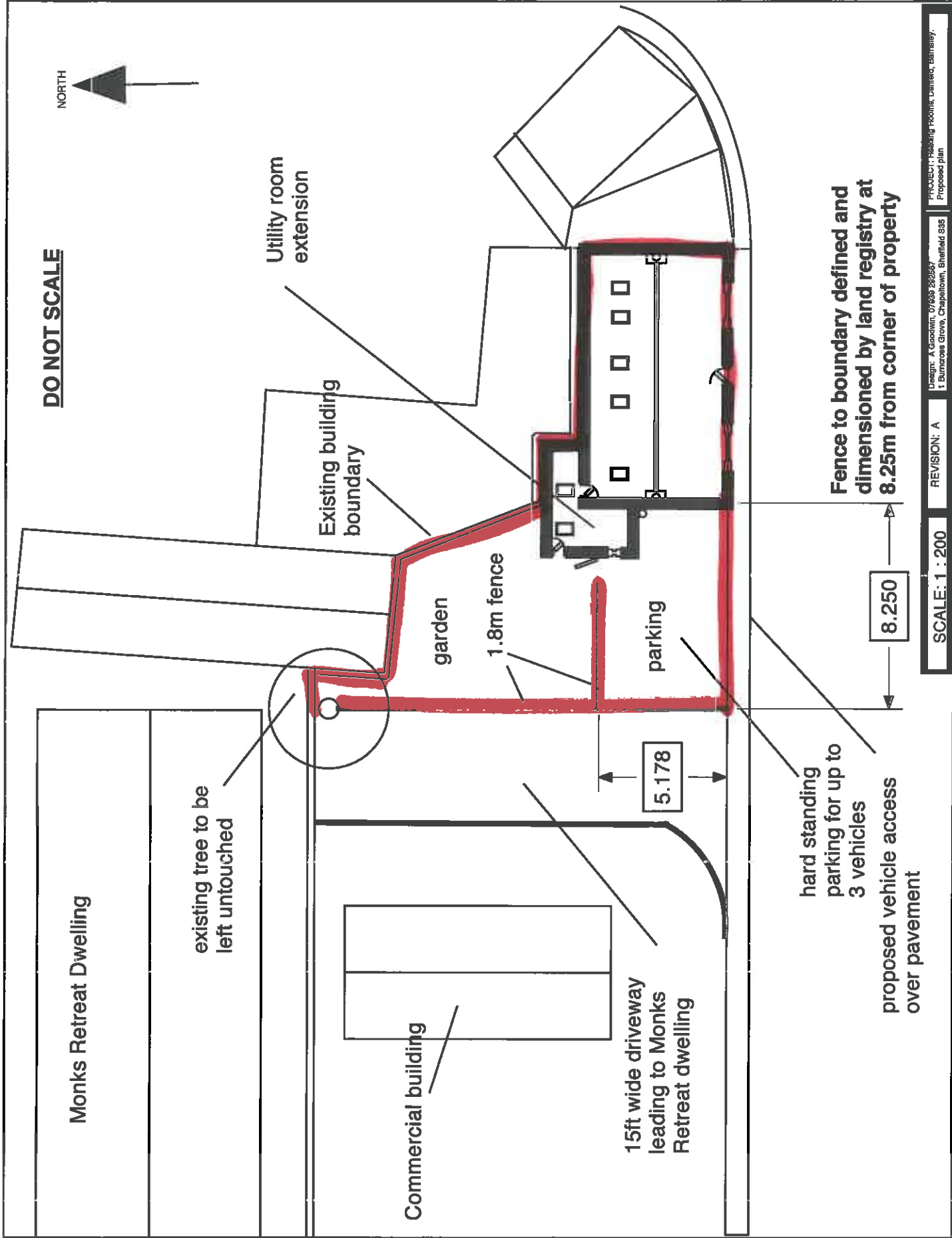
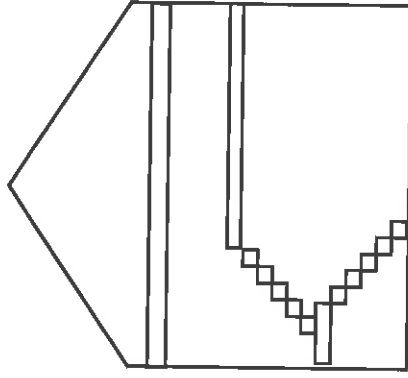
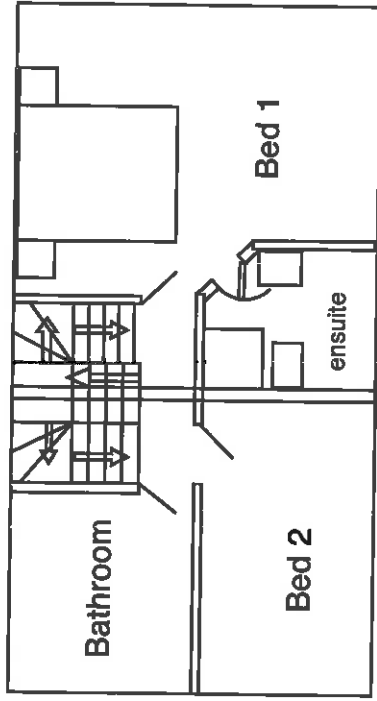




Floor plan of the first floor of a house. The plan shows a Lounge at the top, a Kitchen/Diner in the middle, and a staircase in the center. The Kitchen/Diner area includes a dining table with six chairs and a kitchen unit with a sink and stove. The Lounge area has a fireplace on the left wall and a door leading to the Kitchen/Diner. The staircase has four steps going up and four steps going down. There are two windows on the left wall of the Kitchen/Diner area and one window on the left wall of the Lounge area.

[REDACTED]

PROJECT: Reading Rooms, Darfield, Barnsley.
Proposed ground floor layout plan



FIRST FLOOR CONSTRUCTION: Timber First floor construction to structural engineers detail using 220 x 75mm C16 timber joists at 450ctr supported off heavy duty steel joist hangers on timber wall plate bolted to existing walls. Finish to top with 20mm flooring grade chipboard or floorboarding.

ROOF: Roof insulation Min U-value 0.18W/m²K to ceiling area using pur 40 insulation between rafters and foil insulation to underside. Finish ceiling with foil backed plasterboard.

VELUX WINDOWS: installed in accordance to manufacturers detail.

ELECTRICAL INSTALLATIONS: Complete rewire of entire building to be carried out professionally in accordance with electrical regulations.

LIGHT FITTINGS: Low energy light fittings throughout

INTERNAL SWITCHES/SOCKETS: Installed at appropriate heights between 450mm-1200mm from finished floor level as per building regulations.

HEATING/HOT WATER: To be provided by mains natural gas condensing boiler with SEDBUK rating A. Controlled with radiators/underfloor heating, thermostatic radiator valves, room thermostat and program/timer. Gas installation to be in accordance with current gas safety regulations and carried out by a Gas-Safe registered installer.

SMOKE ALARMS: To be in full accordance with Approved Document Part B requirements B1 of the Building Regulations.

RAINWATER GOODS: To be as per existing Black plastic trough gutters and downpipes.

SCALE: 1 : 100

REVISION: A

Design: A Goodwin, 07939 292567
1 Burncross Grove, Chapelton, Sheffield S35

PROJECT: Heading Rooms, Darfield, Barnsley.
Proposed first floor layout plan

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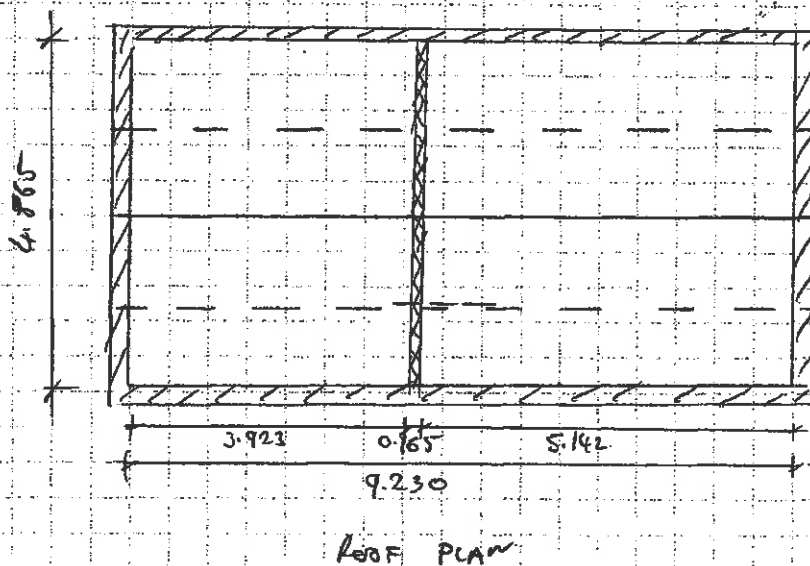
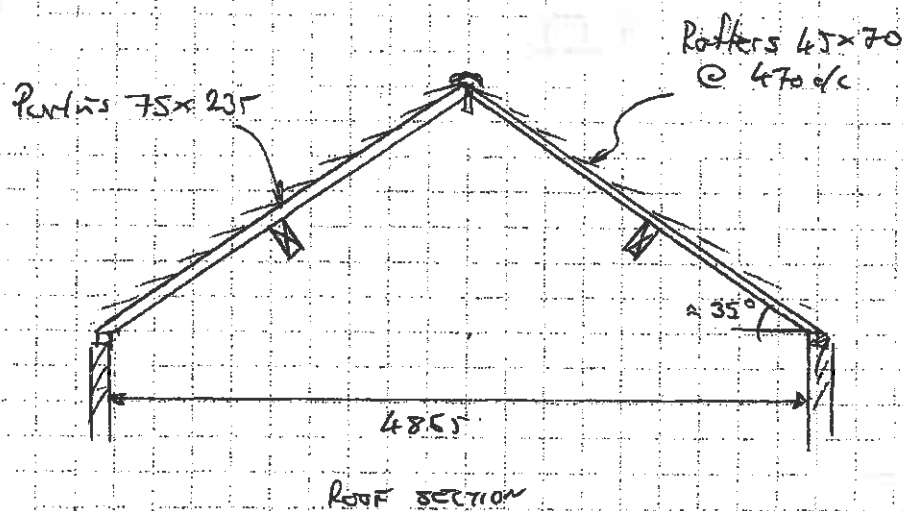
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READING ROOMS, SCHOOL STREET, DARRFIELD, BARNSELEY

CHECK CAPACITY OF EXISTING RAFTERS AND PURLINS



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Loads

$$\begin{aligned} \text{Slate Tiles} &= 0.40 \\ \text{Battens/Roofers} &= 0.070 \end{aligned}$$

$$\text{New Plaster board \& Insulation} = 0.20$$

$$\text{Services} = 0.050$$

$$0.72 / \cos 35^\circ = 0.879 \text{ kN/m}^2$$

$$\text{Snow Load} = 0.60 \text{ kN/m}^2$$

$$\underline{1.48 \text{ kN/m}^2}$$

Roofers - Max span = 1.25m (Assume C16 Grade Timber)

$$\text{UDL} = 1.48 \times 0.47 = 0.7 \text{ kN/m}$$

$$\text{BM} = 0.7 \times 1.25^2 / 8 = 0.14 \text{ kNm}$$

$$\sigma_{\text{max,all}} = \frac{0.14 \times 10^6 \times 6}{45 \times 70^2} = 3.8 \text{ N/mm}^2$$

$$\sigma_{\text{max,drift}} = 5.3 \times 1.25 \times \left(\frac{300}{70} \right)^{0.11} \times 1.1 = 8.55 \text{ N/mm}^2$$

$$> 3.8 \text{ N/mm}^2 \quad \therefore \underline{0.4}$$

$$\delta = \frac{5 \times 0.7 \times 1250^4 \times 12}{384 \times 8800 \times 45 \times 70^3} = 2 \text{ mm} = 0.16\% < 0.40\%$$

$$\therefore \underline{0.16}$$

Hence, existing roofers will be satisfactory for inclusion of new ceiling and insulation.

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Purlins Max Span = 5.2m (C24 Timber Assumed)

$$UDL = 1.48 \times 1.25 \times \cos 35^\circ = 1.52 \text{ kN/m}$$

$$RM = 1.52 \times 5.2^2 / 8 = 5.14 \text{ kNm}, R = 4.0m$$

$$\sigma_{min}/l = \frac{5.14 \times 10^5 \times 6}{75 \times 235^2} = 7.45 \text{ N/mm}^2$$

$$\sigma_{max}/l = 7.5 \times 1.25 \times \left(\frac{300}{235}\right)^{0.4} = 9.63 \text{ N/mm}^2 > 7.45 \text{ N/mm}^2$$

$$\delta = \frac{5 \times 1.52 \times 5200^4 \times 12}{384 \times 7200 \times 75 \times 235^3} = 24.8 \text{ mm} = 0.48\% > 0.4\%$$

Therefore, Unsatisfactory

Therefore, bolt an additional 50x235 timber C16 to the side of the existing purlins to provide additional stiffness. Use M12 @ 450mm staggered centres.

$$\delta = \frac{5 \times 1.52 \times 5200^4 \times 12}{384 \times 5800 \times 1.14 \times (75 \times 235^3 + 50 \times 235^3)} = 16.2 \text{ mm} = 0.31\% < 0.4\% \therefore \text{OK}$$

Assuming both
Purlins are C16 Grade
 $\therefore$ Conservative.

Check span = 4.0m

$$\delta = \frac{5 \times 1.52 \times 4000^4 \times 12}{384 \times 7200 \times 75 \times 235^3} = 8.7 \text{ mm} = 0.22\% < 0.4\% \therefore \text{OK}$$

Thus only the longest spans need additional members.

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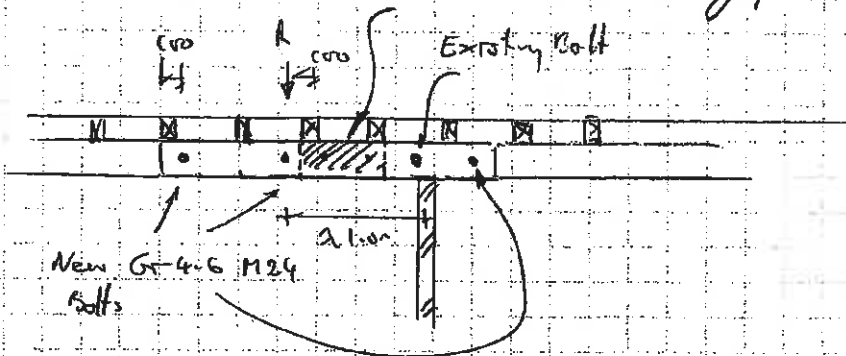
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Existing Portal Splice Connection

Connection appears to be separating due to settlement in roof. Re-bolt the splice connection as follows

Add in-fill timber blocking in gap



$$R = 4.0 \text{ kN}$$

$$G_m = 4.0 \times 1.0 = 4.0 \text{ kNm}$$

$$\sigma_{m,ed} = \frac{4.0 \times 10^6}{78.5 \times 235^2} = 5.8 \text{ N/mm}^2 < 9.63 \text{ N/mm}^2 \quad \therefore \text{OK}$$

Resisted by 21° Bolts @ 800 c/c

$$\text{Shear} = \frac{4.0}{0.8} = 5.0 \text{ kN}$$

BS 5268-2:2002 Table 7.1 - M24 Bolts $\sigma_t = 5.29 \text{ kN}$

$$\text{Edge Distances} = 4 \times 24 = 96 \text{ mm}$$

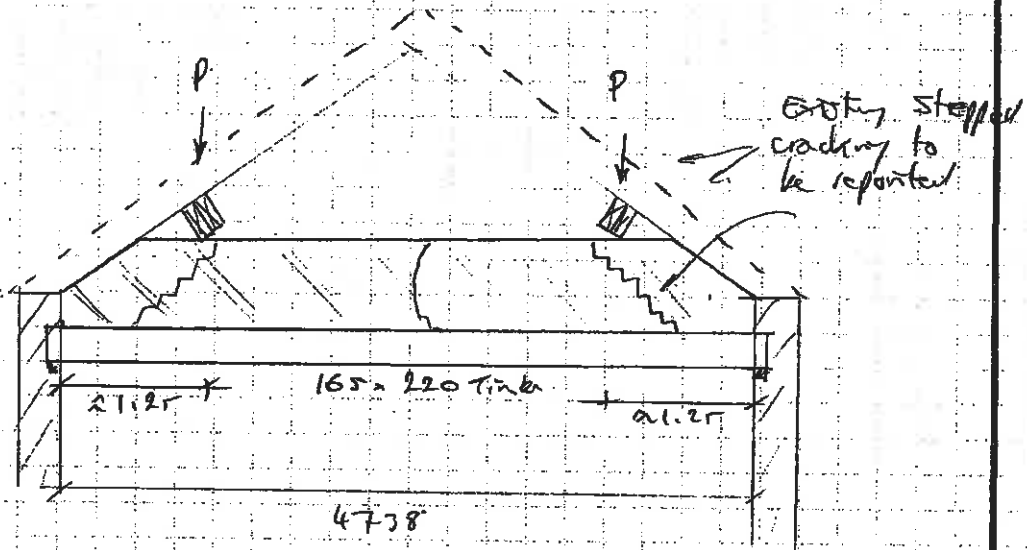
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Central Support Beam - 165 x 220 Timber



$$P = 14.8 \times 1.25 \times 9.23/2 = 8.54 \text{ kN}$$

$$\text{Wall} = 2.6 \times 0.675 = 1.8 \text{ kN/m}$$

$$\text{BM} = 8.54 \times 1.25 + 1.8 \times 4.738^2/8 = 15.7 \text{ kNm}$$

$$\sigma_{\text{max}} = \frac{15.7 \times 10^6 \times 6}{165 \times 220^2} = 11.8 \text{ N/mm}^2$$

The timber beam is a hard wood, probably oak

The cracks in the masonry is most likely that the deflection of the timber beam has been greater than a better finish would normally tolerate, however the deflection of the beam observed did not appear to be excessive

Assuming Grade THA Oak, $\sigma_{\text{max}} = 12.6 \text{ N/mm}^2$ Minimum
 $E_{\text{min}} = 10,500 \text{ N/mm}^2$

$$\text{Equivalent WDL} = \frac{15.7 \times 8}{4.738} = 5.6 \text{ kN/m}$$

$$S = \frac{5 \times 5.6 \times 4.738^4 \times 12}{384 \times 10500 \times 165 \times 220^3} = 24 \text{ mm} = \frac{5 \text{ mm}}{198}$$

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Even with THA Grade oak, the likely deflection under max load are estimated to be excessive and may cause further cracking of the wall. Therefore, provide a prop at $\frac{1}{3}$ rd spans. This will reduce deflection significantly and also reduces stresses within the beam.

- note build up masonry around the ends of the existing purlins to prevent rotation at the supports.
- Alternative to propping the existing timber beam is to replace the timber beam with a new steel beam.

$$BM = 15.7 \times \frac{14.5}{8} = 23 \text{ kNm}, \quad R = 18.5 \text{ kN}$$

$$\text{Equivalent } w_k = \frac{15.7 \times 8}{4.738^2} = 5.6 \text{ kN/m}$$

$$I_{reqd} = 3.18 \times 5.6 \times 4.738^3 = 1894 \text{ cm}^4$$

$$L_e = 1.2 \times 4.738 + 2 \times 0.2 = 6.1 \text{ m}$$

$$\therefore \boxed{\text{Use } 203 \times 133 \times 30 \text{ UB}} \quad M_b = 32.8 \text{ kNm}$$

$$I_x = 2900 \text{ cm}^4$$

By inspection use eng brick padstone or cast in-situ.

150 x 100 x 75 dp mass concrete padstone

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Main 1st Floor

Floor Joists - Spans = 4.74m

$$UDL = 2.0^k \times 0.45 = 0.90 \text{ kN/m}$$

$$BM = 0.90 \times 4.74^2 / 8 = 2.53 \text{ kNm}$$

Try 75 x 220 C16 Joists

$$\sigma_{m,all} = \frac{2.53 \times 10^6 \times 6}{75 \times 220^2} = 4.8 \text{ N/mm}^2$$

$$\sigma_{m,adm} //: 5.3 \times 1.1 \times \left(\frac{300}{220}\right)^{1.1} = 6.0 \text{ N/mm}^2$$

$$\delta = \frac{5 \times 0.9 \times 4740^4 \times 12}{384 \times 8800 \times 75 \times 220^3} = 10.1 \text{ mm} = 0.21\% < 0.3\% \quad \therefore \text{OK}$$

Trimmers to Stairwell

$$UDL = 2.0^k \times \left(\frac{2.4}{2} + \frac{0.45}{2}\right) = 3.0 \text{ kN/m}$$

$$BM = 3.0 \times 4.74^2 / 8 = 8.43 \text{ kNm}$$

$$\sigma_{m,all} = \frac{8.43 \times 10^6 \times 6}{3 \times 75 \times 220^2} = 4.64 \text{ N/mm}^2 < 6.0 \text{ N/mm}^2 \quad \therefore \text{OK}$$

$$\delta = \frac{5 \times 3.0 \times 4740^4 \times 12}{384 \times 5800 \times 1.21 \times 3 \times 75 \times 220^3} = 14.1 \text{ mm} = 0.3\% \quad \therefore \text{OK}$$

$\therefore$ Provide 3 no 75 x 220 C16 Joists

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Support Across window and doors

Max clear opening: 2.1m.

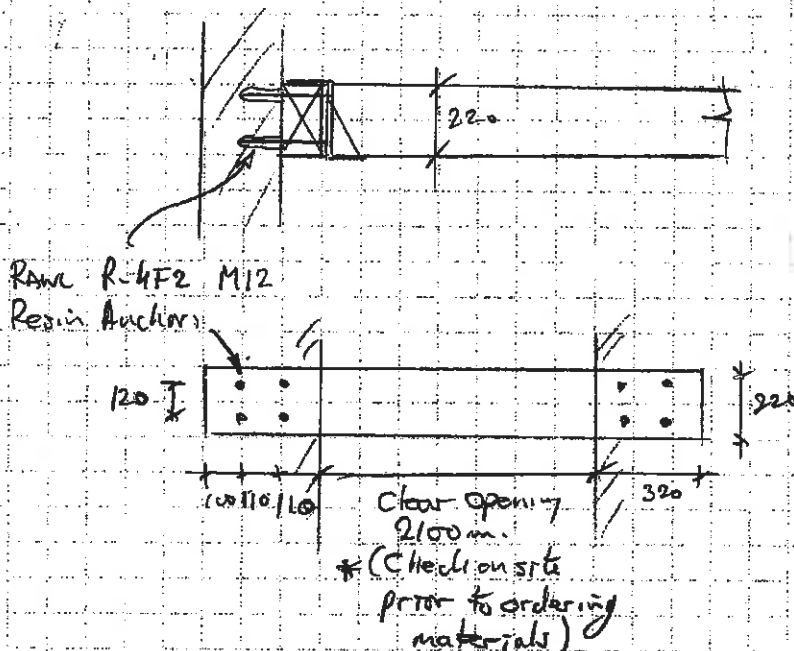
$$UDL = 2.0^2 \times \frac{4.74}{2} = 4.74 \text{ kN/m}$$

$$BM = 4.74 \times \frac{2.1^2}{8} = 2.61 \text{ kNm}, \quad R = 4.8 \text{ kN}$$

$$\sigma_{max,all} = \frac{2.61 \times 10^6 \times 6}{75 \times 220^2} = 4.31 \text{ N/mm}^2$$

$$\sigma_{max,adm,all} = 5.3 \times \left(\frac{3000}{220}\right)^{0.11} = 5.48 \text{ N/mm}^2 \quad \therefore \text{O.K.}$$

$$\delta = \frac{5 \times 4.74 \times 2100^4 \times 12}{384 \times 58000 \times 75 \times 220^3} = 31 \text{ mm} = 0.15\% < 0.5\% \quad \therefore \text{O.K.}$$



$$\text{Shear Capacity of 4x12 bolts} = 4 \times 2.0 = 8 \text{ kN} > 4.8 \text{ kN}$$

$$\text{Pull-out in top bolts} = \frac{4.3 \times 0.075}{0.17} = 1.06 \text{ kN} = 0.53 \text{ kN}$$

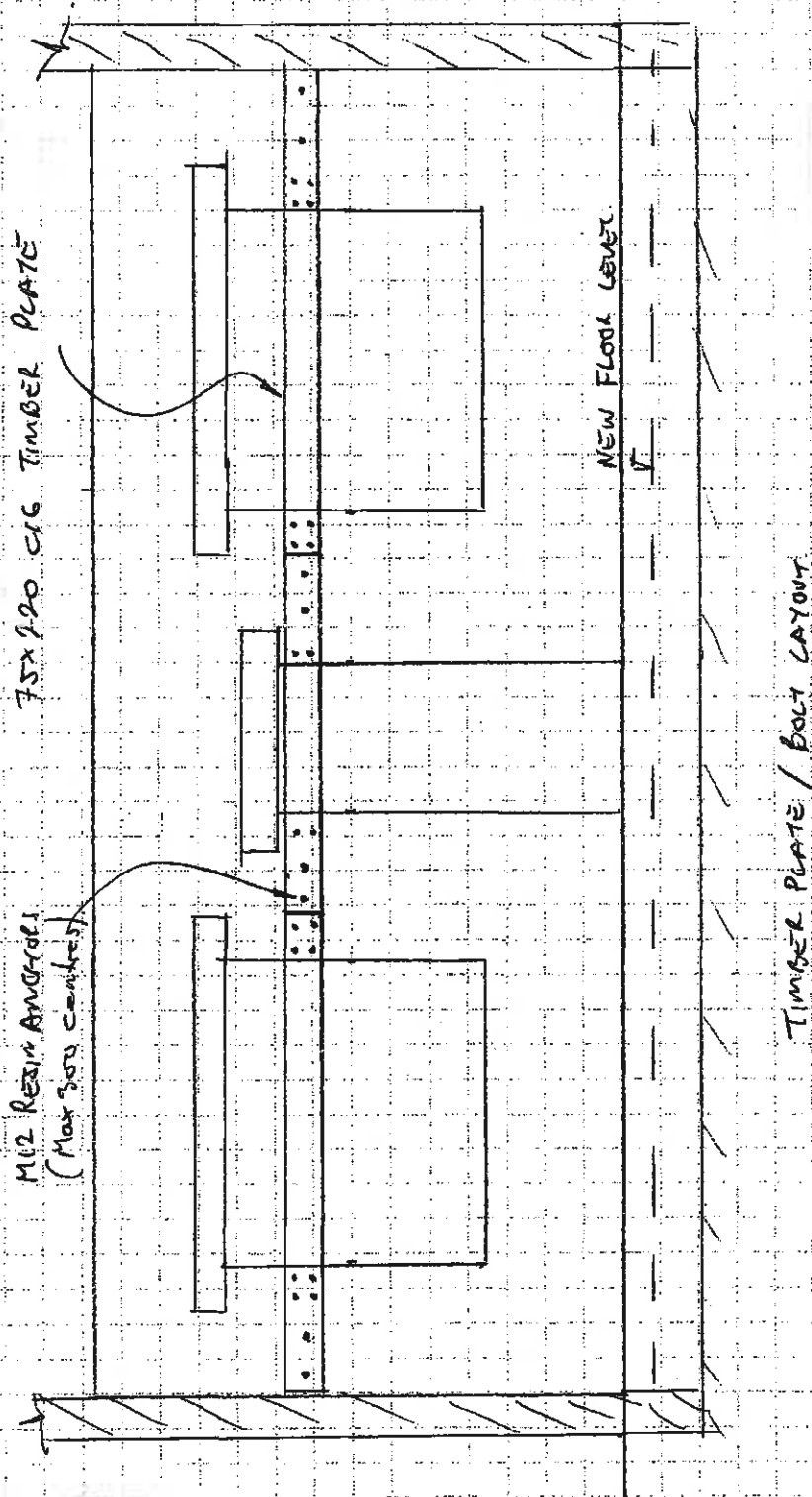
$$\text{Combined Shear/Tension} = \frac{4.8}{2.0} + \frac{0.53}{2.0} = 0.86 < 1.2 \quad \therefore \text{O.K.}$$

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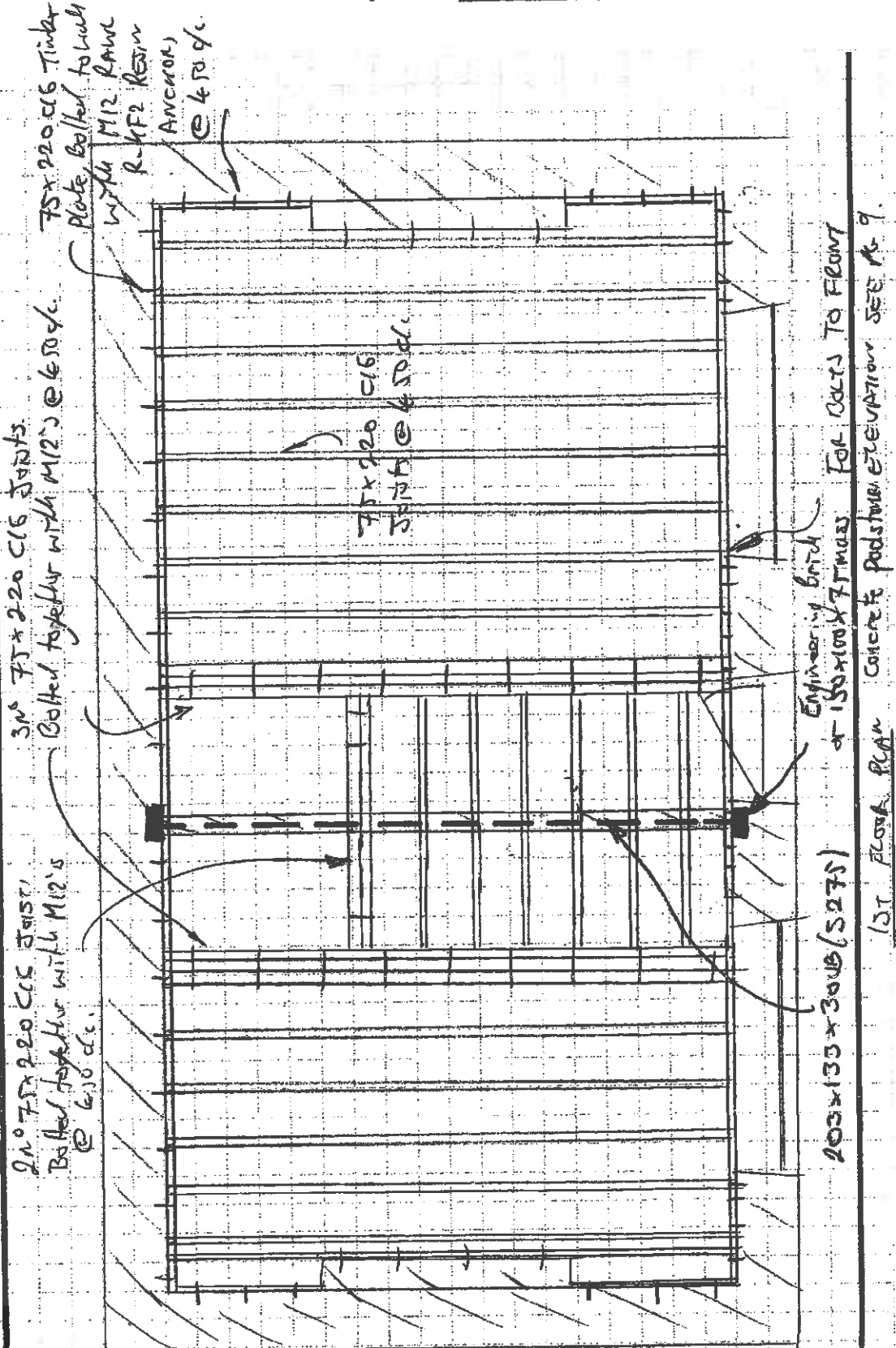


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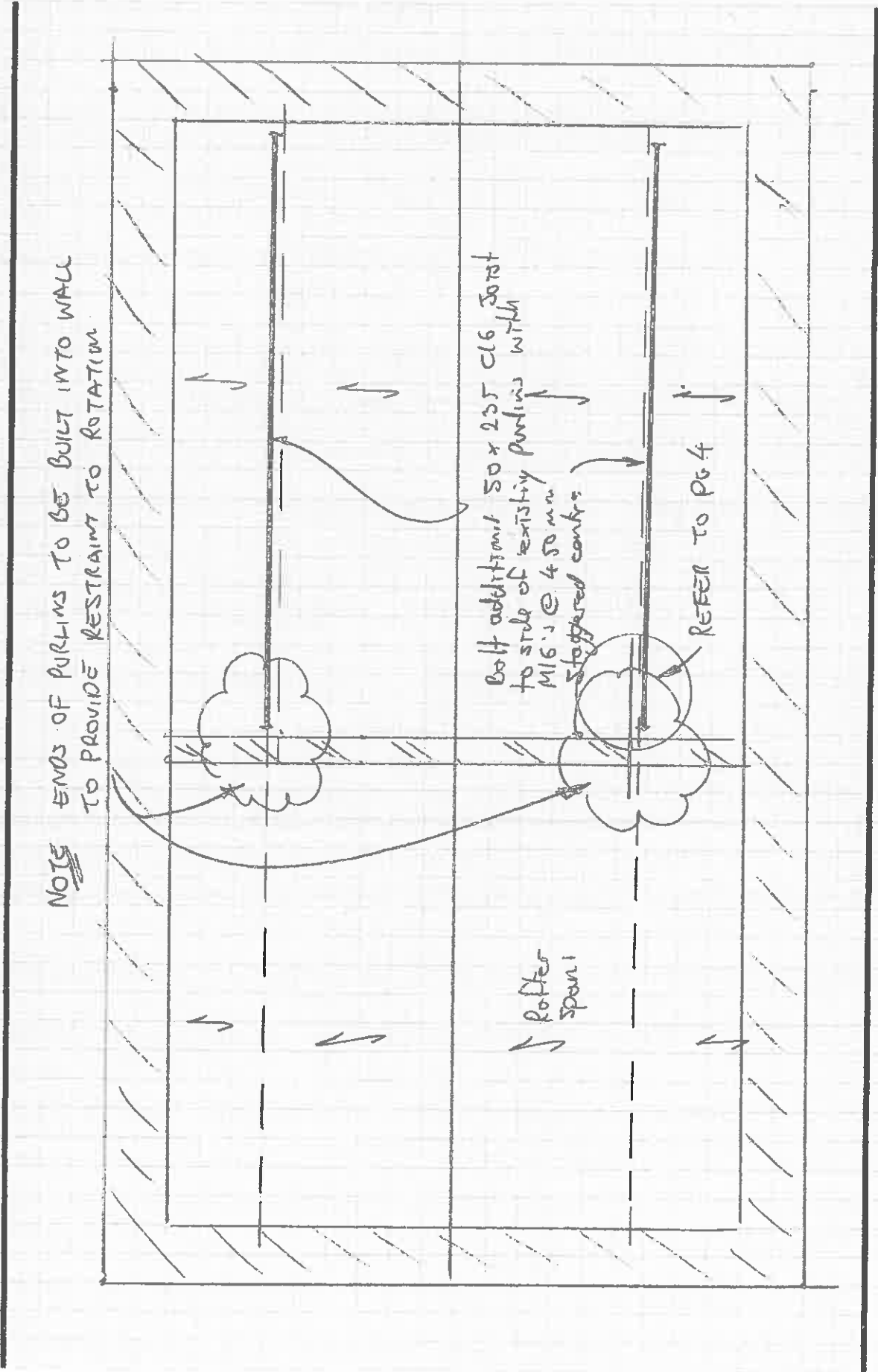


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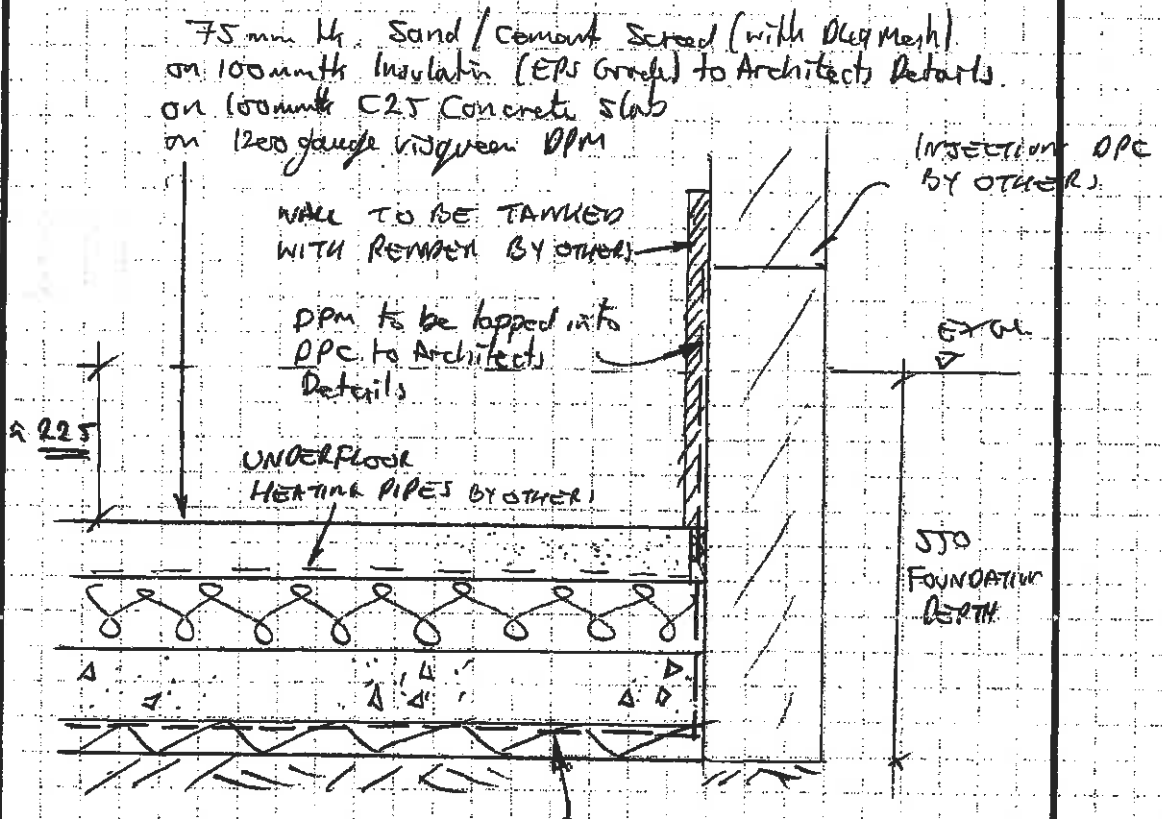
Roof Plan

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- PROOF ROLL FORMATION AND REPLACE ANY SOFT SPOTS WITH TYPE 1 SUB-BASE COMPACTED IN 150mm MAXIMUM LAYER THICKNESS.
- PROVIDE MIN 50mm TYPE 1 SUB-BASE BENEATH SLAB BLINDED WITH FINES.

SECTION THRO' EXISTING WALL
AND PROPOSED FLOOR LEVEL.

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General Construction Notes

1. Do not scale from any drawings
2. The contractor is to verify all dimensions on site before commencing workshop or preparatory drawings
3. Use mass concrete C25 padstones for levelling of beams if required UNO.
4. Ends of beams to be effectively built into walls where possible
5. For any new beams supporting existing load bearing walls and concrete floor, beams are to be pre-deflected (Span/500) using folding steel wedges. Gaps to be filled with slate and dry pack mortar prior to removing any temporary works.
6. Steelwork to be blast cleaned to SA2.5 and primed with zinc phosphate epoxy primer (80 μ m).
7. All walls and floors to be propped prior to demolition of any loadbearing walls / beams.
8. Contractor is to be responsible for the design, maintenance and erection of any temporary works necessary.
9. Any discrepancies to be notified to S.E
10. These notes are to be read in conjunction with all engineers and architects drawings and specifications.

Mr A Goodwin
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Chapletown
Sheffield
S35 1RB

14 Lyminton Lane
Treeton, Rotherham, S60 5UG
(0114) 2548338 Tel
www.cronusdesignltd.co.uk
Company Registration No. 7786838

CR-12036

8th May 2014

Dear Mr A Goodwin

RE: Reading Rooms, School Street, Darfield, Barnsley, S73

Further to our meeting on the 29th April 2014, we enclose advice on the proposed works and repairs necessary to the building. Structural calculations have been issued separately relating to other refurbishment works required.

Rear Wall

Viewed internally a roughly vertical 25mm wide crack was observed at mid span of the wall. The crack coincides with the support location of the timber beam, which in turn supports a brick wall and the roof purlins above. This crack should be repaired to reintroduce the structural integrity of the wall. This can be done by two different methods. The first is to locally rebuild the masonry to reintegrate the wall across the crack using non-hydraulic lime mortar. The second method is to use crack stitching using 1m long helifix bars at 450mm vertical centres.

The method for crack stitching is to cut 45mm deep by 10mm wide slots into the masonry wall, preferably along existing bedding joints. The 6mm diameter helifix bars should then be grouted into the slots using Helibond cementitious grout. The bedding joints can then be finished with a non-hydraulic lime mortar to match the existing.

Existing Floor Supports

The existing timber floor is to be removed and replaced with a traditional insulated concrete floor with underfloor heating and sand/cement screed finish.

At the edges to the gable walls the masonry has been built out to provide a direct bearing support to the timber floor joists. The build outs will be removed to accommodate the new concrete floor construction by trimming the masonry back locally to match the existing internal wall vertical alignment. Any sleeper walls will also need to be removed.

The hearths around the fireplaces are to be removed to make space for the new floor as they will become redundant in the proposed alterations.

Removal of the build outs and hearths will not affect the structural stability of the walls. Introduction of the concrete ground bearing slab will provide additional support to the base of the walls and will be beneficial to the structure.

Left Hand Gable End

The single storey brick off-shot is to be demolished with the remaining door opening to be closed using blockwork and timber stud. The door opening is currently supported by timber lintels and the removal of the off-shot and door frame should not be detrimental to the stability of the structure. The timber lintels should be checked for rot and infestation when access is more readily available. If any structural defects are found, the timber lintels should be replaced with concrete lintels as necessary.

On the rear elevation an old doorway is to be opened up for access. The presence and height of lintels should be checked on site.

The proposal is to form a new single storey pitched roof extension which will wrap around the rear wall and gable end. The existing boundary walls to the back of the building are to be utilised to support the rear walls and roof structure to the proposed extension. Based on the existing configuration of the existing boundary walls, this area previously contained a mono pitch roof and is considered to be capable of supporting a new mono-pitch roof structure. Since the loss of the existing mono-pitch roof the boundary walls have suffered from weather and vegetation ingress. The walls should therefore be repaired by removing the top 2 or 3 courses as necessary and rebuilding the walls locally to reintroduce structural integrity. The masonry leaves should be tied together using Ancon Staifix R/R and resin fixed into the masonry. A sleeve may be necessary to retain the resin within the wall. Alternatively the walls could be completely rebuilt using traditional methods and masonry ties.

The proposed extension will require strip footings to support the new walls which need to be a minimum of 600mm wide by 300mm thick. The overall depth of the footings should match the existing building which are around 550mm below the existing ground level at the front door, or as directed by the Building Control Office on site.

Should you have any queries in connection with the above please contact me.

Yours Sincerely



James Roberts
Director