUALITY MANAGEMENT WITHIN THE SUPPLY CHAIN**

10.14.1 The effectiveness of quality management and implementation of quality assurance methodologies by the main contractor, given the increasingly large proportion of actual construction that is undertaken by sub-contractors, is dependent on ensuring that those sub-contractors have in turn quality systems that align with those of the contractor.

10.14.2 The requirement for main contractors to carry out due diligence on sub-contractors was raised in evidence to the Inquiry by a representative attending on behalf of the Scottish Building Federation, who was a Director of a Building

Company, which also provided sub-contracting bricklaying services on larger projects. He stated:

*"We would normally expect the contractor to check out the sub-contractor and do due diligence in the marketplace. However, we would think it unlikely that they would be in a position to check the operatives who the subcontractors engage."*

*"There is a tendency for good contractors to get more and more work but they will eventually get to the point where they will be unable to properly resource jobs they take on and quality can go down."*

*"Certainly, a main contractor will assume that their sub-contractors will employ competent tradesmen but the main contractor cannot necessarily control it. You will then have to rely on a supervisor or even a Clerk of Works or both."*

*"Building standards and quality issues can sometimes be enhanced if the client puts in place additional supervision as a check. However many clients won't have anyone on site to act in their interest as an additional set of eyes and ears..."*

- 10.14.3 The availability of well-trained bricklayers has already been raised as a concern within the construction industry. In periods of heavy demand, such as when so many schools were simultaneously being built, there can be a pressure on contractors and sub-contractors to use members of the workforce that may not be well known to them and who may not have the requisite skills or even training.
- 10.14.4 In evidence to the Inquiry it was acknowledged that while operatives coming on site would be required to show Construction Skills Certification Scheme (CSCS) cards, the focus of this system tended to be on safety matters rather than on the skillset or competence as a tradesman. This was acknowledged by several witnesses as a potential weakness in the on-site quality control of those undertaking the work.
- 10.14.5 Another issue raised in discussion about the quality assurance of sub-contractors was the influence of the way in which individual bricklayers were paid. It has become commonplace over recent years, with the increasing demise of bricklayers being permanent employees of main contractors, that payment is on the basis of the number of bricks laid or square metres of wall completed in a day. The bricklayer is not normally paid anything extra for the incorporation of wall ties, corner ties, bed joint reinforcement or head restraints. The more complicated and numerous the accessories to be fitted the longer it takes and

the less bricks are laid, reducing the earnings for that day. For that reason some bricklayers will not take on more complicated work.

- 10.14.6 The Inquiry was advised by two senior Clerks of Works, permanently employed by a large public sector organisation in Scotland, that the quality of bricklaying was still today a constant problem for them, requiring their on-going inspection. They both were of the view that the common means of remunerating bricklayers, as described above, was one of the contributory factors in bringing about this situation.
- 10.14.7 One of them described a recent example from a major project where they spotted that a bricklayer was building a significant section of the wall he had been working on without building in any wall ties. When he was stopped by the Clerk of Works and queried, his response was that as the contractor hadn't provided enough wall ties they had run out, and he could not afford to sit around as his earnings for that day were dependent on him completing the wall.
- 10.14.8 The Inquiry would not expect that this is a regular occurrence in the practice of the trade but in the situation described, without the inspection of Clerks of Works, another wall could have been built that represented a potential danger to members of the public using or in the proximity of the building.
- 10.14.9 In the case of the PPP1 schools, it is particularly noticeable that throughout the various buildings, the areas that tended to be least provided with head restraints were those areas where the steel beams were sloping upwards at the angle of the roof, making it more difficult and time-consuming for a bricklayer to install head restraints than in the case where the beam they were to be attached to was horizontal .
- 10.14.10 The chair of this Inquiry was informed during a visit to the site of one of the PPP1 Schools, undergoing remedial work, by a representative of the builder undertaking the remedial work, that a number of head restraint fittings were found sitting on top of the steel beams where the bricklayer has placed them rather than take the time to connect them to the steel beam and build them into the adjacent wall, from which they were found to be missing.
- 10.14.11 It is also of notice that throughout the schools in those walls where head restraints were fitted, the specified more complicated head restraint fitting, which was designed to connect both leaves rather than just the inner leaf to the steel beam, were rarely found. Instead they tended to be replaced by the simpler single leaf fitting, which was quicker to fit but did not share the structural advantage of helping to tie the two leaves to each other as well as to the steel beam.

- 10.14.12 From the programmes provided, it is clear that the schools were built quite quickly, the incentive to do so being that if they failed to achieve the required dates for the start of school terms, they risked losing income from Council payments. In evidence the Inquiry was told by an experienced contractor and ex-bricklayer that a focus on speed of construction in which tradesmen such as bricklayers are required to accelerate can often be at the cost of quality.
- 10.14.13 It is difficult for the Inquiry to be categorical about the degree to which any of these factors may have impacted on the quality of the brickwork in the PPP1 schools given the non-availability or unwillingness of witnesses involved in the actual construction of the walls to come forward. The Inquiry also experienced difficulty in getting representatives from a number of invited specialist bricklaying sub-contractor, who had not been involved in the PPP1 projects, to agree to give evidence to the Inquiry on quality in the Industry.
- 10.14.14 However, it is clear that the quality systems and supervision in place were inadequate to prevent the repeated and widespread occurrence of similar defects across a range of school projects delivered by a range of contractors and sub-contractors. It is also clear that the lack of embedment of ties on the scale discovered must have been obvious to those building the walls and should have been obvious to anyone supervising them.

10.15 **DEFECTIVE CONSTRUCTION MORE WIDESPREAD WITHIN THE INDUSTRY**

- 10.15.1 **The fact that this sub-standard, unacceptable and potentially dangerous quality of construction simultaneously failed to be identified and rectified on so many different sites would suggest that the standard of wall construction in the industry may be a more widespread problem and not limited to the Edinburgh PPP1 schools.**
- 10.15.2 The Inquiry sought information from each of the 32 Local Authorities in Scotland in order to understand whether the underlying cause of poor quality construction, and non-compliance with building standards or approved warrant drawings, in the construction of cavity walls was something that extended beyond the Edinburgh schools. The Local Authorities were asked to advise the Inquiry of any relevant information they held in relation to any similar recurrences to the problems of defective construction as experienced in Edinburgh or if anything of relevance had emerged as the outcome of precautionary investigations undertaken since they had been notified of the Edinburgh incident by the Scottish Futures Trust. The Inquiry first wrote seeking this information in August 2016. Most Local Authorities responded quickly and positively.

10.15.3 The Inquiry also sought from the SFT the collation of information that had been collected by them following the Edinburgh incident. The following is an extract from a letter received by the Inquiry from SFT in December 2016.

*"Across Scotland, four related instances of partial wall collapse over the past four years have been reported to SFT, in addition to the Edinburgh PPP1 project. A number of Authorities have identified some issues with wall ties in similarly constructed buildings. The use of intrusive survey techniques such as the borescope, and the removal of individual bricks and blocks have been found to be the preferred methods for identifying similar issues. A number of Local Authorities have undertaken intrusive investigations, either following observed signs of distress on visual inspection, or directly following risk assessment of their building types. Where related issues have been identified, these have included:*

- *Minor structural observations such as deteriorating mortar bed joints and evidence of hairline settlement cracks in the building fabric which required minor precautionary remedial works;*
- *Instances where cavity walls have been built wider than specified or wider than would appear to have been the original design intent;*
- *Wall ties installed with depth of embedment in one or both leaves of cavity walls less than the recommended minimum;*
- *Number of wall ties or horizontal and vertical spacing of wall ties not according with normal standards;*
- *Wall ties around door and window openings not installed at closer centres as normal standards suggest;*
- *Walls not evidently tied to the main steel framed structure, including potentially inadequate or missing ties at the interface between head of wall and header beam and column supports – though it can be difficult to be clear whether head restraint had been required as part of the original design;*
- *Evidence of defects to blockwork walls particularly in large expansive panels in gymnasium/assembly halls and/or around wall mounted sports equipment."*

10.15.4 The above information, while clearly identifying that similar problems had been found in other schools across Scotland, did not provide details on the frequency of these findings or where they were found. However, as stated in the letter,

many Local Authorities, recognising the significance of the issue, were most helpful in providing comprehensive information directly to the Inquiry.

- 10.15.5 The level of information provided to the Inquiry by Local Authorities varied and, from the nature of the responses received, it was apparent that the level of investigations undertaken by different Local Authorities had also varied, from simply receiving statements of reassurance from Project Companies or contractors, to visual inspections of external walls to preliminary and follow-up intrusive testing.
- 10.15.6 There was an unwillingness on the part of some Local Authorities to provide copies of the structural reports that had been commissioned into their schools.
- 10.15.7 **The Inquiry is of the view that while Local Authorities may not wish to have information on defects in their buildings publicised for various reasons, there should be a public duty on such organisations to openly share with each other and the construction industry, information on recurring defects of a type, which unless addressed by the construction industry and regulatory bodies, may present an on-going risk to the public they serve.**
- 10.15.8 The risk of injury from falling masonry will be greatest in circumstances where defective masonry is present in larger panels that are not properly restrained or reinforced and are located higher up a building. In several of the following examples of defects described to the Inquiry by Local Authorities, it can be seen that, due to the recurring poor quality of wall construction, this risk was real.
- 10.15.9 The following information is based on a small selection of extracts taken from structural engineering reports voluntarily provided to the Inquiry by the relevant Local Authorities. These highlight the recurrence of a similarity of defects to those found in the Edinburgh PPP1 schools. The reports were commissioned by Local Authorities or by the relevant PPP companies, either following problems encountered with wall construction in newly built schools or as a precautionary follow-up after being informed of the Edinburgh wall collapse.
- 10.15.10 The reports indicate that the defects identified below in the various schools either have been fully addressed or are in the course of being addressed by the relevant Local Authority or its PPP Company.
- 10.16 **FOUR SCHOOLS OUTSIDE EDINBURGH WHICH SUFFERED DAMAGE IN HIGH WINDS**
- 10.16.1 **South Lanarkshire schools**
- 10.16.2 In early January 2012 during a period of exceptionally high winds, external wall panels collapsed at two secondary schools, Trinity High School and Duncanrig Secondary School in South Lanarkshire. Fortunately both schools were closed at

the time of the collapse for the Christmas holiday period. These schools were built in 2009 under a PPP contract.

- 10.16.3 As shown in the photograph below, the Trinity High School collapse had a striking similarity to the collapse at Oxfangs School, with the corner brickwork panel of the external leaf of a gable wall separating from the internal leaf and falling from a height onto a playground below.



**Image 26:** Photograph of the collapsed panel at Trinity High School.

- 10.16.4 An extract from a structural report on the collapse at Trinity High School stated:

*"The wall tie pattern evident at the collapsed outer leaf locations did not take account of the outer leaf movement joints and only provided ties at 900 centres vertically and not set out horizontally to provide the 225mm horizontal dimensions from the joint location.*

*The as-built spacing of cavity ties at the movement joints would lead to the wall ties near the joints being subjected to an increasing tensile and compressive loading compared with loads had the ties been installed to code spacing requirements. It should also be noted that the overall length of the two-part tie (400mm) in light of the cavity width of 330mm does not provide the minimum code requirement of 50mm embedment in the inner and outer leaves."*

- 10.16.5 This last point is particularly important; if the same embedment had been provided to each leaf, this could only have achieved 35mm embedment which is 30% less than the minimum British Standard requirement of 50mm. In fact, for two-part ties a greater embedment of 75mm is recommended by leading wall tie manufacturers, making the defect potentially more serious.

- 10.16.6 At Duncanrig School, a brick panel on a gable wall collapsed inwards against the internal leaf of the cavity wall. A structural report on the event stated that the head of the brick panel did not appear to be restrained. In relation to the embedment of the wall ties it stated:

*"It appears that the wall ties had significantly less than this 50mm and in some instances the ties were not embedded at all."*

- 10.16.7 The following photographs, together with the comments below the photographs, are taken from the structural reports and show evidence of the lack of wall ties and improperly installed wall ties at Duncanrig School.



**Image 27:** Photograph from Duncanrig Secondary School. 'Note no ties or head restraints to inner face of outer brick leaf'.



**Image 28:** Photograph from Duncanrig Secondary School. 'Note wall ties with no embedment in outer brick leaf of cavity wall'.



10.16.8 **Stirling Council**

10.16.9 In May 2016, Balfron High School in Stirlingshire was partially closed after structural problems were identified. A wall at the school had been damaged during winter storms and after checks were carried out by engineers, issues with walls in the stairwell, gym and atrium were discovered. Stirling Council advised that defects had been discovered in relation to insufficient wall ties and lack of embedment of wall ties. The school which opened in 2001 was delivered under a PPP contract. The Inquiry was not provided with further details as to the extent of the defects.

10.16.10 **Glasgow Council**

10.16.11 The following paragraphs on Lourdes Primary School in Glasgow are based on information provided in evidence to the Inquiry as the structural report was not made available to the Inquiry.

10.16.12 At Lourdes Primary School, on the 3<sup>rd</sup> January 2012, during a period of exceptionally high winds, a wall at a high level partially collapsed, damaging the roof section onto which it fell. The section which came down was approximately 15 square metres in total.

10.16.13 This school was not procured under a PPP scheme but, most unusually, was built for the Council as part of a land swap deal with a major retailer, who procured the school through a design and build/turn-key arrangement, whereby the Council was provided with a completed school.

10.16.14 The structural engineering report concluded that there had been a lack of wall head restraints on the wall panel that had collapsed. Also, there was an insufficient number of wall ties and those that were there had not consistently adequate embedment.

10.16.15 When the walls were subsequently intrusively examined, similar defects were found on five other gable walls at the school. A two-part wall tie had been used where the cavity width was 300mm but in many cases, only one half of the two-part wall ties was found to be present. A number of walls were taken down and in large part rebuilt. Remedial wall ties, lateral ties and wall head restraints were installed where found missing and a number of windposts were added.

10.16.16 It was also noted in the Report that bed joint reinforcement which had been specified at 600mm centres, were found to have been installed at 900mm centres.

10.17 **EXAMPLES OF SIMILAR DEFECTS FOUND IN OTHER SCHOOLS IN SCOTLAND**

10.17.1 In addition to the above four schools outside Edinburgh where actual physical damage to or collapse of external walls had been caused by the force of the wind, other Local Authorities advised the Inquiry of the discovery in some of their schools of the same range of defects that caused the collapses elsewhere. The following is a sample of these findings.

10.17.2 **Inverclyde Council**

10.17.3 Inverclyde Council provided the Inquiry with structural engineering reports on surveys completed in August 2016 on four PPP schools and four Non-PFI/PPP schools. The surveys were commissioned following reports of the problems with the Edinburgh schools.

10.17.4 The reports on the four PPP schools indicated the following:

(i) **All Saints Primary School, Greenock:**

The structural report stated that a wall panel over a doorway some 4m wide by 2m high was found to have no wall ties over the full area of the panel and required the installation of remedial wall ties. Otherwise the wall ties were found to be generally compliant.

(ii) **Notre Dame High School, Greenock and Clydeview Academy, Gourock:**

The structural reports state that in both schools there was inadequate embedment where two-part wall-ties had been used in the wider cavities. The embedment was reported as being only 30mm at the inspection locations as opposed to the recommended 75mm for these type of wall ties. The installation of remedial wall ties was recommended at these locations.

(iii) **Aileymill Primary School, Greenock:**

No defective construction was identified in the surveys.

10.17.5 The reports on the four Non-PPP Schools indicated the following.

(i) **Inverclyde Academy, Greenock:**

The structural report stated that a panel of brickwork, approximately 2m x 2m located in a high part of the building was found to be held with only one wall tie, in an area of the building that was exposed to the highest concentration of wind-loading. The installation of remedial wall ties was recommended.

(ii) **Newark Primary School, Port Glasgow and St. Joseph’s Primary School, Greenock:**

No defective construction identified in either school.

(iii) **Kings Oak Primary School, Greenock:**

No defective Construction identified in the surveys but further testing suggested as a final check.

10.17.6 **Angus Council**

10.17.7 Six PPP schools constructed in Angus, which opened in 2009, were inspected following the Report of the Oxfangs school wall collapse. Five of the six schools were found to have been constructed where head restraints were not in accordance with the construction drawings. Insufficient wall tie embedment was identified in three of the six schools. In one of these latter three, there were differences in the coursing levels of the inner and outer leaf resulting in ties not being horizontal and in some cases missing.

10.17.8 **Dundee Council**

10.17.9 Eight PPP schools under the control of the Dundee City Council, which opened in 2009, were inspected following the Report of the Oxfangs school wall collapse. Three of the eight PPP schools were found to have deficiencies. Two schools had a lack of provision of bed joint reinforcement and wall head restraints in a small number of panels and in one other school wall tie embedment was found to be less than the minimum requirement in some locations and in several wall panels the required wall head restraints were found to be missing.

10.17.10 **East Renfrewshire Council**

10.17.11 East Renfrewshire Council provided to the Inquiry structural reports produced in 2011 on two PPP schools, St. Ninian's High School and Mearns Primary School built in 2006. Remedial work was required in 2011 to both schools in relation to the lack of provision or proper embedment of wall ties. Examples of the defective work at St. Ninian's High School are shown below. These photographs were taken during the remedial works contract in 2011.

**St Ninian's High School, East Renfrewshire**



**Image 29:** St Ninian's High School;  
"Photo showing one of the defective wall ties (no embedment) in place behind the internal skin of blockwork in the sports hall."

Commentary and photograph from the Structural Report.



**Image 30:** St Ninian's High School;  
"No wall ties have been installed into a large section of the wall."

Commentary (and photograph) from the Structural Report.



**Image 31:** St Ninian's High School.

*The structural report refers to:*

*'misalignment of bed joints' between the two leaves of the wall';*

*'deformation of wall ties allowing the transfer of water to the inner leaf';*

*'the slope of the wall tie at 105 degrees is not permissible'; and*

*'the spacing of wall ties at 675mm x 900mm fails to meet the required 450mm x 900mm'.*

- 10.17.12 **The Inquiry is of the view that the nature of defects identified in the above examples from other schools in Scotland clearly posed risks to those using the schools, which risks could have been avoided if effective quality assurance processes had been in place during the original construction of these schools.**
- 10.17.13 **There is sufficient evidence of the repetition of the same basic faults in the building of external masonry walls across a range of schools in Scotland to demonstrate that this issue requires a proactive response on the part of both clients and contractors in relation, respectively, to enhanced independent inspection and improved quality management to seek to eradicate this repeated failing of the construction industry.**

## **SECTION 11 - REMIT ITEMS 5 AND 6: MAINTENANCE OF BUILDINGS AND MANAGEMENT OF CONTRACTS**

### **Remit Item 5:**

*"The management and maintenance of the buildings since construction, including advising on whether the current defects should have been found earlier."*

### **Remit Item 6:**

*"The management of the contract by the relevant parties since construction; and the quality of the contract undertaken."*

- This section of the Report will deal with both Items 4 and 5 together as there is a significant overlap between the two issues.

#### **11.1 COULD THE CURRENT DEFECTS HAVE BEEN FOUND EARLIER?**

**11.1.1 In relation to the key question asked in Remit Item 5, the Inquiry is of the view that the defective embedment of the wall-ties and the presence or otherwise of secondary steelwork such as head restraints could not have been found earlier through normal visual inspection of the walls unless there had been some outwardly visible indications or signs of distress, such as bulging or cracking of the walls.**

11.1.2 A visual inspection of the external walls of all the PPP1 schools had been carried out as a precautionary check after the collapse of the wall at Oxgangs School. Despite the subsequent evidence of widespread defects discovered through the programme of intrusive surveys undertaken, the visual inspection undertaken by teams of experienced structural engineers gave no reasons for concern that the similar defects were present.

**11.1.3 The only time at which this defective construction within the cavity could have been detected was during regular quality inspections of the work at the time of construction prior to the work being closed in or through subsequent requested opening up of walls for inspection during construction, which would not have been usual without some outward indication that the work may be defective.**

11.1.4 In relation to the recent discovery of breaches in the fire-stopping, the Inquiry is of the view that their discovery should not have required a proactive request from the Council for reassurance on this issue and that these breaches of fire-stopping should have been identified and remedied much earlier through appropriate on-going inspection of the premises by the facilities management company.

11.1.5 It is difficult for the Inquiry to be specific about the number of breaches identified in the fire-stopping surveys that dated from the original construction but it would appear from evidence of the photographs that a proportion would have done so. What is irrefutable is that many of these breaches did not suddenly appear in recent months.

11.1.6 **Accordingly, it is the view of the Inquiry that the defective fire-stopping could have been identified earlier and that, prior to the recent actions of ESP and Amey, there had been a failure to identify, report and remedy the breaches in fire-stopping from which ever date they were first caused.**

## 11.2 **MANAGEMENT AND MAINTENANCE OF THE SCHOOLS SINCE CONSTRUCTION**

11.2.1 In relation to the general management of the schools since opening, the Inquiry was given limited reason to suggest that the day-to-day management was carried out other than largely to the satisfaction of the users.

11.2.2 A level of satisfaction was expressed by several witnesses from the Council including the Head of Finance who said;

*"We have been getting the service that we wanted to the standard required at the price set out in the Contract. I believe, until the closures, the Contract had worked well in Edinburgh.*

*Here in Edinburgh Head Teachers have fed back to us that the standard of service they have been getting has been generally good compared to non-PFI funded schools. In a non-PFI school, if there are problems or repairs required, these need to be considered against budget availability and priorities elsewhere. In a PFI school it is reported to the Helpdesk and the work is undertaken within a timescale set out in the Project Agreement."*

11.2.3 The Acting Head of Property and Facilities Management at the Council broadly agreed with this view;

*"...in terms of ongoing service and maintenance over the life of the Contract I would say that overall the PFI model does represent value-for-money ..."*

*"...we have service levels agreements in place which appear to work well."*

11.2.4 This Inquiry was also keen to hear the views from the perspective of the recipients of the service at first hand, who were best placed to comment on the day-to-day experience. The views expressed by Council representatives were generally supported by representatives of both teaching staff and parents of children at the PPP1 schools. The Head Teacher of Ogangs stated;

*"I have been a Head Teacher both in the PPP school Oxfords and also previously in non-PPP schools. I would say that overall my PPP experience has been very positive. Things are very well maintained and if there are issues they are fixed relatively quickly. Overall, I would say that a school like Oxfords is a fantastic environment. I am very happy there."*

11.2.5 There was a relative unanimity of opinion on this issue. The Head Teacher of Braidburn said;

*"Overall, the maintenance at a PPP school is better than in a traditional set-up. Repairs and damage are attended to very promptly. The janitors at Braidburn take great pride in the school. The catering is also very good as is the landscaping and other facilities."*

11.2.6 A Chair of a Parent Council at one of the schools also agreed with this assessment;

*"So far as maintenance and cleanliness are concerned the standards are very good. As the facilities management team are very helpful and go out of their way to ensure that things run smoothly.*

*By way of more general conversation, I have had some contact with Parent Councils at non-PPP schools in the city. I know from speaking to them that they have a constant battle to get improvements at those schools. There are difficulties at both types of schools but for different reasons. I know that there are constant maintenance issues with leaks, flooring and other elements."*

11.2.7 Whilst generally positive about the maintenance and repair regimes in the PPP1 schools, there was one aspect of the PPP Contract on which a consistent degree of frustration was expressed by the parent councillors and head teachers, who gave evidence to the Inquiry. This related to the difficulties, in terms of what they considered to be both excessive levels of cost and lengths of time required under the PPP process in seeking to incorporate minor changes or improvements to the schools even in relation to items for which they were prepared to provide the funding.

11.2.8 In response to this issue in evidence to the Inquiry, representatives of ESP explained that they had no option but to include in their estimates the whole life costs of additions and not just the initial capital cost, as they would have to maintain and replace these items as appropriate over the period of the 30-year concession. Due to this factor, some desired requirements had been rendered unaffordable to some of the schools seeking them.



- 11.2.9 A measurement of the quality of services provided should be broadly related to the amount of deductions made by the Council from otherwise due payments to ESP for any failures by ESP to meet the performance standards as a result of the application of the contract management processes set down in the Project Agreement. The following table provided by the Council shows the level of deductions made over the last five years excluding the current year, 2016, for which the deductions made are not representative.

Calendar Year	Deductions by Council
2010	£9,700.02
2011	£4,146.94
2012	£34,011.19
2013	£10,174.92
2014	£9,558.36
2015	£5,254.00

- 11.2.10 In the years since 2010, the level of deductions has been very modest, the worst year amounting to only 0.23% when expressed as a percentage of the annual payment of approximately £15 million. If all due deductions are currently being made, this would infer that, prior to the recent major set-back, the service has been consistently provided in line with the requirements of the Project Agreement, only attracting minor deductions.
- 11.2.11 **It is the view of the Inquiry that the level of service provision under the Contract has been largely consistent with the requirements of the Contract and would generally seem to have been to the satisfaction of the staff and members of the Parent Councils of the PPP1 schools.**
- 11.2.12 **The Council may wish to investigate what flexibilities there may be in the approach to and management of requests for minor changes within the schools, which was identified as an on-going source of frustration by those members of staff and of Parent Councils who gave evidence to the Inquiry.**

## SECTION 12 - REMIT ITEM 7: EDINBURGH COUNCIL'S HANDLING OF THE INCIDENT

### Remit Item 7:

*"A review of Edinburgh Council's handling of the incident from January 2016 to the reopening of the schools in Summer 2016"*

- This section of the Report will examine how effectively the City of Edinburgh Council responded to the overall situation arising from the collapse of the wall at Oxbgangs School and the subsequent discovery of defective construction in the external walls of the remaining PPP1 schools.

#### 12.1 ORGANISATIONAL RESPONSE

12.1.1 The significance of this issue emerged over several weeks with further results of the evermore intrusive surveys throughout the 17 PPP1 projects revealing a widening range of defects with an increasingly widespread level of occurrence. Over that period, what had initially seemed to be a localised problem with one wall in one school, turned into one of the most demanding logistical tasks the Council may have ever faced.

12.1.2 Initially, the reasonable view taken by the Council officers was that the collapse of the wall at Oxbgangs School was an isolated incident resulting from Storm Gertrude and a senior manager with a professional construction-related qualification from within the Council was allocated to directly manage the issue. This council officer would subsequently play a hugely effective role in the wider remediation process that was at this stage still unsuspected.

12.1.3 The school was closed with immediate effect, information was issued to parents, consultant engineers WRD were appointed to advise the Council and temporary works were designed and carried out to the wall to render it safe. The school was able to reopen within a matter of only three days including a weekend.

12.1.4 Additionally, a precautionary programme of visual inspections of all the PPP1 schools was commissioned to seek to identify any signs of damage or stress to the external walls of rest of the PPP1 the schools. This investigation raised no such concerns.

12.1.5 Once the immediate practical objective had been completed of seeking to ensure a safe environment at Oxbgangs and the other schools, a detailed report on the reason for the collapse of the wall was sought from WRD, whose appointment had been transferred to ESP as owners of the schools.

12.1.6 **It is the view of the Inquiry that, despite the unavoidable disruption and inconvenience caused, the response to the initial collapse of the wall by the**

**Council was prompt, effective and appropriate in the known circumstances at the time.**

- 12.1.7 It was only subsequently, when the possible extent of the defective construction was identified through further surveys, that it was recognised that there could be a requirement for closure of some or all of the schools.
- 12.1.8 On the 18<sup>th</sup> March 2016, the Chief Executive responded to concerns expressed in emerging survey information, which reported that the presence of defective embedment of wall ties was not limited to the gable wall at Oxfords and had been discovered in the other Phase 2 schools. He declared the situation should be considered as a 'serious incident' and established and instigated daily meetings of a Corporate Incident Management Team (CIMT), with senior representation from all the relevant sections of the Council.
- 12.1.9 This team supported the Chief Executive in developing the strategic response and directing the operational management of the situation as it evolved in response to the constantly changing information being received from ESP.
- 12.1.10 **It is evident to the Inquiry from the minutes of the meetings of the CIMT and from the evidence provided by Council witnesses that at all times the key central objective of the Council was to protect the safety of pupils and staff and that this factor was the underlying consideration in relation to all decisions taken by the Council throughout the process. The establishment of the CIMT and the role it played was critical in providing a fully coordinated management response to the situation.**
- 12.2 **MANAGEMENT OF THE CLOSURE OF ALL PPP1 SCHOOLS**
- 12.2.1 On 8<sup>th</sup> April 2016, ESP reported to the Council the discovery of further defects and as a result withdrew their previous confirmation that the schools were safe to occupy.
- 12.2.2 Up to this point the only defect that the Council has been aware of was the lack of embedment of wall ties across the PPP1 schools. To deal with this, while the Council had strongly stated a preference for all of the remedial work necessary to be carried out immediately, a compromise option had been agreed with ESP.
- 12.2.3 As previously described, this compromise would have allowed the schools to reopen, after the Easter holiday, on 11<sup>th</sup> April 2016 subject to the later completion in the holiday period of: the installation of remedial wall ties at entrances and exits to schools; the creation of adequately protected external exclusion zones around areas of wall that had not been remediated during this period; and the introduction of an inclement weather protocol.

- 12.2.4 **With the announcement on Friday 8<sup>th</sup> April, only three days before reopening of the schools was due, of a second serious deficiency in the construction of the walls, followed by the withdrawal by ESP of confirmation that the schools were safe to occupy, the Council had little option but to close all the PPP1 schools with immediate effect. The Inquiry has already concluded that this was the correct decision in the circumstances.**
- 12.2.5 This decision was largely driven by the determination of the Council not to expose pupils and staff to what were largely indeterminate risks.
- 12.2.6 The Head of Schools and Life Long Learning at the Council stated in evidence to the Inquiry:
- "There was at that time talk about initiating a more measured approach with a 'red, amber, green' system of effectively prioritising different sites. But to be honest, we wanted everything to be green and completely safe. We needed to have confidence in the safety of the buildings and to be able to convey that confidence to parents. A risk based approach was not enough to satisfy us or the parents."*
- 12.2.7 The decision to close the schools had major implications for the Council in terms of dealing with the requirement to relocate within the shortest possible time 3,198 primary school children, 4,327 secondary school pupils, 107 children with additional support needs and 738 nursery children; a total of 8,371 pupils.
- 12.2.8 The Inquiry was advised that alternative teaching accommodation, alternative transport and alternative catering arrangements had been put in place for most of the pupils by Thursday 14<sup>th</sup> April 2016 and for all by Wednesday 20<sup>th</sup> April 2016.
- 12.2.9 **It is the view of the Inquiry that this was quite a remarkable feat to have achieved within an immensely short time, especially without the benefit of any lead-in period and within only a few days of the unexpected announcement that the schools would have to close.**
- 12.2.10 As a result of clear and timely decision making by the leadership team at the Council, the concerted efforts of all parties concerned and the generous support of a range of other agencies, what would have been considered at the outset to be almost impossible was achieved. Emergency arrangements might be expected to cater for the closure of perhaps one or two schools simultaneously but to cope as effectively as was done with the simultaneous closure of 17 schools is deserving of praise to all those involved.
- 12.2.11 The solution, while finding places for all the children, did however create a range of unavoidable difficulties for pupils, parents and teaching staff.

- 12.2.12 The difficulties in coping with the logistics of the decant in relation to Rowanfield and Braidburn were particularly significant for pupils, parents and teachers.
- 12.2.13 Because of the city-wide nature of the catchment population for these two schools, the disruption of having the pupils dispersed over several sites across the City was particularly difficult to cope with. The more complex needs of the pupils required access to special catering, special equipment and specialist teaching support, all of which because of the dispersed locations of pupils required additional transport and storage arrangements.
- 12.2.14 The Inquiry was informed by one of the two Head Teachers that it was impossible, because of the time lost travelling between the sites, to maintain the same level of access to specialist teachers and allied health professionals who provide direct therapy support for a range of the pupils. She also advised the Inquiry that the changes were particularly unsettling for that group of pupils who were on the autistic spectrum for whom any change to routine can be problematic.
- 12.2.15 The additional travel time was seen as perhaps the worst aspect of the enforced moves for this group. She added;
- "Journey times increased very significantly for some pupils who could find themselves being bussed from their muster points to the alternative accommodation and that taking anything up to an hour each way. That would need to happen both at the beginning and at the end of each school day so that in some extreme cases, pupils were not leaving to go to their school facilities until ten thirty in the morning and were coming back by two thirty in order for pick up. Given their lunch break they were only getting about three hours of education a day."*
- 12.2.16 While relocating the pupils and teaching staff was clearly a major achievement, the process of having to do so was undoubtedly the cause of disruption and inconvenience to many parents in homes throughout Edinburgh. There was little that the Council could effectively do to avoid these inevitable consequences of the enforced moves, however it was clear to the Inquiry that at all times throughout the decant period the Council were very sensitive to the concerns of pupils, parents and teaching staff and sought to address them in every way possible.
- 12.3 **THE ROLE OF THE COUNCIL IN ENSURING EFFECTIVENESS OF REMEDIAL WORKS**
- 12.3.1 Immediately following notification of the collapse at Oxfangs School, the Council acted quickly and effectively, firstly, by allocating one of the senior building professionals in the Council to act as their main representative in relation to the

issue and secondly, by appointing WRD to provide them with professional structural engineering advice and services in relation to the collapse.

- 12.3.2 Within a matter of days, in recognition of the fact that under the contract responsibility for making Oxfords School safe to occupy lay with ESP, the Council transferred the appointment of WRD to ESP. At this stage, the Council had no reason to suspect that this was more than an isolated failure of a gable wall although they had sensibly asked for precautionary checks to be carried out elsewhere.
- 12.3.3 In accordance with interim arrangements made with ESP, the remedial works for Phase 1 were undertaken by Amey under the professional direction of WRD and for Phase 2 were undertaken by Galliford Try as advised by the structural engineers they directly appointed, Goodson Associates. This latter relationship was very similar to a Design and Build arrangement in that ESP had no direct contractual relationship with Goodson Associates in regard to this particular area of work and also had limited access to the technical information they produced other than through Galliford Try.
- 12.3.4 These arrangements while properly reflecting the contractual structures underlying the PPP contract indicate a level of separation created by the procurement model between the Council and direct access to core information relating to the actual fabric of schools, the condition of which determined the Council's ability to meet its statutory obligations in providing a safe environment for the pupils and teachers in Edinburgh.
- 12.3.5 It has been noted that even though there were clearly contractual issues between the Council and ESP arising from the discovery of defective construction and the enforced enclosure of the schools, there was a relatively open and transparent sharing of technical information between these two parties. It is clear, however, from evidence to the Inquiry that the timely making available of all relevant information to the Council was less than ideal. This was particularly true in relation to the lack of clarity provided to the Council by ESP as to the detailed proposals that Galliford Try were adopting in their approach to the remedial work.
- 12.3.6 When evidence began to emerge of the extent of defects across the schools, the Council appointed Scott Bennett to provide them with independent professional advice and to quality assure any structural proposals that were put to them by ESP.
- 12.3.7 In evidence to the Inquiry, supported by that contained in copies of correspondence and minutes of meetings held at the time, the Council felt that the response from ESP and communications with ESP largely carried out through its agents, initially tended to be more focussed on legal and financial matters

and was less clear as to how to address the practical issues arising from the defective construction.

- 12.3.8 In minutes from the Corporate Incident Management Team held on the morning of 26<sup>th</sup> April 2016 there was discussion as to the quality of responsiveness and capability of ESP in relation to the management of the remediation works. The following extract from the minutes stated:

*"There was also concern that it was not exactly clear who ESP were, making it difficult to have direct dialogue and get firm answers. There was frustration that the pace of action was not adequate."*

- 12.3.9 The meeting discussed proposals that the Council might suggest to ESP in relation to strengthening their team from a technical and construction project management perspective. However, there was also a concern that the Council should not undertake any direct actions that could be seen to dilute the full responsibility that lay with ESP.
- 12.3.10 On the afternoon of the same day, 26<sup>th</sup> April 2016, the Council held a meeting with the funders and directors of ESP at which they expressed their concerns.
- 12.3.11 It would certainly have been a key objective of ESP to achieve the earliest completion of the remedial works with the least period of closure of schools, both to reduce the level of disruption to the education of the children and in order to minimise the reductions from payments to ESP made by the Council as a result of the closures.
- 12.3.12 ESP still felt that this could be achieved through their proposed phased approach to remediation, with the second phase of remedial works occurring in the period when the schools would be closed for the summer. At the meeting the Council made it explicitly clear to the funders that this was an option which they would no longer accept and sought confirmation from the meeting that full remediation would be undertaken in a single phase.
- 12.3.13 When it was confirmed to Galliford Try that a two-phased solution was not acceptable, they continued with the implementation of the full extent of the required remedial works on the Phase 2 school. However, they did so in advance of the completion of detailed surveys of the defects to the structure of the external walls of the schools and without submission of the details of their proposed remedial works to ESP or through them to the City of Edinburgh Council.
- 12.3.14 In evidence Galliford Try stated that they were seeking to achieve the earliest return of pupils to their original schools, as indeed they were being encouraged to do so by the Council. They were successful in this regard, in that they

completed the remedial work to the Phase 2 schools significantly before this was achieved for any of the Phase 1 schools.

- 12.3.15 It had been reported at a CIMT meeting held on 22<sup>nd</sup> April that there was a perceived reluctance on the part of Galliford Try to provide the same level of documentary reassurance that ESP had agreed to provide to the Council in relation to the quality and effectiveness of the remedial works. The meeting was advised that Galliford Try believed that they were acting in compliance with the full extent of the requirements in their contract and that this requirement exceeded the obligations placed on them by the contract.
- 12.3.16 In this situation, the nature of the PPP contract structures seemed to act to inhibit the Council in its desire to undertake due diligence in seeking appropriate assurance as to the safety of the schools. Ultimately, agreement was reached that all relevant participants, including Galliford Try and Goodson Associates who had acted as their structural engineers, would provide the required assurances.
- 12.3.17 However, by proceeding with the remedial works without the opportunity for prior comment by Council advisors as to the adequacy or acceptability of the proposed engineering solutions or the opportunity by Council appointees to inspect the carrying out of the work while it was being done, they to some degree replicated the situation of the original construction of the school, where there had been no contemporaneous independent scrutiny of the quality and appropriateness of the design and construction in advance of their implementation.
- 12.3.18 The situation was resolved through the appropriate insistence of the Council and their engineering advisors, Scott Bennett, that prior to the reopening of any schools they would require the receipt of certified documentation as to the detailed nature of the works undertaken and the structural calculations on which these works had been based.
- 12.3.19 The Phase 2 works, somewhat after-the-fact, were further checked against this documentation by a Clerk of Works appointed by the Council. Fortunately, the major proportion of the remedial installation of head restraints and windposts was visible for inspection due to being retrofitted on the inner faces of the inner leaves of cavity walls.
- 12.3.20 Due to the unusual nature of the circumstances and the nature of the work, it was agreed that retrospective building warrant applications could be made based on evidence supplied by other inspecting parties.
- 12.3.21 Will Rudd Davidson and Goodson Associates as structural engineers, and Amey and Galliford Try as contractors, provided ESP with letters stating that they were



satisfied with the standard and safety of the remediated buildings. Scott Bennett Associates, the Council's Structural Engineers, reviewed the evidence on which Will Rudd Davidson and Goodson Associates had based their designs, and the signed records of implementation of these designs by Amey and Galliford Try. They confirmed that they were satisfied with the evidence provided.

- 12.3.22 The fact that both firms of structural engineers responsible for the design and supervision of the remedial works and Scott Bennett Associates had members registered with the Structural Engineers Registration Ltd ("**SER**") gave greater legitimacy to this approach. SER have been appointed by the Scottish Government to administer the national scheme for certification of building design through which SER-certified engineers have the authority to certify that designs comply with building regulations.
- 12.3.23 In addition to an in-depth review of this documentation, a final inspection of all remediated buildings was undertaken by Scott Bennett Associates supported by Hickton, the firm of Clerks of Works appointed by the City of Edinburgh Council to inspect the remedial works to the schools.
- 12.3.24 Taking the above evidence into account, the Council's Building Standards team was satisfied that retrospective building warrant applications would be appropriate. This approval method was seen by the Council as being the most expedient route to re-open the schools.
- 12.3.25 The process of approval of the 'Completion Certificate Where No Building Warrant Obtained' for each of the PPP1 schools is at the time of completion of this Report still on-going. The description of the works submitted in these applications primarily are in respect of the retro-fitting of the windposts to all the PPP1 schools.
- 12.3.26 **Given the limited nature of the work involved, the certification and counter checking by structural engineers who are registered with the SER scheme and the urgency of getting the pupils back to their schools for the beginning of the new school year, the Inquiry is of the view that the response was pragmatic, if not fully compliant, and in the circumstances was an understandable approach.**
- 12.3.27 As the same level of pre-remediation reports of surveys of the walls of the Phase 1 schools was not produced by Galliford Try or made available to the Inquiry, with regard to the Phase 2 schools, the Inquiry was unable to undertake the same level of analysis as that undertaken for the Phase 1 schools in relation to the level of missing head restraints, bed joint reinforcement or windposts in the Phase 2 schools.

12.3.28 While, in addition to the defective wall ties, it had been confirmed by Galliford Try that all three elements had been found not to be in full accordance with the design, the lack of survey information in relation to these items makes it difficult to be precise as to the full extent of the failure by the original contractor Miller Construction to properly construct the external walls of these four schools.

12.3.29 **The Inquiry is of the view that the Council could have been more proactive in terms of seeking to ensure that proper surveys were undertaken and records made of the defects or omissions in the construction of the external walls of the Phase 2 schools and could in relation to these schools have more actively pursued its rights under the contract.**

12.3.30 **It is also the view of the Inquiry that, given the original problems were associated with the poor quality of construction, the Council could possibly have appointed a Clerk of Works at an earlier stage than was done, so that all opening up of walls and remedial construction work could have been inspected as it was being done rather than relying on retrospective inspection of the completed work as in the case of the four Phase 2 schools.**

#### 12.4 **REVIEW OF TECHNICAL AND DESIGN INFORMATION**

12.4.1 As part of the Inquiry process, the structural engineering advisor to the Inquiry undertook a comprehensive review of the technical reports, drawings and design information made available to the Inquiry by the Structural Engineers acting for ESP, Galliford Try and the City of Edinburgh Council.

12.4.2 This technical review examined and considered the following:

- the nature of the investigations undertaken;
- the nature of the defects identified, and the scale of defects found;
- the design calculations prepared by the different Structural Engineering Consultants as part of the structural assessments process and design of remedial works; and
- the scope, appropriateness, and extent of the remedial works that had been designed and installed.

12.4.3 The technical review did not carry out detailed checks of the designs prepared by the Engineers, as this was beyond the remit of the Inquiry. The Inquiry has been advised that comprehensive design checks for the remedial works had been undertaken by the structural engineers employed respectively by ESP and Galliford Try, and that these were submitted for scrutiny by the structural engineer appointed by the City of Edinburgh Council, before a final letter of assurance was issued for each school.

12.4.4 **Following the technical review of the information provided, the Inquiry concluded that a satisfactorily robust approach had been adopted to the process of structural assessments of the buildings following the identification of defects relating to lack of head restraints, poor wall tie embedment, and missing or inconsistent bed joint reinforcement or windposts.**

12.4.5 **The Inquiry found that the design process for the remedial works was thorough and comprehensive, resulting in a high level of confidence that the risk of structural failure arising from the defects uncovered on the buildings has been properly addressed.**

12.4.6 **Based on the above, the Inquiry also concluded that the factors of safety required within the relevant design standards, as required under the Building Regulations, have been satisfactorily reinstated in the masonry wall panels through the implementation of the programme of remedial works.**

## 12.5 **IMPACT ON EDUCATIONAL ATTAINMENT**

Perhaps the most significant issue arising from the dislocation of so many pupils over the eight to ten weeks of closure of their schools is the impact that this may have had on the educational growth and attainment of the pupils. It is somewhat easier to assess this in relation to any unexpected variation in the grades attained by those pupils sitting standard exams than in the case of those that were not. The following tables show this information for the exam classes and would suggest that there has been no apparent disadvantage to that particular group of pupils as a result of the disruption, at least in terms of results.

## 12.6 **TABLES COMPARING EXAM ATTAINMENT IN 2016 WITH RECENT**

12.6.1 The following tables were provided to the Inquiry by the City of Edinburgh Council as provisional information and have been compiled from several different sources with no national or comparator information yet available. They should therefore be treated with a degree of caution.

12.6.2 The column for each school for 2016 has been colour-coded as follows:

- green if the percentage attaining awards is higher than 2015; and
- red if the percentage is the lowest over the four year-period since 2013.

12.6.3 The measures used are those that were available in August 2016. Using the eight measures for each school, only one school is coloured red, for one measure. Across all schools, there is the type of normal fluctuation that would be expected from year to year, with some measures going up and others down.

12.6.4 However, all the five schools show improvement in at least half of the measures, which would suggest that the exam results have not been negatively affected by closure/decant.

### **Craigmount High School**

Percentage of the S4 roll attaining awards at SCQF levels

<b>By the end of S4</b>				
	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
5@5+		46	54	51
<b>By the end of S5</b>				
1@6+	59	63	66	74
3@6+	40	43	38	55
5@6+	21	23	19	27
<b>By the end of S6</b>				
1@6+	60	67	69	76
3@6+	45	53	51	50
5@6+	34	36	39	36
1@7+	24	26	32	28

**Drummond Community High School**

Percentage of the S4 roll attaining awards at SCQF levels

<b>By the end of S4</b>				
	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
5@5+		16	12	22
<b>By the end of S5</b>				
1@6+	42	38	38	51
3@6+	14	16	12	14
5@6+	3	4	1	3
<b>By the end of S6</b>				
1@6+	38	57	48	45
3@6+	24	23	25	22
5@6+	15	10	18	13
1@7+	5	9	11	5

**Firrhill High School**

Percentage of the S4 roll attaining awards at SCQF levels

<b>By the end of S4</b>				
	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
5@5+		49	54	51
<b>By the end of S5</b>				
1@6+	65	60	62	62
3@6+	47	37	43	43
5@6+	22	19	24	23
<b>By the end of S6</b>				
1@6+	69	73	66	70
3@6+	57	55	51	51
5@6+	47	45	34	42
1@7+	30	31	25	27

**Gracemount High School**

Percentage of the S4 roll attaining awards at SCQF levels

<b>By the end of S4</b>				
	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
5@5+		11	15	10
<b>By the end of S5</b>				
1@6+	29	29	36	40
3@6+	12	9	17	14
5@6+	3	4	2	5
<b>By the end of S6</b>				
1@6+	53	34	39	43
3@6+	19	21	17	24
5@6+	9	13	11	11
	12	10	5	9

**The Royal High School**

Percentage of the S4 roll attaining awards at SCQF levels

<b>By the end of S4</b>				
	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
5@5+		58	58	62
<b>By the end of S5</b>				
1@6+	63	71	69	75
3@6+	37	53	54	50
5@6+	23	27	35	27
<b>By the end of S6</b>				
1@6+	75	69	78	76
3@6+	61	53	62	67
5@6+	45	37	52	53
1@7+	36	27	36	35

- 12.6.5 It is however a fact that, as the above groups of pupils were due to sit exams, there was a degree of prioritisation attached to protecting their teaching time. Due to the period of the year they were also able to benefit from the exam study leave so they could work at home for some of the time. It is therefore perhaps not that surprising that their performance in exams was much in line with the attainment of previous years.
- 12.6.6 In evidence, there was concern expressed in relation to the effect on S3 pupils, as during the latter period of the decant from mid-May onwards they would normally have been commencing their transition to S4, including the initial preparation of course work which ultimately will be examined at the end of the S4 year.
- 12.6.7 It is more difficult to assess the impact on primary school pupils. The information provided by the Council indicate that whereas the average lost teaching time per pupil per day in the secondary schools was approximately 12 minutes, the equivalent for primary schools was 71 minutes per pupil. The Inquiry has no way of assessing the impact of this over the period of approximately ten weeks of being decanted, however this does represent a significant proportion of each school day over the period.
- 12.6.8 The Inquiry took the view as Oxfangs school was initially closed in January as a result of the wall collapse and subsequently from mid-March up until May, the head teacher from that school was well-placed to provide an informed opinion on the impact of these events on educational development.
- 12.6.9 In her evidence, she offered the view that there were positives as well as negatives in relation to the children's development during this period. She said;
- "As far as any detriment to the children was concerned, I do not believe there was anything significant. In fact, there were many positives which came out of this experience which the children found initially at least a "big excitement"."*
- "In many cases children came back to Oxfangs after their experiences in other schools with lots of good ideas that they had seen elsewhere. Although they were fed up towards the end of the decant and were keen to get back. Following the situation, I expected to see a big dip in levels of attainment but in fact this never materialised. In fact, in some cases I have seen something of an improvement. Overall, I would say that the experience for children has been at worst neutral."*
- 12.6.10 The Inquiry also sought the views of the head teacher at Braidburn in relation to the impact on the attainment of pupils with additional needs.

*"We would reiterate that it was disruptive but they did make progress at a rate which was not unduly affected. Our targets in terms of educational attainment were still met but the day-to-day experience for many of the children was not the same as it would have been in Braidburn.*

*There were some positives that came out of the situation. Our children mixed well when they were at some of the decant locations. That was a very positive experience. Unfortunately, some of our children went to different facilities and did not have that opportunity. However, it was not necessarily a bad experience in every sense. For the staff, it was helpful in that it strengthened partnerships between us and other groups. It was good for staff development and teamwork."*

**12.6.11 It is difficult to determine and it will subsequently be difficult to prove whether the closure and decant of the schools has had any longer-term negative impact on the educational attainment of the pupils affected. However, on the basis of the evidence provided, the Inquiry is of the view that any negative impact is likely to have been of a limited nature and that these may have been offset in certain instances by some unexpected positive impacts of the experience.**

## **12.7 SUPPORT TO PARENTS OR FAMILIES OF DECANTED PUPILS**

12.7.1 Having given due and appropriate praise to all involved in achieving the hugely challenging logistical task of providing an alternative place for every pupil within an amazingly short time-scale, there is still little doubt that the impact of the enforced arrangements resulted in significant concern, inconvenience and disruption to the lives of pupils, parents and staff. Some of the parents expressed the view that the level of anxiety caused by the uncertainty and disruption to their daily arrangements was not fully appreciated by the Council.

12.7.2 There was little that the Council, itself a victim of circumstances, could do to mitigate this negative impact but a complaint made by several parents who gave evidence or made submissions to the Inquiry, was in relation to the lack of clear information from the Council at the early stages of the process. In a number of circumstances, it is evident that this led to a degree of frustration on the part of some parents.

12.7.3 It is also evident to the Inquiry from the records of the daily meetings held, that the Council were constantly aware of the importance of good communication and anxious to keep parents as fully advised as possible. This issue was discussed at every meeting of the CIMT and was viewed as a priority issue. It is also clear from these minutes as to the degree of frustration felt by officers of the Council as to their inability to provide more information and greater certainty in their communications in the early stages of the decant period.



- 12.7.4 On the Council's part, particularly at the early stages of the closures, the reason for the somewhat limited content in their communication with parents was that they in turn were unable to get the information they needed from ESP to allow them to give firm information to teachers and parents on the extent of the defects, the level of remedial works required and, most importantly, dates for the completion of remedial works and the reopening of schools.
- 12.7.5 ESP also in turn experienced difficulty, particularly in the initial weeks, in getting firm information from their supply chain.
- 12.7.6 A very much more positive view was expressed by those parents interviewed as to the quality of communication by the Council during the later stages of the decant, once clearer information had been made available to the Council.
- 12.7.7 Despite this initial problem, there was also extensive praise expressed to the Inquiry for the many individual contributions made by a wide range of individuals and teams from within the Council and the schools. There was also a major appreciation of the pressures that heads and teachers had been put under and the level of resilience and positivity they were able to maintain throughout the process.
- 12.7.8 **The Inquiry would suggest that, if it has not already happened, the Council should facilitate a joint meeting with representatives of the Parent Councils and heads of schools to review all issues relevant to the management of the closure, and to help inform the development of protocols for future emergency situations which hopefully will not be on the same scale as this one.**

## SECTION 13 – REMIT ITEM 8: RECOMMENDATIONS

### Remit Item 8:

*"Provide advice and recommendations on any specific or wider lessons which can be learned from these unfortunate events for Edinburgh Council and any other bodies."*

- This Section will set out a series of recommendations for consideration by the City of Edinburgh Council. The Inquiry is of the view that many of these recommendations have a wider relevance to those engaged in the procurement, design and construction of public buildings. It is not intended to repeat here the evidence provided earlier in this Report from which these recommendations have been derived.
- Many of the recommendations relate to factors which, when combined over time, have helped to create circumstances in the procurement of public buildings, such that the collapse of the wall at Oxfangs appears to be a symptom of a broader problem.
- The collapse of the wall at Oxfangs School and the defects found in the construction of the 17 Edinburgh projects were fundamentally the result of a combination of poor quality of workmanship, inadequate supervision and ineffective quality assurance within the construction industry. The level of independent scrutiny applied to the construction on behalf of the Council was also insufficient to identify and seek rectification of the defective construction that subsequently caused the failure of the wall.
- Whilst it is not suggested that this lack of quality is representative of the construction industry as a whole, the recurring nature of similar defects in relation to the construction of masonry walls undertaken by a range of contractors, subcontractors and bricklaying squads in the Edinburgh schools and other schools across Scotland, can only indicate that the risk of occurrence of defects of this nature is high. Accordingly, clients should ensure that they incorporate into their procurement arrangements the provision of appropriately qualified and resourced independent scrutiny that provides the necessary level of assurance as to the quality of the buildings being procured.
- By independent scrutiny, the Inquiry is referring to inspection by individuals or organisations appointed or directly employed by the client who are independent of the contractor undertaking the project.

## **THE LIST OF RECOMMENDATIONS**

The full list of recommendations of this Inquiry as provided below is based on an analysis of the evidence provided to the Inquiry. The 40 individual recommendations are listed under the following nine headings.

1. Procurement
2. Independent Certifier
3. Client's Relationship with the Design Team
4. Information Sharing
5. Construction
6. Training and Recruitment
7. Building Standards
8. Sharing of Information
9. Recommendations for the City of Edinburgh Council
10. Further Inspections

## 1. **PROCUREMENT RECOMMENDATIONS**

### **Recommendation 1.1 - Expertise and resources**

Public sector bodies engaged in the procurement of public buildings should maintain, or have assured access to, a level of expertise and resources that allows that body to act as an 'intelligent customer' in undertaking transactions with Private Sector Construction Companies. Before commencing a programme of work or an individual project, a public body should first assess this requirement and ensure that it has in place the requisite and appropriate resources in terms of governance arrangements, type of expertise, allocated time and the funding required to enable it to act as an 'Intelligent Customer'.

### **Recommendation 1.2 - Ensuring compliance with specification**

In any construction contract let by a public body, the public body should ensure that due diligence is undertaken at an appropriate level to confirm that the requirements of that contract are actually delivered in accordance with the terms of that contract. The level of due diligence applied should be determined through an informed assessment of risk of the likelihood or implications of non-compliance.

### **Recommendation 1.3 - Public bodies cannot delegate duties**

In seeking to transfer as much risk as possible away from themselves in relation to the design and construction of facilities, public bodies should understand that they cannot delegate to others the duty that they ultimately owe to the public to ensure the provision of a safe environment for the delivery of services to their communities and this should inform their approach to their quality assurance processes of projects. There should always be an appropriate level of independent scrutiny in relation to all aspects of design and construction that are in effect largely or partly self-certified by those producing them.

### **Recommendation 1.4 - Building it right first time**

The procurement strategies adopted by public bodies should include appropriate investment in the provision of informed independent scrutiny of projects when they are being designed and constructed so that they are built right first time, rather than clients subsequently seeking to rely on their ability to seek remediation or compensation if they are not. It is the view of the Inquiry that seeking savings through cutting investment in quality assurance is inevitably a false economy.

### **Recommendation 1.5 - Quality of design and construction**

- There should be a more informed approach among public bodies as to how best practice methodologies aimed at optimising the quality of design and the quality of construction can be incorporated into the current models of

procurement of public buildings, whilst maintaining other benefits of these processes. One key element of such processes is a clear and considered articulation in a comprehensive brief by the client of the quality objectives for a project and of the methodology to be used for ensuring the achievement of that quality in both the design and construction phases.

- Appropriate time and resource should be allocated by clients during the initial stages of a project and during the development of the brief in order to establish and clearly define these quality objectives and approaches to ensuring quality.

## 2. **INDEPENDENT CERTIFIER RECOMMENDATIONS**

### **Recommendation 2.1 - Nature of Inspection**

- There would appear to be a lack of shared understanding, both by those commissioning and providing the services of Independent Certifier in PPP forms of contracts, with regard to the level of inspection to be undertaken by the Independent Certifier and the degree of reliance that clients can place on the issue of Availability Certificates as to the quality of the construction.
- The level of service provided by Independent Certifiers needs to be reviewed and contracts of appointment written to reflect what clients actually require of the role, so that clients better understand exactly what they are getting and providers of the service better understand what is required of them. Standard forms for these appointments should spell out the nature of the inspection required.
- The Inquiry is of the view that one possible model or option to overcome the type of issues identified in the PPP1 project would be to extend the range of services required in the appointment of Independent Certifiers to include the provision and management of Clerks of Works services.

### **Recommendation 2.2 - Professional indemnity insurance and Liability Period**

- The level of professional indemnity insurance sought and the liability period for Independent Certifiers should be assessed to properly and appropriately reflect the significance of their Certification processes and the degree of reliance that is to be placed on it.

### **Recommendation 2.3 - Method of appointment of Independent Certifier**

Given the essential requirement that those undertaking the role of Independent Certifier are truly independent, the appointment of Independent Certifiers should be made following properly advertised and conducted public procurement processes and not through nomination or recommendation by the private sector party (as appears frequently to have been the case).

### **Recommendation 2.4 - Fees of Independent Certifier**

The fees for undertaking the Independent Certifier role should reflect the level of service required, rather than the service being restricted to fit a predetermined budget.

### **Recommendation 2.5 - Independent Inspection of the Works**

- Public sector clients should engage appropriately qualified individuals or organisations with the necessary professional construction expertise to

undertake on their behalf an appropriate level of ongoing inspection of the construction of their buildings. This is in order to identify and report defective work to the client and to ensure proper rectification of same.

- Depending on the nature of the project, this inspection role, at the level at which the defects in the Edinburgh PPP1 schools occurred, is traditionally undertaken by a combination of resident architects, resident engineers and Clerks of Works, the use of whom has dramatically reduced over recent years, yet the essential role they played does not appear to have been effectively provided for by alternative arrangements within the forms of procurement currently in vogue.
- Clients need to reappraise this gap in the assurance processes which has been allowed to develop.

### 3. CLIENT'S RELATIONSHIP WITH THE DESIGN TEAM

#### **Recommendation 3.1 - Scope of service of design team members**

- Under current models of procurement, the relationship between the client and key members of the design team has tended to become at least one or more steps removed, yet the inherent fundamental quality and safety of projects as determined by the design of spaces, the specification of materials and the structural intent behind the design, relies on the creativeness and effectiveness of their designs and the proper implementation of these on site. The extent of their appointments and the level of involvement of design team members (either with clients or on site) is now frequently delegated to contractors to determine.
- Public bodies should review current procurement arrangements to ensure they are providing the optimum level of communication between clients and key members of the design team and that clients are able to benefit to the fullest extent from their professional advice and expertise. They may wish to consider how more direct communication could be incorporated into current forms of contract, in addition to the existing requirement for the provision of collateral warranties.

#### **Recommendation 3.2 - Role of design teams in inspecting works on site**

If clients do not wish to prescribe in their tender documentation the minimum level of services which they require to be provided by design team members when employed by a contractor, public sector clients should at least require that submitted tenders include a full description of the proposed scope of design team services, including any proposed role in the inspection of the works on site. This, in addition to the quality of the proposed design team or proposed design, should be important factors in the assessment of such tenders.

#### **Recommendation 3.3 - Notification of issues to public sector client**

The Inquiry is of the view that, where possible, there should be a mandatory provision built into such contracts that where, to the knowledge of a professional design team member, a contractor has failed to take appropriate action as advised by a member of the professional design team on issues that could impact on the subsequent safety of building users or functionality of the building, the consultant in question should be required to inform the public sector client of the advice provided to the contractor.



#### 4. **INFORMATION SHARING RECOMMENDATIONS**

##### **Recommendation 4.1 - Production, retention and updating of information**

- The production, retention and updating of accurate construction and operational information and related documentation on projects should be regarded as a fundamental requirement and requires a systematic and disciplined approach by all parties to the contract.
- Public bodies should establish a mandatory protocol for receipt and processing of all such project information within their own organisations.

##### **Recommendation 4.2 - Provision of as-built drawings**

- The process of producing as-built drawings is frequently included in appointment documents as a requirement of the design team. In evidence to the Inquiry, design team members have stated a practical limitation on them in that they may be unaware of the detail of on-site changes to the issued design drawings or specifications that may be made by the contractor or its supply chain.
- Contractors should be required to put in place appropriate arrangements for the recording of all subsequent changes to final 'construction issues' drawings and arrange for the production of a final as-built set of documents to a standard suitable for issue to the client for retention as a permanent record of the detail of the project.
- Contractors should also be required to certify that the 'as-built' documentation as provided is an accurate record of what has actually been built.

##### **Recommendation 4.3 - Provision of as-built drawings to Building Control**

It is also recommended by the Inquiry that consideration be given to the requirement for 'as built' drawings as prepared for and certified by the Contractor to be submitted to Building Standards as a definitive record of what was built. This could be a formal part of the Completion Certificate process.

##### **Recommendation 4.4 - On-site accessibility of design information**

- It is critical that there is effective communication of essential design information in an accessible form to tradesmen such as bricklayers working on site. In relation to the construction of walls and the incorporation of related structural accessories, in order to avoid mistaken omissions of accessories such as wall ties, head restraints or bed joint reinforcement, it is recommended that all relevant information should be fully integrated into a

single document, rather than requiring reference by bricklayers to a range of different documents produced by different members of the design team.

- The design and construction professions should consider the need for the development of a better approach to the integration of documentation to reflect the practical needs associated with the implementation of design information in a building site environment.
- From the evidence provided to the Inquiry, there was a unanimous view that a comprehensive set of all such information in regard to the construction of external cavity walls should be provided on a document produced by the structural engineering consultants.

#### **Recommendation 4.5 - Communication of design intent**

- The evidence to the Inquiry suggested that the design intent in relation to the importance to the structural integrity of masonry panels of the proper installation of wall accessories and secondary steelwork, may not always be adequately conveyed in design documentation and may not be fully understood by those reviewing the documentation (or perhaps more importantly by those actually building the walls).
- Structural engineers should be required to describe in their documentation and drawings the approach and design philosophy adopted in their designs in terms of the reliance on the inclusion of bed joint reinforcement, wall head and lateral restraints or windposts in the required locations and in accordance with the specification, and the relative inter-dependence of these various components.

#### **Recommendation 4.6 - Structural amendments to be approved**

The approved building warrant system relies on buildings being constructed in accordance with the approved drawings. Contractors should ensure that any amendments to the structural design of buildings should only be implemented after having undertaken any necessary checks or amendment to the design by the structural engineer and any changes to the approved design should be documented and processed in compliance with the statutory obligations imposed by the Buildings Standards regulations under the amendment to warrant process.

#### **Recommendation 4.7 - Access to original construction information**

- The City of Edinburgh Council was not automatically provided with all relevant design, construction and survey information relating to the original construction, the subsequent investigations and the implementation of the remedial works to the PPP1 schools. In response to requests for elements of this information, the Council was advised by various members of the supply

chain that it did not have a direct contractual right to this information and would have to seek it through the various levels of ESP's supply chain, including members of their original supply chain who may be out of contract.

- PPP contract arrangements should incorporate clearly the right for public sector clients to be provided, by members of current and original PPP supply chains (and where relevant in return for an appropriate fee), with copies of all design and technical information, surveys, proposed amendments and as-built documentation in relation to their projects.

## 5. CONSTRUCTION RECOMMENDATIONS

### **Recommendation 5.1 - Building of leaves of cavity walls separately**

The evidence from this Inquiry suggests that the subsequent practical difficulties that arise from building the inner and outer leaves of cavity walls at different times may have been significant contributory factors in the lack of embedment of wall ties achieved. The construction industry should carefully review this practice and if the separate building of the leaves of cavity walls is still required to achieve programme dates, it is recommended that standard wall ties should not be used and instead be replaced by alternative approved ties or by alternative construction to blockwork for the inner leaf e.g. use of structural framing systems.

### **Recommendation 5.2 - Design of wall ties**

There would be significant benefit if the design of wall ties, particularly the type used on the Oxfangs School, more readily enabled both those laying the bricks and those inspecting cavity walls before closure, to determine that the minimum or recommended embedment of wall ties was being or had been achieved. Clearer calibration or marking of these points through the introduction of colour, texture or shape could assist in this process, by making the level of embedment more clearly visible.

### **Recommendation 5.3 - Design and use of head restraints**

- There may be benefit in designers, contractors and manufacturers reviewing the practical complexity of installing the different forms of head restraints, particularly when being connected to sloping beams, and seeking to simplify this in terms of specification, design and fixing of this component, thereby reducing the time required to fit them and any potential reluctance on the part of bricklayers to install them.
- As in the case of the wall ties, it would be beneficial if they were designed to incorporate some visible indicator to prove in any subsequent inspections that they had actually been fitted, thus preventing the need for avoidable intrusive investigations.

### **Recommendation 5.4 - Payment of bricklayers**

The most common method of paying bricklayers in recent years has tended to be based on the number of bricks laid rather than on the time that bricklayers work. As generally applied, this approach would appear not to take account of the number, type and complexity of accessories that are required to be incorporated. The construction industry should seek to review this approach to remove any perverse incentive of the payment mechanism to encourage the omission of elements providing the essential structural integrity of walls.

#### **Recommendation 5.5 - Contractor quality assurance processes**

- The quality assurance processes applied by the contractors on the PPP1 projects failed to identify or rectify fundamental non-compliance with required standards in the construction of masonry walls. Irrespective of the potential role of independent inspections by agents of the client, such failures are and remain the direct responsibility of the contractor.
- The repeated failures across many different projects would suggest that either the quality assurance processes themselves or the manner in which these processes are implemented have frequently proved inadequate.
- It is therefore recommended that the construction industry should seek to introduce, develop and promulgate standardised best practice methods in relation to the requirements of the related quality assurance processes, how they are implemented and who implements them.
- The design of such processes should consider the potential greater use of modern technology in relation to the digital recording of such areas of work.

#### **Recommendation 5.6 - Inspection and sign-off of cavity walls**

- It is particularly important to note that in the case of the 17 PPP1 projects, visual only inspections of the external walls of these schools, by experienced teams of qualified structural engineers, failed to identify any indications of the subsequently identified presence of significant deficiencies in the construction of the walls.
- While visual inspections are clearly the first part of any structural assessment of walls and can help identify any movement, bulging or alignment issues, they should not be relied upon as evidence that the walls are properly constructed and have the required structural capacity to resist strong winds.
- It is therefore recommended that quality assurance processes on site are such that they prevent the closure of walls before proper inspection and sign-off has been facilitated to confirm the quality and completeness of the work.

#### **Recommendation 5.7 - Bricklaying profession**

- The Inquiry is of the view that, given the widespread nature of similar defective construction across the 17 PPP1 projects, undertaken by bricklayers from different sub-contracting companies, and from different squads within these companies, there is clear evidence of a problem in ensuring the appropriate quality in this fundamental area of construction.

- It is therefore recommended that the construction industry should re-examine its approach to recruitment, training, selection and appointment of brick-laying subcontractors, means of remuneration, vetting of qualifications and competence, supervision and quality assurance of bricklayers.

**Recommendation 5.8 - Fire-stopping and fire-proofing**

- Fire-stopping and fire-proofing are fundamental aspects of the safety of buildings and must be treated with the importance that they deserve due to the potential implications for the safety of building users and the risk to property as a result of defects in their incorporation into the building.
- There has been significant evidence of failures of fire-stopping in PPP projects in England and questions have been raised as a result of the initial surveys of fire-stopping undertaken across the 17 PPP1 projects in Edinburgh.
- It is recommended that, in relation to these aspects, consideration be given to the introduction of independent in-depth inspection and certification by a suitably qualified person or specialist company, in accordance with the provisions made within the Building (Scotland) Act 2003, and that this certification be required to be provided to Building Standards as evidence of fully compliant installation, prior to the approval of the Completion Certification by Building Standards.

## 6. TRAINING AND RECRUITMENT RECOMMENDATIONS

### Recommendation 6.1 - Provision of training and recruitment

- The evidence to the Inquiry from several experienced sources suggested that there is an increasing shortage of essential skills and/or deskilling in the construction industry which is impacting on its ability to deliver and ensure the required quality of construction.
- Three particular areas were identified where a combination of a lack of funding, lack of appropriate training courses and lack of recognition of the level of requirement has led to serious skills shortages and difficulties in recruitment. The three areas were:
  - **Bricklaying**
  - **Clerks of Works**
  - **Building Standards Inspectors**
- The appropriate authorities should undertake a review of the current level of provision of training in these areas, and any others considered relevant, to ensure that the construction industry has access to an adequate properly trained and qualified resource in each of these areas.

### Recommendation 6.2 - Apprenticeships

- In relation to the training of bricklayers, the Construction Industry Training Board (CITB) should review with the industry the effectiveness of current apprenticeship arrangements in meeting the objective of developing a highly skilled bricklaying workforce.
- The current apprenticeship course and skills tests should also be reviewed to ensure that there is sufficient focus on understanding the function of and the practical installation of brickwork accessories.

## 7. **BUILDING STANDARDS RECOMMENDATIONS**

### **Recommendation 7.1 - Scope of Building Standards inspection and certification**

- The Inquiry formed the view that there was a common misconception as to the extent of the reliance that can be placed on the quality of construction of a building because it had successfully gone through the statutory Buildings Standards process.
- The typical frequency of site visits and the level and nature of inspections undertaken, as provided in evidence, can only confirm that buildings are being built generally in accordance with approved warrants.
- It would not appear to be either practical or appropriate for Building Standards Departments to be expected to undertake the type and level of detailed inspection that would be necessary to identify the risks to user safety that have been identified in this Report. However, an underlying core objective of their function as expressed in the Building (Scotland) Act 2003 is 'securing the health, safety, welfare and convenience of persons in or about buildings'.
- To resolve this issue, there is a need for Government and the construction industry to consider the introduction of methods that would provide Buildings Standards with the required level of assurance in risk areas.
- In this regard, it is recommended that consideration be given to the practicality of extending the concept of mandatory inspection and certification of construction by approved certifiers to elements of the building that could potentially pose significant risk to users if not constructed properly and which level of inspection cannot practically be undertaken by Building Inspectors themselves.

### **Recommendation 7.2 - Sanctions for non-compliance with Building Standards**

- The evidence provided to the Inquiry showed a number of breaches in relation to the PPP1 schools compliance with the statutory applications and certification processes required under the Building (Scotland) Act 2003.
- The Inquiry noted that: (a) there does not appear to be an automatic follow up by Building Standards Departments to require compliance, where proper processes have not been complied with; and (b) that the non-application for and non-issue of completion certificates for new buildings would not appear to be an infrequent occurrence.
- The Inquiry would recommend that in order to improve the effectiveness of the revised Building (Scotland) Act 2005, in delivering the key stated policy



objective of, 'securing the health, safety, welfare and convenience of persons in or about buildings', systematic and appropriate administrative arrangements should be developed and implemented by verifiers to identify, pursue and sanction those who fail to comply with its statutory requirements.

### **Recommendation 7.3 - Temporary Occupancy Certificates**

- In circumstances in PPP contracts where the Building Standards Certificate of Completion cannot yet be issued, and the issue of an Availability Certificate is permitted under the contract on the basis of a Temporary Occupancy Certificate, it is recommended that there should be a specific requirement that the Independent Certifier issuing an Availability Certificate should formally advise the public sector client of this fact and qualify the documentation to reflect this position.
- Additionally, it is recommended that there should be a requirement under the contract that, in such circumstances, a date should be set by which the Project Company should be required to have achieved an accepted Certificate of Completion or be in default.

### **Recommendation 7.4 - Prioritisation of risk factors**

- The Inquiry noted, from the evidence provided, the number and preponderance of visits by Building Inspectors which focussed on drainage issues compared to the limited number of visits that were undertaken in relation to the compliance of the construction of the general structure and fabric of the buildings, the design and specification of which would have represented the vast majority of information submitted and scrutinised by Building Standards prior to approval of the design warrant.
- It is recommended that a review be undertaken as to the overall objective of site visits undertaken by Building Inspectors to ensure that the planning of these properly reflects a prioritisation of the identification and inspection of areas of highest risk.

### **Recommendation 7.5 - Building Standards Department of the city of Edinburgh Council**

It is recommended that a review be undertaken of the staffing and funding of the Building Standards Department in Edinburgh Council to ensure that these are adequate to meet the demand for services and to provide the level of service that is required.

## 8. INFORMATION SHARING RECOMMENDATIONS

### **Recommendation 8 - Sharing of information on matters of structural concern**

- The Inquiry found that there was a degree of reluctance on the part of some Local Authorities to reveal to the Inquiry full details of the extent and nature of defective construction that had been found as a result of investigations undertaken at some of their schools. This reluctance could be related to possible on-going litigation or a reluctance on their part (or that of their project company) to have this information made public.
- It is recommended that there should be a formal requirement on public bodies to make automatic disclosure to a central source of information on building failures, particularly in relation to building failures that bring with them potential risks to the safety of building users.
- In particular, the collation and dissemination of information relating to matters of structural concern is a vital element of achieving safe structures. The Standing Committee on Structural Safety (SCOSS) has introduced the Confidential Reporting on Structural Safety (CROSS) scheme, to facilitate this process in circumstances where those providing the information may wish to retain a degree of anonymity. This should be used more widely.

9. **RECOMMENDATIONS FOR THE CITY OF EDINBURGH COUNCIL**

**Recommendation 9.1 - Minor Changes within PPP1 schools**

The Council may wish to investigate what flexibilities there may be, or may be negotiated, in relation to the application of the provisions of the PPP1 Project Agreement that might better facilitate the implementation of requests for minor changes within the schools. This was identified as an on-going source of frustration by those members of staff and of Parent Councils who gave evidence to the Inquiry.

**Recommendation 9.2 - Parents' and schools' review of management of closure**

The Inquiry would suggest that, if not already done, the Council should facilitate a joint meeting with representatives of the Parent Councils and heads of schools to review all issues relevant to the management of the closure, to benefit from any learning gained from the experience and to help inform the development of protocols for future emergency situations.

**Recommendation 9.3 - Fire-stopping**

In light of the results of the fire-stopping surveys of the PPP1 projects, it is recommended that the City of Edinburgh Council should, in addition to the on-going checking of fire safety measures and components across its wider estate, require that appropriately frequent on-going inspections are undertaken by those responsible for the management of these buildings to ensure that these are properly maintained over time.

10. **FURTHER INVESTIGATIONS**

**Recommendation 10 - Other clients of recently constructed buildings**

- In relation to the potential presence of further defective construction in the external walls of other of their buildings, the City of Edinburgh Council is undertaking a proportionate and structured risk-based approach to investigating their wider estate, specifically regarding the issues identified on the PPP1 Estate i.e. wall tie embedment and the provision of appropriate restraints to masonry panels.
- Other clients of recently constructed buildings of a similar scale and form of construction to the PPP1 schools, if concerned that their buildings may contain similar defects, may wish to adopt a similar risk-based approach to any investigation process they may feel necessary.

## APPENDIX 1

### LIST OF THOSE INVITED TO PROVIDE EVIDENCE TO THE INQUIRY

The following is a list of those to whom invitations were sent and those who subsequently attended or made written submissions to the Inquiry.

#### 1. CITY OF EDINBURGH COUNCIL

##### **Members** of the City of Edinburgh Council

- Several members of Council including the Leader and Deputy Leader attended as witnesses

The **Chief Executive** and **Senior Officers** of the City of Edinburgh Council who were in post during the period leading up to and following the collapse of the wall at Oxfangs School and those officers who have been involved on behalf of the Council in managing all aspects arising from the collapse of the wall in the period from Jan 2016 onwards

- All invited officers attended as witnesses

**Officers** of the City of Edinburgh Council who were involved in the PPP1 project during the time of the development of the original business case in 1998 through to the completion of the PPP1 project in 2005 and officers who were involved in the contract management process between 2005 and 2016;

- All those contacted attended as witnesses including three ex-officers of the Council; one of these three having been a senior member of the project team who led on the process up to financial close and the two others having been involved in the process during the development phase

Representatives of the **City of Edinburgh Council's Building Standards Department**, including building inspectors who were involved in some of the warrant applications and certifications of the PPP1 school projects:

- The senior building surveyor in the Building Standards Department, who coincidentally had also undertaken the duties of building inspector in relation to several of the PPP1 schools, attended as a witness
- A second building inspector who had acted in this role in relation to other of the PPP1 schools also attended as a witness

#### 2. TEACHERS AND PARENTS

Representatives of the teaching staff and of the parents of children affected by the enforced closure of the schools

- All those invited attended as witnesses including three Chairs of Parent Councils at affected schools, two School Principals and one other member of staff.

### 3. PROJECT PARTIES

Representatives of the **ESP** in relation to their role at the original initiation and implementation of the contract, in the intervening period since completion of construction in 2005 and in their response to the events arising from the collapse of the Oxfangs School wall and the subsequent discovery of building defects

- Senior representatives of all four shareholders in ESP attended as witnesses
- The operational project manager, a consultant from **IML Edinburgh**, who oversees the implementation of the contract on behalf of ESP, attended as a witness

Senior representatives of **Galliford Try**, the construction company which in 2014 acquired Miller Construction. Miller Construction was an original shareholder in ESP, and undertook the construction of the majority of Phase 1, and all four of the Phase 2 schools. Galliford Try undertook the recent remedial works to the four PPP1 Phase 2 schools;

- The Chief Operating Officer of Galliford Try attended with other senior staff of the company

Members of staff employed by **Miller Construction** at the time of the original construction of the schools;

- Three members of Miller's staff who had been involved in the construction of the schools attended as witnesses

### 4. CONSTRUCTION CONTRACTORS

Senior representatives of the several **Tier 2 Building Contractors** employed by AMJV to construct Phase 1 PPP1 schools;

- Lilley Construction was appointed by AMJV to construct the Pirrie Hall/St David's Primary School and Broomhouse/St Joseph's Primary School. This company was dissolved in 2013.
- Tulloch Construction was appointed by AMJV to construct Craigroyston Primary School. This company was dissolved in 2012.
- John Dickie and Son Ltd. were appointed by AMJV to undertake the Drummond Community HS project but the construction was taken over by

Miller following contractual issues between the companies involved. This company was dissolved in 2014.

- Ogilvie Construction was appointed by AMJV to construct Craigour Primary School. The Managing Director of Ogilvie Construction attended as a witness.
- Robertson Construction was appointed by AMJV to undertake the Royal HS project but the construction was taken over by Miller following contractual issues between the companies involved.

Senior Managers of the firms of **bricklaying sub-contractors** used on the PPP1 schools by the Tier 1 and Tier 2 Contractors and representatives of current leading firms of bricklaying sub-contractors in Scotland.

- VB Contracts were engaged as bricklaying sub-contractors by Miller Construction for all four Phase 2 PPP1 schools. No response was received to recorded mail requests for the attendance of an ex-senior officer in the company. This company is stated at Companies House as being in liquidation with the last accounts submitted in 2008.
- The Inquiry was advised that Lochpark Builders Ltd had acted as a brick-laying sub-contractor on one or more of the PPP1 schools. An ex-senior officer of the company when contacted expressed an unwillingness to attend as a witness. This company is stated at Companies House as having been dissolved in 2015.
- The Inquiry was informed that a brick-laying sub-contracting company called Brownlee and Hogan acted as sub-contractors for Craigour Primary School, part of Phase 1 of PPP1. The Inquiry was also advised that the Company ceased trading and were in sequestration in 2005.
- Despite both written and verbal requests by the Inquiry to several leading firms of bricklayers, following a period of consideration, they all expressed a reluctance to give evidence on current practice in this area of the construction industry.

Representatives of the three **architectural practices** involved in the design of the schools; **Holmes Miller** of Edinburgh; **3DReid** of Edinburgh and **Hickton Madeley** of Telford;

- Two senior directors of Holmes Miller attended as witnesses.
- Holmes Miller also made a written submission to the Inquiry.
- 3DReid Architects of Edinburgh offered a named member of their staff to attend the Inquiry as a witness. However, shortly prior to the date of

attendance, the Inquiry was advised that 3DReid no longer intended to attend, despite a further request from the Inquiry to reconsider this decision.

- The Director of 3DReid, who had at the time overseen the design of the five PPP1 projects undertaken by 3DReid, is no longer part of that practice. He is currently with another practice and after consideration advised the Inquiry that he felt unable to attend the Inquiry because of a potential conflict of interest.
- Hickton Madeley, a firm of architects from Telford that had worked collaboratively with 3DReid on the design of the schools, was dissolved as a company in 2011.

Representatives of the **structural engineering consultancy, WSP Parsons Brinckerhoff**, which was responsible for the structural design of all 17 projects or any past employees of the firm who had been involved in the design of the PPP1 projects;

- The WSP Operations Director for Building Structures based at Basingstoke attended as a witness
- A senior structural engineer no longer working at WSP, but who was Technical Director for WSP with responsibility for oversight of the provision by WSP of structural engineering services for the original design and construction of all the PPP1 school projects attended as a witness.

Senior Representatives of the two companies who had undertaken the role of **Independent Certifiers** on the school projects, **Mouchel** (previously Mouchel Parkman) on the 13 Phase 1 PPP1 projects and **Ove Arup and Partners Scotland** on the four Phase 2 PPP1 schools.

- The Kier Group acquired Mouchel in April 2015. A senior representative of this company, with responsibility for the group of staff still undertaking the roles of Independent Certifier on behalf of the Kier Group, attended as a witness. He informed us that, as recently as October 2016, WSP, which had provided structural engineering services for the PPP1 projects, had acquired the part of Kier that undertook the Independent Certifier role although that expertise remained with Kier.
- An associate director with Ove Arup and Partners, who had responsibility for oversight of the member of staff, who had undertaken the role of Independent Certifier on the Phase 2 PPP1 schools, attended as a witness.



## 5. ADVISORS ENGAGED FOLLOWING OXGANGS SCHOOL WALL COLLAPSE

Senior representatives of the three **structural engineering consultancies** that were employed to advise ESP and the contractor Galliford Try on the cause of the collapse, the nature of the structural defects and the required remediation;

- Senior members of staff of **Will Rudd Davidson** (appointed by ESP), attended as witnesses
- Senior members of staff from **Goodson Associates** (appointed by Galliford Try and ESP) attended as witnesses
- A senior member of staff from **Harley Haddow** (appointed to assist Will Rudd Davidson) attended as a witness

The senior representative of the firm of **structural engineers, Scott Bennett Associates** of Glasgow, appointed to provide the Council with independent professional advice on the work undertaken by the team appointed by ESP in relation to their surveys, analysis and proposals for remediation following the January 2016 events;

- The appointed senior representative of the firm attended as a witness

Senior representatives of the firm of legal advisers, **Ashurst LLP** from London, employed by the Council to advise on the legal implications arising from the January event;

- Two Partners from Ashurst LLP gave evidence to the Inquiry

## 6. CONTRACTORS ENGAGED FOLLOWING THE OXGANGS SCHOOL WALL COLLAPSE

A senior representative of **Amey** in relation to their role in managing the remediation projects for the Phase 1 PPP1 schools

- A Principal Engineering Manager, from the Consulting and Strategic Infrastructure Division of Amey, who had overseen the construction of the remedial works contract on the Phase 1 schools, accompanied by the senior legal adviser employed by the company, attended as a witness and provided supportive documentation to the Inquiry

Senior representatives from **Amey Communities**, the company responsible for the operational and facilities management of the PPP1 schools since their opening.

- Two senior managers from the company, accompanied by the company's senior legal adviser, attended as witnesses.

## 7. NATIONAL BUILDING STANDARDS

The head of Building Standards Division of the Scottish Government

- The senior officer of the Division attended as a witness

A senior representative from Local Authority Building Standards Scotland (LABS)

- The current Chair of LABS attended as a witness

## 8. INDUSTRY BODIES

A senior representative from **Structural Engineers Registration Ltd (Scottish Registration Board)**, an organisation that approves and holds a register of approved certifiers of structural design

- The Chair of the Scottish Registration Board attended as a witness

A senior representative of **Structural Safety**, an organisation supported by the Health and Safety Executive, the Institution of Structural Engineers and the Institution of Civil Engineers, which operates the Confidential Reporting of Structural Safety (CROSS), a formally recognised system established in 2005 to improve structural safety and reduce failures by using confidential reports to highlight lessons that have been learnt, to generate feedback and to influence change.

- The Director of Structural Safety attended as a witness

A senior representative of the **Institute of Clerks of Works**

- A designated senior Scottish representative of the Institute of Clerks of Works did arrange to attend as a witness to the Inquiry but unfortunately had to withdraw due to unavoidable unforeseen circumstances.
- A written submission was made to the Inquiry by the Institute of Clerks of Work
- Two Scottish members of the Institute of Clerk of Works with significant relevant experience were subsequently interviewed

Senior representatives from **Scottish Futures Trust (SFT)** an organisation set up by the Scottish Government to improve public sector infrastructure investment processes and outcomes.

- The Deputy Chief Executive and another senior member of SFT attended as witnesses

**Audit Scotland** in relation to any findings/reports previously undertaken that may be relevant to this Inquiry

- A senior auditor attended as a witness

Senior Representatives from the **Scottish Buildings Federation**

- Two representatives attended as witnesses; one a senior employee of the federation; the other the CEO of a main contractor, whose company also provided sub-contracting brick-laying services to other companies

A senior representative of the Construction Industry Training Board (CITB) in Scotland

- The Regional Delivery Manager for the CITB in Scotland attended as a witness

## 9. OTHER ORGANISATIONS

A senior technical representative from one of the main **manufacturers and suppliers of wall ties**, head restraints and related cavity wall accessories

- Ancon Building Products, a major supplier of steel fixings to the construction industry provided their Technical Services Manager with responsibility for Scotland, the North of England, Wales and Northern Ireland to attend as a witness
- The architect who had contributed to a **BBC documentary** based on the collapse of the Oxfords School wall attended to give his views on the issues in question
- A **Chartered Surveyor** who had had significant involvement in the management of the delivery of PPP projects in Scotland offered his services as a witness to the Inquiry and subsequently attended

Representatives from other **Local Authorities in Scotland** that had experienced problems of a similar nature to that in the case of the Edinburgh schools

- The Head of Property Services from Local Authority attended as a witness
- A senior estates officer from another Local Authority attended as a witness
- Submissions were received from the large majority of Local Authorities setting out the findings of surveys they had undertaken of their school estates following the incident in Edinburgh. A number of Local Authorities were unwilling to share with the Inquiry the structural reports relating to defective construction in their schools.

Verbal or written submissions were also invited from several professional bodies associated with the construction industry in relation to their views of any current arrangements within the industry that may contribute to the type of defects that had been identified in the PPP1 Edinburgh Schools.

Written submissions were received from the Royal Incorporation of Architects in Scotland, from the Institution of Structural Engineers, and from the Institute of Clerks of Works

In total some 66 witnesses gave evidence to the Inquiry, with each interview being allocated approximately 90 minutes.

## APPENDIX 2

### EXAMPLE OF LETTERS OF REASSURANCE AS TO THE STRUCTURAL SAFETY OF THE REMEDIAL WORKS



BY FIRST CLASS POST

Andrew Kerr  
Chief Executive  
The City of Edinburgh Council  
Waverley Court  
4 East Market Street  
Edinburgh  
EH8 8BG

20 May 2016

Dear Andrew

*Edinburgh Schools PPP – Oxfangs Primary School*

We refer to the surveys and remedial works that have been undertaken by ESP and its supply chain over recent weeks.

This letter has been approved by the Board of ESP and the confirmations that it contains are confirmations that each director endorses and supports.

We confirm that:

1. In our view, having taken all reasonable professional advice, Oxfangs Primary School is safe for occupation by staff and pupils.
2. We consider, having taken suitable professional advice, that all wall ties and roof head restraints at Oxfangs Primary School have now been properly surveyed and, where necessary, suitably rectified.
3. We have also engaged structural engineers to undertake visual inspections of Oxfangs Primary School to identify any other defects or potential defects and no such defects have emerged.
4. Having made proportionate and appropriate enquiries, we believe that Oxfangs Primary School has been suitably designed and constructed such that the wall tie and head restraint issues are, we conclude, isolated building defect issues.

**Goodson  
Associates**

53 Melville Street  
Edinburgh  
EH3 7HL  
also at Aberdeen, Glasgow & Leeds

tel +44 (0)131 226 2044  
fax +44 (0)131 226 3107  
web www.goodsons.com  
email edinburgh@goodsons.com

Consulting Civil, Structural and Transportation Engineers

**Strictly Private & Confidential**

Edinburgh Schools Partnership  
Infrastructure Management Ltd  
2nd Floor  
11 Thistle Street  
Edinburgh  
EH2 1DF

LTR/PI3255/TG

19 May 2016

For the attention of Mr. Des French

Dear Sirs

Edinburgh Schools – Oxfangs Primary School

**1. Scope of Retainer**

We have been retained by Galliford Try Construction (UK) Limited following the wall collapse at Oxfangs Primary School (the "Incident") for the following purposes:

- (a) to review the investigations undertaken on behalf of The Edinburgh Schools Partnership ("ESP") by Will Rudd Davidson and advise on any remedial works required for Oxfangs Primary School which was delivered under Phase 2 of the Edinburgh Schools PPP Project consisting of Oxfangs Primary, Braidburn School, St Peter's Primary and Firrhill High School (collectively the "Phase 2 Schools") from a structural perspective taking into account the reasoning in Section 3; and
- (b) To report and advise on the outcome of these investigations and any remedial works required.

**2. The Incident and the Response**

Following the Incident, defects in the construction of Oxfangs Primary School were identified relating to wall ties in the masonry wall panels.

This type of defect does not necessarily show any early warning signs and can hence lead to sudden collapse.

Due to this risk, further intrusive investigations were carried out on the other masonry walls of Oxfangs Primary School. As a further precaution, similar intrusive investigations were also arranged at the other Phase 2 Schools.

These investigations confirmed that the same defect was present in the Phase 2 Schools as well as in other wall panels at Oxfangs Primary School and therefore an extensive scheme of wall tie remediation has been put in place in all affected Phase 2 Schools.



Goodson Associates is the trading name of Goodson Associates Limited  
A Limited Company registered in Scotland No. 344294



PO Box 17452  
2 Lockside View  
Edinburgh  
EH12 1LB

Tel: 0131 200 4400  
Fax: 0131 200 4498

[www.gallifordtry.co.uk](http://www.gallifordtry.co.uk)

Edinburgh Schools Partnership  
Infrastructures Management Ltd  
2nd Floor, 11 Thistle Street  
Edinburgh  
EH2 1DF

For the Attention of Mr Des French

Strictly Private & Confidential

20 May 2016

Dear Sirs,

Edinburgh Schools PPP Phase 2 Schools (the "Phase 2 Schools")  
Oxgangs Primary School

I refer to the letter which has been provided by Goodson Associates who are the structural engineers instructed by Galliford Try in relation to the remedial works which have been carried out following the wall collapse at Oxgangs Primary School.

Under separate cover, Goodson Associates has provided assurances in respect of the remedial works undertaken across the Phase 2 Schools.

We can confirm that the agreed remedial works have been completed to the requisite standard.

In addition, in response to a request from The City of Edinburgh Council to Edinburgh Schools Partnership to provide confirmation regarding the structural integrity of the remainder of the main structure of the Phase 2 Schools, Galliford Try has conducted an extensive visual inspection to check for signs of structural distress or movement.

Having conducted such an inspection in relation to this school, I can confirm that I found no such signs of structural distress or movement and as a result, it is my view that it is reasonable for both Edinburgh Schools Partnership and the City of Edinburgh Council to assume that, from a structural perspective, the school is safe for normal occupation.

Yours faithfully

Jon Hodgins

Technical Director and Chief Engineer MEng CEng FICE





**Edinburgh Schools Partnership Limited**  
Infrastructure Managers Limited  
2nd Floor  
11 Thistle Street  
Edinburgh  
EH2 1DF  
For the attention of Des French

**Amey**  
6 Redheughs Rigg  
South Gyle  
Edinburgh  
EH12 9DQ

Tel: +44 (0)131 314 3000  
Fax: +44 (0)131 339 7490

19 May 2016

Dear Sirs

**Edinburgh Schools – Phase 2 Statutory Maintenance Requirements**

Please accept this letter as confirmation in regards to the current and ongoing statutory maintenance regimes at St Peter's Primary, Oxfgangs Primary, Braidburn School and Firrhill High School.

As of today's date all statutory tests and certification has been complete at the afore mentioned schools in accordance with clause 5.17 of the Facilities Management Agreement.

Amey can also confirm that during the period of low occupation of the schools a flushing regime and all associated testing took place in accordance with the Approved Code of Practice (LB); The Control of Legionella Bacteria in Water Systems.

In addition an Amey Health & Safety practitioner has carried out a visual inspection of the schools on a room by room basis and has not identified any issues which would give concern from a Health and safety perspective.

Yours faithfully,

A handwritten signature in black ink, appearing to read "S. Davies".

Stuart Davies  
Business Director  
For and on behalf of Amey Community Limited

Cc.  
Jeremy Honor  
Richard Charlston



010108 313 21 1004 110

# Scott Bennett Associates

consulting civil and structural engineers



Scott Bennett Associates (Group 2) Limited  
Orion House  
7 Robertson Oval  
Nova Business Park  
Glasgow, G3 7AP  
T: +44 (0)141 538 3855  
E: enquiries@sbaeg2.com  
W: www.sbascotland.com

RS/PR/J3457.06

20 May 2016

The City of Edinburgh Council  
Chief Executive Office  
Waverley Court  
4 East Market Street  
Edinburgh  
EH8 8BG

For the attention of Andrew Kerr

Dear Sirs,

### EDINBURGH SCHOOLS – OXGANGS PRIMARY SCHOOL

We confirm receipt of the reports from Galliford Try in connection with the above and have carried out an independent review of how the building was structurally assessed and deemed safe to reopen.

It is our opinion that the methodology that has been used by Galliford Try's engineering advisors to identify the structural defects, including the use of disruptive investigations, and thereafter design the necessary remedial works has been carried out in a diligent manner and in accordance with accepted industry practice.

Furthermore we would advise that the reports contain sufficient as-built records to demonstrate that the works have been carried out in accordance with the engineer's proposals together with an acceptable degree of quality control which has included in-situ testing where necessary.

In these circumstances we are satisfied that all reasonable precautions have been taken to ensure that the buildings are in a safe condition from a structural perspective and trust that this is sufficient for your purposes.

Yours faithfully,

Robert Storey  
Managing Director  
SCOTT BENNETT ASSOCIATES (GROUP 2) LTD



A Subsidiary of Scott Bennett Associates Limited  
Managing Director: R D Storey BSc (Hons) CEng MStructE AMICE FConst MIPB  
Directors: G D G Bayne BSc CEng MICE FConst  
C Campbell BEng (Hons) CEng MStructE R Hamilton BSc CEng MStructE  
Associates: A Hill BSc CEng MStructE J Dobbin BSc (Hons) MEng  
Accounts & Personnel: M M Bayne MBA FCIPD FCMA  
Registered Office: No. 19 South Castle Drive, Carnegie Campus, Dalrymlore KY11 0RD  
Registered in Scotland No. SC20952 V.A. T. 0141 822 8129



## APPENDIX 3

### TWO AVAILABILITY CERTIFICATES MADE AVAILABLE TO THE INQUIRY

ArupScotland

#### Availability Certificate 1 (D&B Contract)

To: THE EDINBURGH SCHOOLS PARTNERSHIP

We refer to the Project Agreement dated 8 November 2001 (as subsequently amended) between (1) THE CITY OF EDINBURGH COUNCIL and (2) THE EDINBURGH SCHOOLS PARTNERSHIP LIMITED (the "Project Agreement"), the agreement for appointment of independent certifier dated 6 April 2004 between (1) THE EDINBURGH SCHOOLS PARTNERSHIP LIMITED (2) THE CITY OF EDINBURGH COUNCIL, (3) THE GOVERNOR AND COMPANY OF THE BANK OF SCOTLAND and (4) OVE ARUP & PARTNERS SCOTLAND LIMITED (the "Independent Certifier's Appointment") and the Design and Build Contract dated 6 April 2004 between (1) THE EDINBURGH SCHOOLS PARTNERSHIP LIMITED and (2) MILLER CONSTRUCTION (UK) LIMITED (the "D&B Contract").

I Alan Chawk being the authorised Independent Certifier for Ove Arup and Partners Scotland Limited hereby certify, using all reasonable skill, care and diligence (pursuant to the provision of clause 2.1 of the Independent Certifier's Appointment) and pursuant to the provisions of clause 12 of the D&B Contract, that:

- (1) on 1 March 2005 Oxbgangs Primary School satisfied the Availability Criteria, as set out in clause 12.2 of the D&B Contract, and complied with the requirements of the D&B Contract.
- (2) all Required Consents for Oxbgangs Primary School have been obtained.
- (3) the certificates being (i) building control certificates and (ii) the relevant certificates referred to in Part 8 of the Schedule to the D&B Contract and listed in the Appendix hereto have been obtained and approved;
- (4) the only matters which are outstanding in relation to this certificate are the matters set out in the written undertaking prepared in accordance with clause 12.3.3(b) of the D&B Contract and attached hereto; and
- (5) the Defects Liability Period for Oxbgangs Primary School is from 1 March 2005 to 1 April 2006 and the Contractor's Liability Period under clause 30.5 of the D&B Contract is from 1 March 2005 to 1 March 2017.

This certificate is issued pursuant to clause 12 of the D&B Contract and our obligations under the Independent Certifier's Appointment including, *inter alia*, clause 2.1 and clause 9.1, and is subject to the limitations of liability in the Independent Certifier's Appointment.

Defined words and expressions used in this certificate shall have the meanings given to them in the Independent Certifier's Appointment.



Ove Arup & Partners Scotland Limited

**Availability Certificate 2 (Project Agreement)**

**To: THE EDINBURGH SCHOOLS PARTNERSHIP**


We refer to the Project Agreement dated 8 November 2001 (as subsequently amended) between (1) THE CITY OF EDINBURGH COUNCIL and (2) THE EDINBURGH SCHOOLS PARTNERSHIP LIMITED (the "**Project Agreement**") and the agreement for appointment of independent certifier dated 6 April 2004 between (1) THE EDINBURGH SCHOOLS PARTNERSHIP LIMITED (2) THE CITY OF EDINBURGH COUNCIL, (3) THE GOVERNOR AND COMPANY OF THE BANK OF SCOTLAND and (4) OVE ARUP & PARTNERS SCOTLAND LIMITED (the "**Independent Certifier's Appointment**").

I Alan Chawk being the authorised Independent Certifier for Ove Arup and Partners Scotland Limited hereby certify, using all reasonable skill, care and diligence (pursuant to the provision of clause 2.1 of the Independent Certifier's Appointment) and pursuant to the provisions of clause 12 of the Project Agreement, that:

- (1) on 15 March 2005 Firrhill High School satisfied the Availability Criteria, as set out in clause 12.2 of the Project Agreement, and complied with the requirements of the Project Agreement.
- (2) all Required Consents for Firrhill High School have been obtained.
- (3) the certificates being (i) building control certificates and (ii) the relevant certificates referred to in Part 9 of the Schedule to the Project Agreement and listed in the Appendix hereto have been obtained and approved.
- (4) the only matters which are outstanding in relation to this certificate are the matters set out in the written undertaking prepared in accordance with clause 12.3.3(b) of the Project Agreement and attached hereto; and
- (5) the Defects Liability Period for Firrhill High School is from 15 March 2005 to 15 April 2006 and the Contractor's Liability Period under clause 30.5 of the D&B Contract is from 15 March 2005 to 15 March 2017.

This certificate is issued pursuant to clause 12 of the Project Agreement and our obligations under the Independent Certifier's Appointment including, *inter alia*, clause 2.1 and clause 9.1, and is subject to the limitations of liability in the Independent Certifier's Appointment.

Defined words and expressions used in this certificate shall have the meanings given to them in the Independent Certifier's Appointment.



.....

Ove Arup & Partners Scotland Limited

**APPENDIX 4****LIST OF ACRONYMS**

<b>AMJV</b>	Amey/Miller Joint Venture
<b>CIMT</b>	Corporate Incident Management Team of the City of Edinburgh Council
<b>CPM</b>	Council's Project Manager
<b>ESP</b>	Edinburgh Schools Partnership Limited
<b>IML</b>	Infrastructure Management Limited
<b>NPD</b>	Non-profit distributing
<b>PFI</b>	Private Finance Initiative
<b>PPP</b>	Public Private Partnership
<b>PSC</b>	Public Sector Comparator
<b>SFT</b>	Scottish Futures Trust
<b>WRD</b>	Will Rudd Davidson
<b>WSP</b>	WSP Parsons Brinckerhoff

