SEPTEMBER 7, 2023

LOWER WOODHOUSE FARM
FERNHILL
ALMONDSBURY
BRISTOL
BS32 4LU

KYTEX LTD.
2023067
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1. Introduction

1.1 KYTEX LTD. were instructed by Mark Broper to undertake a structural inspection of three barns at Lower Woodhouse Farm, Fernhill, Almondsbury, Bristol, BS32 4LU in relation to converting the structures.

1.2 This report is limited to structural aspects only. All other building aspects are outside the scope of this report.

1.3 No intrusive work was undertaken, all comments are based solely on visual evidence noted during the survey.

1.4 This report is for use by Mark Broper only and shall not be used or relied upon by any third parties without specific written consent from KYTEX LTD.

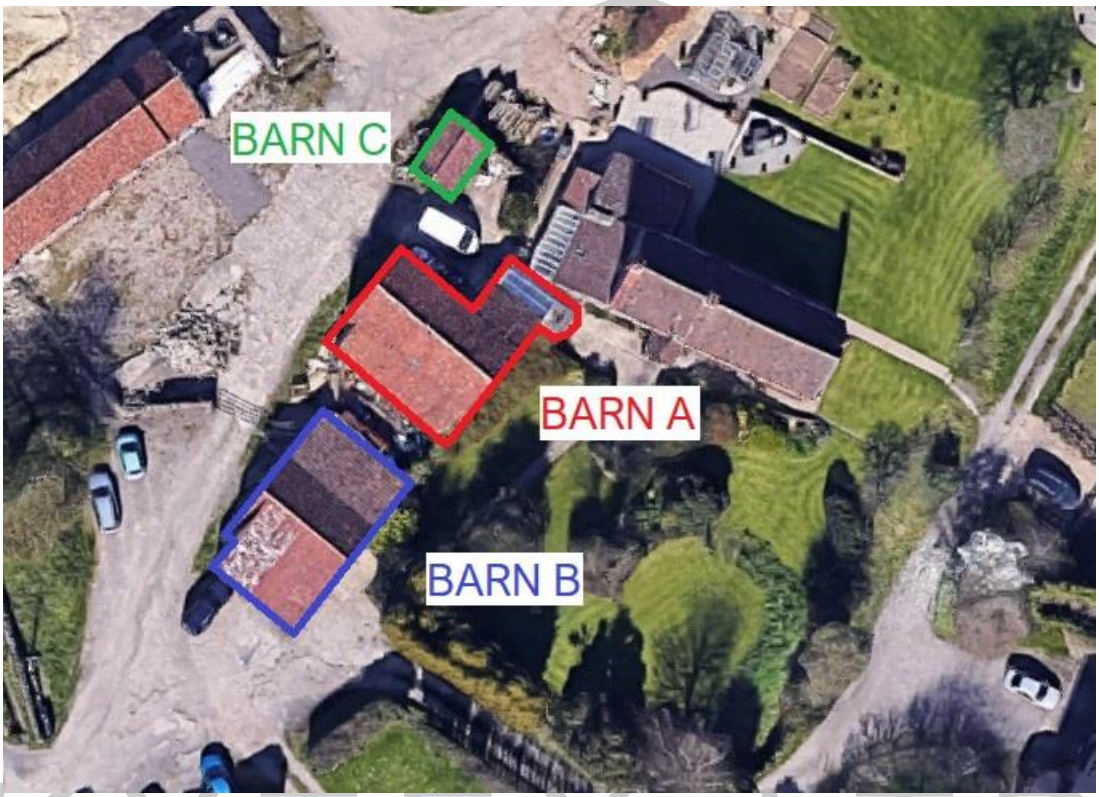

Figure 1: Aerial photograph of the barns

2. Survey

2.1 KYTEX LTD. visited site on 16th August 2023 in the morning. The weather was sunny and bright with no rainfall occurring while on site.

2.2 Access was granted to the barns and the surrounding perimeter.

2.3 The site topography is gently sloping to the North.

2.4 The barns are located in the middle of a working farm, which is surrounded by fields.

2.5 A sketch plans and sections of the structures can be found in Appendix I.

3. Structural Description and Observations – Barn A

3.1 The central barn consists of a duopitched roof and stone walls. A full-length timber lean-to is present on the southwest elevation and a smaller stone walled lean-to on the northeast elevation. The central area of the barn is circa 10.9m x 5.4m on plan, with the ridges at circa. 5.3m above ground level and the eaves at circa 3.4m above ground level. The timber lean-to measures 10.7m x 2.75m on plan, with a high eaves of circa 2.75m and a low eaves of circa 1.4m above ground level. The stone lean-to measures circa 10.5m x 9.4m on plan.

3.2 Roof:

3.2.1 Clay pan tiles form the roof throughout the duopitch barn.

3.2.2 The underside of the roof slope in the southwest, has remnants of a lath and plaster finish. The underside of the northeast roof slope is just felt.

3.2.3 The rafters on the southwest half of the building consists of circa 75mm x 50mm timbers at 300-400mm centres and are assumed to be original. On the northeast slope, newer circa. 50mm x 50mm rafters span at 300-400mm centres.

3.2.4 2 rows of approx. 250mm x 100mm internal timber purlins and a structural ridge support the rafters. The southwest purlins span intermediately between each truss, whereas on the northeast half, newer (sawn cut) timbers span continuously over the purlins a splice connection.

3.2.5 The purlins and ridge are supported off 4 internal hardwood timber trusses. They are constructed from 250mm x 75mm truss rafters, 225mm x 75mm timber ties, and 75mm x 50mm internal timber struts. The northwest truss has lost its bearing at the east eaves and is currently supported with an acrow prop.

3.2.6 Significant sagging was noted to the ridge line internally and externally of the main duo pitch roof.

Photo 1: Central area roof internal view

Photo 2: Older and newer ceiling halves of the central area

Photo 3: Timber decay on truss rafters and previous repairs

Photo 4: Propping of northwest truss

3.2.7 The southwest lean-to roof consists of timber battens and pan tiles.

3.2.8 75mm x 50mm timber rafters at 400mm centres span over a central row of purlins.

3.2.9 120mm x 100mm timber purlins span between large primary lean-to rafters.

3.2.10 6 large 220mm x 65mm primary rafters span between a stone wall and the low eaves wall plate.

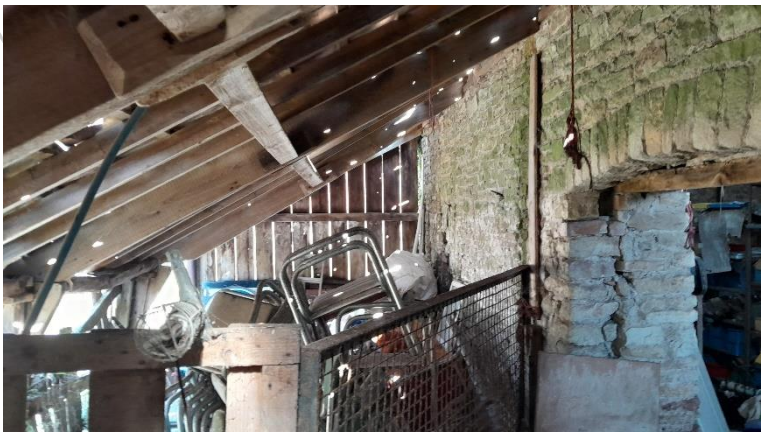

Photo 5: Southwest lean-to internal roof

3.2.11 The northeast lean-to consists of battens and pan tiles with small area of clear perspex roof.

3.2.12 75mm x 50mm timber rafters span between the wall and over a timber purlin of approx. 225mm x 75mm.

Photo 6: Northeast lean-to internal roof

3.3 Load bearing walls:

3.3.1 The duo-pitch barn's walls are constructed from stone ranging from 450-600mm thick with lime mortar joints and areas of lime render and/or lime wash present.

3.3.2 The southeast gable wall is noted to have pulled away from the return walls with significant cracking present on the south and east corners. The purlins have likely lost their bearings through decay and water ingress which has destabilised the wall.

3.3.3 The northwest gable also has multiple cracks present. A large vertical crack runs to the left-hand side of the window opening.

Photo 7: Cracking at the eastern corner *Photo 8: Cracking at the southern corner*

3.3.4 Internally, cement render is present from the ground level up to circa 1200mm high (likely for agricultural purposes).

3.3.5 A stone archway provides access to the timber lean-to in the southwest. The arch has previously been strengthened with the addition of two timber lintels to the underside, 180mm x 150mm and 100mm x 100mm.

3.3.6 The southwest external wall of the lean-to is constructed from timber and is largely open. The roof is supported off 6 No. 140mm x 120mm timber posts constructed off a low, 400mm high stone wall. Partial timber cladding is present along the external elevation.

3.3.7 The west gable of the timber lean-to is constructed from upright timber slats, with the east gable being part of a longer stone wall running past the building extents. Significant cracking is present on the east corner where the gable wall of the main structure has pulled away.

Photo 9: Cracking at the east corner of the timber lean-to

3.3.8 There is a single cast iron (assumed) 120mm diameter column supporting the roof on the west corner of the timber lean-to.

3.3.9 The northeast lean-to consists of stone walls. The floor level of this lean to is approximately 1100mm lower than the duopitch and is therefore assumed to be retaining.

Photo 10: Stone lean-to

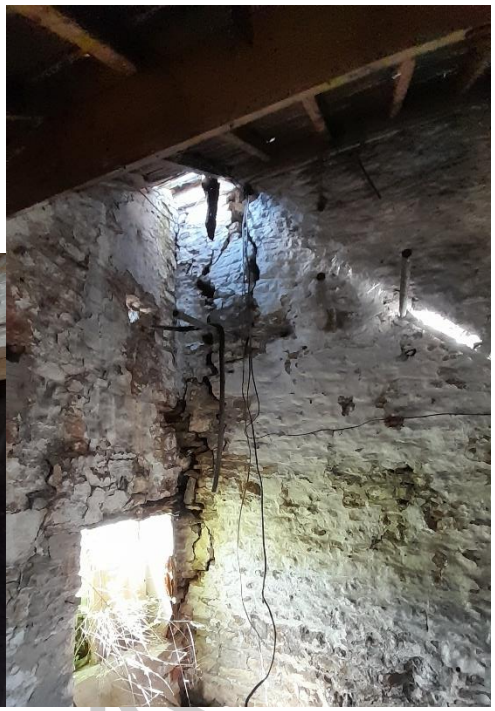

Photo 11: Stone lean-to interior

3.4 Foundations:

3.4.1 A concrete slab is present to the majority of the floor. The thickness and makeup is unknown.

3.4.2 The existing foundations to the stone walls are unknown. Then are assumed to be shallow and corbelled.

3.5 Stability:

3.5.1 The roof acts as an inclined diaphragm on plan to the whole structure. The masonry walls act as vertical sheer walls.

3.6 Guttering and drainage:

3.6.1 Partial guttering is present on the north east elevation of the stone lean-to, no downpipes are present.

Photo 12: Northwest elevation

Photo 13: Northeast elevation

Photo 14: Southeast elevation

Photo 15: Southwest elevation

4. Structural Description and Observations – Barn B

4.1 The barn consists of a single storey duopitch roof and 2 lean-tos on the northeast and southwest elevations. The central area of the barn below the duopitch is circa 8.5m x 5.9m on plan, with the ridge at circa. 4.9m above ground level. The northeast eaves height is circa 2.8m with the southwest eaves at circa 3.7m. The northeast lean-to measures 8.5m x 4m on plan, with a high eaves of circa 2.75. The southwestern lean-to measures circa 8.5m x 3.4m on plan, split into two internal rooms with a high eaves of 2.7m.

4.2 Roof:

4.2.1 Battens support triple roman tiles for the roof covering.

4.2.2 150mm x 42mm timber rafters span at circa 400mm centres between internal walls and the ridge, with 150mm x 42mm timber collars bolted to the rafters.

4.2.3 150mm x 42mm rafters continue down into the lean-to roofs.

4.2.4 The rafters are braced on plan with diagonal timbers fixed to the underside of the rafters.

4.3 Walls:

4.3.1 The rafter bearings to the northeast are supported by an internal steel frame consisting of a 178 x 102 x 19UKB and 100SHS. A block work wall has been built tight between the steels and is now assuming to take the load.

4.3.2 The southwest internal wall consists of stone at the low level. The high level continues up and block and brickwork forming a cavity wall.

4.3.3 The rear of the frame (southeast) appears to be constructed from an internal blockwork wall and an external timber frame. Externally this is clad with 150mm horizontal featherboard with a 25mm lap.

Photo 16: Internal view of blockwork wall and timber frame.

4.3.4 The northeast lean-to is constructed in blockwork with timber clad door to the front (northwest).

4.3.5 The southwest lean-to is constructed of blockwork, finished with an external render and a large door opening on the southeast elevation, clad with featherboard timbers. There is a step up of circa 660mm into the southwest lean-to from the central duopitched area.

Photo 17: Internal view of southwest lean-to

4.4 Foundations:

4.4.1 A concrete slab is present to most of the floor. The slab is assumed to be ground bearing however there are stepped levels present. The thickness and makeup are unknown.

4.4.2 The existing foundations are unknown however due to the structure being relatively new (visual assessment) along with no signs of settlement or cracking, traditional mass concrete foundations on firm ground are assumed.

4.5 Stability:

4.5.1 The roof acts as an inclined diaphragm on plan to the whole structure. The masonry walls act as vertical sheer walls.

4.6 Guttering and drainage:

4.6.1 Guttering and downpipes are present on the southwest elevation.

Photo 18: Northwest elevation

Photo 19: Southwest elevation

Photo 20: Southeast elevation

Photo 21: Northeast elevation

5. Structural Description and Observations – Barn C

5.1 The barn consists of a single storey duopitch roof with walls on all 4 sides. The plan footprint of the structure is approximately 4.5m x 2.8m. The ridge is circa 4.5m above ground level, with an eaves of circa 2.0m above ground level.

5.2 Roof:

5.2.1 Battens support double roman tiles for the roof covering.

5.2.2 75mm x 50mm timber rafters span at circa 400mm centres.

5.2.3 Alternative rafter pairs have raised ceiling ties.

5.2.4 The southern end of the roof has tiles missing and a visible sag on the rafter line.

Photo 22: Internal view of barn

5.3 Walls:

5.3.1 Stone walls frame the building on all 4 sides.

5.3.2 Internally a cement render has been applied.

5.3.3 Externally the stonework has been repointed throughout using cement based mortar.

5.4 Foundations:

5.4.1 A concrete slab is present throughout, which gently slopes to the northwest. The thickness and makeup are unknown.

5.4.2 The existing foundations are unknown.

5.5 Stability:

5.5.1 The roof acts as an inclined diaphragm on plan to the whole structure. The masonry walls act as vertical sheer walls.

5.6 Guttering and drainage:

5.6.1 No guttering or downpipes are present.

Photo 23: Northwest elevation

Photo 24:Northeast elevation

Photo 25: Southeast elevation

Photo 26: Southwest elevation

6. Structural Comments – Barn A

6.1 Overview

6.1.1 Analysis of the timber trusses and roof timbers should be undertaken to confirm their capacity to support new loadings. Though the structure has historically demonstrated an ability to support the current dead and environmental imposed loadings, the additional dead loads and additional requirements for residential loadings will need to be justified. It would be pragmatic that the proposed conversion should use lightweight materials where possible.

6.2 Roof

6.2.1 New build-ups including finishes and insulation will add additional weight to the current structure. It is highly likely that the existing timbers will require strengthening or replacing particularly where they have suffered from water ingress and decay.

6.2.2 Existing timbers will require inspections to identify areas of decay or significant section loss.

6.2.3 Existing timbers should be appropriately treated against decay and insect attack.

6.2.4 The repairs to the roof timbers along with adequate strapping and securing the walls (in accordance with building regulations is expected to stabilise the walls.

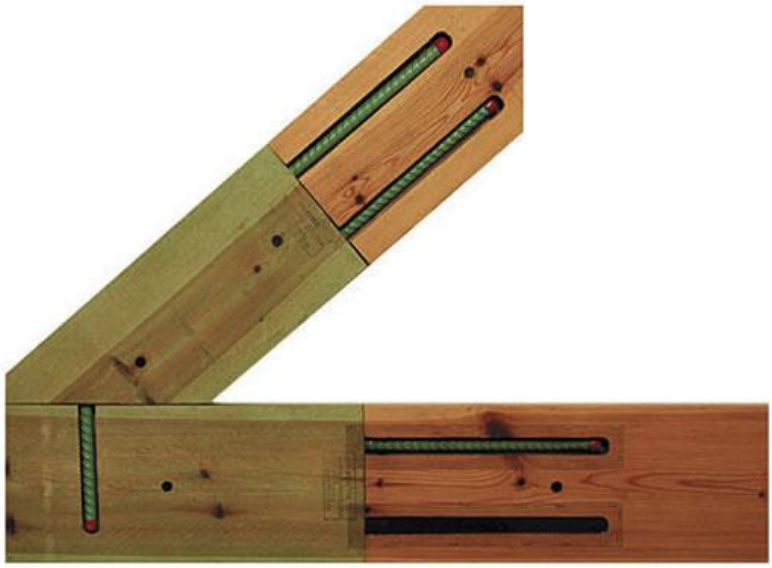

Photo 27: Typical truss bearing repair

6.3 Foundations

6.3.1 Foundations are expected to be shallow and should be confirmed as part of the building regulation design for competent bearing strata.

6.3.2 The additional load of the new build-ups is expected to be relatively small (assuming lightweight constructions). The increased stress on the foundations is therefore expected to be small.

6.4 Floor

6.4.1 Reuse of the existing floor slab will need to consider the necessary damp proof membranes, insulation, and finishes to achieve building regulations standards.

6.5 Walls

6.5.1 The large stone walls are expected to be sufficient for the expected loads of a residential conversion.

6.5.2 Large cracks will require a combination of specialist stitch bars and partial rebuilding to ensure the walls are sufficiently bonded into the return buttressing walls.

6.5.3 Timber lintels should be checked for decay and where required replaced.

6.5.4 The addition of a first floor (if undertaken), will be able to provide additional lateral restraint to walls.

6.6 Stability

6.6.1 The roof and walls will secure the stability of the structure.

6.7 Elevations

6.7.1 New walls or cladding along with reuse of the existing walls will need to consider the appropriate build-ups and details to achieve a domestic standard, including membranes and insulation. Appropriate fixings to the existing structure will need to be developed. These items will form part of the building regulations.

6.8 Guttering and drainage

6.8.1 New below ground drainage will need to be addressed for foul and surface water.

7. Structural Comments – Barn B

7.1 Overview

7.1.1 Analysis of the timber roof sections should be undertaken to confirm their capacity to support new loadings. Though the structure has historically demonstrated an ability to support the current dead and environmental imposed loadings, the additional dead loads and additional requirements for residential loadings will need to be justified. It would be pragmatic that the proposed conversion should use lightweight materials where possible.

7.2 Roof

7.2.1 New roof build-ups including finishes and insulation will add additional weight to the current structure. The presence of graded sawn cut timbers with bolted connections in tied A frame arrangement implies a designed roof.

7.2.2 Existing timbers will require inspections to identify areas of decay or significant section loss.

7.2.3 Existing timbers should be appropriately treated against decay and insect attack if currently not treated.

7.3 Foundations

7.3.1 The existing foundations are expected to be sufficient for the load bearing of domestic structure.

7.3.2 The foundations should be confirmed as part of the building control submission.

7.4 Floor

7.4.1 Reuse of the existing floor slab will need to consider the necessary damp proof membranes, insulation, and finishes to achieve building regulations standards.

7.5 Stability

7.5.1 The roof and walls will secure the stability of the structure.

7.5.2 The front elevation would need to consider the effects of a large opening and consider secondary supports to avoid any sway on fragile materials e.g. glazing.

7.6 Elevations

7.6.1 New walls or cladding along with reuse of the existing walls will need to consider the appropriate build-ups and details to achieve a domestic standard, including membranes and insulation. Appropriate fixings to the existing structure will need to be developed. These items will form part of the building regulations.

7.7 Guttering and drainage

7.7.1 New below ground drainage will need to be addressed for foul and surface water.

8. Structural Comments – Barn C

8.1 Overview

8.1.1 Due to the small size of the structure, Building Regulations Part A considers this as a Small Single Storey Building where the design can be justified using span tables and rule of thumb.

8.2 Roof

8.2.1 The existing roof rafters are currently tied with collars for every other rafters. A collar to every rafter is expected to provide a sufficient roof design.

8.2.2 Existing timbers will require inspections to identify areas of decay or significant section loss.

8.2.3 Existing timbers should be appropriately treated against decay and insect attack if currently not treated.

8.3 Foundations

8.3.1 The existing foundations are expected to be sufficient for the load bearing of a small domestic structure.

8.3.2 The foundations should be confirmed as part of the building control submission.

8.4 Floor

8.4.1 Reuse of the existing floor slab will need to consider the necessary damp proof membranes, insulation, and finishes to achieve building regulations standards.

8.5 Stability

8.5.1 The roof and walls will secure the stability of the structure.

8.6 Elevations

8.6.1 New walls or cladding along with reuse of the existing walls will need to consider the appropriate build-ups and details to achieve a domestic standard, including membranes and insulation. Appropriate fixings to the existing structure will need to be developed. These items will form part of the building regulations.

8.7 Guttering and drainage

8.7.1 New below ground drainage will need to be addressed for foul and surface water.

9. Conclusion

9.1 Based on the visual assessment and subject to the points outlined within this report, we judge that the existing structures are suitable for conversion.

9.2 An engineer should review the proposed designs necessary to form part of the building regulations submission.

9.3 Timbers will need to be inspected and treated for insect and fungal decay. Allowance should be made for repairing and strengthening some timbers.

9.4 Large cracks to stone walls will need to be stitched by a specialist contractor and the design prepared by a suitably qualified engineer.

Report prepared by Alexander J D Kyte MEng (Hons), CEng MICE

A J D Kyte

KYTEX LTD

CIVIL AND STRUCTURAL DESIGN CONSULTANTS

On behalf of KYTEX LTD.

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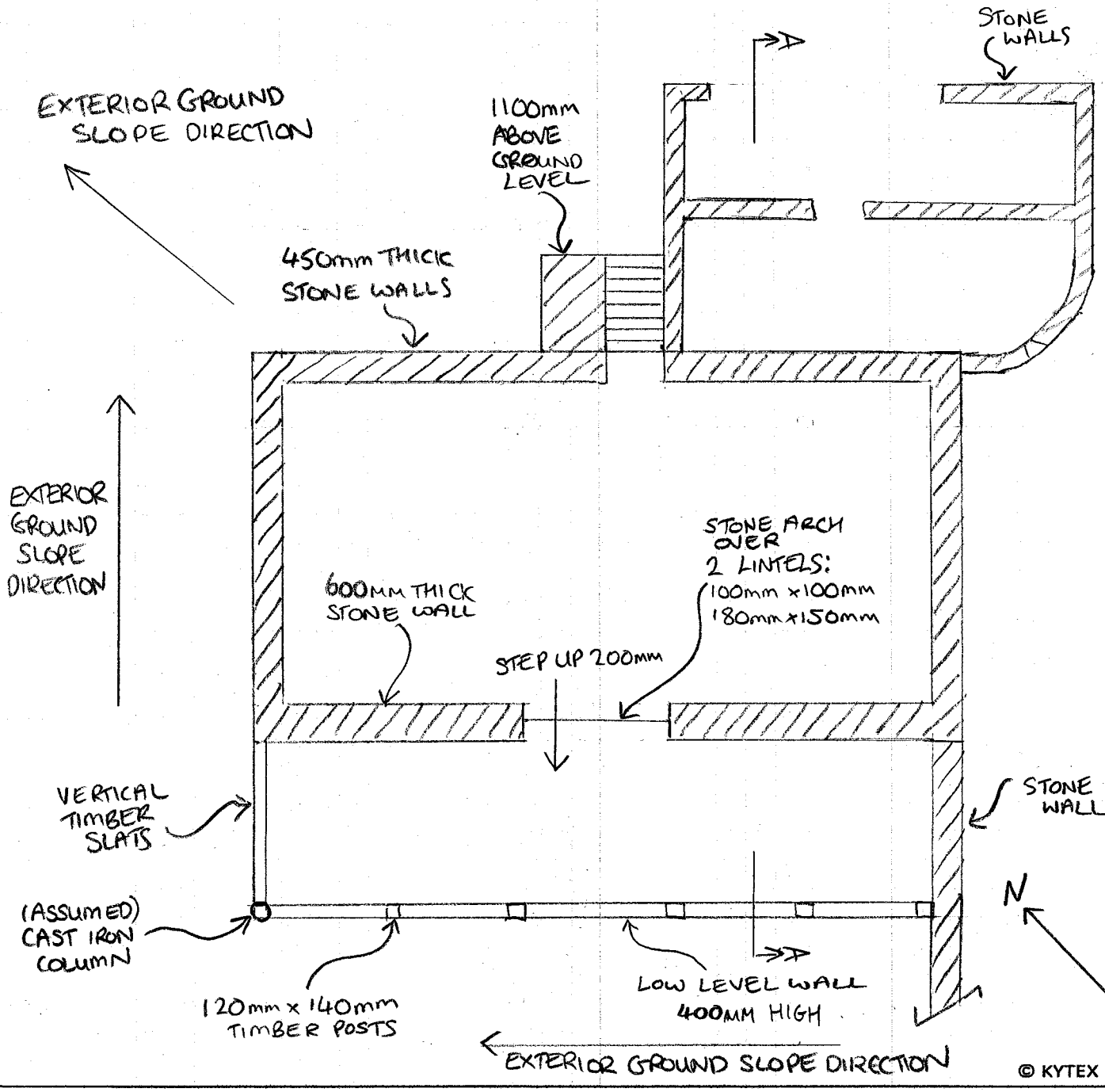
APPENDIX I

KYTEX LTD.
CIVIL & STRUCTURAL DESIGN CONSULTANTS

PROJECT TITLE:	LOWER WOODHOUSE FARM
PROJECT NO.:	2023067
DATE:	07.09.23
BY:	XK CHECK:

SK01

PLAN - BARN A



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BY:	XK CHECK: ✓

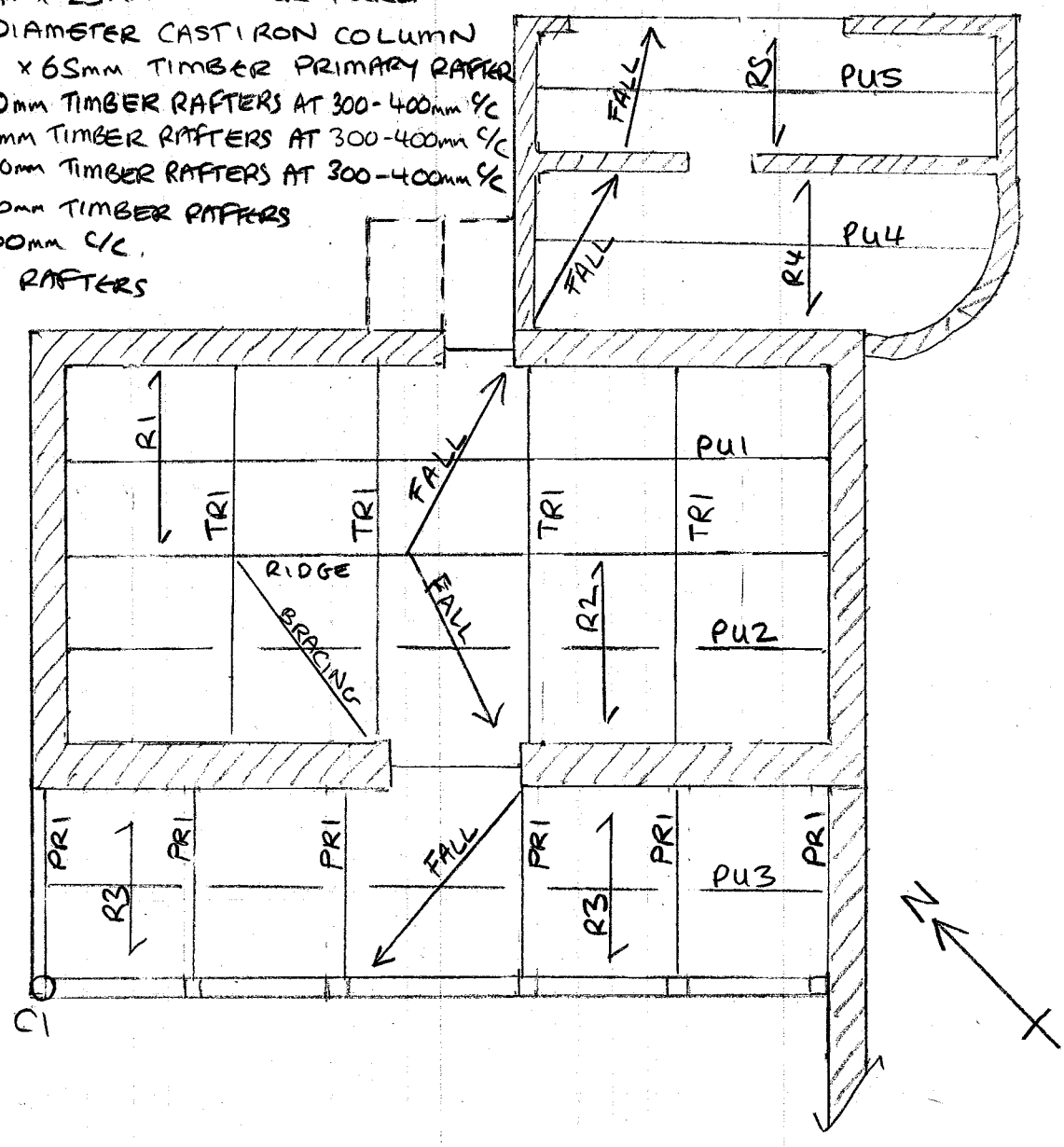
SK02

ROOF PLAN - BARN A

STRUCTURAL KEY

TR1: TIMBER TRUSS (250mm x 70mm TRUSS RAFTERS, 225mm x 75mm TIMBER TIES, AND 75mm x 50mm TIMBER STRUTS)

PU1: 250mm x 100mm TIMBER PURLIN
PU2: 250mm x 100mm INTERMEDIATE TIMBER PURLINS
PU3: 120mm x 100mm INTERMEDIATE TIMBER PURLINS
PU4: 225mm x 75mm TIMBER PURLIN
PU5: 100mm x 25mm TIMBER PURLIN
C1: 120mm DIAMETER CAST IRON COLUMN
PR1: 220mm x 65mm TIMBER PRIMARY RAFTER
↳ R1: 50mm x 50mm TIMBER RAFTERS AT 300-400mm C/C
↳ R2: 75mm x 50mm TIMBER RAFTERS AT 300-400mm C/C
↳ R3: 75mm x 50mm TIMBER RAFTERS AT 300-400mm C/C
↳ R4: 75mm x 50mm TIMBER RAFTERS AT 300mm C/C.
↳ R5: TIMBER RAFTERS



KYTEX LTD.
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PROJECT TITLE:	LOWER WOODHOUSE FARM
PROJECT NO.:	2023067
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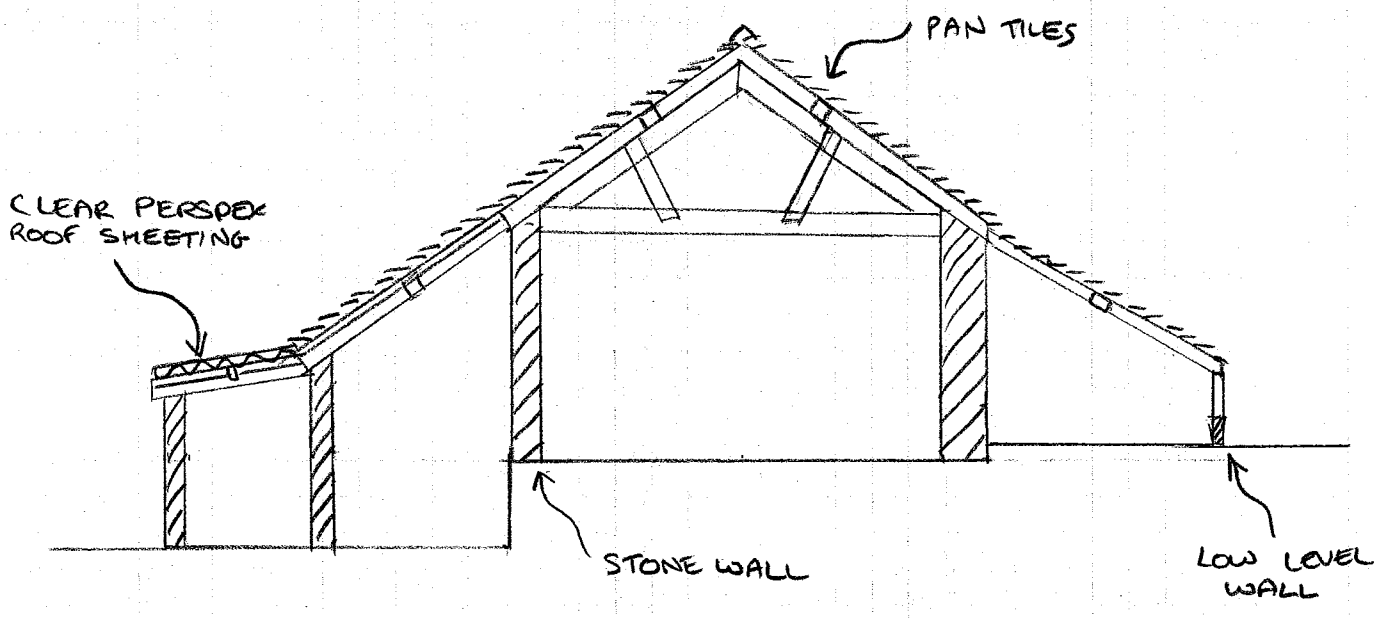
SECTION A-A BARN A



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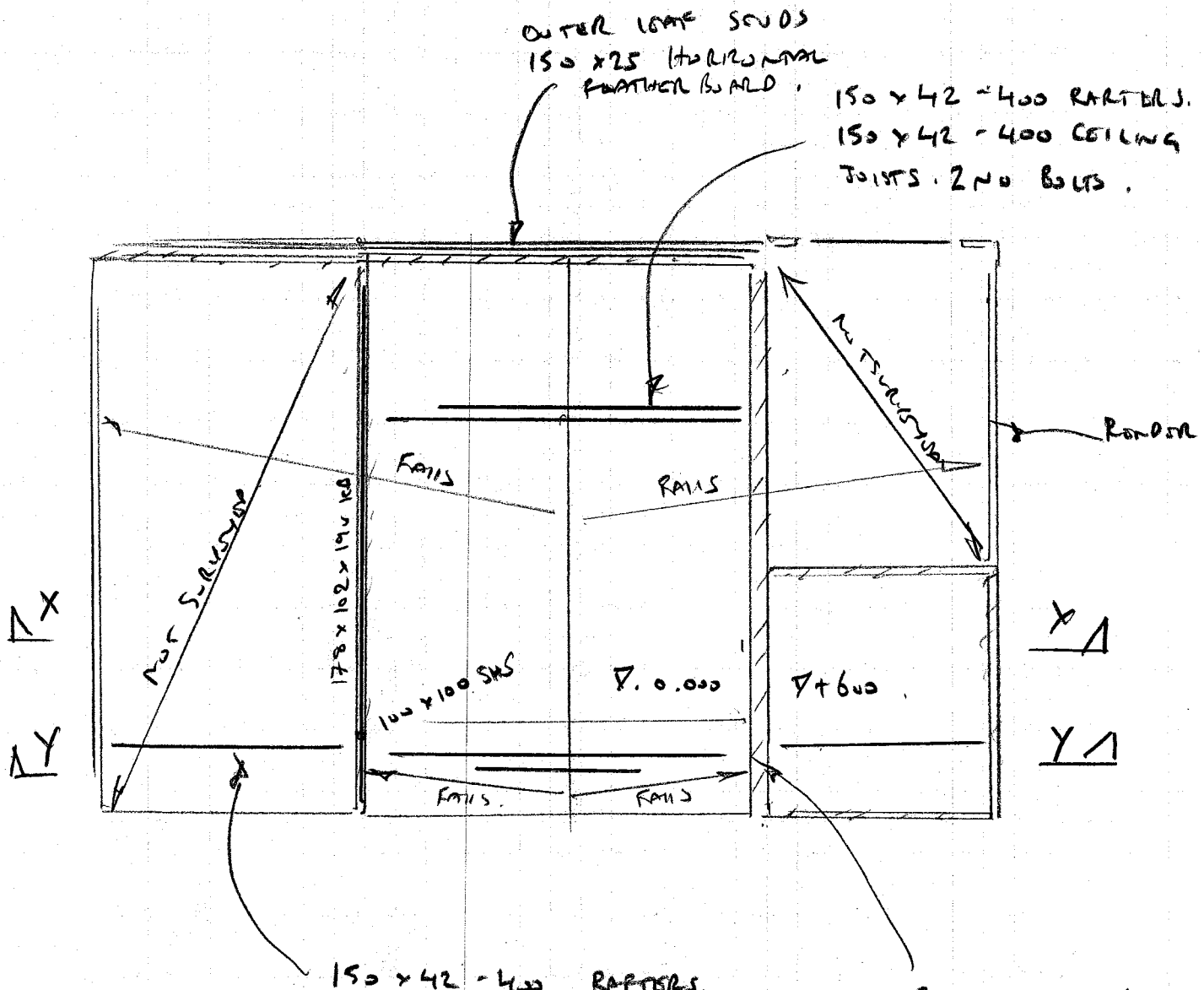
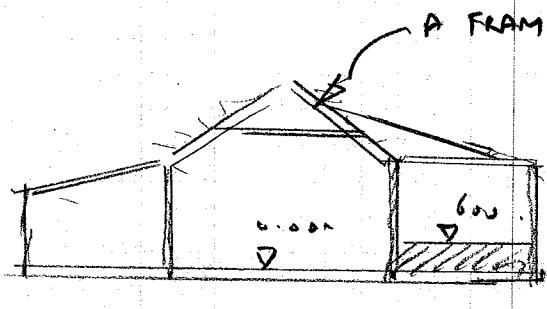
PROJECT NO.:	2023067
DATE:	07.09.23
BY:	Y N. CHECK:

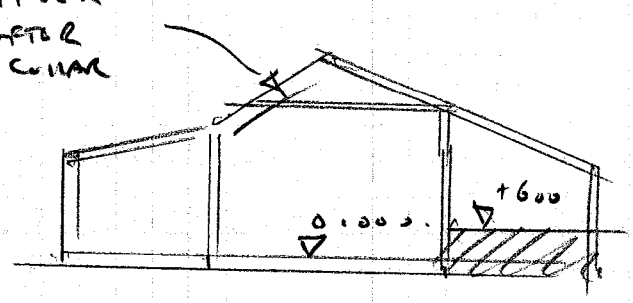
BARN B.

SK04





SECTION Y-Y



SECTION X-X

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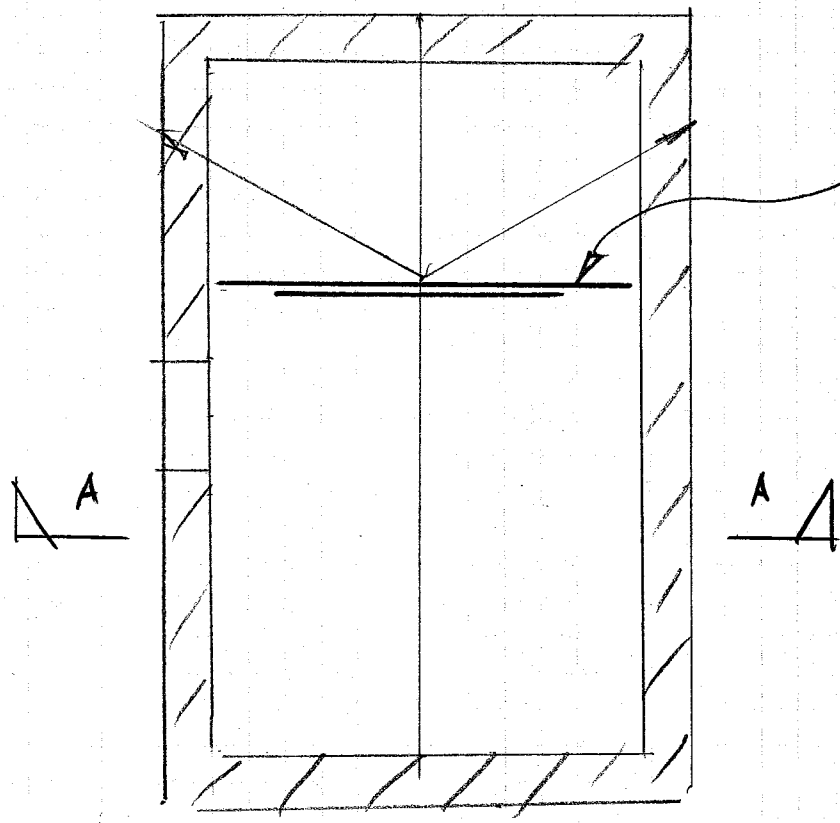
PROJECT TITLE:	LOWER WOODHOUSE FARM
PROJECT NO.:	2023067
DATE:	07.09.23
BY:	CHECK:

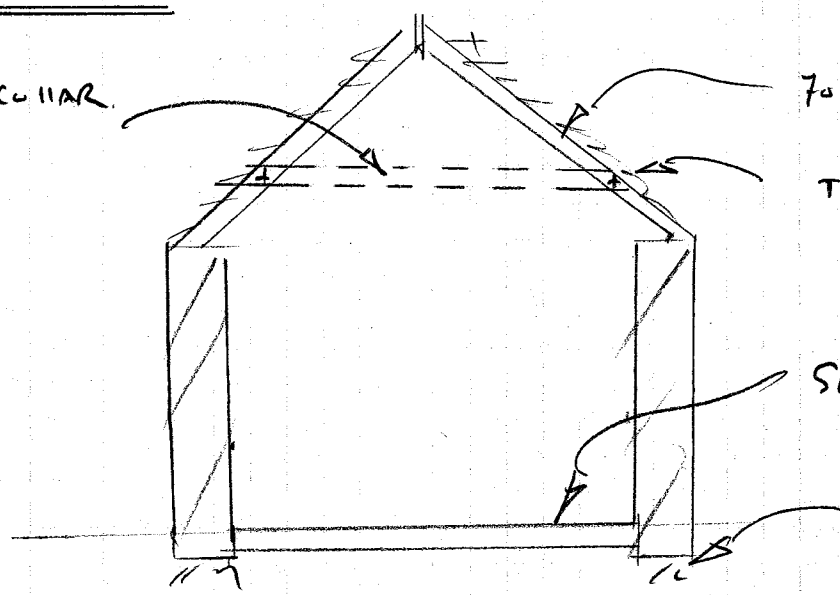
BARN C

SK05



70 x 50 RAFTERS @ 400 c/c.
ALTERNATE RAFTERS HAVE RAISED COLLARS 70x50.

PLAN



70 x 50 COLLAR.

70 x 50 RAFTERS.

TIES.

SLAB.

FOUNDATIONS UNKNOWN.

SECTION A-A