

SHERIFFDOM OF LoTHIAN AND BORDERS AT EDINBURGH

[2017] FAI 14

EDI 14006538

DETERMINATION

BY

SHERIF PRINCIPAL MHAIRI M STEPHEN QC

UNDER THE FATAL ACCIDENTS AND SUDDEN DEATHS INQUIRIES (SCOTLAND)
ACT 1976

into the death of

KEANE GRACE WALLIS BENNETT

EDINBURGH, 23 August 2017

The Sheriff Principal, having heard and considered the evidence and the submissions of parties, determines in terms of Section 6(1) of the Fatal Accidents and Sudden Deaths Inquiry (Scotland) Act 1976 as follows:

- (a) Keane, born on 14 February 2002, a first year pupil at Liberton High School Edinburgh died within the girls' changing room on the ground floor of the old PE block there at 10.32 hours on Tuesday 1 April 2014. The accident which caused her death occurred at approximately 09.53 hours on 1 April 2014 when a freestanding "privacy wall" situated within the shower area of the girls' changing room collapsed on top of her.
- (b) Keane died of multiple injuries due to the collapse of the brick wall. The immediate cause of the wall collapsing was the application of a lateral force to the wall sufficient to push it beyond its tipping point. It is probable that the activities of other pupils who were braced between the freestanding

"privacy wall" and the shower wall was sufficient to cause the wall to move beyond the tipping point. The lateral force generated by the innocent high-spirited behaviour of those pupils could push it past its tipping point due to the wall being inherently unstable and liable to sudden collapse. The unstable nature of the wall was the real cause of the accident. That instability was caused by the alignment of two main factors: firstly, the design and construction of the wall and secondly, due to the wall being cracked along its horizontal plane. The wall separated close to its base and had been cracked at the separation plane for a long period of time prior to 1 April 2014. This internal defect or cracking would not be obvious on visual inspection.

- (c) There are no reasonable precautions I can propose whereby Keane's death or the accident might have been avoided.
- (d) As no system of working was placed under examination in the evidence or in submissions I make no finding under this sub-section.
- (e) I make the following recommendation:- The potential risks from free standing masonry walls in the light of the evidence to this Inquiry is clear. Measures were taken by the Health and Safety Executive, in conjunction with the Scottish Government, in 2014 to warn and raise awareness of these risks. All reasonable steps should be taken to reinforce that warning to ensure that measures are taken in both the public and private domain to assess the risk of the continued use of such walls with associated guidance on remedial measures which can be taken to promote safety and stability which failing safe and effective removal of such walls from use should follow.

NOTE:

The Inquiry

[1] Representation at the Inquiry:-

on behalf of the Procurator Fiscal – G Aitken, Procurator Fiscal Depute;

for Keane's parents – G Anderson, Advocate;

for City of Edinburgh Council – P L Gray, QC;

for the Health and Safety Executive (HSE) – Ms Towers, Solicitor;

for Nicole Christie – S O'Rourke, Advocate.

[2] At the conclusion of the Inquiry I spoke of my appreciation of the constructive approach which those appearing at the Inquiry adopted both at the preparatory stages and throughout the Inquiry. It is proper to repeat and record this in my Determination.

Agreement was reached that certain facts and statements given to police by pupils and teachers who were present at the time of this tragedy could be admitted as evidence. This allowed the Inquiry to focus on the issues which are truly important in particular 'the wall' – why it collapsed; why it collapsed when it did and whether it had caused concern prior to 1 April 2014. The submissions of parties assisted me greatly in reaching my Determination.

Legal Framework

[3] This Inquiry was held under section 1(1)(b) of the Fatal Accidents and Sudden Deaths Inquiry (Scotland) Act 1976 ("the 1976 Act"). The petition of the Procurator Fiscal for Edinburgh made application for the holding of this Inquiry as:

"It appears to the Lord Advocate to be expedient in the public interest that an Inquiry under the said Act should be held into the circumstances of the death of said Keane Grace Wallis Bennett as it has occurred in such circumstances as to give rise to serious public concern."

The objective is to establish publicly the requirements of section 6(1) of the 1976 Act.

Section 6(1) of the 1976 Act provides:-

"That the purpose of a fatal accident inquiry is for the sheriff to make a determination setting out the following circumstances of the death, so far as they have been established to his satisfaction:

- (a) where and when the death and any accident resulting in the death took place;
- (b) the cause or causes of such death and any accident resulting in the death;
- (c) the reasonable precautions, if any, whereby the death and any accident resulting in the death may have been avoided;
- (d) the defects, if any, in any system of working which contributed to the death or any accident resulting in the death;
- (e) any other facts which are relevant to the circumstances of the death."

[4] A fatal accident inquiry is essentially a fact finding exercise. I have no power to find, establish or apportion blame. Nevertheless, if there is evidence which points to the conclusion that individuals, public bodies, organisations or systems may be criticised inferences may be drawn from such findings which can form a basis for alleging fault. My Determination must proceed solely on the evidence led at the Inquiry and is defined by the matters set out in section 6(1) above.

[5] Fifteen witnesses were called to give oral evidence to the Inquiry. They gave evidence on oath (or affirmed) and were, where appropriate, cross-examined. A list of those witnesses may be found in Appendix 1. Two of the witnesses were pupils at Liberton High School who were classmates of Keane and who were present in the girls' changing room when the accident occurred. These pupils are now 15 and have recently finished fourth year. They gave evidence by way of remote link. At the commencement of the Inquiry I made an order in terms of section 4(4) of the 1976 Act prohibiting the identification of those witnesses and any other pupil under the age of 17 subject to the proviso that the prohibition did not extend to naming the school which these pupils attend for obvious reasons. Accordingly, the pupils

who gave oral evidence will be referred to as Pupil 1 and Pupil 2 following the order in which they gave evidence.

[6] Two joint minutes of agreement were lodged. Any facts agreed by joint minute are accepted as being proved without the necessity of leading evidence. Of course, much of the first joint minute and the second joint minute in its entirety relate to written statements provided to police officers by witnesses, including pupils at Liberton High School, in the aftermath of the accident. The joint minutes agree that these statements were made and the statements are attached in an annex to the joint minute. The joint minutes do not agree the truth of these statements but admit the statements as evidence before the Inquiry which will fall to be considered and assessed from the point of view of both credibility and reliability. It is important to bear in mind that the individuals who gave these statements did not give oral evidence on oath and were not subject to cross-examination. The second joint minute admits as evidence before the Inquiry the statement of a pupil who gave her statement to the police on 8 June 2017 after the Inquiry had commenced and begun hearing evidence. The joint minutes of agreement together with written statements annexed were read *viva voce* by Mr Aitken, Procurator Fiscal depute, in open court and became part of the written transcript.

[7] I heard submissions on the final day of the Inquiry. In particular, the meaning of "reasonable precautions" in section 6(1)(c) of the 1976 Act was considered. Section 6(1)(c) refers to the reasonable precautions, if any, whereby the death and any accident resulting in the death may have been avoided. It follows that I do not require to be satisfied that the precaution "would" have avoided the accident or death but only that it "might" have done. The meaning of section 6(1)(c) has been considered in the past in similar Inquiries. Any precaution proposed which might have avoided the accident or the death must be a reasonable one.

[8] I propose to deal with the evidence and how I find the evidence on the following issues.

- What happened on 1 April 2014 at Liberton High School
- The wall – why it collapsed and why it collapsed when it did
- Fault reporting and maintenance regime at Liberton High School
- Had the wall moved prior to 1 April 2014 and how to reconcile the statements of pupils and the evidence of teachers as to reports of movement?
- HSE investigation and opinion evidence.

1 April 2014 – What Happened?

[9] Liberton High School is situated on Gilmerton Road, Edinburgh. It is a secondary school owned and operated by the City of Edinburgh Council which is the relevant education authority. The school with associated PE block and changing rooms for boys and girls was designed and constructed in the 1950s opening in 1959. The PE block as originally designed had two floors with separate changing rooms for boys and girls on both floors. The 1st floor girls' changing room was removed in the 1980s when the use of that room was changed. Sometime later a separate and additional Gym/PE block was built in the school grounds. The new PE block and associated changing rooms tends to be used for indoor activities such as gym and badminton. The old PE block with its changing facilities tended to be used for activities such as rugby, football and dance.

[10] At Liberton High School the bell rings at 25 minutes past 8 o'clock to alert pupils to go to their registration or tutor classroom for 8.30am. Classes begin at 8.45am and last approximately one hour. On 1 April 2014 this routine was no different until the second class

which for Keane and many of her fellow pupils was PE. This involved them walking from their first class in the science building to the old PE block to change for football. The football pitches are adjacent to the old PE block.

[11] There was evidence which suggested that it was raining on 1 April 2014¹. There was much cheering when Miss Sweeney, who was due to take the S1 class for PE, announced that PE would be indoors. Of course nothing turns on this; it is mere context.

[12] The girls' and boys' changing rooms in the old PE block are of identical design, construction and layout. Appendix 2 shows the layout and dimensions of the girls' changing room as originally planned. One of the toilet areas on the right-hand side subsequently became a staff area/cupboard. Appendix 3 shows an extract of the drawing from the 1955 plans for the school showing the equivalent boys' changing room. The Inquiry viewed 360° panoramic images taken of the girls' and boys' changing rooms. The panoramic image of the girls' changing room is taken in the immediate aftermath of the accident. The image of the boys' changing room shows an identically constructed privacy wall within the shower area.

[13] I offer the following description of the changing room layout. On entering the changing room the door opens inwards from the corridor, as one would expect. Straight ahead is a wall with a low level radiator and high level windows at the opposite end of the changing room. To the left is an area with benches and pegs along its length. Under the benches there are recessed areas for shoes, etc. To the right is the toilet area and a staff/cupboard area. The tiled communal shower recess is situated on the right-hand side furthest away from the entrance door. The shower area is the locus of the accident. There is a step down when entering into this area. Appendix 5 shows the layout and dimensions of the shower area. The measurements were taken by Mr Weston of the HSE.

¹ Pupil 1 statement dated 2 April 2014; Pupil 2 - oral evidence

[14] The evidence discloses that S1 pupils tended to change either in the toilets or in the shower area especially when sharing the changing room with older girls. On 1 April 2014 S1 pupils were due to have PE with Miss Sweeney in period 2. At the same time S3 pupils were using the changing room getting ready for a dance class to be taken by Miss Christie. The older pupils tended to use the benches and pegs situated on the left side of the changing room as one enters. Miss Christie was present in the changing room when the wall collapsed. She had been in the staff room or cupboard fetching a leotard for one of the S3 pupils who had forgotten her dance kit. There were a number of S3 girls changing at that time.

[15] Accordingly, it can be understood that the shower area was routinely used as part of the "dry" changing area. On the back wall of the shower area there were six shower heads opposite the rear face (or shower face) of the modesty wall. The evidence indicates that the showers were not used and the water supply feeding the shower heads had been turned off. However, it appears that they were capable of operating as showers. Aside from the panoramic photographs which include footage of both the boys' and girls' changing rooms there is also a photograph of the identical privacy wall and shower area taken in situ within the boys' changing room². The wall is supported on its bottom edge or foundation but is not connected in any way to any other part of the room. One can walk round either side of the wall to reach the area with the shower heads. The wall is some 3.65ms in length and 2.3ms high. On stepping down into the shower area the floor surface was finished with ceramic tiles with a raised grip non-slip surface. Similar tiles returned upwards from the floor to form the skirting tiles along the base of the wall. The skirting tiles on the shower face of the wall were missing but skirting tiles were visible on the room side. They are visible on the

² page 6 of Mr Hatfield's report, as shown and reproduced in Appendix 4

base of the remaining wall stub. The wall as originally designed and planned as its name suggests was to provide privacy or modesty for those using the showers. The wall had no other function. Without the wall the shower area which was communal would be open to the view of others in the changing room.

[16] Although it is by no means clear what degree of changing was required for PE, S1 pupils, in the main, chose to use the shower area where pegs were provided. Some chose to use the area behind the privacy wall that is between the privacy wall and the shower wall. From the oral evidence of Pupil 1 it is clear that she and another pupil were changing behind the privacy wall on the shower side. Whilst doing so they were chatting together and with other classmates. They were also bracing themselves between the privacy wall and the shower wall. The evidence indicates that two S1 pupils were braced between these walls either simultaneously or around the same time. By using the expression 'bracing' I mean that their back or part of their back would be against the privacy wall with their feet off the ground and in contact with the shower wall opposite. This activity is not dissimilar to a climbing technique known as "*chimneying*" used to climb a rock cleft with almost parallel sides just large enough for a climber's body. The climber may use his back and feet to apply opposite pressure on the vertical rock walls. (See illustration in Appendix 7) It is more likely, than not, that this activity was sufficient to exert enough lateral pressure on the wall to cause it to topple. Keane was changing on the other side, that is, the room side of the wall when it collapsed, crushing her. Pupils 1 and 2 suffered minor trauma when the wall collapsed. Pupil 1 fell with the wall backwards landing onto her bottom and Pupil 2 sustained bruising to a leg which required treatment at school. The weight of the wall that fell was approximately 1865kg or 1.9 tonnes.

[17] Immediately following the collapse of the wall staff and pupils attempted to assist by endeavouring to move the wall. Miss Christie was in the girls' changing room and responded without hesitation. She got the S1 pupils out of the room and asked them to call for Ms Sweeney. Along with some of the older girls they tried to remove the wall to relieve the pressure on Keane. That proved impossible due to the size and weight of the fallen wall. Assistance had been summoned immediately and staff of the school with first aid training, including a qualified nurse, attended to provide medical assistance to Keane. It was obvious she had sustained very serious and significant injuries. No pulse could be detected and she did not appear to be breathing. Staff carried out Cardio Pulmonary Resuscitation (CPR). An emergency call had been made to the Ambulance Service. The first ambulance with a paramedic and ambulance technician arrived at 9.56am having received the call at 9.53am. The ambulance crew took over CPR and provided additional treatment. Medic 1, a specialised ambulance resource, crewed by a senior consultant, a registrar and two specially trained nurses was dispatched from the Royal Infirmary of Edinburgh and arrived at 10.05am. They took over treatment from the ambulance crew. Despite the administration of adrenalin, intravenous fluids and other emergency steps they were unable to obtain any response. At 10.32am on 1 April 2014 the senior consultant from Medic 1 confirmed that Keane had died.

[18] The following day, 2 April 2014, an autopsy examination was carried out by Dr Kerry-Anne Shearer and Dr Ralph BouHaidar, Consultant Forensic Pathologists. Their report is Crown Production No 20 dated 16 June 2014. They certified the cause of Keane's death as 1(a) multiple injuries and 1(b) collapse of internal brick wall. It is clear from the autopsy report and the neuropathology report that Keane sustained serious and multiple injuries *"entirely in keeping with the circumstances of an internal wall collapsing on her"*. She

suffered very serious head injuries including a hinge fracture of the skull with associated damage and disruption to the brain. She also had fracturing of the pelvis; damage to the abdomen and related internal injuries.

[19] Standing the agreed evidence that Keane was unresponsive when the school nurse and other staff rendered assistance in the immediate aftermath of the wall collapsing it is quite likely that either Keane died instantly or never regained consciousness. Neither the ambulance crew nor Medic 1 were able to obtain any response to the treatment administered by them. This tends to support that theory. It was not necessary to lead medical evidence at the Inquiry as it had been agreed in the joint minute. For the purpose of the formal findings I am content to follow the terms of the joint minute. It should be recorded that the first responders both from within the school and from the emergency services arrived speedily along with the specialist resource of Medic 1. They provided medical assistance which regrettably proved futile given the catastrophic injuries Keane had sustained.

The Wall

[20] The wall has been described as a "painted monolith"³. Simply by looking at the wall (or the equivalent wall in the boys' changing room) it is not possible to tell what it is made of and how it was constructed.

[21] Following the accident the girls' changing room with the collapsed wall in situ was treated as a scene of crime and the wall fragments were preserved by police and HSE. The similarly constructed contemporaneous wall in the boys' changing room was photographed,

³ M Hatfield, HM Specialist Inspector of Health and Safety (Construction and Engineering) in his oral evidence on day seven of the Inquiry.

inspected and samples from that wall retained for testing. Subsequently, both PE blocks were demolished.

[22] Initially, Mr Weston, HM Inspector of Health and Safety, conducted investigations and noted measurements. Mr Mark Hatfield, HSE Civil Engineering Specialist Inspector, took over the investigation relating to the wall towards the end of 2014 when Mr Weston became indisposed. Therefore, Mr Hatfield did not have an opportunity to inspect the wall in situ in the boys' changing room or the collapsed wall in situ in the girls' changing room. The Building Research Establishment (BRE), who are an independent and impartial research and testing organisation, were engaged by HSE to carry out a materials analysis report on samples from both walls and also to analyse the brick bedding mortar at various parts of the collapsed wall and the boys' wall. The BRE report is dated 16 September 2015. It is compiled by John Houston, Principal Consultant at BRE (Crown Production No 3). Mr Hatfield compiled two reports. His first report was prepared in March 2015 (Crown Production No 1) and his second report is dated October 2015 (Crown Production No 2) which he compiled following the BRE report on their analysis of the samples. Mr Hatfield also prepared a short guide to the findings in the BRE report dated 29 March 2017 which has been lodged as Crown Production No 16.

[23] I base my findings as to the construction and design of the wall on the unchallenged evidence of Mr Hatfield, who spoke to his reports. In particular, his second report examines the issues of the construction, design and stability of the wall.

[24] Liberton High School opened in May 1959. Drawings prepared for the equivalent boys' changing room in 1955 indicate the position of the wall and the thickness of the wall at 4½ inches. (See Appendix 3). The wall was built of unreinforced single brick masonry approximately 4 inches or 105mm thick. Both faces of the brick wall had been covered in

cement render which was then finished with a polished decorative render known as "terrazzo". The overall dimensions of the wall are discussed above at paragraph [12].

During construction on each face of the wall there were a number of Bakelite dividing strips inset into the terrazzo finish. These Bakelite strips were installed to initiate and manage shrinkage cracks in the outer terrazzo layer. On each face of the wall there were six vertical strips and a horizontal strip near the base of the wall. The finished wall thickness was approximately 140mm. The terrazzo finish and Bakelite strips had been overpainted on at least five occasions. As a result it was not possible to see either the terrazzo finish or the Bakelite dividing strips on either privacy wall.

[25] The wall was supported along its base only from foundations below the floor. There was no other support for the wall such as a buttress and it was not otherwise connected to or with any other wall or to the ceiling. Although Mr Hatfield found no obvious defects in the standard of construction of the wall he considered that the wall as originally built would not have complied with any design codes used at the time of its construction nor with modern design codes due to it being too slender and therefore much less stable.

[26] National building regulations came into effect in 1963 and therefore the construction of the wall predated these regulations. Whilst there may have been local bye-laws relating to proper standards in building construction it is not known what bye-laws were used or adopted in the City of Edinburgh. It is unlikely that these bye-laws would apply specifically to the design and construction of this sort of free standing privacy wall in the mid-1950s. Indeed, it is unlikely that there would have been much by way of design input on this wall. New buildings require to comply with the relevant and applicable bye-laws or regulations at the time of their construction but do not require to be reviewed for compliance when subsequent regulations come into force. The Inquiry heard evidence that buildings are "of

their time". Once the completion certificate is issued then the building in use becomes the responsibility of other regulators. The building standards regime ends at this point. There is no ongoing 'MOT' for buildings other than it falling into a dangerous condition when the local authority has a duty to act⁴. Building regulations and standards promulgated after the school was built would not apply. British Standards on building maintenance management (BS: 8210) do however apply on a continuing basis. This is a matter to which I will return.

[27] The privacy walls in the changing rooms at Liberton High School remained in place without incident between May 1959 and April 2014. Mr Hatfield indicates in his report that the forces holding the wall in place would come from the weight of the wall itself and the strength of the mortar joints in the wall. In a changing room environment the forces which might create "destabilising moments" are likely to come from the activities of people applying force to the wall (paragraph 56 of his second report dated October 2015). External forces such as wind or weather would not be present.

[28] The BRE report concludes that the wall was already cracked across its full thickness for some considerable time prior to the fatal collapse. BRE reach that view based upon their testing of the various samples from the collapsed wall. Accordingly, BRE cannot say with certainty that the wall was fully cracked across its entire separation plane prior to collapse. Mr Hatfield considers that it is probable that the wall was fully cracked for some time without there being any visible external evidence of that cracking beyond minor cosmetic cracking which would be readily anticipated in a wall of that age. The summary of the joint opinion of the experts (Crown Production No 24) indicates that Mr Clarkson and Mr McCartney (civil/structural engineers engaged by those representing City of Edinburgh Council and Keane's parents respectively) agree with Mr Hatfield that the bond between the

⁴ Source: evidence of William Dodds, Head of Building Standards, Scottish Government.

bricks and the bedding mortar along the failure plane of the wall was at least partially cracked before 1 April 2014. However, the experts have different views as to whether it was fully cracked. I propose to accept Mr Hatfield's contention as to the extent of the cracking supported as it is by the BRE report that the wall was probably fully cracked along its separation or failure plane as at the 1 April 2014 and had been for some time. The separation plane can be seen in the cross section prepared by Mr Hatfield in his report of 29 March 2017 which is reproduced in Appendix 8 and in photo 4 of Mr Hatfield's second report which is set out in Appendix 7.

[29] BRE found that the crack through the wall originated from the horizontal Bakelite strips on each side of the wall and they suggest that the way these strips were installed when the wall was built may have contributed to the weakening of the mortar bed which ultimately became cracked through. For example, a degree of chiselling into the mortar was required to insert the Bakelite strip in the first place. BRE found chemical and physical changes in the render and mortar that indicated it had been exposed to air and water for some time and therefore the crack(s) which allowed the air and water to penetrate had existed for some considerable time. BRE found evidence that significant amounts of water had become trapped where the render layer joined the brick surface. This caused weakness of the mortar bed between the bricks making the wall more vulnerable to cracking.

[30] Of course a further significant factor in causing the wall to crack would be pressure or force applied to the wall. Mr Hatfield makes the following observations at paragraphs 85 and 86 of his second report:

"85 *If a horizontal force is applied to a wall then the leverage effect (and hence the tensile force) on a mortar bed increases the further that mortar bed is situated below the point of application. Therefore, with cracking as the result of a horizontal force, that crack is more likely to occur near the base of a wall. The position of the crack in*

the wall at Liberton is consistent with it being caused by the application of a sideways force to the wall that was more than the wall could withstand.

86. *Changing rooms can be boisterous places, and horseplay should be anticipated. An example is given in the statements referred to in paragraph 27 above. As a high school, pupils will range in size up to that of a fully grown adult; in addition, I understand that previously adult teams sometimes used the changing rooms at weekends. The wall had stood in place for more than fifty years, and I would therefore expect that it had been subject to numerous significant horizontal forces from impacts, climbing, pushing etc. Given the substandard design, many of these could have been enough to have caused the wall to crack without it falling completely."*

[31] Accepting that the mortar bond between the bricks had cracked the wall would remain stable by virtue of its own weight unless lateral pressure was applied to the wall to cause it to tilt far enough to fall. The joint expert report indicates that the wall would have to tilt approximately 130 to 140mm at its top edge before it tilted far enough to fall. It is agreed that even if the wall was fully cracked before 1 April 2014 girls simply leaning on the wall for balance when changing would not create enough force to cause it to move or tilt. There was evidence that the wall had been subjected to horizontal force from activity such as wall walking in the past.

[32] I consider the evidence of Mr Hatfield, supported by the BRE report, to be the most authoritative analysis of the wall and how it failed. The conclusion to be drawn from Mr Hatfield's evidence is this:- The wall was probably fully cracked along the separation plane. If the wall was fully cracked along its failure plane then two first year pupils engaged in "chimneying" or similar activity to that described by Pupil 1 would probably be able to exert sufficient force on the cracked wall to cause it to be pushed over. However, again assuming the wall was fully cracked, only one first year pupil engaged in "chimneying" would reduce that probability to a possibility only. On the evidence led at the Inquiry it was probable that the bracing or "chimneying" by Pupil 1 and her classmate as described in her

evidence was the immediate cause of the wall tilting. In legal terms that activity was the *causa sine qua non*. The true cause of the collapse was the inherent instability of the wall due to its construction and design which also made it more vulnerable to cracking. Lateral force over the years also materially contributed to a crack forming along the separation plane. Of course, high spirits and indeed boisterous behaviour can be expected and should be anticipated in a school changing room. There was nothing extreme in the activity described by Pupil 1. It can be described as horseplay. It was foreseeable that young pupils would engage in this sort of behaviour. The gap between the privacy wall and the shower wall of less than a metre presented a wall walking opportunity and challenge⁵.

Fault Reporting and Maintenance Regime at Liberton High School

[33] It was a matter of agreement that there was a fault reporting system in place at the school prior to 1 April 2014. This was a system for reporting defects to the fabric of the school and other hazards. Any faults detected should be reported to a member of the janitorial staff. Once a fault is reported a simple form is completed giving details of the report; the nature of the fault; its location; and the manner in which the fault was reported. A reference number is allocated to the report. The forms are logged in the maintenance section of the property register which is kept at the school. The report would be passed to the help desk at the Waverley Court office of City of Edinburgh Council responsible for maintenance and repairs at schools operated by the Council. The helpdesk will arrange for the appropriate tradesmen to attend to deal with the fault. These can be Council employees or outside contractors depending on the nature of the fault. The City of Edinburgh Council has a Building Services Department - Edinburgh Building Services (EBS) - who can effect repairs

⁵ See Illustration in Appendix 7.

otherwise outside contractors would be called in. Whoever attends to the repair requires to use the contractors' log at the school giving details of the contractor and the nature of the work. Once the fault is repaired the report in the property register would be signed off. No fault had been recorded in relation to the privacy wall with which this Inquiry is concerned.

[34] Evidence relating to the defect reporting system comes from the joint minute (para 20); Susan Brown, who is employed by the City of Edinburgh Council as the Area Facilities Manager for the South East of Edinburgh; Andrew Gray, the Head Janitor (or Service Support Officer as he is now known), and Walter Thomson, a retired Head Janitor. Additionally, staff at the school spoke knowledgeably about how the defect reporting system works. I detected no reluctance whatsoever about reporting any fault or concerns relating to the fabric of the school. Instead, there seemed to be a good and comprehensive understanding of how the system works.

[35] I formed the clear impression that the Head Janitors Walter Thomson and Andrew Gray would take immediate action to deal with a complaint which pointed to there being a risk to the health, safety and wellbeing of pupils and staff at the school. Had they received a complaint or had their suspicion been raised about the safety and stability of the wall by whatever means they would have put the changing room out of use immediately and demolished the wall.

[36] HSE evidence reflects and endorses Mr Hatfield's conclusion that the combination of the defect reporting system and staff awareness and use of the system mean that the actions of the council did meet the BS:8210 requirement for routine maintenance⁶.

[37] A suitably functioning fault reporting system is only one aspect of the school's maintenance regime. The defect reporting system which is essentially the reactive part of

⁶ Garry Stimpson: oral evidence on day 6 of Inquiry and page 10 of his report.

property maintenance appeared to work well. However, the Inquiry is also interested in the steps taken to put in place a system for managing the facility and managing risk. In this respect the Inquiry was assisted by the evidence of Mr Stimpson and Mr Hatfield who had a duty to investigate whether there were any reasonable precautions which might have been taken by the Council which might have prevented this accident. Both Mr Stimpson and Mr Hatfield had a role to play in this regard. Mr Hatfield was given a remit initially to consider, amongst other things:-

- The application of BS: 8210 "Guide to Building Maintenance Management" to the maintenance regime in place at Liberton High School, and
- What would a reasonable duty holder be expected to do with regard to maintenance of similar parts of buildings?

He concluded that the maintenance regime in place from 2012 appeared to comply with BS:8210 and he considered it reasonable if properly implemented.

[38] Staff, especially the janitorial staff and Mrs Angela Young who cleaned the changing rooms daily, were in effect the first line of routine maintenance inspection in the sense that they regularly worked in this area and were well placed to report any problems. Mrs Young had worked at the school for approximately 12 years and was very familiar with the changing rooms. She impressed me as a conscientious and responsible member of staff. She occasionally had to scrub graffiti from the wall in the girls' changing room and more frequently mud and muddy boot prints from the equivalent wall in the boys' changing room. To get rid of graffiti she would need to use some elbow grease and scour the wall yet she detected no problem with movement of the wall. If there was an issue to report Mrs Young was not shy to come forward and was anything but reluctant to press a complaint.

Mrs Young was not only an employee - she was also a mother with children at Liberton High

School. She had a real interest in the school and the welfare of its pupils. She cleaned the changing rooms on the morning of 1 April 2014 and on being informed that a serious accident had occurred later was surprised to learn that the wall in the girls' changing room was the one that collapsed. Mrs Young was completely attuned to the fault reporting system and I am satisfied that had she had any concern about the wall in question she would have reported it immediately to the janitor who would in turn have checked it. I imagine Mrs Young would have made sure that the janitor attended to it straight away.

[39] BS:8210: 2012 "Guide to Facilities Maintenance Management" gives guidance on the maintenance management of facilities including the inspection of buildings and the frequency at which these inspections should be carried out. In addition to routine maintenance, the guidance stipulates standards for general and detailed inspections as follows:-

"Clause 4.2.3:

- General: visual inspections of main elements should be made annually under the supervision of suitably qualified personnel at times appropriate for client's budgetary requirements.
- Detailed: the frequency of full inspections of the building fabric by suitably qualified personnel should not normally exceed a five year period."

[40] The general inspection regime comprised the day to day work of the janitors and other staff together with more formal annual health and safety audits. The most recent health and safety audit prior to the accident was carried out on 3 March 2014. Mr Stimpson considered these factors and concluded that the City of Edinburgh Council met and indeed exceeded the requirements of the British Standards for general inspection. That conclusion is supported by the evidence.

[41] Evidence was led at the Inquiry about a condition survey carried out at Liberton High School in July 2012. The City of Edinburgh Council engaged F3 Building Surveyors to

conduct this survey. It was carried out by Alasdair Balfour, Building Surveyor, along with an engineer, David Runciman. The Building Survey Report is Crown Production No 23. The surveyor was required to conduct a visual assessment of the fabric of the school and was not expected to carry out exploratory or intrusive work. Along with his colleague Mr Balfour surveyed the girls' changing room on 25 July 2012. He noticed no defect in the privacy wall having walked round the wall. He did not consider that there was any need to carry out any further inspection. There were no visible cracks and he had no concerns for the privacy wall at that time. His assessment of internal areas may be found at 5.15 of his report and his recommendation related to some plaster work and redecoration but not specifically in the girls' changing room. According to Mr Hatfield the only ongoing maintenance work on the wall would most likely be a coat of paint.

[42] Subsequently, in the summer and autumn of 2012 Morris and Spottiswood contractors carried out works at Liberton High School involving decoration, floor coverings and lighting upgrades. The contract did not involve any work in the boys or girls changing rooms. Morris and Spottiswood raised no concerns about structural safety in the school. They had no cause to comment on the changing rooms as their schedule of works did not involve these areas at all.

[43] Mr Hatfield did not find it unusual that the surveyor did not identify the wall as inadequate. We know that the underlying construction of the wall and any associated internal defects would not be apparent on visual inspection.⁷ The scope of the survey undertaken by F3 Surveyors would meet the recommendation for a detailed survey under BS:8210. Accordingly, I can readily understand and accept the conclusion reached by the HSE (both Mr Hatfield and Mr Stimpson) that the survey commissioned by the Council in

⁷ M Hatfield : first report 5.27; second report para78 and his conclusion at paragraph 124.

2012 meets the requirements for detailed inspection and therefore the maintenance regime in place at the school from 2012 onwards would comply with the British Standard and would be reasonable if properly implemented. Mr Hatfield would not have expected the surveyors to have identified any design deficiency in either of the privacy walls. I accept the opinions of these witnesses, which were both authoritative and unchallenged.

[44] Of course, there is other evidence in the form of statements of pupils which might suggest firstly, that a reasonable maintenance and inspection regime would have identified concerns about the stability of the wall due to movement in the wall. Further, these statements may undermine the conclusion that the fault reporting system was well known and adhered to by teachers had mention been made to them by pupils about movement in the wall. I now turn to consider the apparent conflict between the evidence of PE Teachers and the statements of certain pupils as to the reporting of issues relating to the wall.

Interaction between pupils and teachers - was any teacher put on notice that there was a problem with the wall's stability prior to 1 April 2014?

[45] This question opens up an area of real controversy. It is not possible to reconcile the oral evidence given by teachers at the Inquiry with certain of the statements given by pupils to police officers and admitted in evidence by the joint minutes. This is an important issue which, as I have already indicated, bears upon the question of whether an opportunity to report movement in the wall was missed in the months prior to the accident. If a teacher had been put on notice that the wall was moving that raises an issue not only about the stability of the wall but also as to the effectiveness of the fault reporting system as a mechanism for escalating any concern to those who could assess and deal with it. It is agreed that no report

had been made in the defect reporting system by anyone as to the privacy wall in either the girls' or boys' changing rooms.

[46] I have been asked to resolve the conflict between the evidence of certain pupils that they mentioned movement in the wall to teachers and the testimony of teachers to the effect that no such matter was raised by any pupil prior to 1 April 2014. The resolution of this conflict is not strictly necessary for the purpose of section 6(1)(c) - "reasonable precautions". There was a suitable fault reporting system and a good understanding and awareness of it and its operation on the part of staff. There are however quite formidable difficulties in attempting to resolve this question.

[47] This involves an assessment of the oral evidence given by the teaching staff and the evidence of the pupils as provided in their written statements about any dialogue or complaint prior to 1 April 2014 relating to movement in the wall. Detailed submissions were made at the conclusion of the Inquiry by counsel for Keane's parents and counsel for both Nicole Christie and City of Edinburgh Council. It is worth repeating that the terms of the two joint minutes of agreement accept that certain pupils provided a statement to police officers following the accident. Their statements annexed to the joint minute of agreement are to be admitted in evidence. That is the extent of the agreement. The truth of the statements is not a matter of agreement but is a matter for me to assess against the whole body of evidence led at the Inquiry.

[48] The content of the statements falls to be assessed from the point of view of credibility and in particular reliability along with any oral evidence. Witnesses who give oral evidence in open court are, of course, liable to have their evidence tested in cross-examination. The following teachers gave oral evidence which bears upon this issue:- Mhairi Henderson, a PE Teacher at Liberton High School between January and June 2014; Ian Hutchison, a PE

Teacher at Liberton High School until December 2013; Stephen Kelly, Head Teacher at Liberton High School ; Conall Low, now a PE Teacher, who was a PE Student on work placement at Liberton High School between January and March 2014; Kerry Sweeney, PE Teacher; and Nicole Christie, a probationary PE Teacher at Liberton High School between August 2013 and June 2014. The statements of pupils admitted as evidence were read out in the course of the Inquiry and are admissible as evidence in these proceedings. The statements were not spoken to by their maker with the exception of Pupils 1 and 2. The remaining pupils were not called to give evidence on oath and were not cross-examined.

[49] PE teachers who gave evidence were examined and cross-examined as to the pupils' statements. All were clear and certain that the conversations alleged to have taken place had not happened. No pupil had mentioned the wall or movement in the wall. I had the advantage of hearing the witnesses give evidence and I had no reason to disbelieve their evidence. Miss Christie, who was present in the girls' changing room when the accident occurred, was subjected to rigorous cross-examination. She comported herself well when giving evidence and responded to this terrible accident in an appropriately calm and professional manner bearing in mind that she was then a young probationer PE Teacher. Mr Hutchison, together with the other PE Teachers, similarly refuted any conversation attributed to them in some of the statements. Their evidence was clear that no pupil had made any mention or complaint about the wall.

[50] The position advanced by pupils in their statements varied. Of the pupils who gave oral evidence, Pupil 1 accepted that she had not been entirely candid and truthful to the police when she gave a statement on 2 April 2014. Normally, one would expect that the first opportunity to give a statement is likely to produce the most accurate account but that was not necessarily the case in the immediate aftermath of this tragedy. The evidence points to

pupils, quite understandably, being in a shocked and emotional state. Some contemplated personal responsibility and feared blame might attach to them (albeit quite unfounded). Rumours began about the accident and of course before long '*the wall*' was the main topic of conversation. Pupil 1 accepted that she had not told the entire truth to police after the accident about what she was doing at the time of the accident. In her statement she said she had not seen the wall move prior to the accident. She was fearful.

[51] The statement of a pupil given to police officers during the Inquiry and the subject of the second joint minute of agreement is, in my opinion, suspect. This pupil was concerned about what had been reported in the press about evidence given at the Inquiry already. Teachers were denying being aware of the wall shaking. She maintained she had spoken to Miss Christie about the wall prior to 1 April 2014. However at the stage when she gave the statement to the police Miss Christie had not yet given evidence. This pupil cannot say when the conversation is said to have taken place other than before Christmas 2013. This pupil's description of movement of the wall due to wind and draughts has been discredited by the scientific evidence. She asserts that "after the incident that Miss Christie wasn't back at school" which statement is factually inaccurate.

[52] The remaining statements present a kaleidoscope of information about the wall; about activities such as wall walking and climbing involving the wall together with approaches to teachers either about the wall or about the behaviour of fellow pupils in and around the wall. An analysis of the statements reveals that there does appear to have been some noticeable movement in the wall during the autumn term of 2013 due to wall walking by a pupil or pupils. A pupil who is, in effect, the "main complainer" and who spoke to staff and the media on the day of the accident denies that she engaged in any wall walking herself but maintains that another pupil had been '*wall walking*' and caused the wall to move. She

spoke to various teachers about movement in the wall. Her statement as regards her denial of wall walking is directly contradicted by at least one of her group of friends. Another pupil indicates that she overhears the main complainer mentioning the wall to a teacher but cannot say whether the teacher is male or female. Her recollection of that teacher's response differs from what is reported to be Mr Hutchison's response to the main complainer ("*if it moves again let me know*"). The pupil who complained to teaching staff about the "main complainer" causing the wall to move is in turn contradicted by the pupil who allegedly urged her to report that behaviour to a teacher. That pupil had not been aware of the wall moving at all. It is said that Miss Christie in response to the complaint about a fellow pupil's behaviour on the wall replied "*it is going to be all fine*". It is of some significance that this type of response was referred to by a number of pupils. It is difficult to know what to make of that. However, it seems an odd response to a complaint about the behaviour of a fellow pupil. I mention these matters to illustrate the difficulties in assessing evidence from written statements where inconsistencies exist.

[53] My conclusion is that great care must be exercised when considering these statements. It is unclear what parts of the statements bear to be personal recollection of something which the witness experienced prior to 1 April 2014 and which parts are informed by hindsight. We know from the evidence of Pupil 1 and from staff that pupils were understandably shocked in the aftermath of the accident. Some were worried that they may have contributed to the wall collapsing or at least could have done something to prevent this. Statements taken in the immediate aftermath of the accident have subsequently been refined or explained or in the case of Pupil 1 departed from.

[54] After the event there has obviously been heightened awareness of '*the wall*'. Prior to the accident the wall does not seem to have excited much interest at all. It is difficult to

understand firstly what a male PE Teacher would make of a female pupil mentioning '*the wall*' if reference was indeed being made to the privacy wall in the girls' changing room. That male teacher would be familiar with the boys' changing room and its layout but not the girls'. Absent previous reference to the privacy wall I would expect that some clarification of this would be required. Even female PE Teachers might not readily identify what was meant by '*the wall*' prior to 1 April 2014 without fuller explanation.

[55] Hearsay evidence is admissible. The statements constitute hearsay evidence and certain statements contain what may be described as secondary hearsay, namely, what others may have said to the maker of the statement. Where hearsay evidence is admitted, as here, the court has a duty to consider its value and reliability most carefully as it is the unsworn evidence of someone who is not adduced as a witness and cannot be cross-examined. The formidable difficulties presented in assessing this evidence lead me to the view that it would be unwise to prefer such evidence to contrary oral evidence which has been tested. Very compelling reasons would have to exist to prefer these statements over the clear evidence given by teachers. No such reasons exist. It is counter intuitive to accept that if any such reports had been made that all these teachers would have done nothing about them.

Nevertheless, it is important that the pupils who gave these statements understand that their evidence has been considered and analysed very carefully. Their statements have not been rejected; however, there are sound reasons to suggest that this evidence calls for explanation or amplification. Those reasons are firstly, the testimony of Pupil 1 as to the statements she gave to the police. She departed from the content of the earlier statements when she gave evidence. Secondly, in the aftermath of this dreadful accident the school community was in a state of shock with pupils and staff traumatised by what had happened. This led to a highly charged atmosphere with rumour and counter rumour circulating. The third important

reason is that I have attempted to analyse the statements identifying that there are inconsistencies within and between statements. These may well be readily explained but without such an explanation their evidential value is limited. Accordingly, the reliability of these statements is difficult to assess. Of course, the oral evidence is not restricted to the evidence of the teachers but includes the evidence of other members of staff particularly of Angela Young who gave straightforward reliable evidence as to the wall but who, of course, cannot shed light directly on the question of the interaction between the pupils and teaching staff. Great care has to be exercised as to the reliability of these statements. Conclusions should not be drawn from untested and incomplete evidence especially in light of clear oral evidence as to the contrary.

HSE Investigation and Opinion Evidence

[56] Garry Stimpson, one of HM Principal Inspectors of Health and Safety, had a critical role managing the overall investigation into Keane's death and the accident which caused it. HSE have responsibility for regulating health, safety and welfare for those at work and for those affected by any work activity. In this case the local authority City of Edinburgh Council as Education Authority is the relevant duty holder. Of course, a local authority has a degree of parallel responsibility along with HSE for regulating and promoting health safety and welfare. In the aftermath of the accident on 1 April 2014 the HSE therefore had the paramount regulatory and enforcement responsibility in respect of City of Edinburgh Council to assess compliance with the health and safety legislation in particular sections 3 and 4 of the Health and Safety at Work etc Act 1974 (HSWA). They have a duty not only to enforce compliance but where appropriate to hold duty holders to account.

[57] Mr Stimpson required to consider the full circumstances of the accident and the wall and report his recommendations and conclusions to the Crown Office and Procurator Fiscal Service (COPFS) who in Scotland ultimately decide whether to prosecute for any contravention of the HSWA.

[58] Mr Stimpson recognised that specialist construction and civil engineering input was required. He arranged for Mr Hatfield, HSE Civil Engineering Specialist Inspector, to provide advice in the form of a report. The remit to Mr Hatfield initially related to the application of building standards and British Standard 8210 on building maintenance management. That report informed Mr Stimpson's interim report to COPFS on 8 May 2015. HSE had instructed scientific analysis of portions of the wall by the Health and Safety Laboratory (HSL) and the Building Research Establishment (BRE). Mr Hatfield required to consider those findings before he could complete his report. Once available his report formed the basis of Mr Stimpson's final report to COPFS dated 4 November 2015.

[59] During 2014 on HSE advice the City of Edinburgh Council took steps to inspect all Council education establishments and other council property. All freestanding walls in other schools were removed, reinforced or replaced. Additional specialist staff were appointed for the purpose of this enhanced inspection on HSE advice. All other Scottish local authorities received advice. The Standing Committee on Structural Safety (SCOSS) sponsored by HSE in tandem with Structural and Civil Engineering bodies published an alert entitled "*preventing the collapse of free standing masonry walls*" to remind the professions of the risks from such walls.

[60] Mr Stimpson considered the duties imposed on the Council by both sections 3 and 4 of HSWA. Section 3 is concerned with the general duty of employers and self-employed to persons other than their employees. The circumstances relating to the wall clearly caused a

risk to such individuals. The question is whether the duty holder, in this case the Council, had taken steps to remove the risk as far as is reasonably practicable. Consideration of the fault reporting system and building maintenance regime analysed above led to the conclusion that the Council had taken all reasonably practicable steps. The HSE also considered the general duty set out in section 4 and concluded that it was not reasonably foreseeable that the wall in the changing room was defective. Absent evidence of cracking or deterioration they had systems in place to inspect and maintain the walls including annual audits and inspection by independent surveyors.

[61] Mr Stimpson also considered whether the Council had duties under the Workplace (Health, Safety and Welfare) Regulations 1992 and concluded, with the benefit of legal advice, that although Regulation 4A and 5 impose what is in effect strict liability, the regulations applied to "*workplaces*" as the title suggests and they would not apply in the circumstances of this case. By '*strict liability*' I mean the regulations impose an absolute duty on employers to comply with the requirements. If a breach occurs which causes an accident an employer cannot rely on the argument that he took reasonable steps to comply.

[62] The conclusion reached by Mr Stimpson is to the effect that there may have been a breach by the Council of their duties in terms of sections 3 and 4 of the HSWA however an analysis of the measures taken by the Council point to the conclusion that the Council had taken all reasonably practicable measures to ensure that the wall was inspected and maintained. The steps taken by the Council appear to comply with BS:8210 and they were doing what a reasonable local authority would be expected to do in such circumstances. Mr Stimpson was therefore unable to recommend that criminal proceedings be taken for a breach of either section.

[63] Mr Stimpson's report is Crown Production No 15. He gave oral evidence to the Inquiry. Mr Stimpson's report and his evidence represent a logical and detailed assessment of his role representing the statutory body charged with investigating and considering whether there had been a breach of health and safety legislation. His investigation was thorough and his conclusions are readily sustainable and understandable on the material available to him and presented to the Inquiry.

[64] This Inquiry along with Mr Stimpson placed considerable reliance on the advice of Mr Hatfield, the Specialist Inspector, who prepared several reports. He considered fully the background information and witness statements; the real evidence relating to the wall which collapsed and the wall in the boys' changing room which remained. He married this information with the analysis undertaken by BRE in their report. To a large degree his opinion evidence was unchallenged. Other experts in civil engineering and construction had been instructed by the Council and by Keane's parents. There was positive engagement between Mr Hatfield and the other experts who jointly prepared a brief summary of their conclusions. The main area of disagreement was whether the wall was fully or partially cracked along the separation plane as at 1 April 2014. Although it was not an area of controversy which it was essential to resolve I conclude that Mr Hatfield's opinion is to be preferred. His opinion is based on his expertise and the BRE Report. He has both academic and practical experience in the field of civil engineering and construction as set out in Appendix 2 to his first report. Mr Hatfield was a quietly impressive and persuasive witness. His conclusions answer many questions as to the construction of the wall, its stability and why it is likely to have fallen when it did.

Concluding Remarks

[65] The investigation of this tragic accident by the police, HSE and all concerned was commendably thorough and professional. The failure and collapse of the privacy wall was an horrific event especially occurring in a school. The evidence led at the Inquiry shed light on why the wall collapsed. The courage and maturity of the pupils who gave evidence allows us to understand in all probability why it fell when it did. The actions of pupils over many years many have unwittingly contributed to this inherently unstable painted monolith cracking. No pupil should shoulder any responsibility or burden whatsoever in the wake of what happened. Perhaps the most positive and useful outcome of this Inquiry is to inform and warn of the risks from free standing masonry walls. This will reinforce the measures taken in 2014 by HSE in conjunction with the Scottish Government and the Standing Committee on Structural Safety (SCOSS) to promote rigorous inspection of such walls with a view to consideration being given to remedial strengthening measures and where appropriate removal of such walls. In both the public and private domain steps ought to be taken to assess the risk of the continued use of such walls in light of this tragedy.

[66] I have not been able to resolve in a wholly satisfactory manner the issue of whether an opportunity was missed to flag up movement in the wall. Having reflected on all the evidence I consider that the evidence I heard from witnesses was credible and reliable. Agreement of the statements of pupils avoided pupils having to give evidence about events which must have been disturbing, distressing and shocking for first year pupils. However, on the question of whether pupils had had dialogue with teachers about the wall the advantages to be gained from hearing and testing oral evidence about this matter of controversy was lost to the Inquiry. The Inquiry is deprived of the opportunity to hear that evidence and have it tested. There is a clear and obvious risk of unfairness to both teachers

and pupils when evidence about important and controversial matters is not presented in the same manner. *"Unfairness will plainly result where the evidential content of the written statement is crucial and contentious"*⁸

[67] Keane's death at the age of 12 whilst at school was a dreadful and shocking event especially for her parents, her family and her friends, but also for the wider community. The tragic circumstances surrounding Keane's death were explored fully before me during the Fatal Accident Inquiry in June 2017. It was obvious to me that Keane was a much loved daughter, sister and friend. She was clearly a popular and well liked pupil in Senior 1 at Liberton High School. Her devoted parents are clearly bereft and attended the Inquiry not only as a mark of their love for Keane but also in an impressively dignified search for answers about what happened on 1 April 2014. I offer my sympathy to them, and to Keane's family and friends.

⁸ Carmichael : Sudden Deaths and Fatal Accident Inquiries (3rd Edition) 4-36.

List of Appendices to the FAI Determination

Appendix 1	List of Witnesses who gave Evidence to the Inquiry
Appendix 2	Layout and Dimensions of Girls' Changing Room
Appendix 3	1955 Drawing of proposed layout of Boys' Changing Room
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Appendix 7	Illustration of "Chimneying" or "Wall Walking" and estimate of the force necessary to support the weight of the "Walker"
Appendix 8	Cross-section through wall

APPENDIX NO. 1

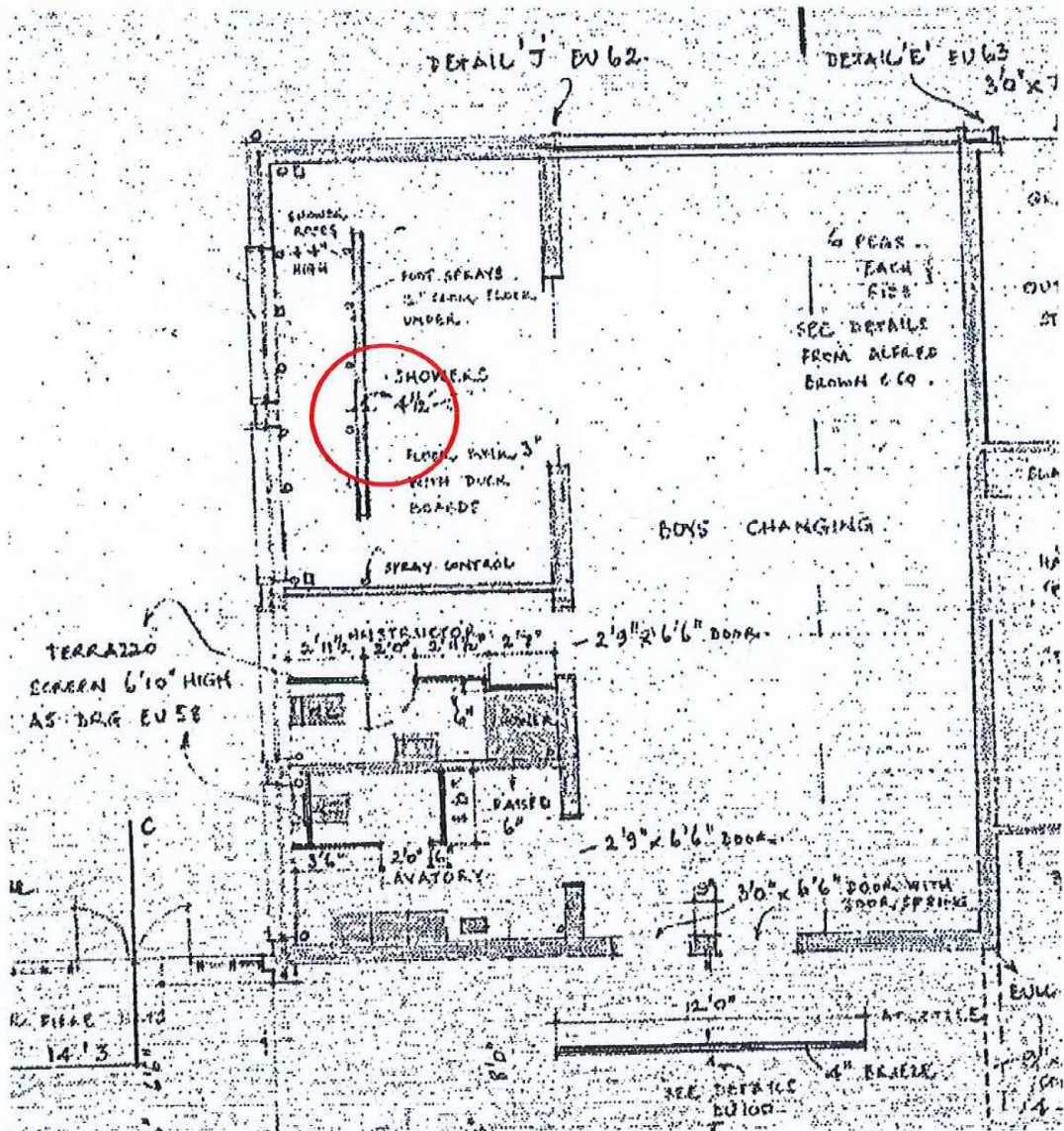
UNDER THE FATAL ACCIDENTS AND SUDDEN DEATHS INQUIRY (SCOTLAND) ACT 1976

LIST OF WITNESSES WHO GAVE EVIDENCE TO THE INQUIRY

1. Detective Chief Inspector Keith Hardie, Police Service of Scotland, who led and co-ordinated the major investigation into Keane's death code name Operation Ensay.
2. Mhairi Henderson, PE Teacher at Liberton High School between January and June 2014.
3. Conall Low, PE Teacher, who was a PE student on work placement at Liberton High School between January and March 2014.
4. Stephen Kelly, Head Teacher, Liberton High School since February 2012.
5. Ian Hutchison, Deputy Head Teacher at Gracemount High School who had been Principal Teacher of PE at Liberton High School until December 2013.
6. Angela Young, Cleaner (and catering assistant) at Liberton High School for almost 12 years.
7. Walter Thomson, retired Head Janitor at Liberton High School (1997 to 2012).
8. Andrew Gray, Head Service Support Officer ("Janitor") at Liberton High School.
9. Alasdair Graeme Balfour, Chartered Building Surveyor with F3 Building Surveyors; co-author of a Building Survey Report dated August 2012 in respect of Liberton High School.
10. Nicole Elspeth Christie, a probationer PE Teacher at Liberton High School between August 2013 and June 2014.
11. William Hood Dodds, Head of Building Standards at Scottish Government.
12. David Garry Stimpson, HM Principal Inspector of Health and Safety with the Health and Safety Executive whose role was to manage the overall programme of the investigation into Keane's death and report to the Procurator Fiscal.
13. Mark Hatfield, HSE Civil Engineering Specialist Inspector, who prepared two reports into the collapse of the wall - an initial report is dated 18 March 2015 and a second report dated 27 October 2015.
14. Pupil 1, a fourth year pupil at Liberton High School who was present in the girls' changing room when the wall collapsed on 1 April 2014.
15. Pupil 2 a fourth year pupil at Liberton High School who was present in the girls' changing room when the wall collapsed on 1 April 2014.

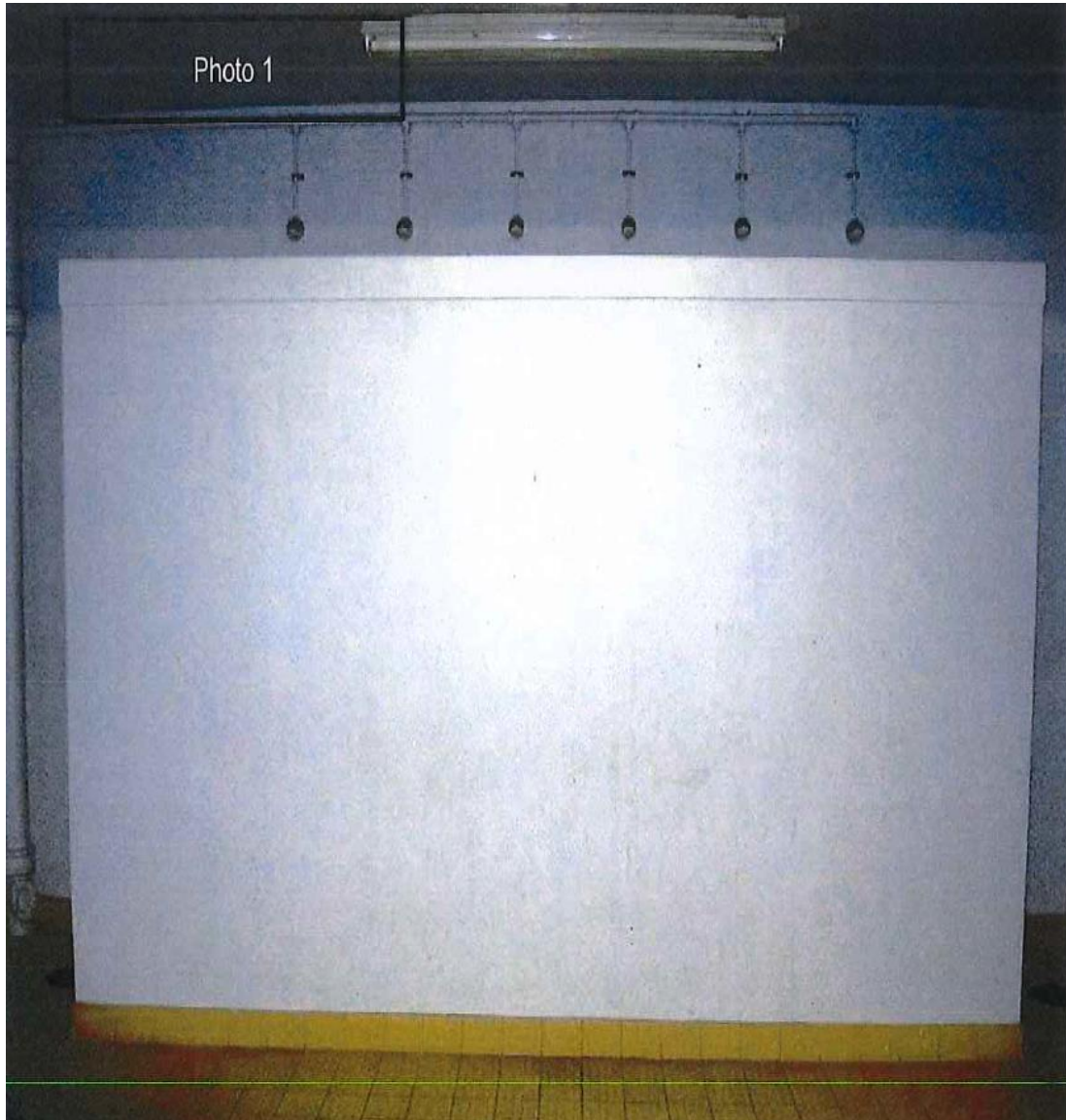
APPENDIX NO 3 – Drawing made in 1955 showing Boys' Changing Room

Extract from 1955 drawing showing dimensioned thickness of privacy wall



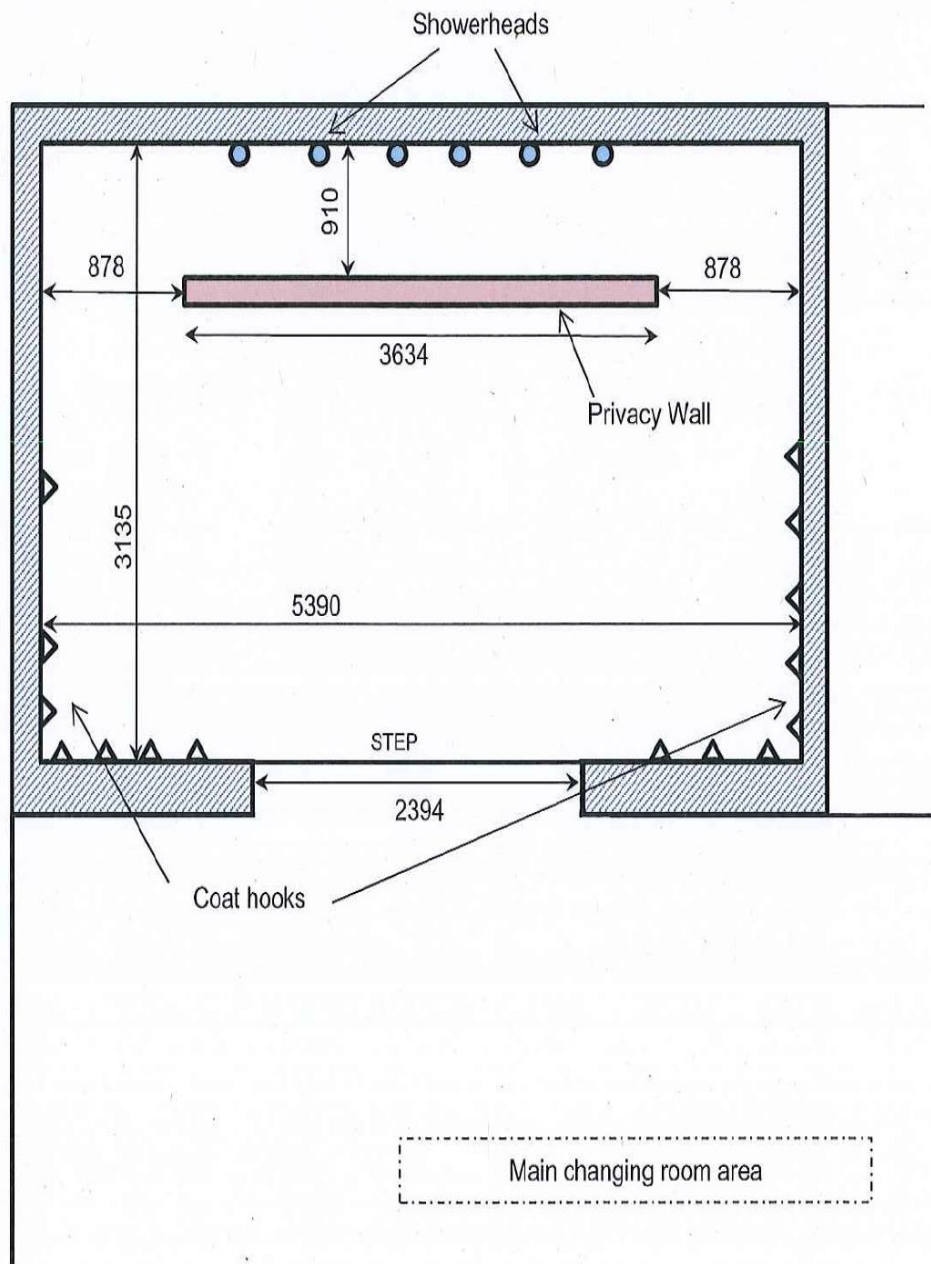
Source – M Hatfield, HSE Report 27 October 2015 - Appendix 1 Figure 8 at page 29

APPENDIX NO 4 – Photograph of Privacy Wall in Boys' Changing Room



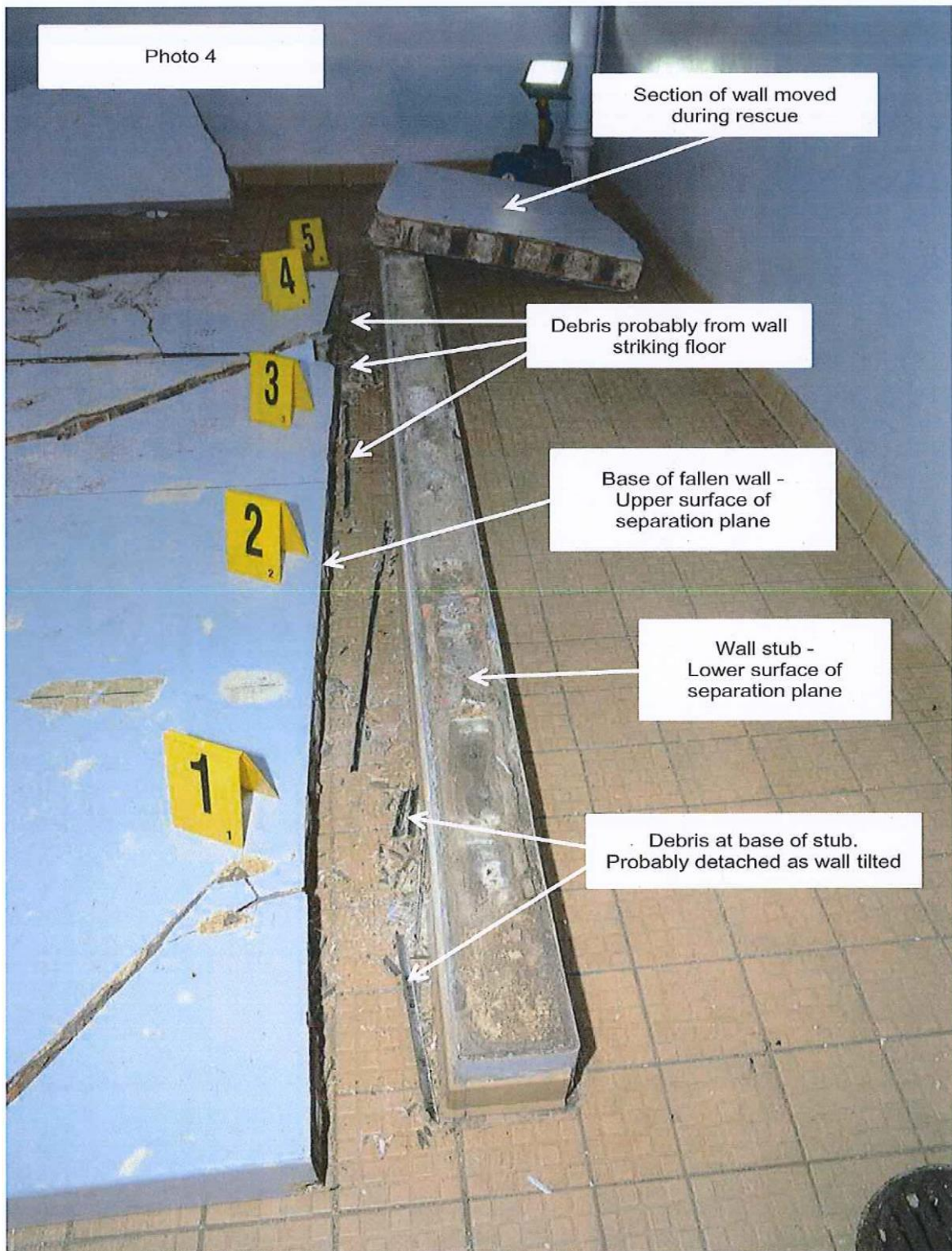
Source – M Hatfield, HSE Report 27 October 2015 – at page 6

APPENDIX NO 5 – Layout and Dimensions of Shower Area in Girls' Changing Room



Source – M Hatfield, HSE Report 27 October 2015 – Appendix 1 Figure 1 at page 23
Measurements by C Weston, HSE (in millimetres)

APPENDIX NO 6 – Photograph of Collapsed Wall in Girls' Changing Room

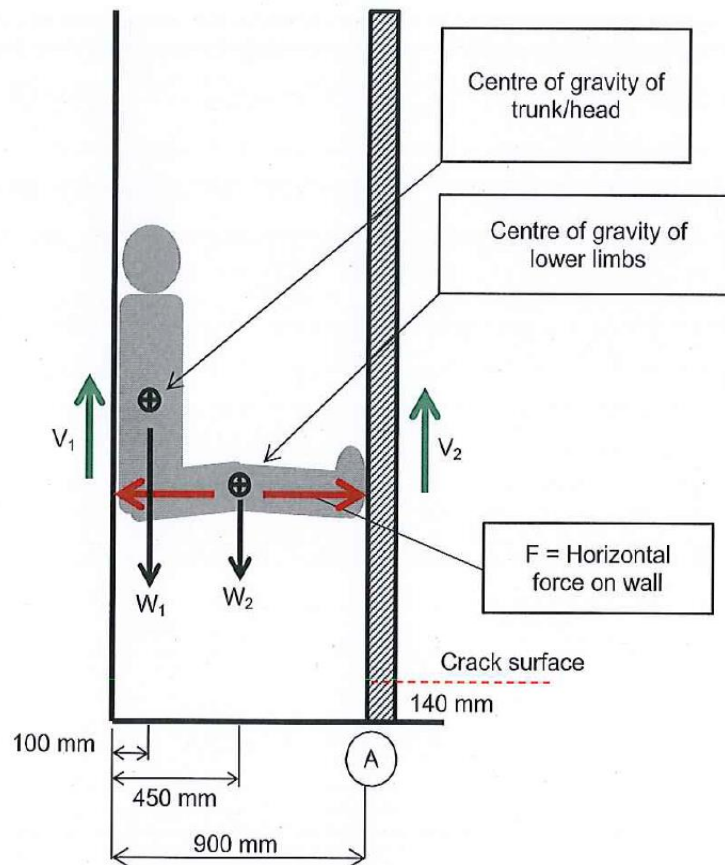


Source – M Hatfield, HSE Report 27 October 2015 – Photo No 4 on page 10

APPENDIX NO 7 – Illustration of "Chimneying" or "Wall Walking" and estimate of the force necessary to support the weight of the "Walker"

Appendix 4

Estimate of forces from "wall walking"



A 95th percentile, 12yr old, female has an estimated weight of 72kg. Average distribution of weight in human body is Head + Trunk = 59%; Lower Limbs = 41%. Converting kilogrammes to force in Newtons:

$$\begin{aligned} \text{Trunk/head } (W_1) &= 72 \text{ kg} \times 59\% \times 9.8 \text{ ms}^{-2} = 416\text{N} \\ \text{Lower Limbs } (W_2) &= 72 \text{ kg} \times 41\% \times 9.8 \text{ ms}^{-2} = 289\text{N} \end{aligned}$$

The weight of the girl is supported by the total of friction forces (V_1 & V_2) on each wall. So $W_1+W_2 = V_1+V_2 = 705\text{N}$.

Taking moments about position A:
 $(289\text{N} \times 0.45\text{m}) + (416\text{N} \times 0.8\text{m}) = V_1 \times 0.9\text{m}$; Therefore $V_1 = 514\text{N}$. Hence $V_2 = 191\text{N}$.

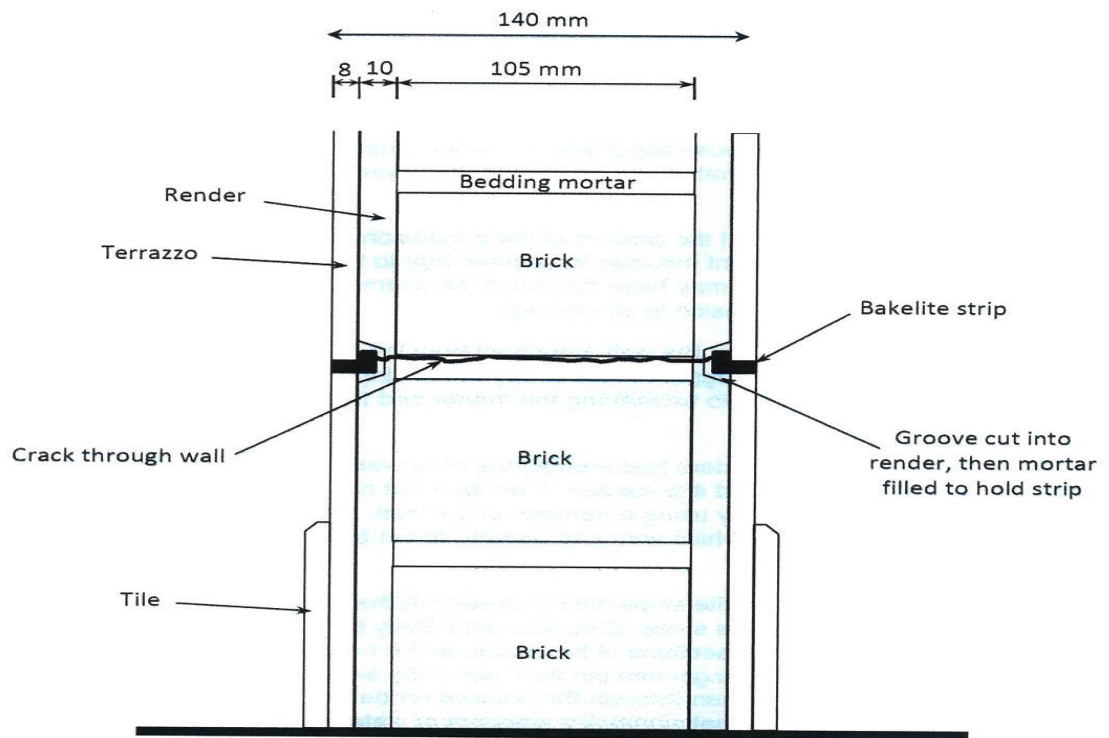
The vertical friction force (V) equals the horizontal force (F) x the coefficient of friction (μ). Therefore $F = V/\mu$. In this case, F will be the greater of V_1/μ_1 and V_2/μ_2 .

V_1 is greater than V_2 . For V_1 the relevant coefficient of friction (μ_1) is for fabric clothing on smooth paint. I have assumed this to be about 0.3. For V_2 the relevant coefficient of friction (μ_2) is for footwear on smooth paint, assumed this to be greater than μ_1 . Therefore I estimate $F = V_1/\mu_1 = 514/0.3 = 1.7\text{kN}$

This is an estimate of the force necessary to just support the weight of the "walker". Depending on their leg strength, they could apply higher forces.

Source – M Hatfield, HSE Report 27 October 2015 – Appendix 4 at page 36

APPENDIX NO 8 – Drawing showing the cross section of the wall prepared by Mr Hatfield



Cross section through wall

Source –M Hatfield Summary Paper – 29 March 2017