ENGINEERING
INVESTIGATION & MONITORING SERVICES
CLAIM HANDLING SECTION

The following sections contain information for NHBC Claims only. They are updated with each new issue of the report.

1. CLAIM DETAILS

Property address	16 Kittlegairy Crescent Peebles EH45 9NJ				*Plot no. (if known)*	9
NHBC Claims reference no.	***Engineering Project no.***	***NHBC claim handler***	***Claim section***	***Original builder***	***Date property finalled***	
17/28448	260967	C A Cambridge	3	Taylor Wimpey East Scotland	22/02/11	

2. REPORT DETAILS

This Engineering Claim Handling Section should be read in conjunction with the associated Engineering Investigation & Monitoring Claim report

Engineering Claim Handling report					***Associated Engineering Claim report***		
Eng. Ref no.	***Prepared by***	***Reviewed by***	***Issue no.***	***Date of issue***	***Eng. Ref no.***	***Issue no.***	***Date of issue***
981455	John Aitken	Christopher Orr	1	28/06/18	981455	1	28/06/18

3. RECOMMENDATIONS

Applicable: Yes

Recommendations	As there is no significant structural damage or distortions on any of the detached double garage walls, apart from the slight mortar erosion in the more exposed areas, no immediate structural remedial works are considered necessary. Superstructure repairs involving raking out and repointing the mortar joints could be considered as a suitable option for remedial works, but only if the mortar erosion issue is determined as valid by NHBC Claims. In addition, the following issues that may affect the structural stability of the detached garage may require further assessment before determining the extent and nature of any remedial works, if the claim is subsequently cosidered valid by NHBC Claims: • The width, thickness, height, spacing and tying of the stiffening piers to the rear and both gable walls of the garage should be determined in accordance with the relevant British Standards, to ensure that they are adequate and capable of resisting the design wind loads. • The corner piers on the rear wall may have to be taken down and re-built with suitable bonding or ties to the main wall, to ensure that they provide adequate resistance to the holding down forces applied to them via the straps.
Are remedial works recommended?	Yes, but only if the mortar erosion issue is determined as valid by NHBC Claims. Reference was made to the following British Masonry Society publication *"Building Mortar for Low Rise Housing – Recommendations, Problems and Solutions"* by Professor Geoff Edgell and B A Haseltine for general guidance on the remedial works option below.

SPECIALIST FOUNDATION REMEDIAL WORK

Is remedial work suitable for specialist contractor?	No	
If "yes" provide details on appropriate scope/extent	N/a	***If "no" go to NON SPECIALIST CONTRACTOR WORK***
Is sufficient information available for a specialist contractor to determine design parameters for remedial works?	N/a	
Are specialist masonry repairs likely to be necessary?	N/a	
Are there other realistic alternatives to the solution recommended above?	N/a	
Additional relevant comments	N/a	

NON SPECIALIST CONTRACTOR WORK

Details of remedial work options, if determined as valid by NHBC Claims	Complete (i.e. 100%) rake out and re-point of all external mortar joints as follows: • All mortar joints should be raked out to a depth of 25mm from the external face of the brickwork. • Ensure that the mortar is cut out squarely to ensure 20mm re-pointing over the full depth of the joints. • Brush cut-out joints and flush with water to remove dust before re-pointing to ensure that the re-pointing bonds well to the brickwork. • The re-pointing mortar is to be in accordance with the guidance in Appendix 6.1-C of NHBC Standards. The 'hungry' internal mortar joints should also be fully filled with mortar. Re-pointing of the mortar joints should provide a suitable solution to the mortar erosion issue, and give the re-pointed external walls adequate durability. This will also provide suitable protection from wind driven rain and severe weather to the remaining mortar in the inner part of the brick walls of the garage.

RECOMMENDATIONS (continued)

Are there other realistic alternatives to the solution recommended above?	• Localised re-pointing (internal and external) of the garage walls could be considered to be a realistic alternative, but it is possible that further erosion will take place in years to come to the areas of wall that are not re-pointed at this time. Given the as-built mix proportions of the mortar, and the severe exposure category of the site, it is considered likely that mortar erosion will continue to take place, both in terms of depth and areas affected, and this may in time affect the structural stability of the garage walls. • 'Do nothing' could also be considered to be a realistic alternative, given the current extent and nature of mortar erosion. However, given the exposure category of the site, the as-built mortar mix proportions, and the extent and depth of mortar erosion that has already taken place in the 7 years since completion, mortar erosion is considered likely to continue at a similar rate and may eventually become a more significant structural issue over time. • Demolishing and rebuilding the garage could also be considered as an alternative, as this would address all the issues identified in the Investigations Report.
Additional relevant comments	• Mortar should be of the mix properties necessary to achieve adequate strength ***and*** durability and be suitable for the type of masonry. Guidance on suitable mortar mixes is given in relevant British Standards, and also in NHBC Standards. Recommended mortar mixes for different locations are given in Appendix 6.1-C of NHBC Standards, and the table from Appendix 6.1-C is shown below:

Location		Recommended cement: lime: sand mix	Recommended cement: sand mix with air-entraining plasticiser	Recommended masonry cement: sand mix	Mortar designation to BS EN 1996-1-1
General wall area above dpc	in areas of *Severe* or *Very Severe* exposure - high durability	1 : ½ : 4½	1 : 3½	1 : 3	(ii)
	other exposure categories - general use	1 : 1 : 5½	1 : 5½	1 : 4½	(iii)
Below dpc level and in chimney stacks	- high durability	1 : ½ : 4½	1 : 3½	1 : 3	(ii)
Cappings, copings and sills	- low permeability	1 : 0 to ¼ : 3	-	-	(i)

	• The site is on the outskirts of Peebles in the Scottish Borders and is in a ***severe*** exposure zone (from Appendix 6.1-A of NHBC Standards), and a class **(ii)** mortar is recommended for general wall areas above dpc to provide adequate durability. • The mortar samples tested on behalf of the homeowner found the mortar to be class (iv) to (v) (this generally agrees with the record specified mortar of M2.5). This indicates that the mortar used may not be suitable to provide adequate durability.

4. COMPLIANCE WITH NHBC STANDARDS

The following relevant non-compliances with NHBC Standards have been identified by the investigation.

- **6.1 – D5:** Mortar shall be of the mix proportions necessary to achieve adequate strength and durability.
- **9.1 – S1:** All sitework shall:
  - **a)** Meet the Technical Requirements
  - **b)** Comply with the design
  - **c)** Follow established good practice and workmanship

5. THIRD PARTY ISSUES

No relevant third party issues have been identified by the investigation to date.

6. CDM IMPLICATIONS

Residual risks to be addressed by the Tenderer are identified on the attached Hazard Assessment Form.

7. PARTY WALL ACT CONSIDERATIONS

Not applicable.

8. TEMPORARY ACCOMMODATION

The need for temporary accommodation during any remedial work should be considered by Claims.

9. INTERIM REPAIRS

Interim repairs are not considered to be necessary.

10. BUDGET COSTS (approx.)

The following are the **approximate** anticipated costs of the recommended work (these are third party costs and do not include Engineering's time/charges):

Trial pit investigation	N/a
Borehole investigation	N/a
Drain survey/testing	N/a
Root analysis	N/a
Soil analysis	N/a
Arboricultural report	N/a
Aerial photo(s)	N/a
Map search	N/a
Other investigation	N/a
Specialist foundation remedial work	N/a
Recommended (non specialist contractor) remedial work	**£10,000.00** (rake out and repoint)
Viable alternatives to recommended remedial work	£30,000.00 (demolish and rebuild)
	£1,000.00 (localised repointing)
	£0 (do nothing)

11. PROGRAMME AND TASK TIMES

Standard response times and default task times as given in the Menu of Services are expected for the recommended work.

12. OTHER CLAIM HANDLING ISSUES IDENTIFIED DURING THE INVESTIGATION

The following other claim handling issues have been identified during the investigation.

- NHBC Engineers have previously investigated five other houses on this development that have reported problems with mortar erosion. These are as follows:
  - No. 28 Kittlegairy Crescent, Claim Ref: 15/30323.
  - No. 26 Kittlegairy Crescent, Claim Ref: 15/31333.
  - No. 2 Kittlegairy Way, Claim Ref: 15/10661.
  - No. 4 Kittlegairy Way, Claim Ref: 15/47477.
  - No. 21 Kittlegairy View, Claim Ref: 16/04543.
  - No. 14 Kittlegairy View, Claim Ref: 16/51293.
  - No. 17 Kittlegairy View, Claim Ref: 16/43953.
  - No. 3 Kittlegairy Way, Claim Ref: 16/54917.
  - No. 15 Kittlegairy View, Claim Ref 16/50084.

- NHBC Engineers have also currently investigating one other house on this development that have reported problems with mortar erosion:
  - No. 7 Kittlegairy Crescent, Claim Ref: 17/44483.

- The Builder has also previously stated that they have already carried out remedial works to the mortar joints at the following nearby properties:
  - No. 6 Kittlegairy Way – complete rake out and repoint of all mortar joints on all elevations.
  - No. 8 Kittlegairy Way – localised rake out and repointing.
  - No. 10 Kittlegairy Way – localised rake out and repointing.

The homeowner also expressed concerns regarding the following issues (see also the reports by David Narro Associates and Roberson Eadie Consulting Engineers):

- The mortar above and below DPC level on the main house.
- The level of the DPC in relation to the external ground level in some areas of the main house.
- The blockwork and mortar used in the foundation of the house and garage.
- The foundation level of the garage in relation to the external ground level.

13. FURTHER INSTRUCTIONS REQUIRED BY NHBC ENGINEERING

Engineering requires further instructions for the all the tasks recommended in this report.

NHBC Technical Services
NHBC House, Davy Avenue, Knowlhill,
Milton Keynes, Bucks MK5 8FP
Tel: 0344 633 1000

Raising Standards. Protecting Homeowners

ENGINEERING INVESTIGATION & MONITORING SERVICES CLAIM REPORT

This report has been prepared in accordance with the brief received from NHBC Claims and the Service Level Agreement. The report relates to those elements of the building that are the subject of the claim and does not represent a full structural survey of the property. The report is written for NHBC Claims. No other parties may have access to or take benefit from this document without the agreement of NHBC Claims or Technical Services.

1. CLAIM DETAILS

Property address	16 Kittlegairy Crescent Peebles EH45 9NJ	***Plot no.*** *(if known)*	9

NHBC Claims reference no.	***Eng. Project no.***	***NHBC claim handler***	***Claim section***	***Original builder***	***Date property finalled***
17/28448	260967	C A Cambridge	3	Taylor Wimpey East Scotland	22/02/11

2. ENGINEERING BRIEF

Brief received (or reason for re-issue of report)	***Eng. referral no.***	***Report***			
		Prepared by	***Reviewed by***	***Issue no.***	***Date of issue***
Initial assessment and report: please contact the homeowner as soon as possible to arrange a date to visit and investigate their claims that the mortar has failed and their garage is structurally unstable.	981455	J Aitken	C Orr	1	28/06/18

3. PROPERTY DETAILS

Property type	Detached		
New build or conversion?	Newbuild		
Number of storeys	2	***Basement Storey?***	No
Garage	Yes – detached double garage		
Additional relevant comments	This initial assessment and report only deals with the detached double garage, and whether it is structurally unstable.		

4. INFORMATION PROVIDED BY THE CLAIMANT

Date of purchase of property	31/03/11	***Is current Homeowner the original purchaser?***	Yes
Has the damage been investigated by other parties?	Yes – see the additional relevant comments below	***Reports provided to NHBC Engineer?***	Yes – see the additional relevant comments below
Has the property been extended or altered?	No	***Has property previously been underpinned / repaired?***	No

History of damage / date damage first noticed by Homeowner

- The original Builder contacted the homeowner in 2016 to advise that there may be an issue with the mortar used on the clay facing brick external walls.
- The homeowner noticed issues with the mortar on the internal and external faces of the garage walls in 2017. Fixings for brackets to suspend bicycles from the internal faces of the walls have consistently failed and worked loose on a number of occasions.
- Following investigation and report by NHBC Claims, the homeowner instructed Consulting Engineers to investigate and report on various issues on the construction of their property, including the detached double garage.
- The homeowner is also aware of similar issues on other houses on this development.

Additional relevant comments

The homeowner provided copies of a structural survey report by David Narro Associates (dated November 2017), Robertson Eadie Consulting Engineers (dated 28th January 2018), and also copies of various mortar test results. These reports have been reviewed, and relevant issues (i.e. relevant to the current brief) can be summarised as follows:

- **David Narro Associates:**
  - The general structural condition of the garage is considered to be good and appears to have been well maintained since being built. There are no immediate signs of significant movement or cracking.
  - The report notes that the garage roof is tied at each end to the masonry gable walls.
  - Some variation in the quality of finish and the colour of the mortar joints on the clay facing brick was noted, with some weathering of the joints in the more exposed areas.
  - The weathering of the mortar is to the surface only, and has not yet reached a stage so as to affect the stability of the walls.
  - The rough finish and unfilled joints in some areas of the internal face of the garage walls was noted.
  - The tests on the mortar indicate this to be class (iv) to (v), and the report comments that this is lower than expected from a review of the original specification, Building Warrant Application information, and NHBC Standards.
  - The report concludes that the mortar shows signs of early deterioration and, if left unchecked, this may impact the structural performance of the walls in advance of their expected design life.
  - The report recommends that raking out the mortar joints to a depth of 15 to 20mm and re-pointing with a suitable durable mortar would provide a suitable repair, but only if a review of the as-built structure confirms that the strength of the remaining mortar is sufficient to provide the required structural performance for the walls.
- **Robertson Eadie Consulting Engineers:**
  - Following an internal and external inspection of the detached garage, calculations were undertaken to determine the adequacy of the as-built walls to sustain the loadings applied to them.
  - The information on which these calculations, carried out in accordance with BS6399 and BS5628, were based is listed, including record drawings and mortar analysis reports.
  - No evidence of distress or cracking in any of the walls was noted during the inspection.
  - The calculations confirmed that the walls are adequate to carry the vertical loads applied to them (note that only the outcomes (i.e. 'pass' or 'fail') are indicated in the report – no actual calculations have been presented).
  - (continued over)

INFORMATION PROVIDED BY THE CLAIMANT (continued)

Additional relevant comments (continued)	➢ The report notes the original design information indicates that, for a garage with full height gables, the piers on the two gable walls should have been 1570mm long, not 440mm long as built (see also sketch No. SK – 02). ➢ The report concluded that the rear (East) and North gable walls of the garage are considerably understrength to resist the design wind loads applied to them (it is considered likely that the same conclusion would also apply to the South gable wall). ➢ The report also states that the gable wall panels do not appear to have been tied into the roof structure, and could collapse under wind load. ➢ Although no evidence of distress in the gable wall panels of the garage were noted, the report recommends that these are tied into the roof structure as soon as possible, as the upper gable panels could be "sucked out" during high winds. The report notes that these should have been tied to the roof structure as recommended in BS5628 and in accordance with good practice. ➢ The report also recommends that additional and extended piers are required to strengthen the rear and gable walls. ➢ It was also noted that there appears to be areas of relatively soft mortars, and higher than anticipated evidence of wear in the mortar joints, particularly in exposed areas of the walls. • **Further comments on the reports:** ➢ David Narro Associates found that the garage roof is tied at each end to the masonry gable walls. ➢ However, Robertson Eadie found that the gable walls did not appear to be tied into the roof structure. ➢ Roberson Eadie's report appears to be the basis for the 'Dangerous Building' notices on the garage and on the storage container in the driveway (see plate Nos. 1.1, 1.2 and 2.1). ➢ Robertson Eadie's conclusions appear to be based on calculations that assume that the tops of the gable walls are unrestrained, as noted on the marked-up elevations at the end their report (this also notes that the widths of the piers is 215mm). ➢ However, as found by David Narro Associates, the gable walls are actually tied into the roof structure, generally in accordance with British Standards and also good practice. ➢ The issue of restraint to the gable walls is discussed further in section 12 below. ➢

5. SUMMARY OF INITIAL INVESTIGATION AND DESK STUDY

This section is used to summarise the work undertaken for the initial assessment. Information is generally factual rather than interpretative. Discussion of results is recorded in "Conclusions" section or "Initial assessment of claim" section if preliminary conclusions are appropriate.

SITE WORK			
Date of initial visit	10/04/18	***In attendance***	• Homeowner • John Aitken – NHBC Engineer
Damage inspected / recorded	Yes – see sketch No. SK – 01 for the as-built general arrangement of the gable walls of the garage.		
Level survey	No		
Plumb survey	No		
Vegetation survey	No		
Crack/level monitoring installed	No		
Trial pits / Boreholes	No		
Drain tests	No		
Other	No		
Site plan sketch appended	No		
Crack survey sketch appended	N/a		
Distortion survey(s) appended	N/a		
Trial pit logs appended	N/a		
Photographs appended	Yes – see plate Nos. 1.1 to 1.3, 2.1 to 2.20, 3.1 to 3.21 and 4.1 to 4.8.		

SUMMARY OF INITIAL INVESTIGATION AND DESK STUDY (continued)

DESK STUDY			
Geological map viewed	No	***Details***	N/a
NHBC or LA Building Control?	LA		
Have NHBC or other readily available records been viewed?	• Record drawings of the detached double garages have been used to prepare the attached sketch No. SK – 02. • Information previously supplied by the Builder indicated that the original mortar mix specified for this area of the site was **M2.5** with mix proportions of **1 : 0.25 : 7 to 8** (cement : lime : sand) using Ordinary Portland Cement (OPC).		
CONSTRUCTION TYPE	***RECORD INFORMATION***		***SITE OBSERVATION***
Superstructure	Masonry		As record info
Foundation	Strip		Not checked
Ground floor	Unknown		Not checked
Ground conditions	N/a		Not checked
Contamination	N/a		Not checked
Additional relevant comments.	None.		

6. SPECIFIC SITE CONDITIONS

This section is primarily applicable to claims where damage may result from ground movement.

Applicable: No

7. DAMAGE TO DETACHED DOUBLE GARAGE

External damage (Location and brief description)	Slight erosion of the mortar in the joints in some areas of the clay facing brick external walls of the garage, particularly in the areas most exposed to the weather – see plate Nos. 2.1 to 2.20.
Internal damage (Location and brief description)	• Unfilled and 'hungry' perpend joints in some areas of the internal face of the garage walls – see plate Nos. 3.7, 3.1, 3.11 and 3.20. • A fixing for the holding down strap to the brick pier in the rear North-East corner has 'split' one of the bricks, and the pier itself shows signs of movement at the top – see plate Nos. 3.13 and 3.14.
Other relevant damage	No other relevant damage was reported or noted during the investigations.
Is the damage in the area of a previous repair/underpin?	No
Worst category of damage to BRE Digest 251 classification	N/a
Additional relevant comments	An indication of the mortar erosion can be assessed by comparing the finish on the relatively sheltered mortar joints below the lean-to on the rear elevation (according to the homeowner, this was erected soon after moving in to the property – see plate Nos. 2.9 and 2.10) with those above the lean-to (see plate Nos. 2.11 and 2.12), and elsewhere around the garage.

8. INITIAL ASSESSMENT OF CLAIM

This section is used to record the investigation status after the initial visit. It does not require updating after further investigation.

Has investigation to determine claim validity been completed?	Yes	***If "yes" go to "Conclusions*** ***If "no" see next section for details***
Is a further instruction from Claims required for Engineering to proceed with investigation?	N/a	
Comments on initial assessment / preliminary conclusions, if appropriate	N/a	

9. FURTHER INVESTIGATIONS REQUIRED TO DETERMINE CLAIM VALIDITY	*Applicable: No*

10. OUTCOME OF FURTHER INVESTIGATIONS	*Applicable: No*

11. MONITORING RESULTS	*Applicable: No*

12. CONCLUSIONS This section is used to record conclusions subsequent to the initial assessment and appropriate to the current stage of the investigations.	*Applicable: Yes*

Is the damage due to ground movement?	No
If damage is not due to ground movement, advise on likely cause	The likely cause of the slight erosion of the mortar in the more exposed areas of the external walls is that the mortar is being gradually eroded by wind driven rain and severe weather because it is not of adequate durability for the site location and exposure conditions.
Are there structural or health and safety concerns regarding the garage walls?	As reported by both David Narro Associates and Roberson Eadie, there are no signs of any significant structural damage or movement, and it is our considered judgement that there are no current structural or health and safety concerns regarding the stability of the garage walls. Roberson Eadie's conclusion that the gable wall panels could collapse under wind load appear to be based on their assumption that the gable wall panels do not appear to have been tied into the roof structure. However, lateral restraint straps tying the gable walls into the roof structure have been installed, and these appear to be in accordance with the guidance given in clause A.4 of Annex A of BS8103-2:2005, and relevant good practice - see Sketch No. SK – 01, plate Nos. 4.1 to 4.8, and NHBC's Consistency Matters 6.1/12: Restraint straps to gable walls of garages. Therefore the risk of collapse reported by Roberson Eadie appears to be based on incorrect assumptions. However, the following structural issues have been identified: • Erosion of the mortar joints may eventually affect the structural stability of the walls (e.g. a 10% reduction in the width of the mortar joints would reduce the flexural stiffness of the wall by almost 20%, as the flexural strength is a function of the square of the overall width of the wall). • The record information indicates that the stiffening piers on the gable walls should be longer (1570mm, compared with the 440mm as-built piers) to provide the gable walls with adequate stiffness - see further discussion below. • The stiffening piers should also extend to the full height of the wall (the middle piers on the gable walls finish ~300mm below the underside of the roof truss ceiling tie level – see sketch No. SK – 01 and plate Nos. 3.7 to 3.9 and 3.19 to 3.21. • The mid-wall piers on both gable and rear walls are built with a vertical 'stack' of 440 x 100 concrete blocks, and are not bonded to the main facing brick walls. These block piers appear to be tied to the main brick walls with standard double triangle wire cavity wall ties – a tie can be seen in plate No. 3.21. These ties are a minimum length of 200mm (to suit a normal cavity wall) and, as the overall width of the piers is 212.5mm, this gives a nominal cover of ~6mm to the end of the tie from the face of the wall/pier. This nominal cover to the end of the tie means that, on occasion, the end of the tie has been exposed when the mortar joint was struck and/or has eroded slightly. To effectively tie the block pier to the main brick wall, 20mm wide x 3mm thick flat ties in pairs at every joint (i.e. 2 ties per bed-joint at 225mm centres vertically) should have been installed (Clause A.3.2 of Annex A of BS8103-2). • (continued over)

CONCLUSIONS (continued)	
Are there structural or health and safety concerns regarding the garage walls (continued)?	• The holding down straps at the rear corners of the garage are fixed to brick piers that are built as vertical 'stacks' of 215mm x 102.5mm bricks – see plate Nos. 3.13, 3.14, 3.16 and 3.17. These piers do not appear to be bonded to the main wall, and the effectiveness of the holding down is questionable (some distress in the pier and the holding strap itself is apparent, and one of the fixings has split a brick – see plate No. 3.14.
Commentary / discussion on investigation and rationale for conclusions	• Although Roberson Eadie has concluded that the rear and gable walls of the garage are understrength to resist the design wind loadings, this appears to be based on the assumption that the gable walls are not tied into the roof structure. However, the gable walls do appear to be effectively tied into the roof structure in accordance with Annex A of BS 8103-2 and relevant good practice – see sketch No. SK – 01, plate Nos. 4.1 to 4.8, and NHBC's Consistency Matters 6.1/12: Restraint straps to gable walls of garages. • Roberson Eadie's calculations have been carried out in accordance with BS5628-1: "Code of practice for use of masonry. Structural use of unreinforced masonry". However, it is also common practice, and structurally justifiable, to design the external walls of small single storey non-residential buildings of this nature in accordance with Annex A of BS 8103-2: "Structural design of low rise building – Part 2: Code of practice for masonry walls for housing". • A check of the as-built construction in accordance with Annex A of BS 8102-2:2005 indicates that the garage form, materials and construction are generally within the scope and recommendations of this code of practice. The only departure from the guidance in Annex A is that the overall height to the apex of the roof (approximately 4.5m) is more than the maximum of 3.6m in Annex A. • Relevant extract from the foreword of BS 8103-2: 2005 are as follows: ➢ *Low-rise buildings constructed within the limitations stated in the relevant clauses will not require additional specialist advice.* ➢ *It ought not to be expected that the recommendations made in this part can be proved by calculation as they are based on traditional prescriptive guidance substantiated by long experience.* ➢ *The recommendations of this code are intended to provide economic safe designs without the need for calculations of loading and strength criteria.* ➢ *This code is based on traditional simple design, within the scope of the code. The outputs are safe but not necessarily comparable with solutions derived from calculation-based design.* ➢ *For any conditions outside the limitations of this code, appropriate specialist advice is needed.* ➢ *It might be appropriate to consider a minor departure from the recommendations of this part and show adequacy by calculation.* ➢ *However, in cases where the recommendations of Clause 6 for conditions relating to a wall are not able to be met or are inappropriate then reference should be made to BS 5628-1.* • Although the overall height of the garage is more than limitations set out in Annex A of BS 8103-2, the length, height, thickness, materials, pier size, pier spacings, lateral restraint and roof bracing of the side gable walls are all well within the guidance. • It therefore appears that this minor departure from the code (i.e. height more than 3.6m) was recognised in the original design, and consequently much wider piers (1570mm) were specified to provide adequate stiffness to the gable walls to resist the design wind loads.

13. ATTACHMENTS		*Applicable: Yes*
Sketches:	**Sketch No. SK – 01:** Elevation of garage gable wall	
	Sketch No. SK – 02: Detached double garage general arrangement (from record information)	
NHBC Technical Guidance:	**Consistency Matters:** Restraint straps to gable walls of garages (6.1/12 – December 2008)	
Photographs:	**Plate No. 1.1 to 1.3:** General views of the garage	
(10th April 2018)	**Plate No. 2.1 to 2.20:** External walls of the garage	
	Plate No. 3.1 to 3.21: Internal walls, piers and holding down straps in the garage	
	Plate No. 4.1 to 4.8: Lateral restraint to the gable walls of the garage	

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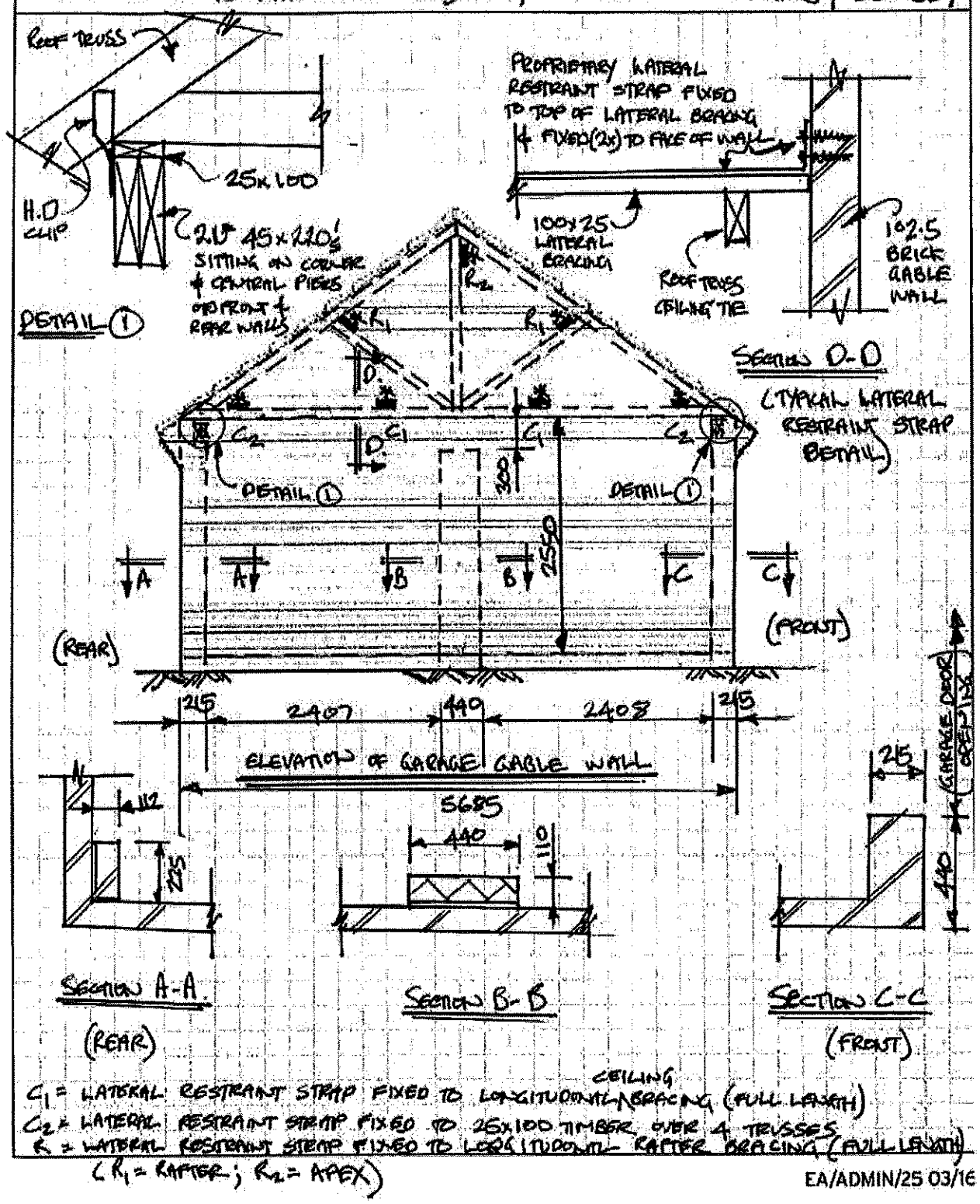
SKETCH

SK – 01
DATE JUNE 2018
MADE BY J. ATKINS

CLAIM REF: 17/28448
SITE ADDRESS: 16 KITTLEAIRY CRESCENT, PEEBLES

REG/REF No.
ELGARS / 260967



C_1 = LATERAL RESTRAINT STRAP FIXED TO LONGITUDINAL CEILING BRACING (FULL LENGTH)
C_2 = LATERAL RESTRAINT STRAP FIXED TO 26x100 TIMBER OVER 4 TRUSSES
R_1 = LATERAL RESTRAINT STRAP FIXED TO LONGITUDINAL RAFTER BRACING (FULL LENGTH)
(R_1 = RAFTER; R_2 = APEX)

EA/ADMIN/25 03/16

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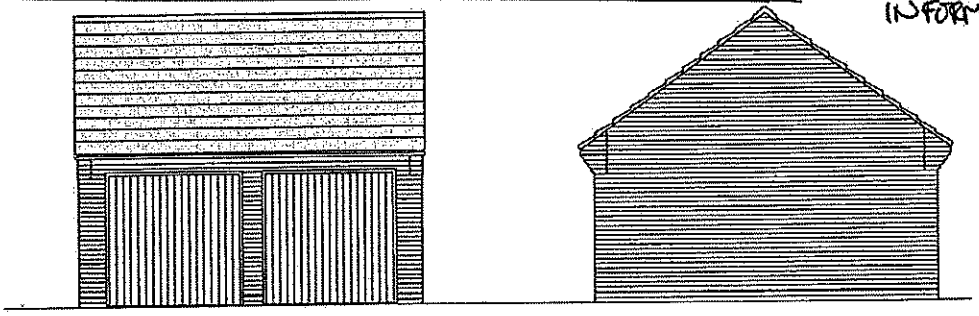
SKETCH

SK – 02
DATE JUNE 2018
MADE BY J. AITKEN

CLAIM REF: 17/28448
SITE ADDRESS: 16 KITTLEGAIRY CRESCENT, PEEBLES

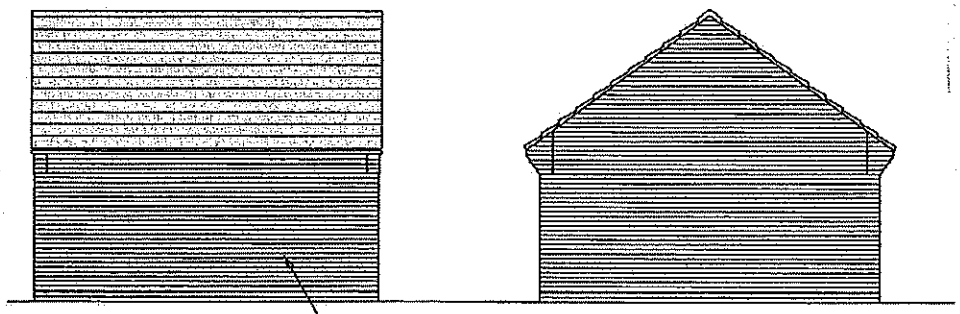
REG/REF No. ENGPROS/260967

DETACHED DOUBLE GARAGE GENERAL ARRANGEMENT (FROM RECORD INFORMATION)



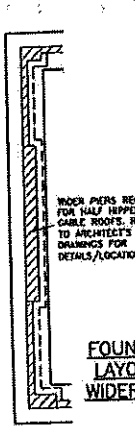
FRONT ELEVATION

SIDE ELEVATION

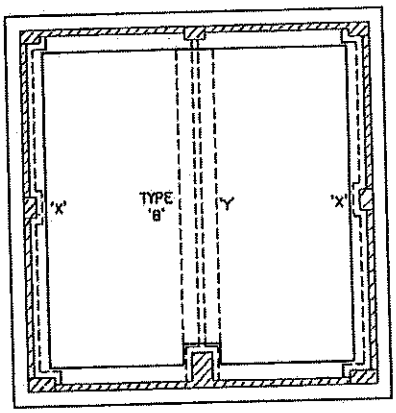


REAR ELEVATION

SIDE ELEVATION



FOUNDATION LAYOUT AT WIDER PIERS



DOUBLE GARAGE FOUNDATION LAYOUT