

STRUCTURAL REPORT

The attached Structural Report was produced in September 2018 by Fairclough Consulting Structural Engineers to support a previous proposal by Leek Cohousing for a cohousing scheme at the site and the adjoining land. The report covers all existing buildings at the site and findings relevant to the current application are summarised as follows.

The foundations of all buildings do not meet current building regulations standards, but as a conservation project it would not be appropriate to expect them to do so. There has been very little foundation movement in the past and provided the loads on the foundations are not significantly increased there is no particular reason to expect structurally significant foundation movement in the future. To avoid potential problems with reinforcement corrosion in the future it is recommended that the lintels are replaced with new and the small amount of brickwork above the lintels should be rebuilt, which would deal with the majority of the brickwork cracks. All embedded steel in the elevations should be removed. All other cracks should be raked-out and re-pointed. A new roof structure will be required to support the increased loads from a domestic roof. (See paragraphs 7 to 9 in the attached Structural Report, recommendations which are repeated for buildings A, B and C). In addition the Structural Report recommends removing the tree in close proximity to building B (paragraph 15).

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Ref No: 180602

Date: 12th September 2018

Patrick Redmond
Leek Co-Housing Ltd
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Staffordshire
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Dear Patrick,

PROPOSED ECO SELF BUILD RESIDENTIAL DEVELOPMENT
THORNCLIFFE LANE, LEEK, STAFFS

1. I am writing with my advice regarding my site visit on the 19th May 2018 to inspect the existing buildings on the site and to witness trial hole investigations. I re-visited the site on the 4th June 2018 to inspect the internal parts of Building A, which had been locked on the 19th May. See attached architects site block plan.

BUILDING A

2. This is a single storey building with solid brick elevations and a pitched roof.

Elevations

3. The elevations are of half-brick construction. The side elevations have alternating regularly spaced large and small brick piers. The larger piers are 1.5 bricks wide and project a half brick from the face of the elevation. The smaller piers are 1 brick wide and project a half brick from the face of the elevation. Regularly spaced windows have concrete lintels. The lower parts of the windows have been in-filled with brickwork.

4. The elevations are plumb within normal tolerances. Horizontal lines are level within normal tolerances. There are no signs of structurally significant or recent foundation movement. One of the concrete lintels is cracked. There are some relatively minor cracks, mainly at or above lintel height. On the West elevation at the right hand end there are small pieces of steel embedded into the brickwork at the two end windows – the steel is corroding and the rust expansion is cracking the brickwork. The brick infill to the windows

is not properly bonded to the adjoining brickwork. The lintel to the opening on the south gable is missing.

Roof Structure

5. The roof structure consists of steel trusses supporting timber purlins. The roof covering is corrugated asbestos sheeting. The trusses are very light-weight by current standards and will not be strong enough to support increased roof loads (for example from insulation, plasterboard, etc).

Foundations

6. A trial hole was excavated on the West elevation. At this location the foundations appeared to be traditional concrete strip footings bearing onto firm clay. The base of the footing was approximately 300mm below ground level and the footing projected 100mm beyond the face of the elevation. The building showed no sign of recent structurally significant foundation movement.

Recommendations.

7. The foundations do not meet current building regulations standards but as a conservation project it would not be appropriate to expect them to do so. There has been very little foundation movement in the past and provided the loads on the foundations are not significantly increased there is no particular reason to expect structurally significant foundation movement in the future. Increasing the height of the eaves and providing a new roof with insulation and plasterboard etc would be acceptable providing the building remains single storey.

8. To avoid potential problems with reinforcement corrosion in the future I recommend that the lintels are replaced with new. It would therefore be sensible to re-build the small amount of brickwork above the lintels and that would deal with the majority of the brickwork cracks. All embedded steel in the elevations should be removed. All other cracks should be raked-out and re-pointed. The brick infill panels to the windows should be removed or re-pointed as required by the proposed conversion scheme.

9. A new roof structure will be required to support the increased loads from a domestic roof.



Building A.



Building A. Infilled window detail - typical of all buildings.



Building A. Corroding embedded metal causing cracks to brickwork.



Building A. Truss detail – typical of buildings A, B, C.

BUILDING B

10. This is a single storey building with solid brick elevations and a pitched roof.

Elevations

11. The elevations are of half-brick construction. The side elevations have alternating regularly spaced large and small brick piers. The larger piers are 1.5 bricks wide and project a half brick from the face of the elevation. The smaller piers are 1 brick wide and project a half brick from the face of the elevation. Regularly spaced windows have concrete lintels. The lower parts of the windows have been in-filled with brickwork. The elevations have been lined internally with 75mm blockwork with a 50mm cavity.

12. The elevations are plumb within normal tolerances. Horizontal lines are level within normal tolerances. There are no signs of structurally significant or recent foundation movement. One of the concrete lintels is cracked. There are more cracks in this building than building A but they do not represent an overall structural defect with the building. There are some horizontal cracks at window head level, and cracks to both gable elevations. There are some stepped diagonal cracks adjacent to windows at the ends of both side elevations. All of these cracks are old. The brick infill to the windows is not properly bonded to the adjoining brickwork. There is a tree in close proximity to the North gable. Lintels to the South gable opening and to internal walls are missing.

Roof Structure

13. The roof structure consists mainly of steel trusses supporting timber purlins. Some of the trusses have been replaced with timber trusses. There is significant rot to some purlins. The roof covering is corrugated asbestos sheeting. The trusses, both steel and timber, are very light-weight by current standards and will not be strong enough to support increased roof loads (for example from insulation, plasterboard, etc).

Foundations

14. A trial hole was excavated on the East elevation. At this location the foundations appeared to be traditional concrete strip footings bearing onto soft clay. The base of the footing was approximately 300mm below ground level and the footing projected 200mm beyond the face of the elevation. The building showed no sign of recent structurally significant foundation movement.

Recommendations.

15. The foundations do not meet current building regulations standards but as a conservation project it would not be appropriate to expect them to do so. There has been little foundation movement in the past and provided the loads on the foundations are not significantly increased there is no particular reason to expect structurally significant foundation movement in the future. Increasing the height of the eaves and providing a new roof with insulation and plasterboard etc would be acceptable providing the building remains single storey. The tree in close proximity should be removed.

16. To avoid potential problems with reinforcement corrosion in the future I recommend that the lintels are replaced with new. It would therefore be sensible to re-build the small amount of brickwork above the lintels and that would deal with the majority of the brickwork cracks. All embedded steel in the elevations should be removed. All other cracks should be raked-out and re-pointed. The brick infill panels to the windows should be removed or re-pointed as required by the proposed conversion scheme.

17. A new roof structure will be required to support the increased loads from a domestic roof.



Building B.



Building B. Cracks to gable.



Building B. Minor cracks to brickwork – typical of all buildings.

BUILDING C

18. This is a single storey building with solid brick elevations and a pitched roof.

Elevations

19. The elevations are of half-brick construction. The side elevations have alternating regularly spaced large and small brick piers. The larger piers are 1.5 bricks wide and project half brick from the face of the elevation. The smaller piers are 1 brick wide and project half brick from the face of the elevation. Regularly spaced windows have concrete lintels. The lower parts of the windows have been in-filled with brickwork.

20. The elevations are plumb within normal tolerances. Horizontal lines are level within normal tolerances. There are no signs of structurally significant or recent foundation movement. The lintel to the South gable elevation is very slender and should be replaced. There are some cracks, mainly at or above lintel height. The brick infill to the windows is not properly bonded to the adjoining brickwork. There are significant cracks to the North gable elevation caused by rust expansion of embedded steel.

Roof Structure

21. The roof structure consists of steel trusses supporting timber purlins. The roof covering is corrugated asbestos sheeting. One of the trusses has been replaced with a timber truss. The trusses are very light-weight by current standards and will not be strong enough to support increased roof loads (for example from insulation, plasterboard, etc).

Foundations

22. A trial hole was excavated on the East elevation. At this location the foundations appeared to be traditional concrete strip footings bearing onto soft clay. The base of the footing was approximately 300mm below ground level and the footing projected 125mm beyond the face of the elevation. The building showed no sign of recent structurally significant foundation movement.

Recommendations.

23. The foundations do not meet current building regulations standards but as a conservation project it would not be appropriate to expect them to do so. Provided the loads on the foundations are not significantly increased there is no particular reason to expect structurally significant foundation movement in the future. Increasing the height of the eaves and providing a new roof with insulation and plasterboard etc would be acceptable providing the building remains single storey.

24. To avoid potential problems with reinforcement corrosion in the future I recommend that the lintels are replaced with new. It would therefore be sensible to re-build the small amount of brickwork above the lintels and that would deal with the majority of the brickwork cracks. All embedded steel in the elevations should be removed. All other cracks should be raked-out and re-pointed. The brick infill panels to the windows should be removed or re-pointed as required by the proposed conversion scheme.

25. A new roof structure will be required to support the increased loads from a domestic roof.



Building C.



Building C. Cracks from corroding embedded metal (tubes).



Building C. Close-up of cracks from embedded metal.

BUILDING D

26. This is a single storey reinforced concrete portal frame building with solid brick elevations and a pitched roof.

Elevations

27. The side elevations consist of half-brick panels between the reinforced concrete portal frame columns. The outer and inner faces of the concrete columns are exposed. There are cracks, exposed reinforcement, and reinforcement corrosion to both the outer and inner faces. Regularly spaced windows have concrete lintels. The lower parts of the windows have been in-filled with brickwork. The gable elevations are of half brick construction. There is an exposed and corroding steel lintel to the opening in the South gable elevation.

28. The elevations are plumb within normal tolerances. Horizontal lines are level within normal tolerances. There are some significant cracks to the North end of the West elevation but they do not appear to have been caused by foundation movement and they are clearly very old. The brick infill to the windows is not properly bonded to the adjoining brickwork. The lintel to the opening on the south gable is missing.

Roof Structure

29. The roof structure consists of reinforced concrete portal rafters supporting timber purlins. The roof covering is corrugated asbestos sheeting. It is highly unlikely that the reinforced concrete portal frames will be able to support increased roof loads (for example from insulation, plasterboard, etc). The purlins are slender by modern standards and they will not be able to support increased roof loads.

Foundations

30. A trial hole was excavated on the East elevation. At this location the foundations appeared to be traditional concrete strip footings bearing onto soft clay. The base of the footing was approximately 500mm below ground level and the footing projected 100mm beyond the face of the elevation. The building showed no sign of recent structurally significant foundation movement.

31. A second trial hole was excavated on the West elevation. At this location the foundations appeared to be traditional concrete strip footings bearing onto soft clay. The base of the footing was approximately 600mm below ground level and the footing projected 50mm beyond the face of the elevation.

Recommendations.

31. The foundations do not meet current building regulations standards but as a conservation project it would not be appropriate to expect them to do so. Provided the loads on the foundations are not significantly increased there is no particular reason to expect structurally significant foundation movement in the future. Increasing the height of the eaves and providing a new roof with insulation and plasterboard etc would be acceptable providing the building remains single storey.

32. To avoid potential problems with reinforcement corrosion in the future I recommend that the lintels are replaced with new. It would therefore be sensible to re-build the small

amount of brickwork above the lintels and that would deal with the majority of the brickwork cracks. The lintel in the gable elevation should also be replaced. All embedded steel in the elevations should be removed. All other cracks should be raked-out and re-pointed. The brick infill panels to the windows should be removed or re-pointed as required by the proposed conversion scheme.

33. The area of significantly cracked brickwork at the North end of the West elevation should be re-built. These cracks do not appear to be the result of foundation movement but this should be investigated further during construction and an allowance made for some localised underpinning at this corner.

34. The reinforced concrete portal frames would not be adequate to support increased roof loads even if they were un-damaged but the damage from reinforcement corrosion to the columns has significantly weakened them further. The portal rafters should be unbolted and replaced with a new roof structure. The haunches (attached to the tops of the columns) should be cut off.

35. The reinforced concrete portal columns will continue to corrode unless they are encapsulated in a permanently dry environment. Continued corrosion would cause significant rust expansion and cause cracking and disruption not only to the columns themselves but also to the adjacent brickwork. To prevent this there are 3 Options: -

- a. **New Outer Leaf.** Build a new insulated outer leaf so that the columns are inside the insulation layer and 'warm'. This option has the disadvantage of requiring additional foundations for the new outer leaf and I assume it would not be favoured from a conservation point of view.
- b. **Cut-Out.** Carefully cut out the columns and then make good the brickwork. This would be a very labour intensive, difficult, and costly option, and there might be problems finding enough matching bricks for the making good. Careful sequencing of the work would be required to maintain the temporary stability of the elevations during the work. Brick piers to stabilise the brickwork might be required depending on how the inner leaf is detailed. Piers could be detailed to match those on the other buildings.
- c. **Demolish.** From a purely structural and practical perspective by far the best option would be to demolish the building and then re-build on new foundations. Existing bricks could be re-used to preserve the original appearance, or used to make matching repairs on other buildings.



Building D.



Building D. Significant cracks – North end of the West elevation.



Building D. External exposed reinforcement to columns.



Building D. External cracks to columns.



Building D. Internal view.



Building D. Internal cracked concrete and exposed reinforcement.

OTHER TRIAL HOLES

36. Trial holes, using a mechanical excavator, were excavated around the site at the proposed locations of new build dwellings. In summary the results are: -

Trial Hole 1. Firm clay to 1m depth but then becoming softer and very soft clay with organic content at 1.35m to 1.5m. Hole stopped at 1.5m.

Trial Hole 2. Firm clay to 1m depth but then becoming softer and very soft clay with organic content at 1.35m to 1.5m. Hole stopped at 1.5m.

Trial Hole 3. Soft clay from 0.9m depth to 1.5m depth at which point the hole was stopped.

Trial Hole 4. Soft to firm clay to 1.5m depth at which point the hole was stopped.

Trial Hole 5. Soft to firm clay to 1.5m depth at which point the hole was stopped

37. The presence of very soft clay with organic content in two of the trial holes and soft clay in another is a cause for concern. It is very possible that the band of soft organic clay is present over most of the site but at greater depth where it was not found in the trial holes. This does not preclude development on the site but it is likely that piled foundations will be needed for the new build properties. Cost plans should be built on that assumption. A full ground investigation will be required including boreholes etc. That investigation should be carried out before any final commitment is made to purchase the site.

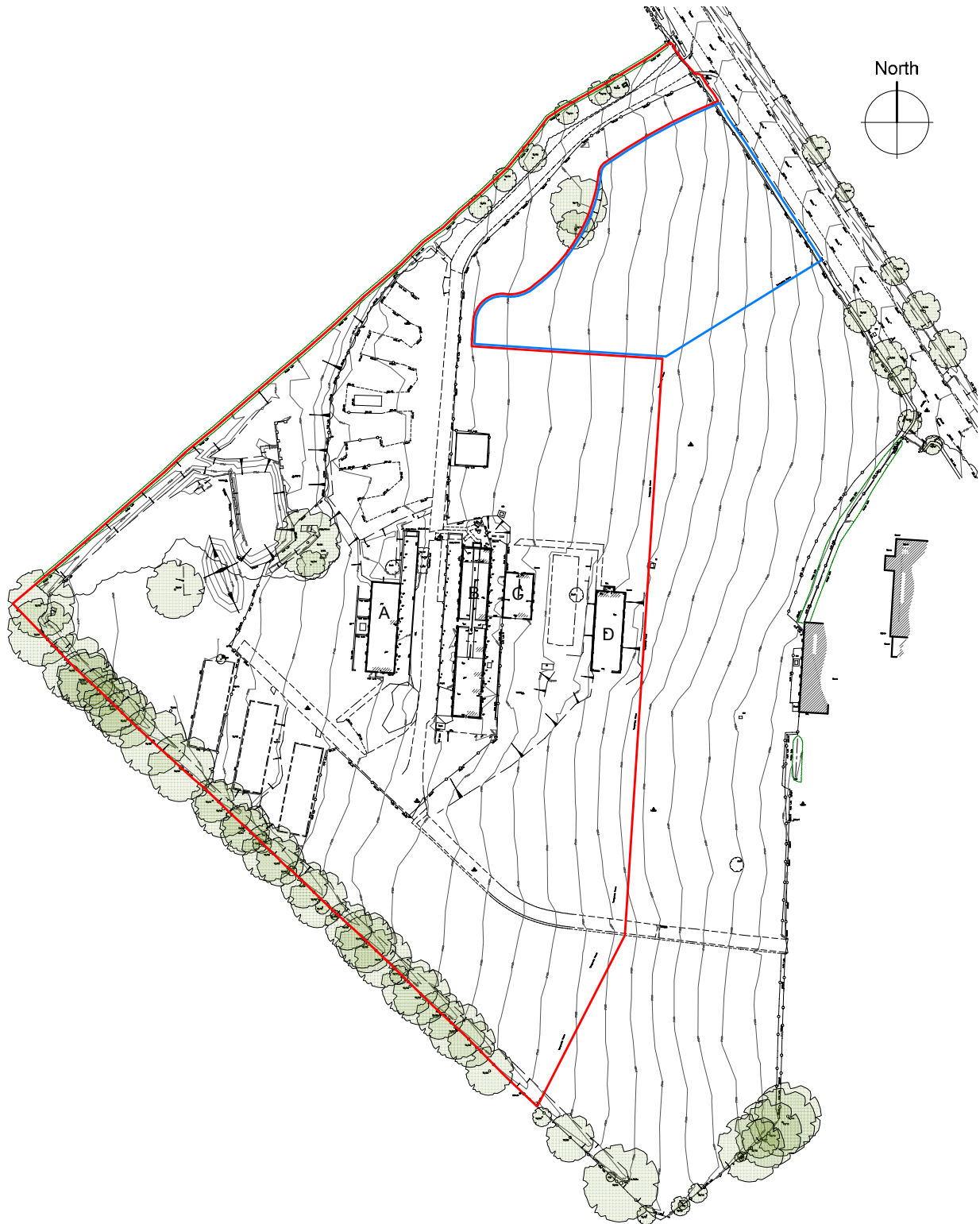
OVERALL CONCLUSIONS

38. My overall conclusion, based on my purely visual inspection, is that the site is suitable for the proposed re-development subject to the points made in this report. The foundations of the existing buildings do not meet current standards but that is not unusual in a conservation project and their continued use in the converted buildings is justified on the basis that there has been no structurally significant foundation movement in the past and that the loads on the foundations will not be significantly increased. Careful detailing of hard landscaping around the buildings could reduce the risk of future ground movement. You must however appreciate that in common with all such projects I cannot give any guarantee that there will be no foundation movement in the future.

Yours faithfully



D.Fairclough BSc., MBA., C.Eng., MICE., MIStructE
For and on behalf of Fairclough & Co Ltd



Rev	Date	Drawn	Description
			ctd architects © 2017 • This drawing is copyright. • All dimensions to be checked on site before proceeding. • Contractor must verify the existence of any discrepancies before proceeding. • Contractor to check/adjust dimensions of new work to suit existing conditions. Do not assume existing structure or levels are correct. Report as noted. • All drawings to be read in conjunction with all other consultants drawings and specs.
ctd architects Client: Clerk Bank House LEEK Staffordshire ST13 5HE Tel: 01538 373477 Fax: 01538 386503 Email: info@ctdarchitects.co.uk Web: www.ctdarchitects.co.uk			Project: Thorncliffe Rd, LEEK, Staffs. Eco Self-Build Residential Development Station: PLANNING Title: site block plan
Scale: 1:500 Size: A2 Drawn: ... Check: ... Date: Nov 2017			Job No: 1764 Drawing No: AL 103

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