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Report Title
BANK HOUSE FARM STRUCTURAL INSPECTION REPORT

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LIMITATIONS

The conclusions presented herein are based on the inspection undertaken on 13th April 2010, and no liability can be accepted for the condition of parts of the structure which were not inspected or for deterioration after the survey. The Structural Inspection was carried out by Robert Marshall and Lee Fisher, ARC Engineers.

We have not inspected the parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

The opinions expressed in this report concerning any defect found and the risks arising there from are based on the personal opinion of the surveying engineer.

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INTRODUCTION

This report has been commissioned by Andrew Brown, Architect of DesignSpace Architects on behalf of Mr Frank Charlesworth to provide comments on the Structural integrity and condition of two former agricultural buildings to the rear of the Grade II listed building forming Bank House Farm, Barnsley Road, Silkstone, Sheffield.

BACKGROUND

The Structural Inspection was carried out on 2No former agricultural buildings, associated with the listed residential building. Evidence on the main building in the form of a plaque to the front dates it as 1806; however it is thought the earlier barn structure will have been built 20 – 30 years later, with the other building being of more recent construction due to the construction materials used. The use of soft wood trusses found in this building would lead us to date the second barn as 1860-1880.

The site is situated at Bank House Farm, Barnsley Road, Silkstone which is on the outskirts of Sheffield and is predominantly a rural area.

The site can be accessed from the M1 Junction 37, onto the A628; Barnsley Road. The Agricultural buildings are set back from the main road, behind the main residential building, but are clearly visible when passing.

AIMS AND PURPOSE OF REPORT

The aim of the Structural Inspection is to provide comments on the structural condition and integrity of the two former agricultural buildings and discuss the feasibility of converting these into habitable space.

The inspection consisted of the following:

- Assessment of existing foundations
- Inspection of trial pits and identifying the nature of the soil
- Assessment of existing structural elements such as masonry walls, concrete and timber floors
- Identify and record defects in the walls, floors, roof and supporting elements
- Catalogue and photograph each point of interest

The purpose of the report is to assess whether the existing structure can be feasibly converted into habitable space and whether it may be viable for the current structural elements to be retained as far as reasonably practicable and to remain intact and be reused.

Although not listed themselves, the two former agricultural buildings are linked by association with the main ‘Grade 2’ residential building. As such, the aim is to keep as much of the current structure as possible and to repair what is necessary so that the Listed residential building remains in context on the site amongst agricultural style structures.

The following sections will show the catalogued defects and the associated photographs. The two former Agricultural Buildings will be described separately (A and B).

AGRICULTURAL BUILDING 'A'

Photograph 35: Shows the South-East Elevation of Agricultural Building 'A'
The main masonry building is two-storey and consists of coursed sandstone masonry with a natural stone slate roof.
The side structure consists of timber posts and trusses with a corrugated roof.

Photographs 4 and 5: Details the trial hole at the East elevation. The trial hole is 1.6m in depth and shows the existing foundations at this depth. The ground is made up of top soil to approximately 1.6m, with signs of stiff clay beneath. The foundations appear to be adequate in their current state, and would not need to be replaced.

Photographs 6 and 16: Show the north elevation of Agricultural Building 'A'. There are 4No doorways with access into the building.
The first opening has a timber lintel (360x430 Softwood in good condition). It is likely that the timber beam has been added at a later date to the main construction.
However 3No openings have a stone lintel, and there is evidence of bowing of the external north facing walls at mid-height, as well as cracking on the lintels. The stone lintels are bulging from the stone face by approximately 30mm, which suggests there has been some movement.

Photograph 9: Illustrates the large crack, 20mm in width within the internal brickwork located behind the first stone lintel. Again this suggests there has been some movement in the walls.
As the internal walls are slender and have inadequate restraint to the main supporting structure, they fail and a crack is formed within the brickwork as the photograph above shows.

Photographs 11 and 10: Show the extent of the weathered coursed sandstone masonry on the north face of the Agricultural Building 'A'.
The stone shows signs of weathering it has been exposed to driving rain and has been exacerbated by freezing whilst wet.
The sandstone has become soft to the touch and is easily broken off or scraped into powder.

Photographs 12 and 13: Illustrate the north face stone walls.
Photograph 12 shows the extent of the weathering on the coursed sandstone masonry to result in a concave face.
Photograph 13 shows where mortar patch repairs have been undertaken to cover up the weathering at eaves level.
These are the areas that have the most cracking; along the full length of the building, due to freezing whilst wet.

Photographs 20 and 21: This elevation has been weathered the worst, leaving concave stonework with only mortar protruding between the coursed sandstone masonry.
This may have occurred due to all of the walls being subjected to the elements causing saturation of the stonework. However as the three other walls are more susceptible to the winds which can effectively dry them, the west face is mostly protected from the wind by the adjacent building and therefore the walls have decayed due to the wet conditions.

Photograph 19: Demonstrates the level of erosion in the sandstone walls.
The individual stone blocks are weathered as deep as 40mm, into what is 100mm wide coursed sandstone masonry.
We would estimate that less than 5% of the sandstone blocks could be reused.

Photograph 23: Details the trial hole at the South elevation. The trial hole is 1.0m in depth and shows the existing foundations at this depth. The ground is made up of top soil to approximately 1.0m, with signs of stiff clay beneath. The foundations appear to be adequate in their current state.

Photographs 25 and 26: Show the South Elevation of Agricultural Building 'A', with the adjoining open timber frame.
The timber frame looks to be in a workable condition, which suggests it was erected at a later date to the main building, particularly with the corrugated steel sheet roof.
There are several openings on this elevation but no significant cracking, to lintels or the stonework. However deterioration and weathering of the sandstone masonry is again apparent.

Photograph 29: Shows eaves level at the rear of the property (South elevation). There is evidence of frost damage to the high level sandstone masonry and mortar, with visible voids between the stonework.

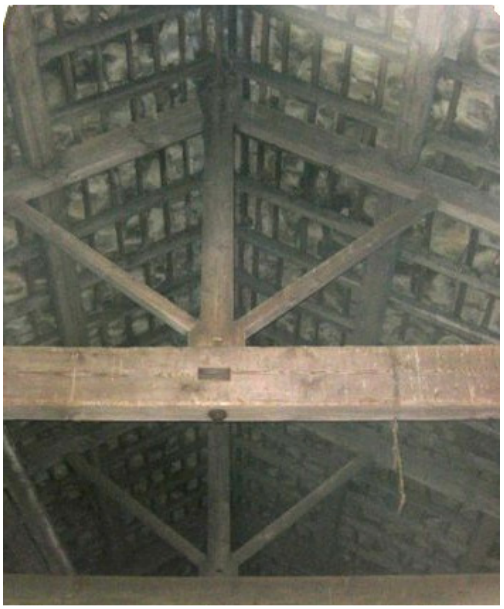
Photograph 32: Illustrates the extent of the open joints in the East elevation wall at low level. However this is only due to the absence of mortar between the coursed sandstone masonry

Photograph 33: Shows the slate roof over the East elevation gable. Frost erosion may have caused the mortar to deteriorate and roof slates to become loose.

Photograph 34: Shows the side structure adjoining Agricultural Building 'A'. It consists of timber posts, haunches and trusses with a corrugated roof. It has no major defects, but would serve no purpose for conversion to alternative use, and should therefore be removed.

Photograph 38: Shows the construction of the ground floors within the building. To the left of the photo shows cobbles with a central drain run, with a concrete slab to the right.

Photograph 39: Details the layout of the underside of first floor. The timber supporting beams and columns are softwood and are generally in a good condition; however the floor boards have aged and are decayed in some areas.



Photograph 40: Shows the layout of the softwood roof structure; King Post truss with purlins and rafters. These all look to be salvageable and it is our opinion that these could be re-used where possible.

AGRICULTURAL BUILDING 'B'

Photograph 68: Shows the South-west Elevation of Agricultural Building 'B'.
The main building consists of coursed sandstone masonry with timber floor and trusses, supporting a slate roof.
Several brickwork extensions have been added on to the main building to each elevation.

Photographs 42 and 43: Shows a double skin brickwork wall shelter abutting the original coursed sandstone masonry construction, built off of the existing ground which is inadequate founding material without proper footings etc.
Spare pieces of timber have been used to act as purlins to support a corrugated roof.
Cracking in both the brickwork and coursed sandstone is evident.
A line of mortar is the only restraint fixing currently visible between the old and new construction.
As such it is our opinion that this area be taken down and rebuilt with adequate fixings and adequate foundations.

Photograph 44: Shows the timber pieces currently used as purlins to support the corrugated roof on the south elevation. The timber pieces are significantly decayed and should be discarded.

Photograph 45: Shows the brickwork masonry pier with considerable cracks and loose bricks. Again it is our opinion that this area be taken down and rebuilt with adequate fixings and adequate foundations.

Photograph 46: Shows the North-east elevation, and demonstrates the connection between old and new construction. There is considerable cracking towards the bottom of the sandstone masonry and there is also signs of movement as the sandstone masonry deviates from horizontal.

Photograph 48: Shows a 45mm crack in the North-east elevation, as described above in Photograph 46. There has been significant movement and therefore may suggest subsidence or inadequate foundations.

Photograph 50: Shows the East elevation. There are many voids present, as well as cracking and signs of movement. Deteriorations of the coursed sandstone masonry is also evident with areas of absent mortar.

Photograph 54: Shows the East elevation. The lintel over the opening shown has significant cracks, which may be from movement rather than buckling.
There are many voids present, as well as cracking and signs of movement in the masonry.
Deteriorations of the coursed sandstone masonry is also evident with areas of absent mortar.

Photographs 55 and 56: Shows the end doorway on the East elevation.
The movement in the building has resulted in 80mm cracks/voids being formed in the masonry.
The existing lintels could be reused.

Photograph 57: Demonstrates the level of erosion in the coursed sandstone masonry walls.
The individual sandstone blocks are weathered as deep as 70mm, into what is 100mm wide coursed sandstone masonry.
We would estimate that less than 5% of the coursed sandstone could be reused.

Photograph 58: Demonstrates the level of erosion in the north facing coursed sandstone masonry walls.
The individual sandstone blocks are weathered as deep as 70mm, into what is 100mm wide coursed sandstone masonry.
We would estimate that 0% of the coursed sandstone masonry could be reused from this elevation.

Photograph 59: Details the condition of the roof and existing brickwork walls to the end of the East Elevation.
This area is adjoining the main coursed sandstone masonry building. It is evident that the buildings have been added to over the years due to the number of different brick types used as well as the different mortar.
The roof members should be discarded as the roof is in a state of disrepair.
The tying of each of the sections of the walls looks to be insufficient which would account for the signs of movement and the voids between the different wall types.

Photograph 61: Shows signs of movement with the lintels and masonry deviating from horizontal.
The tying of each of the wall sections looks to be inadequate which would account for the signs of movement and the voids between the different wall types.
There are several voids above the lintels, 80mm in width; however the coursed sandstone masonry looks to be in a comparatively good condition.
Most of the masonry units could be reused.

Photograph 64: Illustrates the west elevation of the Agricultural Building 'B'.
The majority of this area is newer brickwork, which is in good condition. However the supporting eaves members are decayed and would require replacing.
The cast iron stanchion is used as a column to support the timber roof, and if kept would demonstrate the diversity of building materials used in the past.
The adequacy of the foundations in this area may require investigating.

Photograph 65: Shows the eaves members to the west elevation supported by the cast iron haunch.
It can be clearly seen that the eaves timber is decayed and would need to be replaced.

Photograph 72: Shows the West elevation and the extent of the soil migration of the years, culminating in the external levels immediately in the vicinity of the doorway being higher than the internal finished floor level.
There are many voids present, deteriorations of the coursed sandstone masonry is also evident.

Photograph 74: Shows the West elevation, and the area needing repair around the first floor opening.
Deterioration of the coursed sandstone masonry is again evident.
We would estimate that 5% of the coursed sandstone could be reused from this elevation.

Photograph 75: Shows the West elevation and the extent of the soil migration of the years, culminating in the external levels being higher than the internal finished floor level.
The soil characteristics are top soil down to 1m deep, with firm to stiff clay below.

Photograph 71 and 70: Show the view from the south-west, and shows the end gable with the two extensions which have been added after the original coursed sandstone masonry building.
There are signs of deterioration; however most of the coursed sandstone masonry could be reused in this area.
It is recommended however that the brick building be dismantled and reinstated on adequate foundations, and tied adequately to the main coursed sandstone masonry building.
The roof purlins and rafters on the low roof may be discarded, and so too the few remaining broken slates.

Photograph 77: Shows the construction of the ground floors within the building. To the right of the photo shows the cobbled floor with a concrete slab to the left.

Photograph 78: Illustrates the first floor layout in the Agricultural 'Building 'B'.
The first floor comprises of oak supporting beams, with softwood joists.
The timber floor planks show signs of decay, and should be replaced where necessary

Photograph 79: Shows the first floor layout in the Agricultural 'Building 'B'.
Lime wash walls are evident and the interior walls look to be in an adequate condition.

Photograph 83: Shows the timber roof truss layout in the Agricultural 'Building 'B'.
The truss appears to be a mixture of oak and softwood.
All the timber elements look aesthetically in a good condition, but further assessment may be required due to their age.

CONCLUSIONS AND RECOMMENDATIONS

AGRICULTURAL BUILDING 'A'

It is our opinion that the majority of the Former Agricultural building 'A' structural elements can be retained.

The existing foundations are adequate, and are founded upon stiff clay, with a topsoil back fill.

The existing lintels, whether timber or stone can also be reused.

The roof trusses are softwood and look to be newer than those found in Agricultural building 'B'. The existing floor beams and floor joists are also salvageable. The floor planks should be replaced as required; however it is recommended that all existing timber elements be inspected by a timber specialist.

The roof slates appear to be intact, with only minor areas to be replaced.

The observed bowing in the northern elevation is not sufficiently severe as to require rebuilding. However the wall will require ties to the new/existing internal structure as part of the refurbishment. 50x3 lateral stability straps at 1m centres, which are to be resin anchored into the outer leaf, will be required. Straps are to be 1200mm long, secured to the timber floor with a minimum of 4No 50mm long No8 woodscrews.

The adjoining timber shelter with corrugated roof should be removed, as it is not in keeping with the surrounding buildings.

The external coursed sandstone masonry outer leaf of the Former Agricultural building 'A', is generally in very poor condition having experienced severe weathering and erosion, the extent of which is quite unusual given the age and location of the building.

The south elevation has been sheltered by the adjacent structure to some extent, but is still heavily pitted with the face of most stones showing some sign of erosion. With the removal of the structure providing the current shelter erosion of the stone will only accelerate on this elevation. It estimated that 40-50% of the stone is reusable, however it should be borne in mind that building in this weak stone with new stronger material will lead to further deterioration of the existing.

The north elevation is also in poor condition and it is estimated that between 30-40% of this stone could be reused.

The east and west elevations are both in very poor condition and we would propose that the entire gable elevations are rebuilt with new stone

It should be noted however that the inner leaf of the building looks to be in very good condition and can be entirely retained in its present form.

CONCLUSIONS AND RECOMMENDATIONS

AGRICULTURAL BUILDING 'B'

It is our opinion that the Former Agricultural building 'B' original coursed sandstone masonry building should be retained where possible:

- Foundations;
- timber trusses;
- lintels;
- floor joists; and
- floor beams

are all in good order and capable of reuse.

The newer brickwork buildings adjoining the main sandstone building serve no function and should be removed, particularly on the south and east elevations, as they are extremely weathered and have not been tied to the main structure adequately.

As discussed above, the foundations to the main sandstone buildings are adequate however the foundations to the brickwork buildings are inadequate with areas such as the shelter to the south being built off of the ground floor slab. It is recommended that the areas to be retained such as the west elevation have further trial pits dug to determine the type and depth of foundations to the brickwork buildings.

There is evidence of soil migration on the west elevation, and therefore it would be prudent to amend the landscaping of this area.

The timber trusses in the Agricultural building 'B' are visibly older than those found in Agricultural building 'A', but do seem to be in a good condition. The timber floor beams and floor joists should be retained; however the floor planks do show signs of decay and should therefore be removed.

To the northwest elevation a cast iron column has been used to support the eaves beam and we would consider this can be reused subject to further foundation investigation and a new protective paint finish being applied.

As with Building 'A', the external coursed sandstone masonry outer leaf of building 'B', is generally also in very poor condition having experienced severe weathering and erosion.

The northern elevation is the worst affect area and would require 100% of the stonework to be taken down and rebuilt.

The southern elevation has fared a little better and it is proposed that between 50-60% of the wall would need to be replaced.

The western elevation is again heavily eroded and it is estimated that between 5-10% of the existing stone is suitable for reuse.

The eastern elevation is also in quite poor condition and it is expected that between 20-25% of the stone is reusable.

It should be noted however that the inner leaf of the building looks to be in very good condition and can be entirely retained in its present form.

CONCLUSIONS AND RECOMMENDATIONS

BOTH STRUCTURES

Where practicable and with due regard to existing foundation levels the exiting ground floors should be removed to construct a new ground floor slab at a lower level with insulation to meet current Building Regulation requirements. It is recommended that the DPM is dressed up the inside face of the barn wall to provide a DPC to the inner stone which is felt will offer a more effective solution than trying to inject a chemical DPC into a rubble fill wall.

Timber truss and roof elements are to be investigated further during renovation works. It is recommended that all existing timber elements be inspected and assessed by a timber specialist for infestation and rot and a suitable preservative treatment applied if necessary before occupation for residential purposes.

Roof tiles should be removed and carefully stored to allow repair of rafters where required and a new membrane to be installed. Tiles should then be replaced in exactly the same arrangement as before with localised repairs from matching slate. Tiles should on no account be turned before relaying.

SUMMARY

To sustain the longevity of the two former agricultural buildings detailed in this report, it is necessary to replace the weathered and deteriorating material and to make the structures weathertight as soon as possible. Where required, remedial works should be undertaken such as the replacement of the external leaf, which is to be formed in sandstone masonry sourced from a nearby quarry.

Due to the proximity of the adjacent listed building all works to the barn structures needs to be done in a sympathetic manner, in keeping with the existing materials present on site. It is vitally important that the agricultural barn structures are repaired and rebuilt as necessary in order that the context of the listed farm house building is not lost. This could occur if corrective work is not undertaken in the very near future as the buildings are already suffering the effects of severe weather.

Given the extent of the erosion, we would not recommend patch repairing the stone as this will lead to an inconsistency of the dressed stone faces which will not be attractive or in keeping with surrounding.
Additionally, the retained stone will continue to erode and will require replacing in the future. It is considered more practical to undertake all stonework replacement in one operation. Patch repairing the stonework will in itself be a very difficult task with associated health and safety risks.

We would propose that a scaffold is erected around the full perimeter in order to carry out works to the roof. Whilst the scaffold is erected the external stone can be taken down to ground level and the rubble infill removed. A new cavity wall can then be formed by reusing the existing inner brick masonry walling and reconstructing the external the leaf with new stone or reclaimable stone from site. The newly formed cavity wall can have insulation installed during construction and masonry wall ties should be drilled and screwed to the inner brick wall before bonding in the bed joints of the outer leaf.

Leaving the former agricultural buildings in their current state will only cause further damage to the load bearing structure, which if allowed to decay further will cause additional damage to the elements of the building which are currently in a good condition.

The existing, free standing brick outbuilding remote from the barn structures should be demolished and rebuilt. This structure is considered to be beyond economic repair and would be a safer operation to take it down and rebuild it.

REMEDIAL ACTIONS AND PROPOSED WORKS

- Appoint a timber specialist to assess the existing timber elements and approve them for reuse;
- Undertake further ground investigation and trial pitting to expose foundations.
- Remove and replace the outer leaf of the buildings, retaining the coursed sandstone masonry where possible, and replacing where necessary with sandstone to match the existing listed building;
- Remove brickwork buildings to the east and south elevations.
- Line inside of existing walls with Newtonite or similar damp proof membrane to receive an internal render finish.

DO NOT SCALE

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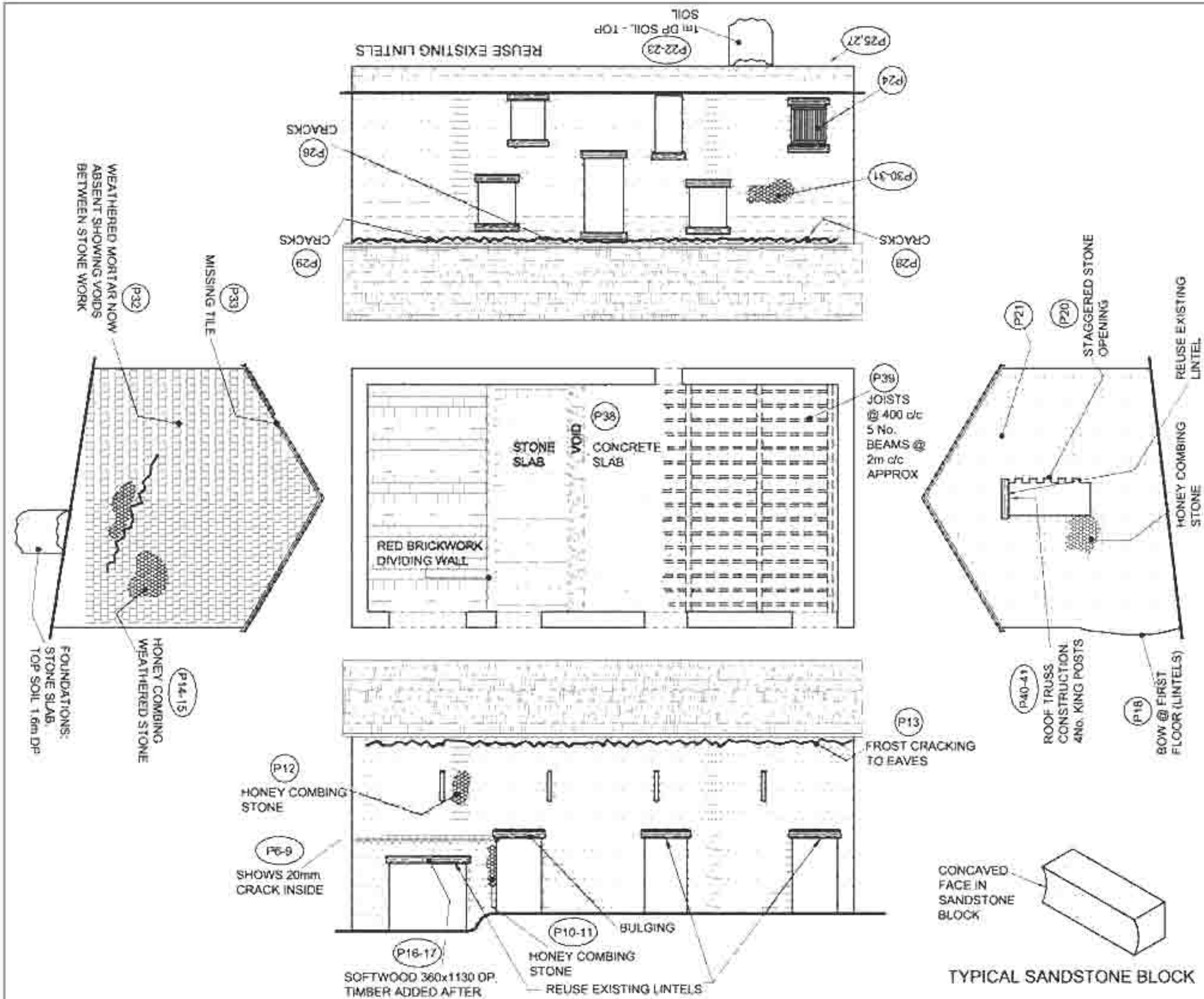

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MR F. CHARLESWORTH

BANK HOUSE FARM

PHOTO INDEX SHEET 1

INFORMATION

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DO NOT SCALE

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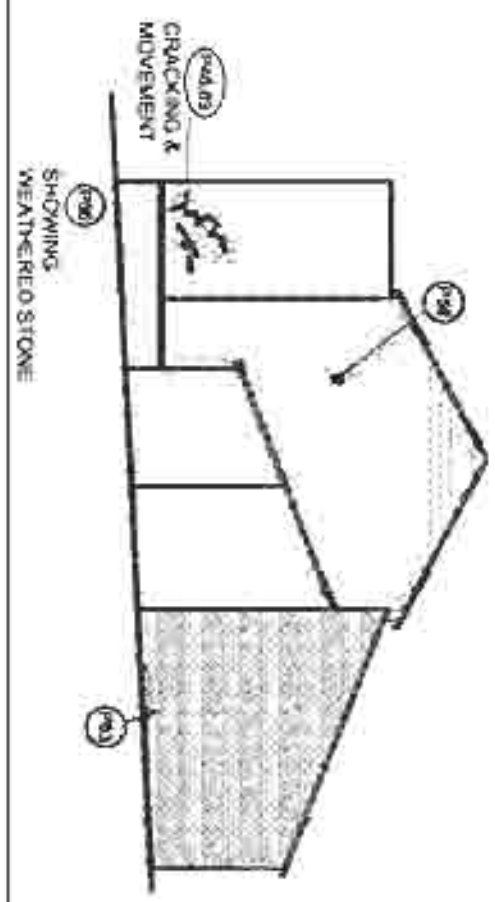

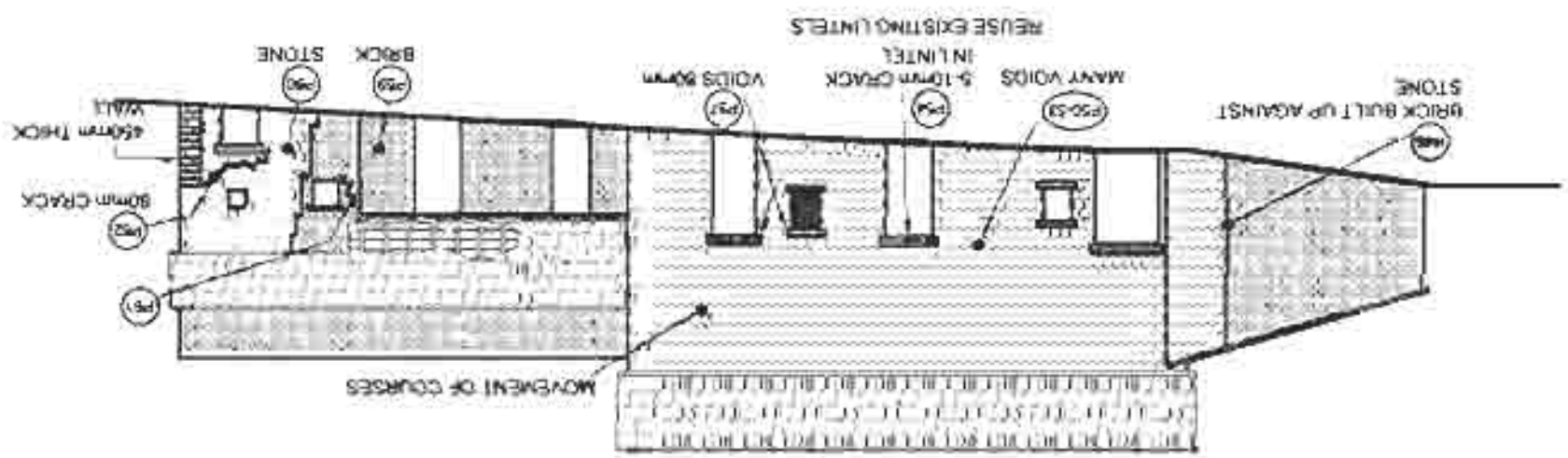

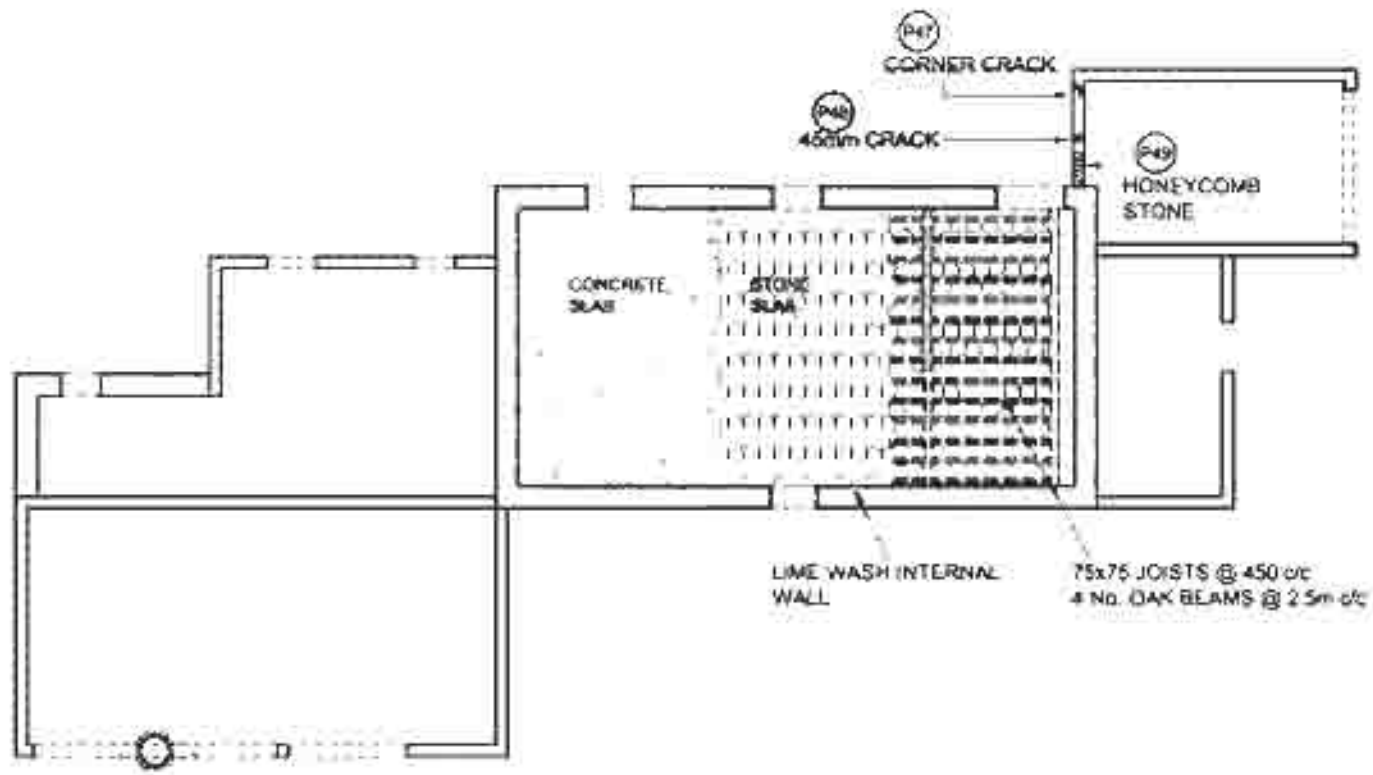

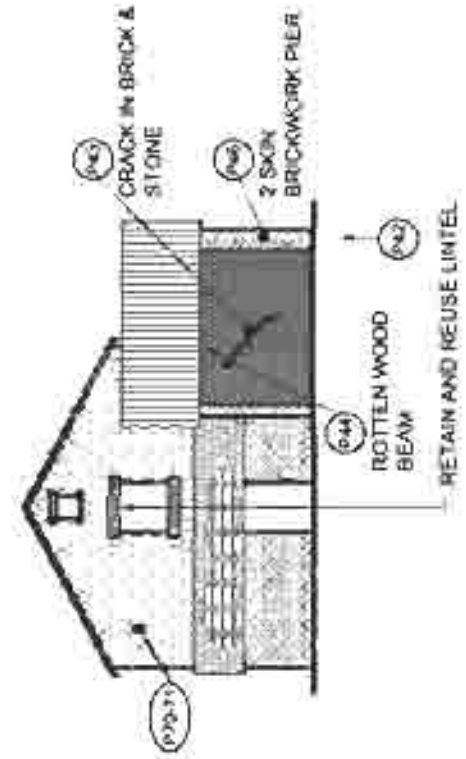

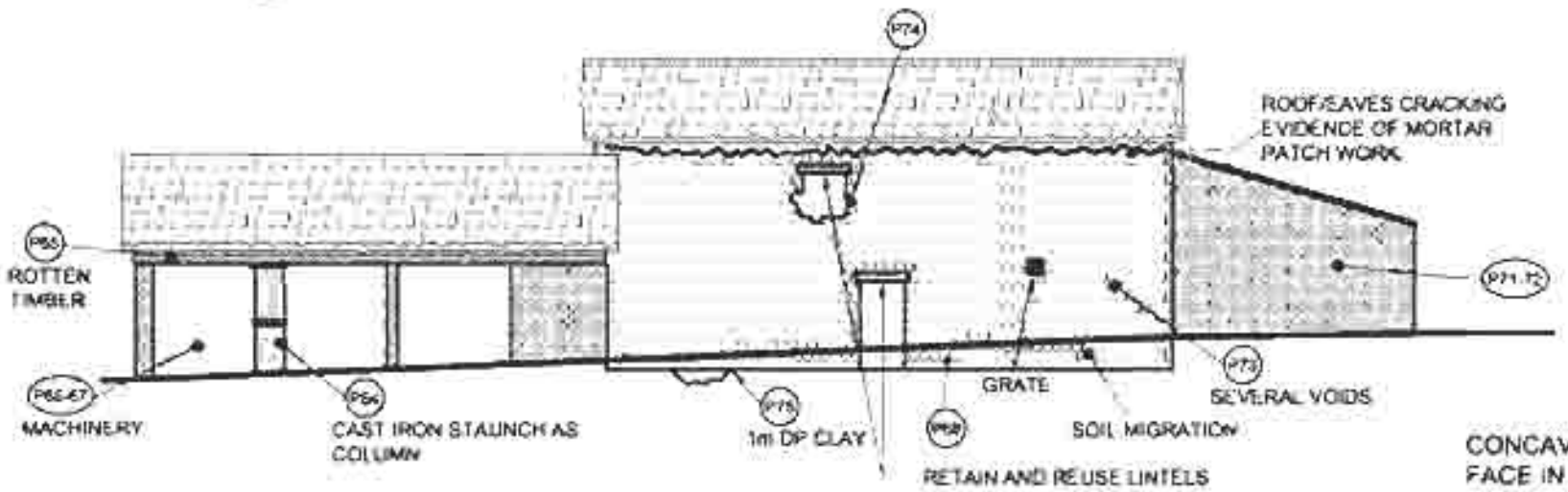

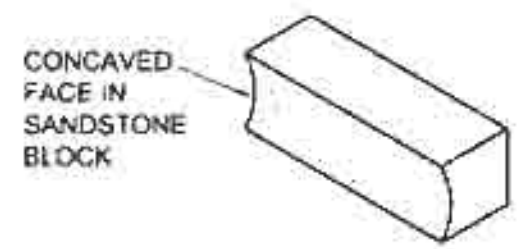

TYPICAL SANDSTONE BLOCK

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OAK HOUSE FARM

PHOTO INDEX
SHEET 2

INFORMATION

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