www.gawnassociates.com | 01223 233888 | mail@gawnassociates.com

LJG/221/1320

Mr J Wyer
Owl Barn
Whaplode Drove
Peterborough
PE12 0TT

10 September 2021

Dear Sir

Ref: Barns at East Reach Farm, Hophole, Deeping St Nicholas, Peterborough, Cambs PE11 3HJ

1.0 Introduction

1.1 Further to your request for a structural inspection of the main loadbearing external walling to a pair of period style barns at the above address, we visited the premises recently and would accordingly advise as follows.

1.2 Our inspection was in response to your request for provision of a structural engineer's report on the current condition of these barns, with specific reference to their suitability for retention and conversion to residential standard accommodation, as referred to in accompanying architectural documentation prepared by Mr P Sharman for the proposed conversion works.

1.3 We have not prepared any drawing information at this time. Our report should be cross referenced to the architectural drawings provided by Mr Sharman.

1.4 Photographs of the barns are attached to this report for illustrative purposes.

1.5 For Planning considerations, we understand that two separate lean-to units positioned at the rear of the main barn will be dismantled, and that these are not being included within the proposal for conversion to residential accommodation. Accordingly, we will not be commenting on the rear lean-to units in the context of this report.

1.6 Separately there is a detached period style timber framed outbuilding set to the rear of the eastern end of the barn, which we understand will be retained as an outbuilding, and accordingly is included within this report.

2.0 Description of Barn

2.1 The main barn is a period style detached brick built construction, consisting of two distinct elements, namely a nominal 20.8m long by 6.3m deep two storey construction, and an adjoining 14.8m long by 5.0m deep single storey element. The single storey element is set to the eastern end of the two storey construction.

2.2 The barn is set parallel with, but offset from, the main roadway at Hophole. This is a traditional detached outbuilding with a series of accompanying smaller storage units.

2.3 The barn has an approximate east/west orientation with the main frontage elevation having a northerly facing aspect over open fields.

2.4 The western end of the building consists of three open cart stores at ground floor level, with a first floor storage deck over. The first two bays are open, with doors providing enclosure on the third bay in from the western gable end.

2.5 The middle section of the barn is again a two storey format, with three separate internal enclosed bays. Sub-divisions between these enclosed bays have been formed using a mix of solid masonry and timber framed wall construction. These enclosed bays have been used for grain storage and drying purposes historically.

2.6 The single storey eastern end of the building is an open clear storage space. The western end of the barn has been formed using solid masonry external walling to support a timber first floor deck and pitched and hipped roof format over. The external walling at this position is typically 335mm wide to both the main front and rear elevations, with solid 225mm thick brickwork present on the western flank wall.

2.7 On the northern elevation, there are a series of 450x450mm solid brick piers on the main bay lines, supporting ex300x300mm timber beams at door head level. These beams in turn support the 335mm wide first floor walling over.

2.8 On the rear elevation, solid masonry walling is present aside from the provision of a single pedestrian door opening which has been cut into the walling.

2.9 In the central section of the two storey barn a mix of solid 335mm and 450mm thick external brickwork construction is present to the main front and rear walls. This is continuous from ground to eaves level, with door openings on the northern elevation.

2.10 There is no intermediate floor construction provided to the central section of the barn, where historically this has been used for grain storage and drying purposes.

2.11 To the eastern end of the barn, solid 225mm thick loadbearing masonry external walling is present to both northern and southern elevations and the eastern flank wall respectively.

2.12 Solid concrete ground bearing floor slabs are present to each of the respective sections of the barn. Within the central section of the main two storey construction, there is a deeper grain hopper present, blockwork enclosure walling and equipment associated with the historic grain drying installation at this position.

2.13 In the western end of the building, on the line of each of the front piers, there are downstand primary trimmer beams extending over the depth of the barn, supporting a series of ex150x63mm timber first floor joists set out at nominal 400mm centres, spanning approximately 3.05m between the downstand trimmer beams, and the end or internal masonry division walls respectively.

2.14 Conventional timber boarding has been secured over the top of the joists where the first floor area has historically been used for general agricultural storage purposes.

2.15 The roof over this section of the building has been formed with a series of common and principal rafters set out at 400-450mm centres along the length of the northern and southern elevations, with the rafters in turn supported on two sets of intermediate canted timber purlins which extend continuously along the length of the building.

2.16 Purlins are in turn secured to a series of feature king post timber trusses spanning from front to rear. The trusses are typically set out at nominal 3.05m centres. The purlins are also supported off the internal masonry and timber framed division walls providing separation between each of the respective bays to the central section of the barn.

2.17 To the western end of the building, there are two sets of canted timber purlins on each of the northern and southern side slopes, forming a traditional hipped roof format, with the purlins secured into the main hip rafters extending from a timber dragon tie at wall plate level through to ridge level, coincident with the first timber truss.

2.18 The common rafters support corrugated asbestos roof sheeting over.

2.19 All of the main roof framing timbers remain in position, with rafters extending continuously from eaves to ridge level, supported off the two sets of canted timber purlins on each of the respective northern and southern side slopes referred to above. This applies over all of the two storey section of the barn.

2.20 The eastern end of the main two storey section of the barn is a traditional full height brick gable construction.

2.21 A similar roof format is present to the single storey eastern end of the building, again with common rafters extending continuously from eaves to ridge level. In this instance, there are three sets of canted timber purlins on each of the northern and southern slopes to the mixed pitched and hipped roof format seen here.

2.22 These purlins are again supported on a series of feature king post timber trusses extending from front to rear over the 5.0m depth of this part of the barn.

2.23 Where there is a hipped detail to the eastern end of the building, a similar construction detail again applies, this time with a single set of canted timber purlins on the side slope and two canted timber purlins on the front and rear roof slopes framing the hip end, with hip rafters again extending through from eaves level to the ridge point coincident with the king post truss framing the main duopitched roof construction.

2.24 To all of the barn, the roof construction supported on solid masonry walling which, as noted above, consists of a mix of 225mm, 335mm and 450mm wide wall formats respectively.

2.25 There are a variety of roof coverings present here. To the western end of the building, asbestos sheeting is present. In the central section of the two storey construction, slate roof coverings are present. To the single storey element, interlocking concrete roof tiles are present.

2.26 Although there are variations in floor and roof format as referred to above, the overall construction of the barn is typical of what we would expect to find in a period style agricultural outbuilding in this Fenland location.

3.0 Adjacent Outbuildings

3.1 Towards the western end of the building there is a single storey return extending off the southern corner of the barn. This has been formed using loadbearing brickwork to support a pitched and hipped roof format over. This section of outbuilding is in a poor condition structurally, and would not merit retention and conversion to habitable standard accommodation. Accordingly, we would recommend that this outbuilding is dismantled and removed from site.

3.2 Directly adjoining this brick built return there is a timber framed lean-to which is approximately 7.0m long, projecting 4.95m off the inner face of the southern flank wall.

3.3 This is effectively an open storage area with a shallow monopitched roof made from lightweight timbers and sarking board with corrugated metal roof sheeting over.

3.4 This again is a rather basic standard of construction which we would suggest should be dismantled and removed from site.

3.5 Directly adjoining this lean-to there is a second, smaller, rear projection which extends approximately 2.50m off the rear wall of the central section of the barn. This has been formed to provide weathering containment for ventilation equipment associated with drying operations.

3.6 This is again a very basic form of weathering enclosure with lightweight timber framing built off a shallow blockwork plinth. Metal sheeting has been provided to both the side walls and the monopitch roof of this enclosure. We would again recommend that this is carefully dismantled and removed form site.

3.7 Approximately in line with the eastern end of the building, and offset by 3.60m from the south eastern corner of the main barn there is a separate, detached, mixed brick and timber framed outbuilding which is approximately 11.2m long by 4.8m wide.

3.8 A continuous solid 225mm thick brick wall has been provided along the eastern elevation of this outbuilding, with timber framed and boarded gables on both the northern and southern ends of the building.

3.9 On the western elevation, there is a mix of infilled timber studwork and principal timber farming members providing support to a traditional duopitched roof format over. There are two sets of internal division walls within the outbuilding. These extend continuously through to ridge level.

3.10 The duopitched roof to the outbuilding has been formed with common rafters set out at nominal 350mm centres along the length of the eastern and western flank walls.

3.11 These rafters extend continuously from eaves to ridge level, with support off a single set of canted timber purlins on each of the two respective side slopes.

3.12 These purlins are supported on the structural timber framing to the gable ends, as well as the framing of the two internal division walls. There are additional upper level collar ties secured between the timber purlins in a traditional manner.

3.13 Pantile roof coverings have been provided to this detached outbuilding.

3.14 In common with the barn, virtually all of the main roof coverings remain in position providing a suitably dry external envelope to each of the respective outbuildings.

4.0 Condition of Barns

4.1 The main loadbearing external walling to the barns generally retains a satisfactory level and alignment.

4.2 Where unevenness or distortions may be present in the main enclosure walling these are typically of a longstanding nature, reflecting the historic use of the building for mixed agricultural processing and storage applications.

4.3 At the time of this visit, we did not note any evidence of significant recent or progressive structural cracking in the exposed sections of perimeter walling.

4.4 Selective repointing has been adopted to some sections of this period style outbuilding, together with a mix of infilling of older window openings, and creation of new door openings respectively, reflecting changing usage of the buildings over a period of time.

4.5 In order to resist the applied loadings from grain storage applications, a selection of tie bars and pattress plates have been provided as stiffening restraint to the walling. Evidence of pattress plates can be seen on the western flank wall at first floor joist level, with a further four sets of pattress plates evident on the northern field side elevation. Pattress plates are secured back to tie bars on the line of internal or external wall elements respectively.

4.6 There is further evidence of corresponding pattress plates on the southern elevation, again with the plates secured to the tie bars through to floor level or end/internal cross wall elements respectively. This is a traditional means of stiffening older style agricultural barns which have been subjected to heavy storage or process application loadings.

4.7 Where cracking is evident in the exposed sections of external perimeter walling, such as can be seen around the south western corner end of the building, this is typically attributable to inappropriate stormwater discharge from the main roof coverings.

4.8 Whilst roof coverings have been renewed/replaced over time to provide a suitably dry weathering envelope to the barn, gutters and downpipes have not been similarly replaced or renewed. Accordingly, sections of guttering are missing, misaligned or generally malfunctioning. This also applies to the down pipes serving the guttering.

4.9 The provision of poor stormwater drainage runoff from the barn results in water collecting directly adjacent to the outer face of the external walling. This in turn can permit some localised minor water softening or disturbance of subsoils to develop. This can cause associated cracking to brickwork as may be seen, around, for example the western corner edge of the main two storey construction.

4.10 Similar comment are applicable to the southern elevation of the single storey construction. The extent of cracking evident in the exposed sections of external walling to the main barn construction is relatively modest for a building of this age. As part of any proposed conversion works to habitable standard accommodation, new above, and below, ground stormwater drainage goods are required to all of the barns.

4.11 The provision of replacement stormwater goods to serve the roof coverings, with carefully positioned downpipes linked through to new below ground storm drains extending out to soakaways set in areas of soft landscaping, will ensure that no further significant cracking or movements develop in the main loadbearing walling to the barns.

4.12 On this basis, conventional maintenance style superstructure repairs can then be adopted to make good current modest cracking. Where minor cracks are present these can be carefully raked clean and repointed. Where any more significant cracking may be present resulting in possible loss of bonding across crack lines, the cracks should be reinforced with stainless steel Helibars cut and grouted into the brickwork in a traditional manner.

4.13 Where repointing is applicable, to include any making good of weathered bedjointing to exposed sections of external brickwork, this should be adopted using a carefully colour and texture matched cement:lime:sand repair mortar of approximately 1:1:6/7 mix proportions.

4.14 Where longer term or historic unevenness or distortions may be present in the main loadbearing external wall fabric to the barns, these should be retained and regarded as an inherent feature of a period style construction of this nature.

4.15 Reflecting comments noted above, where there is a mix of 225mm, 335mm and 450mm masonry walling in the barns, we would confirm that this walling is suitably robust, and is structurally satisfactory to support conventional applied domestic loadings, which in this instance will be significant less than the historic agricultural process and storage loadings previously applicable here.

4.16 The first floor deck to the western end of the building is also in a satisfactory condition structurally.

4.17 Where damp staining is present as a result of poor stormwater drainage arrangements, the walling will dry out once replacement gutters and downpipes are in position, sufficient to then allow for conventional maintenance style repair and repointing of damp affected or weathered masonry finishes.

4.18 On the eastern end of the single storey section of the barn, localised rebuilding has been carried out using common bricks in contrast to the clay facing bricks present elsewhere. We would suggest that the rebuilding seen here would have been carried out some 50-60 years ago, with no current evidence of significant recent or progressive movements or damage affecting this rebuilt end section of the barn.

4.19 Internally, there is no evidence of any significant recent or progressive cracking or damage to the ground bearing concrete floor slabs present throughout the barns. Where unevenness may be present in the flooring, this again is of a longstanding nature, reflecting the historic usage of the barn.

4.20 All of the main roof structure remains in position to both single and two storey elements of the barn. The main roof framing members, to include common rafters, purlins and king post trusses, all retain a satisfactory level and alignment for a period style outbuilding of this age.

4.21 We did not note any evidence of significant recent or progressive movements affecting the main mixed pitched and hipped roof format seen here. There is evidence of some longer term minor unevenness in roof finishes, notably to the central section of the two storey element where slate roof coverings are present.

4.22 The extent of unevenness in roof finishes is very modest for an agricultural outbuilding of this age, and should be regarded as an inherent feature of the premises.

4.23 All of the main roof coverings remain in position to each of the single and two storey elements of the barn, thereby providing appropriate weathering protection to the timber roof framing.

4.24 We do not propose to comment on the small rear outbuildings referred to in Section 3.1 to 3.6 above where we are recommending that these are dismantled and removed from site.

4.25 The detached single storey outbuilding offset from the eastern end of the barn is in a satisfactory condition structurally. There is evidence of some longer term cracking and movements affecting the brickwork enclosure walling along the eastern flank wall.

4.26 A series of buttresses have historically been provided here to restrain this walling. Again where movements are present in the walling, these are of a longstanding nature, and are typically attributable to the inappropriate provision of stormwater drainage goods to serve the pantile roof coverings.

4.27 Otherwise, the main external enclosure walling to this outbuilding retains a satisfactory level and alignment.

4.28 Similar comments are applicable to the duopitched roof construction to the detached outbuilding.

4.29 From our visual inspection, we would advise that the building is suitable for retention and inclusion within a proposed residential development, with the outbuilding providing external utility/garage/storage accommodation as appropriate. We understand that this outbuilding will not be converted to habitable standard accommodation.

4.30 Regarding the single and two storey elements of the main barn referred to above, we would confirm that these are in a satisfactory condition structurally, and are readily capable of retention and conversion to habitable standard accommodation to reflect the architectural proposals noted in Planning Stage information prepared by Mr P Sharman.

4.31 Conventional upgrading works will be required in this respect to facilitate conversion of the retained structural fabric of the barns from their current mixed agricultural process and storage uses into habitable standard accommodation compliant with Building Regulation requirements. Outline recommendations in this respect are as noted below.

5.0 Recommendations

5.1 Allow to cut back and remove any overgrowth or self-set vegetation set either in direct contact with, or in close proximity to, the main external walling of the barn or detached outbuilding respectively.

5.2 Allow to carefully dismantle and remove from site three small external storage/lean-to units set to the western end of the southern flank wall as referred to in Section 3.1 to 3.6 above.

5.3 Allow to carry out conventional maintenance style repair or repointing measures to weathered or cracked brickwork. In general , modest repointing would be applicable in this regard, with raking clean of cracked mortar bedjointing and repointing with a carefully colour and texture matched cement:lime:sand repair mortar of approximately 1:1:6/7 mix proportions.

5.4 Where any more significant cracking may be present, as referred to in Section 4.0 above, masonry repairs can incorporate stainless steel Helibars cut and grouted into the brickwork to effectively stitch across the crack lines prior to then repointing with a colour and texture matched repair mortar as above.

5.5 On the open, northerly, aspect to the western end of the building where three open cart bays are present, allowance should be made for infilling of existing walling at this position to reflect elevational proposals on architectural drawings.

5.6 Internal grain silo walling and associated handling or storage equipment should be carefully broken out and removed from the central section of the two storey barn.

5.7 Considering the extent of disruption applicable to finishes in the two storey barn, we would recommend that allowance is made for breaking out of all of the existing concrete ground bearing floor slab construction and provision of a replacement insulated and damp proofed ground bearing floor slab.

5.8 In the single storey element of the barn, the existing concrete floor slab can be retained as a subfloor element with built up finishes applied over the top of the slab, to include damp proofing and insulation measures compliant with Building Regulation requirements.

5.9 Localised cuts will be required through the ground bearing floor slab construction generally to allow for installation of below ground pipework for either incoming main service ducts or outbuilding drains as appropriate to serve the proposed residential conversion.

5.10 Any necessary alterations should be adopted to the external perimeter wall elevations to allow for revisions for window or door openings respectively, to meet architectural requirements. This would include installation of lintels around window and door openings and toothing and bonding of cut back masonry in with retained masonry in a traditional manner.

5.11 The existing first floor deck to the western end of the building can be retained, with only modest maintenance style joinery repairs adopted as appropriate.

5.12 Following removal of the grain handling equipment in the central section of the two storey barn, a new first floor deck can be installed. Floor joists to be supported on the existing main loadbearing wall elements.

5.13 All of the existing roof structure and framing elements to each part of the barn will be retained. The existing roof coverings in each part of the barn need to be carefully and progressively stripped back in a phased manner to allow for reinstatement of specified architectural roof finishes to each element of the building.

5.14 Where corrugated asbestos roof sheeting is present, this needs to be removed by suitably experienced and qualified subcontractors with offsite disposal to a licenced facility.

5.15 Reinstated roof coverings to be set on tanalised timber tiling battens on breathable felt membrane on retained roof framing components.

5.16 Built up insulation and ventilation detailing applicable for assumed vaulted roof format to each of the respective spaces.

5.17 Internal insulated drylined walling will be required to the inner face of each of the external perimeter walls to the barn, with nominal 20-25mm ventilated clear cavity gap provided between the retained solid masonry walling and the internal insulated wall linings.

5.18 Internal non loadbearing division walls can be built directly off ground bearing slab or first floor timber components respectively to architectural layout requirements.

5.19 New above, and below, ground stormwater drainage goods are required to all of the barn with stormwater directed through downpipes connected into accessible trapped gulleys linked to the ends of new below ground stormwater drainage pipes and fittings extending out to soakaways in areas of soft landscaping.

5.20 In conjunction with upgrading of the building fabric, internal services fixtures and fittings can be installed to architectural requirements.

6.0 Summary

6.1 Based on our visual inspection of these barns, we would confirm that they are readily capable of retention and conversion, with accompanying upgrading works for the proposed change from mixed agricultural use to habitable standard accommodation.

6.2 In this instance, retention and conversion of the existing barns into habitable standard accommodation will be straightforward to adopt, reflecting points noted above.

6.3 Additionally, the proposed conversion and upgrading works will be beneficial in extending the serviceable life of these outbuildings.

6.4 We can provide detailed design proposals for the conversion measures required here as part of a Building Regulations Stage Submission in due course, once relevant Planning Consents have been secured.

We trust that this report is of assistance to you in progressing with design measures for the proposed conversion works.

Should any party either require further clarification of matters referred to above, or additional information from our offices at this time, as part of current Planning Stage considerations, please let us know.

Yours faithfully



L J Gawn BSc. CEng. MIStructE, MICE, MIQA
for and on behalf of Gawn Associates



Northern Elevation



Western End Elevation



Eastern End Elevation



Southern Elevation



Upper Level Roof Structure



Roof Structure to Single Storey Barn



First Floor Structural Timbers



Detached Rear Outbuilding