HSH
**Structural design calculations**
Address: 498 Edge Lane Sept 2023
Proposed Alterations

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# STUCTURAL DESIGN CALCULATIONS FOR PROPOSED ALTERATIONS 498 EDGE LANE

rev A
Rear chimney support added

**Introduction:**

The purpose of these calculations is to present only the main structural elements required form the proposed alterations, in support of building regulation submission.
**The design is limited to the elements considered and the duties of principle designer is not undertaken.**

**Existing building framing:**

The property is a traditional two storey house with load bearing masonry walls, timber floors and tiled timber roof construction.

**Proposal:**

Conversion of roof space into habitable space

<u>Generally worst case beams considered and some are sized by comparison</u>

Lateral stability is achieved by standard floor diaphragm action spanning between internal cross walls and compliance size masonry piers.

***Summary of the design calculations is shown on sketches. The details are indicative and only for general guidance for the builder. The builder must check on site suitability and applicability and if the builder is not sure has any doubt or find any discrepancy then structural engineer must be consulted for further guidance and/or advice.***

These calculations do not constitute a structural appraisal of the building. It is the client responsibility employs an experienced contractor who has full knowledge and understanding of current good building practice.

The calculations are not to be used as working drawings and any setting out dimension should be checked by the builder on site prior to work commencing/ordering materials.

Where these calculations are used to obtain building control local authority approvals, no reliance shall be placed upon them and contained herein are not to be used until such approval have been given in full.

## Structural Reliability - in accordance with BS EN 1990 App B

| | |
|---|---|
| Consequences Classes: | CC2 |
| Reliability Class: | RC 2 |

Steel Execution **class EXC 2**
Durability: Comply with building regulation class 1 , minimum strapping requirements
Design life 50years

## Disproportionate Collapse Requirement

The building domestic and under 4 storey high therefore it classed as 1 low risk group.

floors to walls as described in BS 5628: Part 1; 1992 Clause 28.2.2, and Appendix C, if a strap is added to figures 23, 24 and 25.
straps at 2m maximum but 1.2m is recommended

Examples of horizontal and vertical tying

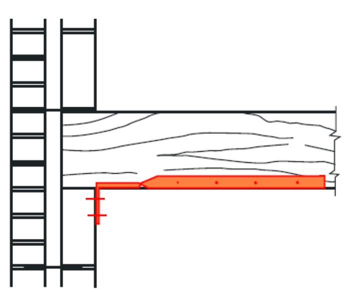


Figure 2: face fix strap to existing building straps at 1.2m c/c

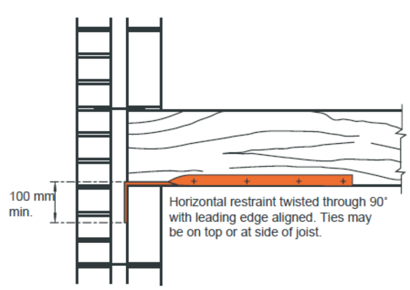



Figure 3: Timber floor bearing directly onto a wall

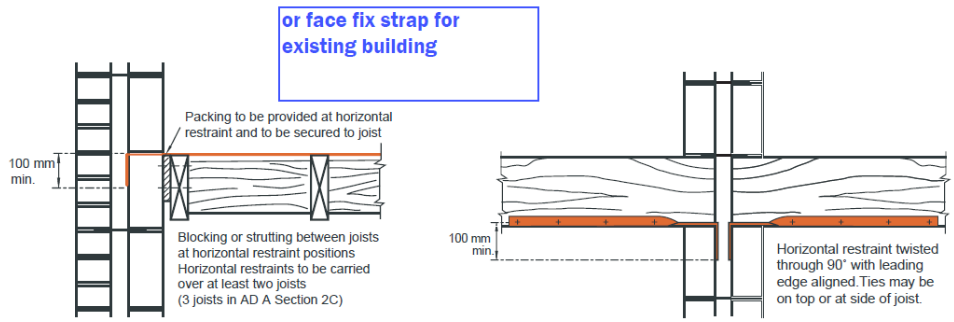



**Figure 10:** Timber floors abutting a wall

**Figure 11:** Timber floor bearing directly onto a cavity separating wall

## References

All Design work is to be carried out in accordance with the Building Regulations and the appropriate British standards and Code of Practice.

Architectural drawings

## General Construction Notes (as applicable)

- It is the responsibility of the Builder/Contractor to ensure that all temporary and permanent construction works are carried out in a safe, competent and professional manner, to good standard of workmanship and in accordance with recognized good building practice
- Temporary support/Needle beams must be designed for a minimum line load of 20 kN/m wall run (where needle beams are to be used, they must be placed at no more than 500mm above new lintels level).
- The Contractor is recommended to refer to the guidance given in the following Building Research Establishments Good Building Guide;
  1. No. 15 - " providing temporary support during work openings in external walls" and

2. No. 20 - "Removing internal load –bearing walls in older dwellings"

- The Contractor is responsible for checking and taking all necessary measurements on site prior to any fabrication, material order and/or commencement of work
- The builder is responsible for the quality of materials and workmanship to carry out the works. All proprietary products to be installed in accordance with the manufacturers recommendations.
- **All main steelwork to be Grade S355 (43) and steel flats to be S275 to BS EN 10025.**
- **All Internal steelwork to have one coat of Zinc Rich Primer 75µ. Touched up where damaged.**
- **Steel lintels to have 1/2hr fire resistance, to Building Regulation specifications**
- **Steel beam ends to be fully built into exiting walls.**
- **Steel beams are heavy and will require mechanical lifting aids. The builder must apply all the appropriate health and safety measure splice o be designed where required.**
- **Floor and roof levels around perimeter wall at 1.2m c/c.**
- It is the responsibility of the Builder/Contractor to ensure that all temporary and permanent construction works are carried out in a safe, competent and professional manner, to good standard of workmanship and in accordance with recognized good building practice
- The Contractor is responsible for checking and taking all necessary measurements on site prior to any fabrication, material order and/or commencement of work
- Lintel beam installed into new opening in existing masonry walls to be slate wedged and mortar packed (dry mix 1 cement: 3 sand) between the soffit of the opening and the top of then lintel, in order to transfer the load onto the lintel.

- All work to comply with the current Building Regulation requirements. All work to be carried out to the satisfaction of the local Authority Building Inspector.
- All TIMBER RAFTERS/JOISTS to be connected with metal truss clip, or similar, to hips and wall plate.
- **Internal load bearing walls, including party walls must be checked by the builder for condition and thickness prior to beam installations.**

- Foundation General
  Existing foundation to be exposed and checked for embedment depth required of 0.75m below ground floor level to allow spread and for soil capacity required of 100 kN/m2 ( such as dense sand or firm to stiff clay) to the satisfaction of the building control inspector. If the ground looked soft and/suspect, enlarge/underpin locally with mass concrete.
  ~~Effects of adjacent trees will need to be considered on foundation depth if the encountered soil is clay type strata which require the builder to seek further advice from structural Eng, NHBC guidance and/or Building inspector~~
  ~~When digging for new wall foundation care need to be taken not undermine existing foundation, boundary foundation, neighbouring building foundation and existing drains.~~
- ~~All new foundations to be of adequate width (600x450mm thick minimum UNO) and taken down to suitable depth (900mm minimum) confirmed by the building inspector~~

- There is always a possibility that some initial settlement may occur due to load re-distribution and the supporting ground strata slight consolidation. This is unavoidable in these situations but will not be a recurring problem. The client may need to carry out some re-decoration when the movement has ceased.

## Construction (Design & Management) Regulations 2015:

- Under the C(D&M) Regs the designer's responsibility is limited to the reasonably foreseeable risks to persons involved in the construction, maintenance and repair of a structure from hazards that arise from the design. Therefore, this DRA only assesses the possible hazards that may arise from the specific structural design at this stage of the project. Should any alterations to the structure be carried out without the knowledge of the designer then no responsibility can be attributed.
- It is the Contractors responsibility to use this document for the construction and future maintenance of the building as designed at this stage. This is not a Method Statement.
- Under the C(D&M) Regulations 2015 it is the clients responsibility to ensure that every person designing the structure and every contractor who has been or may be appointed to work on the project is promptly provided with sufficient preconstruction information to ensure so far as is reasonably practicable the health and safety of all persons engaged in the construction work, liable to be affected by the way in which it is carried out, and who will use the structure in future.

## Designers Risk Analysis:

Considerations to be given are:

During initial construction,

Noise and vibrations. Not only consider the effects these may have on workers but also neighbours.

1. Contamination,
   Where ground may be contaminated may need to consider substructure works that do not allow leaching through surface etc.
2. Falls from height, generally over 2m. These include around edges of deep excavations, upper floor and roof edges.
3. Collapse of the structure under both temporary and permanent imposed loads.
4. Handling of structural elements.
5. Consideration must be given to the weight of elements specified and whether mechanical handling is feasible. Otherwise consider splicing beams and columns etc or the use of lightweight masonry if acceptable.
6. Fire.
   Although on site welding may be necessary, using this near combustible materials is not wise.

Long term,

7. Falls from height, generally over 2m. Consideration should be given for the future maintenance of the building such as ladder restraint to upper walls.
8. Collapse of the structure under the permanent imposed loads. The structural elements should be clearly marked on the drawings.

## DEMOLITION/WALLS REMOVAL NOTES:

NOTE:

CONTRACTOR TO CONFIRM HIS PREFERRED METHOD AND SEQUENCE OF DEMOLITION WORKS PRIOR TO ANY WORKS TAKING PLACE. MEETING TO TAKE PLACE WITH ENGINEER TO DISCUSS CONTRACTORS PROPOSALS AND TEMPORARY WORKS REQUIREMENTS.

DEMOLITION NOTES:

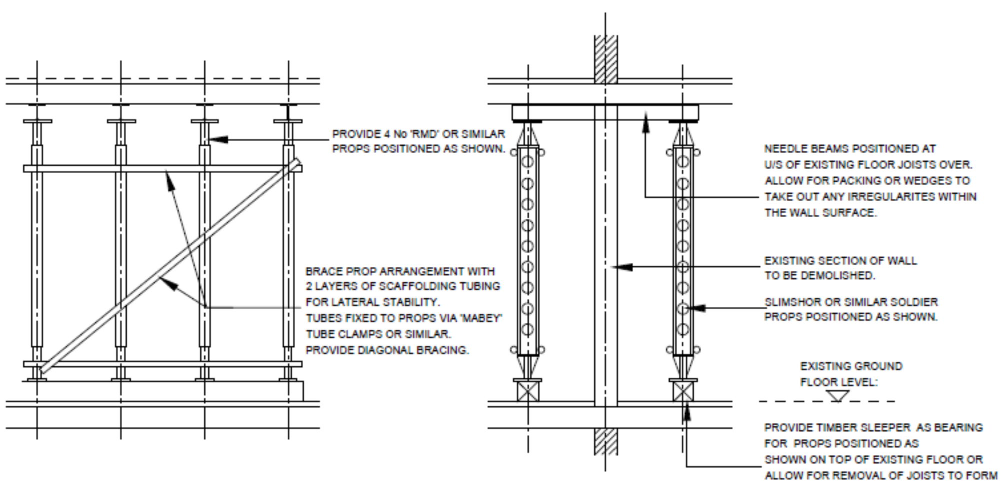
1. DEMOLITION CONTRACTOR TO CONFIRM ALL FLOOR SPANS AND FLOOR CONSTRUCTION PRIOR TO ANY DEMOLITION TAKING PLACE.
2. DEMOLITION CONTRACTOR TO CONFIRM ALL WALL CONSTRUCTION PRIOR TO ANY DEMOLITION TAKING PLACE.
3. DEMOLITION CONTRACTOR TO SUBMIT METHOD STATEMENTS TO ENGINEER FOR REVIEW AND COMMENT PRIOR TO ANY WORKS BEING CARRIED OUT.

DEMOLITION NOTE **:

PROPOSED NEW OPENINGS THROUGH EXISTING WALLS AT FLOOR LEVEL WILL REQUIRE THE FOLLOWING TEMPORARY WORKS:

ALSO REFER TO MAIN DEMOLITION NOTES:

1. THE EXISTING WALL AT FIRST FLOOR LEVEL OVER WILL NEED TO BE NEEDLED AND PROPPED PRIOR TO REMOVAL OF WALL AT GROUND FLOOR LEVEL.
2. A FIRM BASE WILL BE REQUIRED TO SUPPORT THE PROPS AT GROUND FLOOR LEVEL AND THIS MAY REQUIRE SECTIONS OF THE EXISTING GROUND FLOOR TO BE REMOVED TO FORM A FIRM BASE OR ALTERNATIVELY SPREADER BEAMS COULD BE USED.




INDICATIVE PROPPING & BRACING PROPOSALS - 1:50:

**Loading**

| | | |
|---|---|---|
| Tiles | | 0.55 kN/m2 |
| Felt + Battens | | 0.05 kN/m2 |
| Rafter | | 0.12 kN/m2 |
| Insulation +Plaster Board | | 0.12kN/m2 |
| On Plan Roof Loading, | Total | 0.84 kN/m2 |
| For Typical Roof Pitch 30 degree | ∴Total = | 1.0 kN/m2 |
| Flat Roof dead | | 0.60 kN/m2 |
| Roof Imposed Loading | | 0.60 kN/m2 |
| Floor Dead loading | | 0.5kN/m2 |
| Floor imposed | | 1.50 kN/m2 |

**Walls**

| | |
|---|---|
| Brickwork, 102mm | 2.10 kN/m2 |
| Blockwork, 100mm (1350kg/m3 ) | 1.35 kN/m2 |
| Plaster Finish, 12.5 mm | 0.12 kN/m2 |

## SuperBeam Project Summary

Project started Jan 2022 by NK
Site address: 498 Edge Lane
Job: structrual design
Client: 01

**ITEMS:**

1: Beam: Dormer joists
Span: 3.6 m. Reactions: R1: 0.86 kN R2: 0.86 kN
Use 50 x 150 C16

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2: Beam: ridge
Span: 5.0 m. Reactions: R1: 12.70 kN R2: 12.70 kN
Use 152 x 152 x 23 UC S355
Bearing R1: 250 x 100 mm padstone
Bearing R2: As R1

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3: Beam: dormer window lintel
Span: 2.1 m. Reactions: R1: 2.65 kN R2: 2.65 kN
Use 2no 50 x 150 C16

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4: Beam: chimney beam
Span: 3.65 m. Reactions: R1: 5.97 kN R2: 5.26 kN
Use 152 x 89 x 16 UB S355
Bearing R1: 89 x 100 mm padstone
Bearing R2: Not specified

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5: Beam: Loft Beam1 support dormer face
Span: 2.0 m. Reactions: R1: 12.90 kN R2: 8.72 kN
Use 127 x 76 x 13 UB S355
Bearing R1: 125 x 100 mm padstone
Bearing R2: 125 x 100 mm padstone

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6: Beam: floor joists
Span: 3.65 m. Reactions: R1: 1.46 kN R2: 1.46 kN
Use 75 x 150 C16

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7: Beam: stair trimmer
Span: 1.6 m. Reactions: R1: 4.16 kN R2: 4.16 kN
Use 2no 50 x 150 C16

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8: Beam: trimmer 2
Span: 3.65 m. Reactions: R1: 3.45 kN R2: 3.63 kN
Use 127 x 76 x 13 UB S355
Bearing R1: 76 x 100 mm padstone
Bearing R2: Not specified

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9: Beam: Loft front Beam 1
Span: 5.0 m. Reactions: R1: 17.82 kN R2: 12.56 kN
Use 203 x 102 x 23 UB S355
Bearing R1: 400 x 100 mm padstone
Bearing R2: Not specified

10: Beam: ground floor knockthrough
Span: 1.6 m. Reactions: R1: 14.22 kN R2: 12.06 kN
Use 152 x 89 x 16 UB S355
Bearing R1: 125 x 100 mm padstone
Bearing R2: 125 x 100 mm padstone

| | |
|---|---|
| **Site: 498 Edge Lane** | **Made by NK** |
| **Job: structrual design** | **Page 12** |
| **Job number:** | **Client copy** |

SuperBeam 7.05b 411924 **dormer loft+ alteration +chimn .SBW** **Printed 14 Sep 2023 09:23**

**Beam: Dormer joists** **Span: 3.6 m.**

| | | *Load name* | *Loading w1* | *Start x1* | *Loading w2* | *End x2* | *R1comp* | *R2comp* |
|---|---|---|---|---|---|---|---|---|
| U | D | Flat roof dead | 0.60x0.4 | 0 | | L | 0.43 | 0.43 |
| U | L | Flat roof live | 0.6x0.4 | 0 | | L | 0.43 | 0.43 |
| | | | | | | Total load: 1.73 kN | **0.86** | **0.86** |
| | | | | | | *Dead:* | *0.43* | *0.43* |
| | | | | | | *Live:* | *0.43* | *0.43* |

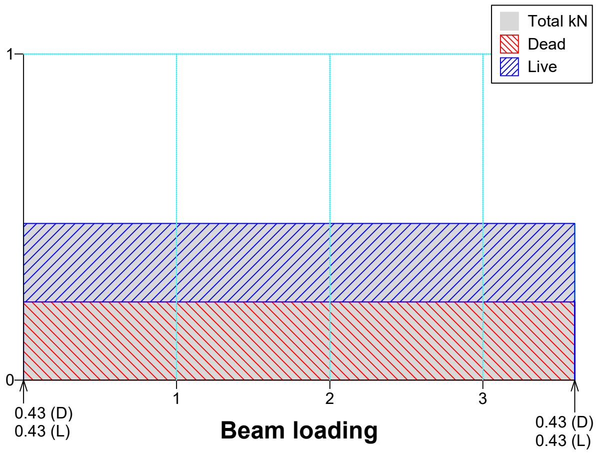
*Load types: U: UDL D: Dead; L: Live (positions in m. from R1)*

Maximum B.M. = 0.778 kNm at 1.80 m. from R1

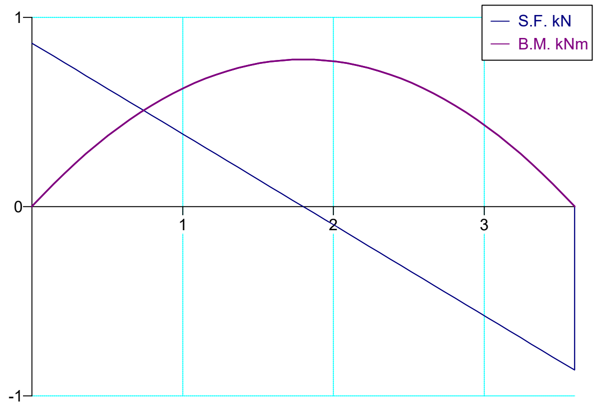
Maximum S.F. = 0.864 kN at 0.00 m. from R1

Live load deflection = 0.525 x $10^8$/EI at 1.80 m. from R1 *(E in N/mm², I in cm⁴)*

Total deflection = 1.05 x $10^8$/EI at 1.80 m. from R1




**Beam loading**




**Bending moment and shear force**

*Timber beam calculation to BS5268 Part 2: 2002 using C16 timber*

**Use 50 x 150 C16** *2.8 kg/m approx*

z = 187.5 cm³ I = 1,406 cm⁴

Timber grade: C16 Load sharing system: $K_8$ = 1.1 [§2.10.11]

$K_3$ (loading duration factor) = 1.25 (medium term)

$K_7$ (depth factor) = $(300/150)^{0.11}$ = 1.08 [§2.10.6] $K_8$ (load sharing factor) = 1.1 [§2.9,2.10]

E = 8,800 N/mm² ($E_{mean}$)

**Bending**

Permissible bending stress, $\sigma_{m,adm} = \sigma_{m,g}.K_3.K_7.K_8$ = 5.3 x 1.25 x 1.08 x 1.1 = 7.86 N/mm²

Applied bending stress, $\sigma_{m,a}$ = 0.778 x 1000/187.5 = 4.15 N/mm² OK

**Shear**

Permissible shear stress, $\tau_{adm,//} = \tau_{g,//}.K_3.K_8$ = 0.67 x 1.25 x 1.1 = 0.92 N/mm²

Applied shear stress, $\tau_a$ = 0.864 x 1000 x 3/(2 x 50 x 150) = 0.17 N/mm² OK

**Deflection**

Bending deflection = 1.05 x $10^8$/(8,800 x 1,406) = 8.48 mm

Mid-span shear deflection = 1.2 x 0.778 x $10^6$/((E/16) x 50 x 150) = 0.23 mm

Total deflection = 8.48 + 0.23 = 8.71 mm (0.0024 L) <= 0.003L OK

| Site: 498 Edge Lane | Made by NK |
|---|---|
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| SuperBeam 7.05b 411924 dormer loft+ alteration +chimn .SBW | Printed 14 Sep 2023 09:23 |

**Beam**: **ridge** **Span: 5.0 m.**

| | | *Load name* | *Loading w1* | *Start x1* | *Loading w2* | *End x2* | *R1comp* | *R2comp* |
|---|---|---|---|---|---|---|---|---|
| U | D | flat roof dead | 0.6x2.1 | 0 | | L | 3.15 | 3.15 |
| U | D | pitched roof dead | 1x1.6 | 0 | | L | 4.00 | 4.00 |
| U | L | Pitched roof live | 0.6x1.6 | 0 | | L | 2.40 | 2.40 |
| U | L | Flat roof live | 0.6x2.1 | 0 | | L | 3.15 | 3.15 |
| | | | | | Total load: 25.40 kN | | **12.70** | **12.70** |
| | | | | | | *Dead:* | *7.15* | *7.15* |
| | | | | | | *Live:* | *5.55* | *5.55* |

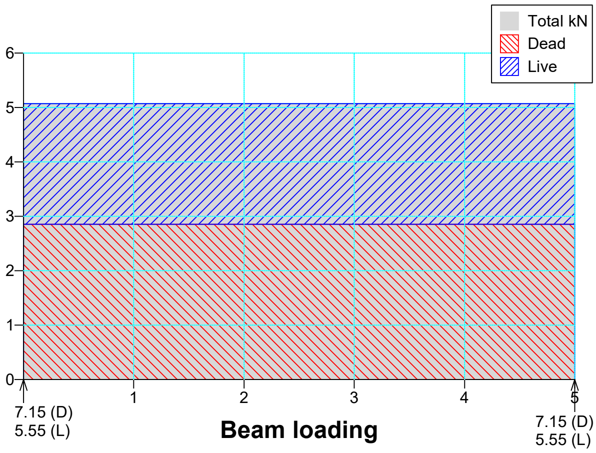
*Load types: U: UDL D: Dead; L: Live (positions in m. from R1)*

Maximum B.M. = 15.88 kNm at 2.50 m. from R1

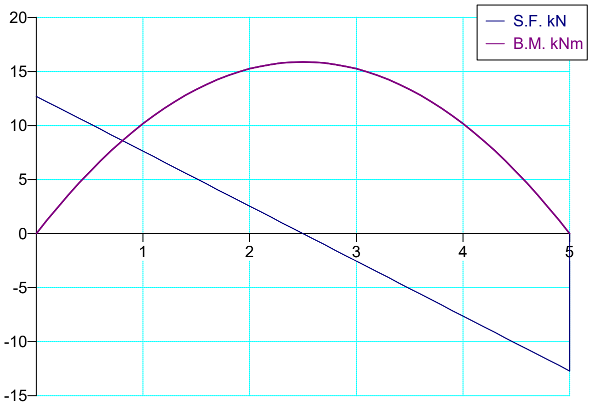
Maximum S.F. = 12.70 kN at 0.00 m. from R1

Live load deflection = 18.1 x $10^8$/EI at 2.50 m. from R1 *(E in N/mm², I in cm⁴)*

Total deflection = 41.3 x $10^8$/EI at 2.50 m. from R1




**Beam loading**




**Bending moment and shear force**

*Steel beam calculation to BS449 Part 2 using S355 steel*

**SECTION SIZE** : **152 x 152 x 23 UC** S355

D=152.4 mm B=152.2 mm t=5.8 mm T=6.8 mm $I_x$=1,250 cm⁴ $r_y$=3.70 cm $Z_x$=164 cm³

Bending: $L_e$ = 0 = 0.00m. $L_E/r_y$ = 0.00 x 100/3.70 = 0 D/T = 22.4

Permissible bending stress, $p_{bc}$ = 230 N/mm² (Table 3b)

Actual bending stress, $f_{bc}$ = 15.9 x 1000/164.0 = 96.8 N/mm² OK

Shear: Maximum shear in web, $f_s$ = 12.7 x 1000/(5.8 x 152.4) = 14.4 N/mm² OK

Beam web: Check unstiffened web capacity with load of 12.70 kN

Bearing: $p_b$ = 260N/mm² (Table 9); C1 = 37.6 kN; C2 = 1.51 kN/mm
Buckling: $p_c$ = 196N/mm² (Table 17b); C1 = 86.6 kN; C2 = 1.14 kN/mm

Minimum required stiff bearing length, $L_b$ = 0mm
Bearing capacity, $P_w$ = C1 + $L_b$.C2 = 37.6kN <<<
Buckling capacity, $P_x$ = C1 + $L_b$.C2 = 86.6kN

Deflection: Live load deflection = 18.1 x 1e8/(205,000 x 1,250) = 7.0 mm (L/709) OK

Total deflection = 41.3 x 1e8/(205,000 x 1,250) = 16.1 mm (L/310)

Combined bending and shear check (14.c): $(f_{bc}/p_{bc})^2 + (f_s/p_s)^2$ = 0.177 at 2.50 m. (<=1.25 OK)

## Bearings

152 x 152 x 23 UC stiff bearing length, $b_1$ = t + 1.6r + 2T = 31.6 mm

Masonry: 20N/mm$^2$ brick, class (iii) mortar, normal const/normal mfr, Class 1 bearing
Local design strength (factored) = 5 x 1.25/3.5 = 1.79N/mm$^2$ (BS5628-1:2005 Table 2a)

**R1: 250 x 100 mm padstone**

Factored reaction = 7.15 x 1.4 + 5.55 x 1.6 = 18.89 kN

Factored stress under padstone = 18.89 x 1000/250 x 100 = 0.76 N/mm$^2$

**R2 as R1**

| | |
|---|---|
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**Beam: dormer window lintel** **Span: 2.1 m.**

| | | *Load name* | *Loading w1* | *Start x1* | *Loading w2* | *End x2* | *R1comp* | *R2comp* |
|---|---|---|---|---|---|---|---|---|
| U | L | | 0 | 0 | | L | 0.00 | 0.00 |
| U | D | Flat roof dead | 0.60x2.1 | 0 | | L | 1.32 | 1.32 |
| U | L | Flat roof live | 0.6x2.1 | 0 | | L | 1.32 | 1.32 |
| | | | | | | Total load: 5.29 kN | **2.65** | **2.65** |
| | | | | | | *Dead:* | *1.32* | *1.32* |
| | | | | | | *Live:* | *1.32* | *1.32* |

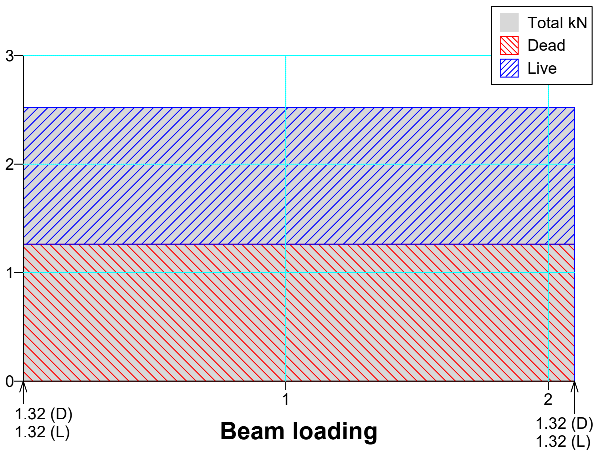
*Load types: U: UDL D: Dead; L: Live (positions in m. from R1)*

Maximum B.M. = 1.39 kNm at 1.05 m. from R1

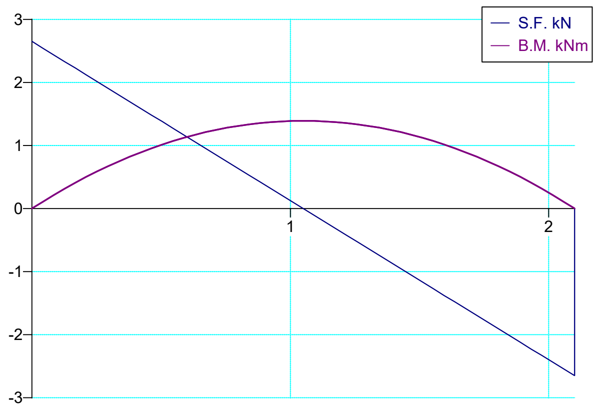
Maximum S.F. = 2.65 kN at 0.00 m. from R1

Live load deflection = 0.319 x $10^8$/EI at 1.05 m. from R1 *(E in N/mm², I in cm⁴)*

Total deflection = 0.638 x $10^8$/EI at 1.05 m. from R1




**Beam loading**




**Bending moment and shear force**

*Timber beam calculation to BS5268 Part 2: 2002 using C16 timber*

**Use 2no 50 x 150 C16** *5.6 kg/m approx*

z = 375.0 cm³   I = 2,813 cm⁴

Timber grade: C16   2 members acting together: $K_8$ = 1.1 [§2.9]

$K_3$ (loading duration factor) = 1.25 (medium term)
$K_7$ (depth factor) = $(300/150)^{0.11}$ = 1.08 [§2.10.6]   $K_8$ (load sharing factor) = 1.1 [§2.9,2.10]

E = 5,800 x 1.14 = 6,612 N/mm² ($E_{min}.K_9$)

**Bending**

Permissible bending stress, $\sigma_{m,adm} = \sigma_{m,g}.K_3.K_7.K_8$ = 5.3 x 1.25 x 1.08 x 1.1 = 7.86 N/mm²

Applied bending stress, $\sigma_{m,a}$ = 1.39 x 1000/375 = 3.70 N/mm² OK

**Shear**

Permissible shear stress, $\tau_{adm,//} = \tau_{g,//}.K_3.K_8$ = 0.67 x 1.25 x 1.1 = 0.92 N/mm²

Applied shear stress, $\tau_a$ = 2.65 x 1000 x 3/(2 x 100 x 150) = 0.26 N/mm² OK

**Deflection**

Bending deflection = 0.638 x $10^8$/(6,612 x 2,813) = 3.43 mm

Mid-span shear deflection = 1.2 x 1.39 x $10^6$/((E/16) x 100 x 150) = 0.27 mm

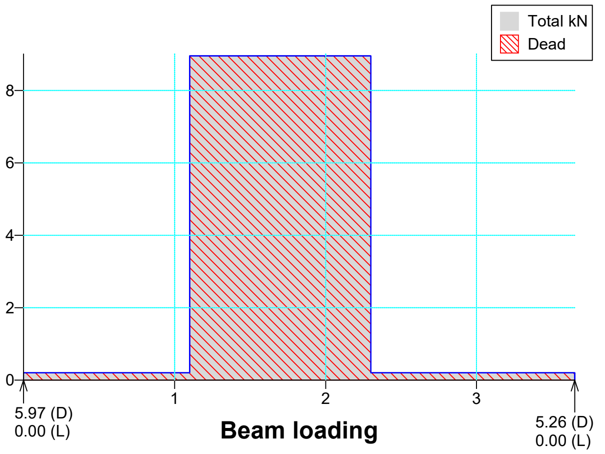
Total deflection = 3.43 + 0.27 = 3.70 mm (0.0018 L) <= 14mm OK

**Beam: chimney beam** **Span: 3.65 m.**

| | | *Load name* | *Loading w1* | *Start x1* | *Loading w2* | *End x2* | *R1comp* | *R2comp* |
|---|---|---|---|---|---|---|---|---|
| U | D | o.w. | 0.2 | 0 | | L | 0.37 | 0.37 |
| R | D | chimney | 0.35x20x0.5x2.5 | 1.1 | | 2.3 | 5.61 | 4.89 |
| | | | | | | Total load: 11.23 kN | **5.97** | **5.26** |
| | | | | | | *Dead:* | *5.97* | *5.26* |
| | | | | | | *Live:* | *0.00* | *0.00* |

*Load types: U: UDL R: Part UDL D: Dead; L: Live (positions in m. from R1)*

Maximum B.M. = 8.30 kNm at 1.74 m. from R1
Maximum S.F. = 5.97 kN at 0.00 m. from R1
Live load deflection = 0.00 x $10^8$/EI at R2 *(E in N/mm², I in cm⁴)*
Total deflection = 10.5 x $10^8$/EI at 1.79 m. from R1



**Beam loading**

**Bending moment and shear force**

*Steel beam calculation to BS449 Part 2 using S355 steel*

**SECTION SIZE** : **152 x 89 x 16 UB** S355

D=152.4 mm B=88.7 mm t=4.5 mm T=7.7 mm $I_x$=834 cm⁴ $r_y$=2.10 cm $Z_x$=109 cm³

Bending: $L_e$ = L = 3.65m. $L_E/r_y$ = 3.65 x 100/2.10 = 174 D/T = 19.8
Permissible bending stress, $p_{bc}$ = 103.9 N/mm² (Table 3b)
Actual bending stress, $f_{bc}$ = 8.30 x 1000/109.0 = 76.2 N/mm² OK

Shear: Maximum shear in web, $f_s$ = 5.97 x 1000/(4.5 x 152.4) = 8.7 N/mm² OK

Beam web: Check unstiffened web capacities with loads of 5.975 kN and 5.255 kN
Bearing: $p_b$ = 260N/mm² (Table 9); C1 = 31.0 kN; C2 = 1.17 kN/mm
Buckling: $p_c$ = 187N/mm² (Table 17b); C1 = 64.2 kN; C2 = 0.842 kN/mm
R1:Minimum required stiff bearing length, $L_b$ = 0mm
Bearing capacity, $P_w$ = C1 + $L_b$.C2 = 31.0kN <<<
Buckling capacity, $P_x$ = C1 + $L_b$.C2 = 64.2kN
R2:Minimum required stiff bearing length, $L_b$ = 0mm
Bearing capacity, $P_w$ = C1 + $L_b$.C2 = 31.0kN <<<
Buckling capacity, $P_x$ = C1 + $L_b$.C2 = 64.2kN

Deflection: Live load deflection = 0.00 x 1e8/(205,000 x 834) = 0.0 mm OK
Total deflection = 10.5 x 1e8/(205,000 x 834) = 6.1 mm (L/594)

Combined bending and shear check (14.c): $(f_{bc}/p_{bc})^2 + (f_s/p_s)^2$ = 0.537 at 1.75 m. (<=1.25 OK)

## Bearings

152 x 89 x 16 UB stiff bearing length, $b_1$ = t + 1.6r + 2T = 32.1 mm

**R1: 89 x 100 mm padstone**

Factored reaction = 5.97 x 1.4 + 0.00 x 1.6 = 8.36 kN
Masonry: 20N/mm$^2$ brick, class (iii) mortar, normal const/normal mfr, Class 1 bearing
Local design strength (factored) = 5 x 1.25/3.5 = 1.79N/mm$^2$ (BS5628-1:2005 Table 2a)

Factored stress under padstone = 8.36 x 1000/89 x 100 = 0.94 N/mm$^2$

**R2: None**

| | |
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| **Site: 498 Edge Lane** | **Made by NK** |
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| **Job number:** | **Client copy** |

SuperBeam 7.05b 411924 **dormer loft+ alteration +chimn .SBW** **Printed 14 Sep 2023 09:23**

**Beam**: **Loft Beam1 support dormer face** **Span: 2.0 m.**

| | | *Load name* | *Loading w1* | *Start x1* | *Loading w2* | *End x2* | *R1comp* | *R2comp* |
|---|---|---|---|---|---|---|---|---|
| U | D | dormer face | 1x2.3 | 0 | | L | 2.30 | 2.30 |
| U | D | Flat roof dead | 0.60x2.1 | 0 | | L | 1.26 | 1.26 |
| U | L | Flat roof live | 0.6x2.1 | 0 | | L | 1.26 | 1.26 |
| U | D | loft floor | 0.5x1.5 | 0 | | L | 0.75 | 0.75 |
| U | L | Floor live | 1.5x1.5 | 0 | | L | 2.25 | 2.25 |
| P | D | Beam: chimney beam : R1 | 5.97 [B/F] | 0.3 | | | 5.08 | 0.90 |
| P | L | Beam: chimney beam : R1 | 0.00 [B/F] | 0.3 | | | 0.00 | 0.00 |
| | | | | | Total load: 21.61 kN | | **12.90** | **8.72** |
| | | | | | | *Dead:* | *9.39* | *5.21* |
| | | | | | | *Live:* | *3.51* | *3.51* |

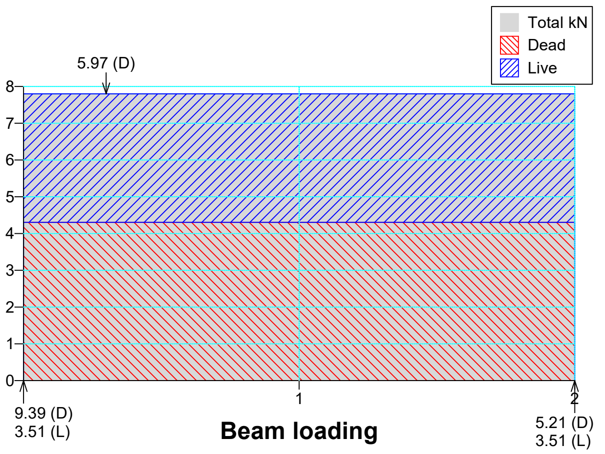
*Load types: U: UDL P: PL D: Dead; L: Live (positions in m. from R1)*

Maximum B.M. = 4.86 kNm at 0.89 m. from R1

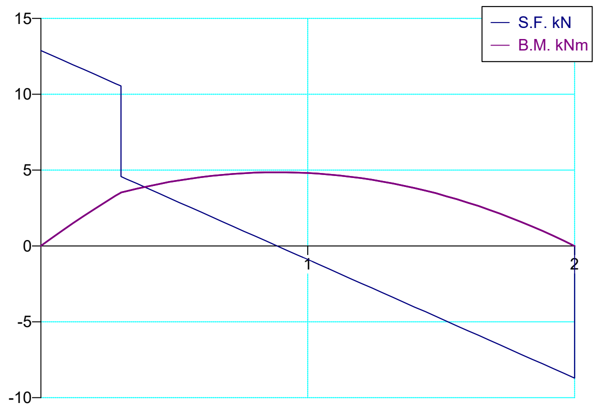
Maximum S.F. = 12.90 kN at 0.00 m. from R1

Live load deflection = 0.731 x $10^8$/EI at 1.00 m. from R1 *(E in N/mm², I in cm⁴)*

Total deflection = 2.07 x $10^8$/EI at 0.97 m. from R1




**Beam loading**




**Bending moment and shear force**

*Steel beam calculation to BS449 Part 2 using S355 steel*

**SECTION SIZE** : **127 x 76 x 13 UB** S355

D=127.0 mm B=76.0 mm t=4.0 mm T=7.6 mm $I_x$=473 cm⁴ $r_y$=1.84 cm $Z_x$=75.0 cm³

Bending: $L_e$ = 0.85L = 1.70m. $L_E/r_y$ = 1.70 x 100/1.84 = 92 D/T = 16.7

Permissible bending stress, $p_{bc}$ = 182.7 N/mm² (Table 3b)

Actual bending stress, $f_{bc}$ = 4.86 x 1000/75.0 = 64.8 N/mm² OK

Shear: Maximum shear in web, $f_s$ = 12.9 x 1000/(4.0 x 127.0) = 25.4 N/mm² OK

Beam web: Check unstiffened web capacities with loads of 12.90 kN and 8.716 kN

Bearing: $p_b$ = 260N/mm² (Table 9); C1 = 27.4 kN; C2 = 1.04 kN/mm
Buckling: $p_c$ = 192N/mm² (Table 17b); C1 = 48.8 kN; C2 = 0.769 kN/mm

R1:Minimum required stiff bearing length, $L_b$ = 0mm
Bearing capacity, $P_w$ = C1 + $L_b$.C2 = 27.4kN <<<
Buckling capacity, $P_x$ = C1 + $L_b$.C2 = 48.8kN

R2:Minimum required stiff bearing length, $L_b$ = 0mm
Bearing capacity, $P_w$ = C1 + $L_b$.C2 = 27.4kN <<<
Buckling capacity, $P_x$ = C1 + $L_b$.C2 = 48.8kN

Deflection: Live load deflection = 0.731 x 1e8/(205,000 x 473) = 0.8 mm (L/2652) OK

Total deflection = 2.07 x 1e8/(205,000 x 473) = 2.1 mm (L/939)

Combined bending and shear check (14.c): $(f_{bc}/p_{bc})^2 + (f_s/p_s)^2 = 0.126$ at 0.88 m. (<=1.25 OK)

## Bearings

127 x 76 x 13 UB stiff bearing length, $b_1 = t + 1.6r + 2T = 31.4$ mm

Masonry: 20N/mm² brick, class (iii) mortar, normal const/normal mfr, Class 1 bearing
Local design strength (factored) = 5 x 1.25/3.5 = 1.79N/mm² (BS5628-1:2005 Table 2a)

**R1: 125 x 100 mm padstone**

Factored reaction = 9.39 x 1.4 + 3.51 x 1.6 = 18.76 kN

Factored stress under padstone = 18.76 x 1000/125 x 100 = 1.50 N/mm²

**R2: 125 x 100 mm padstone**

Factored reaction = 5.21 x 1.4 + 3.51 x 1.6 = 12.90 kN

Factored stress under padstone = 12.90 x 1000/125 x 100 = 1.03 N/mm²

**Beam: floor joists** **Span: 3.65 m.**

| | | *Load name* | *Loading w1* | *Start x1* | *Loading w2* | *End x2* | *R1comp* | *R2comp* |
|---|---|---|---|---|---|---|---|---|
| U | D | floor dead | 0.5x0.4 | 0 | | L | 0.37 | 0.37 |
| U | L | Floor live | 1.5x0.4 | 0 | | L | 1.10 | 1.10 |
| | | | | | | Total load: 2.92 kN | **1.46** | **1.46** |
| | | | | | | *Dead:* | *0.37* | *0.37* |
| | | | | | | *Live:* | *1.10* | *1.10* |

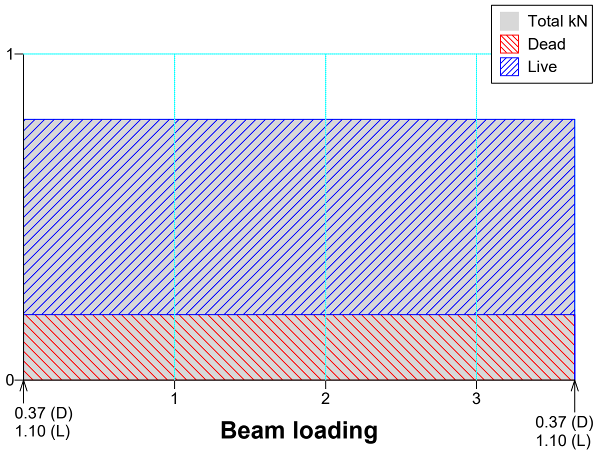
*Load types: U: UDL D: Dead; L: Live (positions in m. from R1)*

Maximum B.M. = 1.33 kNm at 1.82 m. from R1

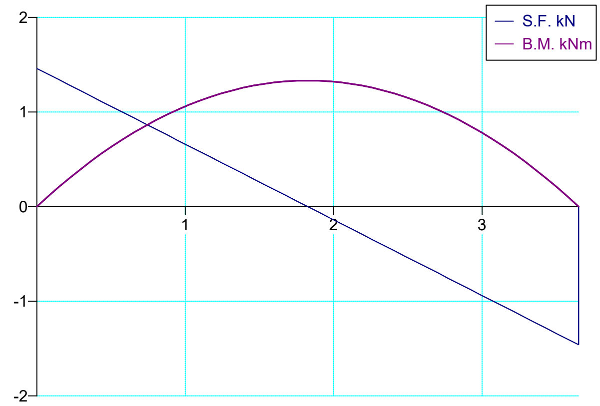
Maximum S.F. = 1.46 kN at 0.00 m. from R1

Live load deflection = 1.39 x $10^8$/EI at 1.83 m. from R1 *(E in N/mm², I in cm⁴)*

Total deflection = 1.85 x $10^8$/EI at 1.83 m. from R1




**Beam loading**




**Bending moment and shear force**

*Timber beam calculation to BS5268 Part 2: 2002 using C16 timber*

**Use 75 x 150 C16** *4.2 kg/m approx*

z = 281.3 cm³ I = 2,109 cm⁴

Timber grade: C16 Load sharing system: $K_8$ = 1.1 [§2.10.11]

$K_3$ (loading duration factor) = 1.00 (long term)

$K_7$ (depth factor) = $(300/150)^{0.11}$ = 1.08 [§2.10.6] $K_8$ (load sharing factor) = 1.1 [§2.9,2.10]

E = 8,800 N/mm² ($E_{mean}$)

**Bending**

Permissible bending stress, $\sigma_{m,adm} = \sigma_{m,g}.K_3.K_7.K_8$ = 5.3 x 1.00 x 1.08 x 1.1 = 6.29 N/mm²

Applied bending stress, $\sigma_{m,a}$ = 1.33 x 1000/281 = 4.74 N/mm² OK

**Shear**

Permissible shear stress, $\tau_{adm,//} = \tau_{g,//}.K_3.K_8$ = 0.67 x 1.00 x 1.1 = 0.74 N/mm²

Applied shear stress, $\tau_a$ = 1.46 x 1000 x 3/(2 x 75 x 150) = 0.19 N/mm² OK

**Deflection**

Bending deflection = 1.85 x $10^8$/(8,800 x 2,109) = 9.96 mm

Mid-span shear deflection = 1.2 x 1.33 x $10^6$/((E/16) x 75 x 150) = 0.26 mm

Total deflection = 9.96 + 0.26 = 10.22 mm (0.0028 L) <= 0.003L OK

**Beam: stair trimmer** **Span: 1.6 m.**

| | | *Load name* | *Loading w1* | *Start x1* | *Loading w2* | *End x2* | *R1comp* | *R2comp* |
|---|---|---|---|---|---|---|---|---|
| U | D | floor dead | 0.5x2.6 | 0 | | L | 1.04 | 1.04 |
| U | L | Floor live | 1.5x2.6 | 0 | | L | 3.12 | 3.12 |
| | | | | | | Total load: 8.32 kN | **4.16** | **4.16** |
| | | | | | | *Dead:* | *1.04* | *1.04* |
| | | | | | | *Live:* | *3.12* | *3.12* |

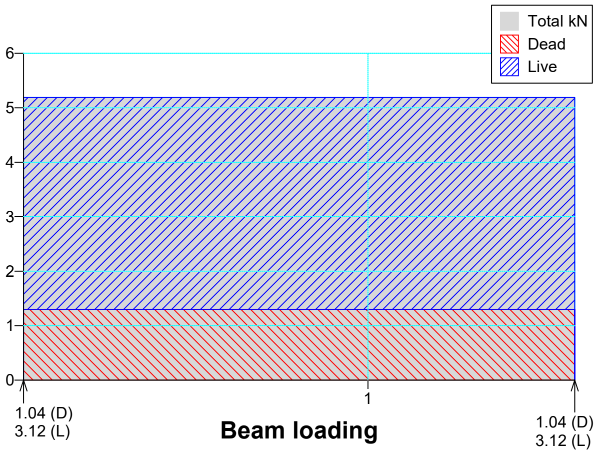
*Load types: U: UDL D: Dead; L: Live (positions in m. from R1)*

Maximum B.M. = 1.66 kNm at 0.80 m. from R1

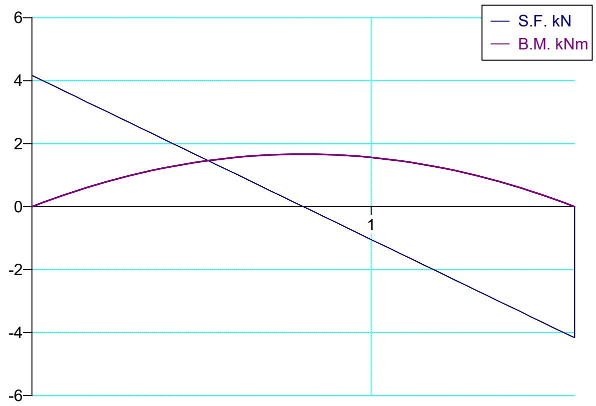
Maximum S.F. = 4.16 kN at 0.00 m. from R1

Live load deflection = 0.333 x $10^8$/EI at 0.80 m. from R1 *(E in N/mm², I in cm⁴)*

Total deflection = 0.444 x $10^8$/EI at 0.80 m. from R1




**Beam loading**




**Bending moment and shear force**

*Timber beam calculation to BS5268 Part 2: 2002 using C16 timber*

**Use 2no 50 x 150 C16** *5.6 kg/m approx*

z = 375.0 cm³ I = 2,813 cm⁴

Timber grade: C16 2 members acting together: $K_8$ = 1.1 [§2.9]

$K_3$ (loading duration factor) = 1.00 (long term)

$K_7$ (depth factor) = $(300/150)^{0.11}$ = 1.08 [§2.10.6] $K_8$ (load sharing factor) = 1.1 [§2.9,2.10]

E = 5,800 x 1.14 = 6,612 N/mm² ($E_{min}.K_9$)

**Bending**

Permissible bending stress, $\sigma_{m,adm} = \sigma_{m,g}.K_3.K_7.K_8$ = 5.3 x 1.00 x 1.08 x 1.1 = 6.29 N/mm²

Applied bending stress, $\sigma_{m,a}$ = 1.66 x 1000/375 = 4.44 N/mm² OK

**Shear**

Permissible shear stress, $\tau_{adm,//} = \tau_{g,//}.K_3.K_8$ = 0.67 x 1.00 x 1.1 = 0.74 N/mm²

Applied shear stress, $\tau_a$ = 4.16 x 1000 x 3/(2 x 100 x 150) = 0.42 N/mm² OK

**Deflection**

Bending deflection = 0.444 x $10^8$/(6,612 x 2,813) = 2.39 mm

Mid-span shear deflection = 1.2 x 1.66 x $10^6$/((E/16) x 100 x 150) = 0.32 mm

Total deflection = 2.39 + 0.32 = 2.71 mm (0.0017 L) <= 0.003L OK

**Beam: trimmer 2** **Span: 3.65 m.**

| | | Load name | Loading w1 | Start x1 | Loading w2 | End x2 | R1comp | R2comp |
|---|---|---|---|---|---|---|---|---|
| U | D | floor dead | 0.5x0.4 | 0 | | L | 0.37 | 0.37 |
| U | L | Floor live | 1.5x0.4 | 0 | | L | 1.10 | 1.10 |
| P | D | Beam: stair trimmer : R1 | 1.04 [B/F] | 1.9 | | | 0.50 | 0.54 |
| P | L | Beam: stair trimmer : R1 | 3.12 [B/F] | 1.9 | | | 1.50 | 1.62 |
| | | | | | Total load: 7.08 kN | | **3.45** | **3.63** |
| | | | | | *Dead:* | | *0.86* | *0.91* |
| | | | | | *Live:* | | *2.59* | *2.72* |

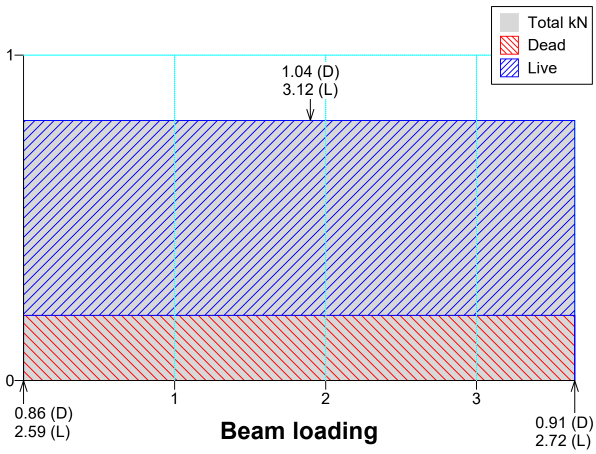
*Load types: U: UDL P: PL D: Dead; L: Live (positions in m. from R1)*

Maximum B.M. = 5.12 kNm at 1.90 m. from R1

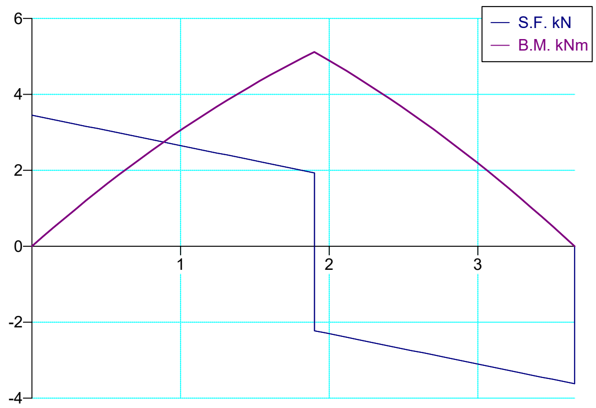
Maximum S.F. = -3.63 kN at R2

Live load deflection = 4.54 x $10^8$/EI at 1.86 m. from R1 *(E in N/mm², I in cm⁴)*

Total deflection = 6.05 x $10^8$/EI at 1.86 m. from R1



**Beam loading**



**Bending moment and shear force**

*Steel beam calculation to BS449 Part 2 using S355 steel*

**SECTION SIZE** : **127 x 76 x 13 UB** S355

D=127.0 mm B=76.0 mm t=4.0 mm T=7.6 mm $I_x$=473 cm⁴ $r_y$=1.84 cm $Z_x$=75.0 cm³

Bending: $L_e$ = 0.85L = 3.10m. $L_E/r_y$ = 3.10 x 100/1.84 = 169 D/T = 16.7
Permissible bending stress, $p_{bc}$ = 119.6 N/mm² (Table 3b)
Actual bending stress, $f_{bc}$ = 5.12 x 1000/75.0 = 68.3 N/mm² OK

Shear: Maximum shear in web, $f_s$ = 3.63 x 1000/(4.0 x 127.0) = 7.1 N/mm² OK

Beam web: Check unstiffened web capacities with loads of 3.455 kN and 3.625 kN
Bearing: $p_b$ = 260N/mm² (Table 9); C1 = 27.4 kN; C2 = 1.04 kN/mm
Buckling: $p_c$ = 192N/mm² (Table 17b); C1 = 48.8 kN; C2 = 0.769 kN/mm

R1:Minimum required stiff bearing length, $L_b$ = 0mm
Bearing capacity, $P_w$ = C1 + $L_b$.C2 = 27.4kN <<<
Buckling capacity, $P_x$ = C1 + $L_b$.C2 = 48.8kN

R2:Minimum required stiff bearing length, $L_b$ = 0mm
Bearing capacity, $P_w$ = C1 + $L_b$.C2 = 27.4kN <<<
Buckling capacity, $P_x$ = C1 + $L_b$.C2 = 48.8kN

Deflection: Live load deflection = 4.54 x 1e8/(205,000 x 473) = 4.7 mm (L/780) OK
Total deflection = 6.05 x 1e8/(205,000 x 473) = 6.2 mm (L/585)

Combined bending and shear check (14.c): $(f_{bc}/p_{bc})^2 + (f_s/p_s)^2$ = 0.326 at 1.90 m. (<=1.25 OK)

## Bearings

127 x 76 x 13 UB stiff bearing length, $b_1$ = t + 1.6r + 2T = 31.4 mm

**R1: 76 x 100 mm padstone**

Factored reaction = 0.86 x 1.4 + 2.59 x 1.6 = 5.35 kN
Masonry: 20N/mm$^2$ brick, class (iii) mortar, normal const/normal mfr, Class 1 bearing
Local design strength (factored) = 5 x 1.25/3.5 = 1.79N/mm$^2$ (BS5628-1:2005 Table 2a)

Factored stress under padstone = 5.35 x 1000/76 x 100 = 0.70 N/mm$^2$

**R2: None**

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| **Site: 498 Edge Lane** | **Made by NK** |
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| SuperBeam 7.05b 411924 **dormer loft+ alteration +chimn .SBW** | **Printed 14 Sep 2023 09:23** |

**Beam: Loft front Beam 1** **Span: 5.0 m.**

| | | *Load name* | *Loading w1* | *Start x1* | *Loading w2* | *End x2* | *R1comp* | *R2comp* |
|---|---|---|---|---|---|---|---|---|
| U | D | Pitched roof dead | 1x1.8 | 0 | | L | 4.50 | 4.50 |
| U | L | Pitched roof live | 0.6x1.8 | 0 | | L | 2.70 | 2.70 |
| U | D | floor dead | 0.5x1 | 0 | | L | 1.25 | 1.25 |
| U | L | Floor live | 1.5x1 | 0 | | L | 3.75 | 3.75 |
| P | D | Beam: chimney beam : R1 | 5.97 [B/F] | 0.3 | | | 5.62 | 0.36 |
| P | L | Beam: chimney beam : R1 | 0.00 [B/F] | 0.3 | | | 0.00 | 0.00 |
| | | | | | Total load: 30.37 kN | | **17.82** | **12.56** |
| | | | | | *Dead:* | | *11.37* | *6.11* |
| | | | | | *Live:* | | *6.45* | *6.45* |

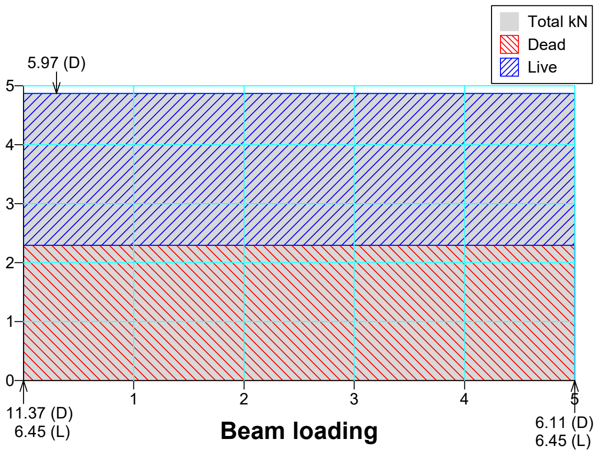
*Load types: U: UDL P: PL D: Dead; L: Live (positions in m. from R1)*

Maximum B.M. = 16.16 kNm at 2.43 m. from R1

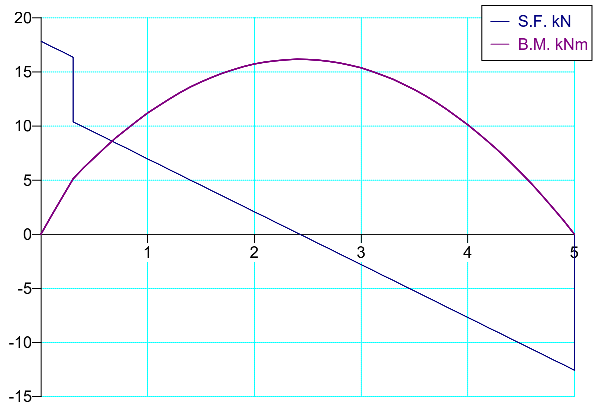
Maximum S.F. = 17.82 kN at 0.00 m. from R1

Live load deflection = 21.0 x $10^8$/EI at 2.50 m. from R1 *(E in N/mm², I in cm⁴)*

Total deflection = 42.5 x $10^8$/EI at 2.46 m. from R1




**Beam loading**




**Bending moment and shear force**

*Steel beam calculation to BS449 Part 2 using S355 steel*

**SECTION SIZE** : **203 x 102 x 23 UB** S355

D=203.2 mm B=101.8 mm t=5.4 mm T=9.3 mm $I_x$=2,110 cm⁴ $r_y$=2.36 cm $Z_x$=207 cm³

Bending: $L_e$ = L = 5.00m. $L_E/r_y$ = 5.00 x 100/2.36 = 212 D/T = 21.8

Permissible bending stress, $p_{bc}$ = 83 N/mm² (Table 3b)

Actual bending stress, $f_{bc}$ = 16.2 x 1000/207.0 = 78.1 N/mm² OK

Shear: Maximum shear in web, $f_s$ = 17.8 x 1000/(5.4 x 203.2) = 16.2 N/mm² OK

Beam web: Check unstiffened web capacities with loads of 17.82 kN and 12.56 kN

Bearing: $p_b$ = 260N/mm² (Table 9); C1 = 41.1 kN; C2 = 1.40 kN/mm
Buckling: $p_c$ = 178N/mm² (Table 17b); C1 = 97.8 kN; C2 = 0.963 kN/mm

R1:Minimum required stiff bearing length, $L_b$ = 0mm
Bearing capacity, $P_w$ = C1 + $L_b$.C2 = 41.1kN <<<
Buckling capacity, $P_x$ = C1 + $L_b$.C2 = 97.8kN

R2:Minimum required stiff bearing length, $L_b$ = 0mm
Bearing capacity, $P_w$ = C1 + $L_b$.C2 = 41.1kN <<<
Buckling capacity, $P_x$ = C1 + $L_b$.C2 = 97.8kN

Deflection: Live load deflection = 21.0 x 1e8/(205,000 x 2,110) = 4.9 mm (L/1030) OK

Total deflection = 42.5 x 1e8/(205,000 x 2,110) = 9.8 mm (L/509)

Combined bending and shear check (14.c): $(f_{bc}/p_{bc})^2 + (f_s/p_s)^2$ = 0.884 at 2.40 m. (<=1.25 OK)

## Bearings

203 x 102 x 23 UB stiff bearing length, $b_1$ = t + 1.6r + 2T = 36.2 mm

**R1: 400 x 100 mm padstone**

Factored reaction = 11.37 x 1.4 + 6.45 x 1.6 = 26.23 kN
Masonry: 20N/mm$^2$ brick, class (iii) mortar, normal const/normal mfr, Class 1 bearing
Local design strength (factored) = 5 x 1.25/3.5 = 1.79N/mm$^2$ (BS5628-1:2005 Table 2a)

Factored stress under padstone = 26.23 x 1000/400 x 100 = 0.66 N/mm$^2$

**R2: None**

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| **Site: 498 Edge Lane** | **Made by NK** |
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SuperBeam 7.05b 411924 **dormer loft+ alteration +chimn .SBW** **Printed 14 Sep 2023 09:23**

**Beam**: **ground floor knockthrough** **Span: 1.6 m.**

| | | *Load name* | *Loading w1* | *Start x1* | *Loading w2* | *End x2* | *R1comp* | *R2comp* |
|---|---|---|---|---|---|---|---|---|
| U | D | dormer face | 1x2.3 | 0 | | L | 1.84 | 1.84 |
| U | D | Flat roof dead | 0.60x1.8 | 0 | | L | 0.86 | 0.86 |
| U | L | Flat roof live | 0.6x1.8 | 0 | | L | 0.86 | 0.86 |
| U | D | loft floor | 0.5x1.8 | 0 | | L | 0.72 | 0.72 |
| U | L | Floor live | 1.5x1.8 | 0 | | L | 2.16 | 2.16 |
| U | D | wall | 2.3x2.7 | 0 | | L | 4.97 | 4.97 |
| P | D | Beam: trimmer 2 : R1 | 0.86 [B/F] | 0.3 | | | 0.70 | 0.16 |
| P | L | Beam: trimmer 2 : R1 | 2.59 [B/F] | 0.3 | | | 2.11 | 0.49 |
| | | | | | Total load: 26.29 kN | | **14.22** | **12.06** |
| | | | | | *Dead:* | | *9.09* | *8.55* |
| | | | | | *Live:* | | *5.13* | *3.51* |

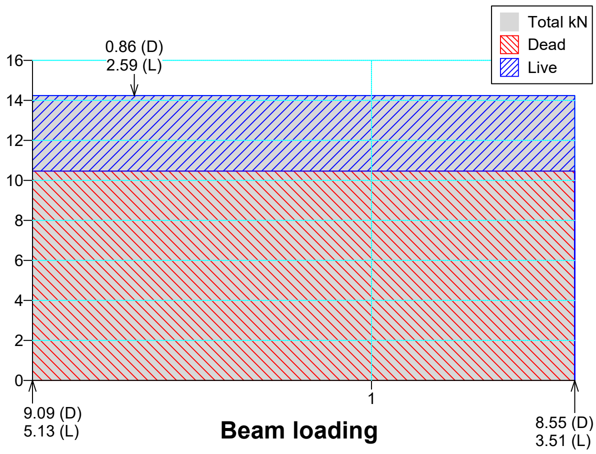
*Load types: U: UDL P: PL D: Dead; L: Live (positions in m. from R1)*

Maximum B.M. = 5.10 kNm at 0.75 m. from R1

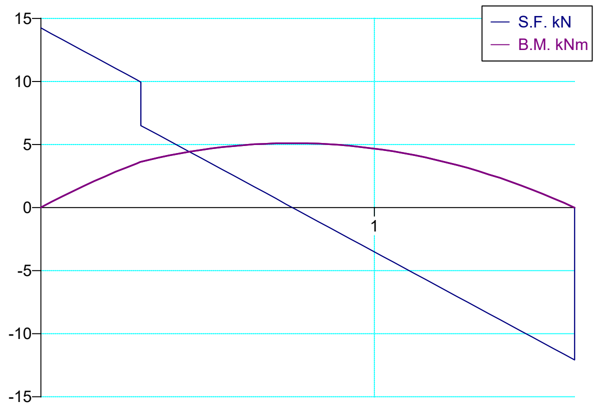
Maximum S.F. = 14.22 kN at 0.00 m. from R1

Live load deflection = 0.442 x $10^8$/EI at 0.77 m. from R1 *(E in N/mm², I in cm⁴)*

Total deflection = 1.38 x $10^8$/EI at 0.79 m. from R1




**Beam loading**




**Bending moment and shear force**

*Steel beam calculation to BS449 Part 2 using S355 steel*

**SECTION SIZE** : **152 x 89 x 16 UB** S355

D=152.4 mm B=88.7 mm t=4.5 mm T=7.7 mm $I_x$=834 cm⁴ $r_y$=2.10 cm $Z_x$=109 cm³

Bending: $L_e$ = 0.85L = 1.36m. $L_E/r_y$ = 1.36 x 100/2.10 = 65 D/T = 19.8

Permissible bending stress, $p_{bc}$ = 210.7 N/mm² (Table 3b)

Actual bending stress, $f_{bc}$ = 5.10 x 1000/109.0 = 46.8 N/mm² OK

Shear: Maximum shear in web, $f_s$ = 14.2 x 1000/(4.5 x 152.4) = 20.7 N/mm² OK

Beam web: Check unstiffened web capacities with loads of 14.22 kN and 12.06 kN

Bearing: $p_b$ = 260N/mm² (Table 9); C1 = 31.0 kN; C2 = 1.17 kN/mm
Buckling: $p_c$ = 187N/mm² (Table 17b); C1 = 64.2 kN; C2 = 0.842 kN/mm

R1:Minimum required stiff bearing length, $L_b$ = 0mm
Bearing capacity, $P_w$ = C1 + $L_b$.C2 = 31.0kN <<<
Buckling capacity, $P_x$ = C1 + $L_b$.C2 = 64.2kN

R2:Minimum required stiff bearing length, $L_b$ = 0mm
Bearing capacity, $P_w$ = C1 + $L_b$.C2 = 31.0kN <<<
Buckling capacity, $P_x$ = C1 + $L_b$.C2 = 64.2kN

Deflection: Live load deflection = 0.442 x 1e8/(205,000 x 834) = 0.3 mm (L/6194) OK

Total deflection = 1.38 x 1e8/(205,000 x 834) = 0.8 mm (L/1988)

Combined bending and shear check (14.c): $(f_{bc}/p_{bc})^2 + (f_s/p_s)^2$ = 0.049 at 0.77 m. (<=1.25 OK)

## Bearings

152 x 89 x 16 UB stiff bearing length, $b_1$ = t + 1.6r + 2T = 32.1 mm

Masonry: $20N/mm^2$ brick, class (iii) mortar, normal const/normal mfr, Class 1 bearing
Local design strength (factored) = 5 x 1.25/3.5 = $1.79N/mm^2$ (BS5628-1:2005 Table 2a)

### R1: 125 x 100 mm padstone

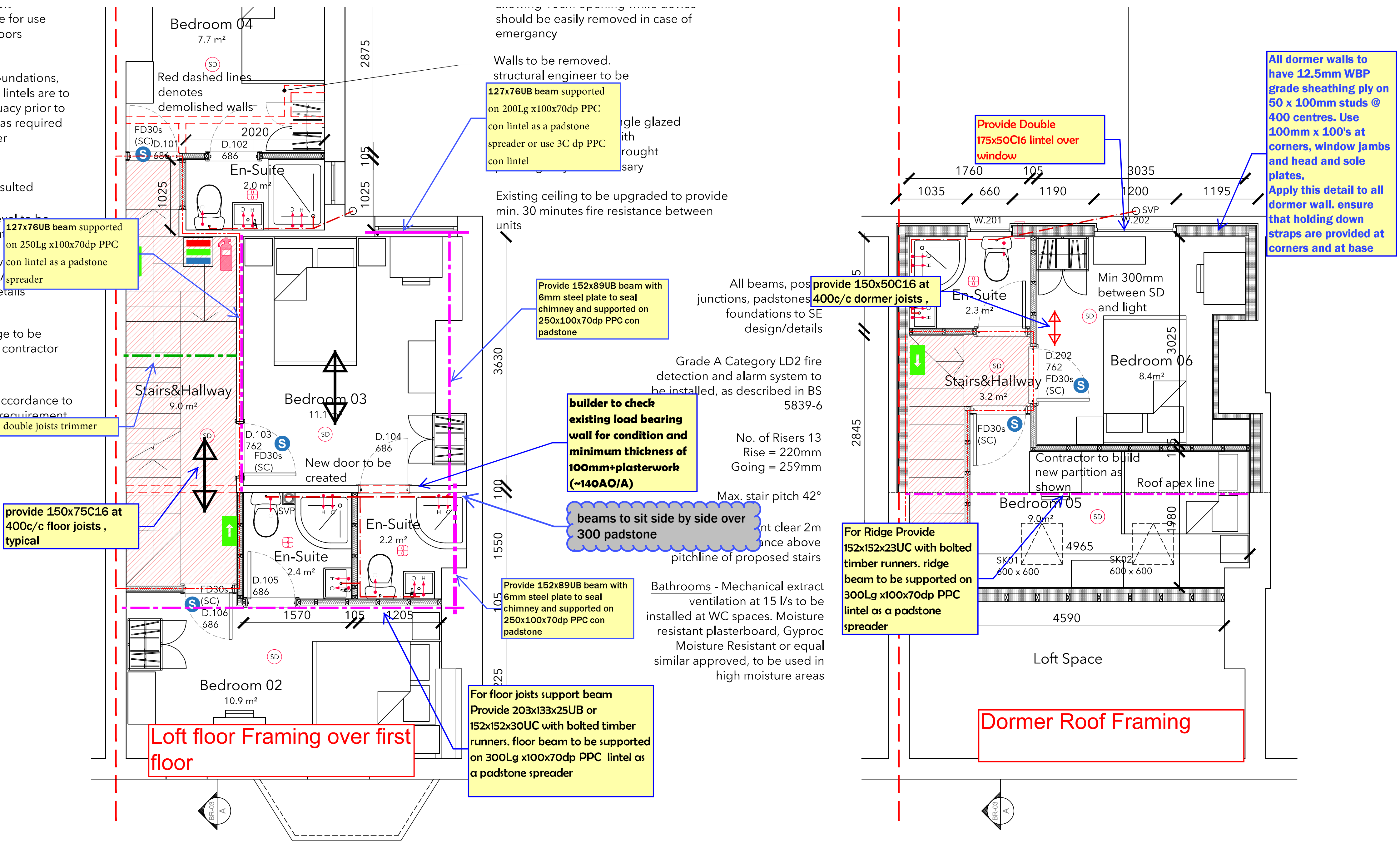
Factored reaction = 9.09 x 1.4 + 5.13 x 1.6 = 20.94 kN

Factored stress under padstone = 20.94 x 1000/125 x 100 = 1.68 $N/mm^2$

### R2: 125 x 100 mm padstone

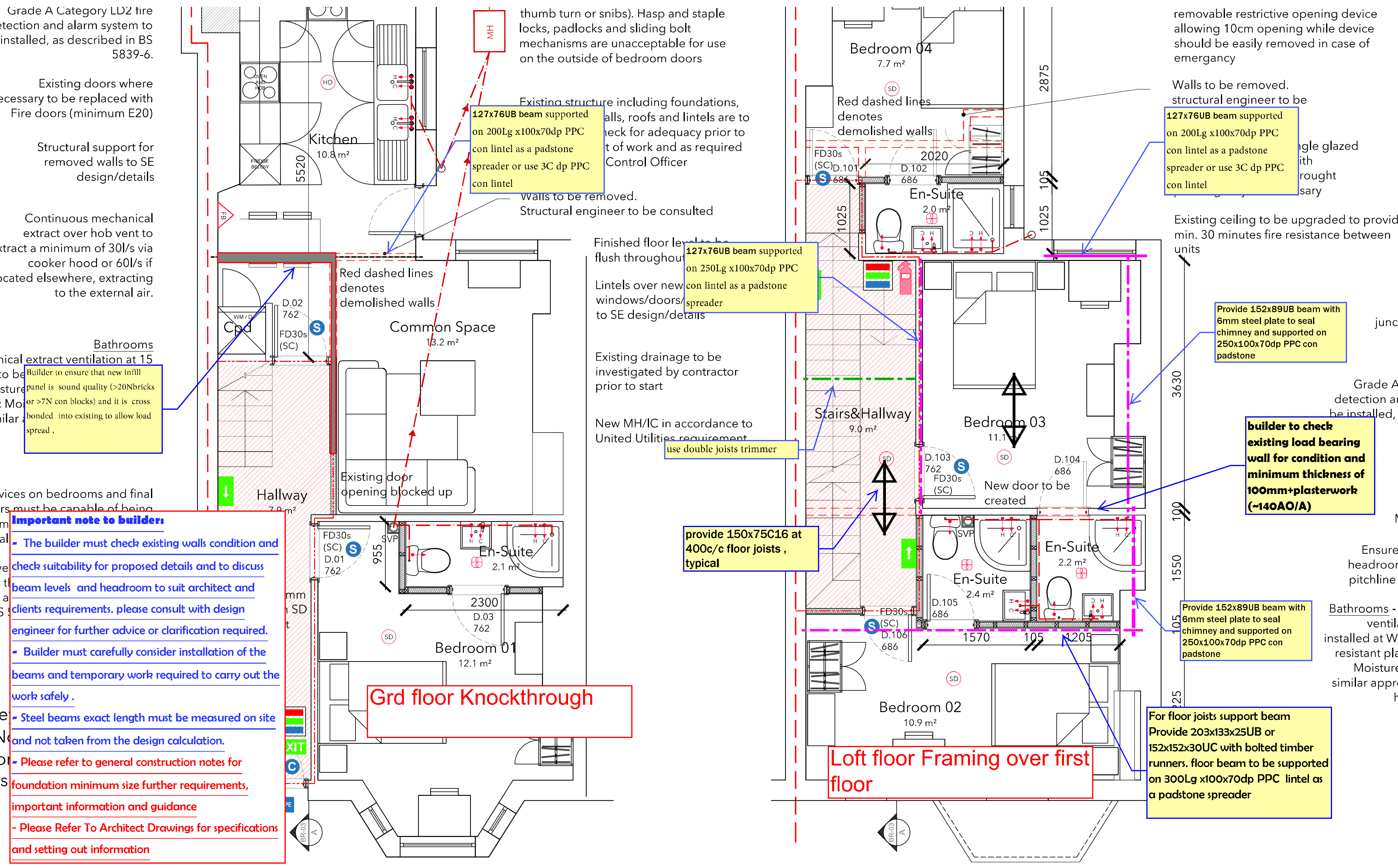
Factored reaction = 8.55 x 1.4 + 3.51 x 1.6 = 17.59 kN

Factored stress under padstone = 17.59 x 1000/125 x 100 = 1.41 $N/mm^2$



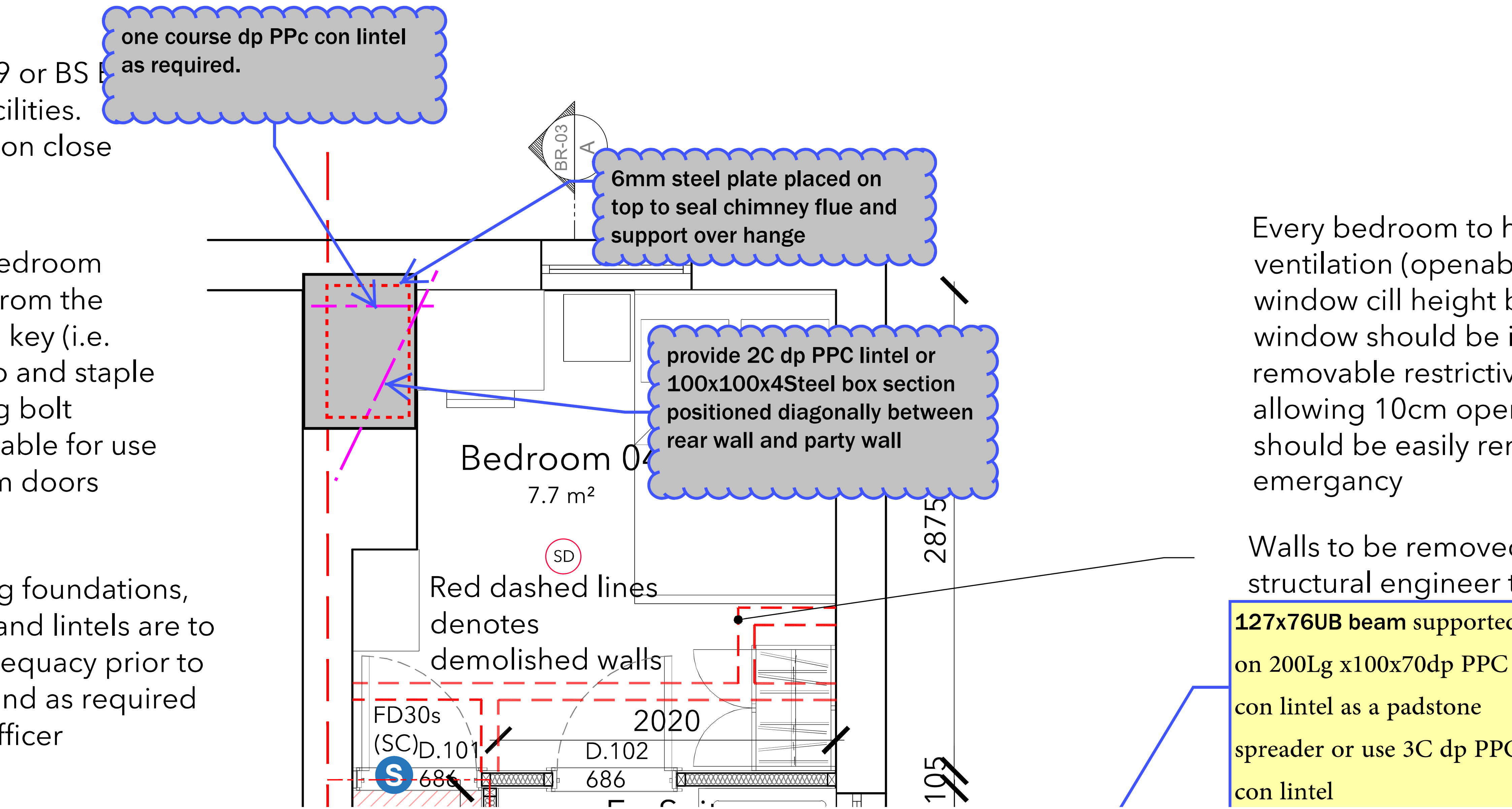

First Floor Plan

Second Floor Plan




Ground Floor Plan

First Floor Plan



9 or BS
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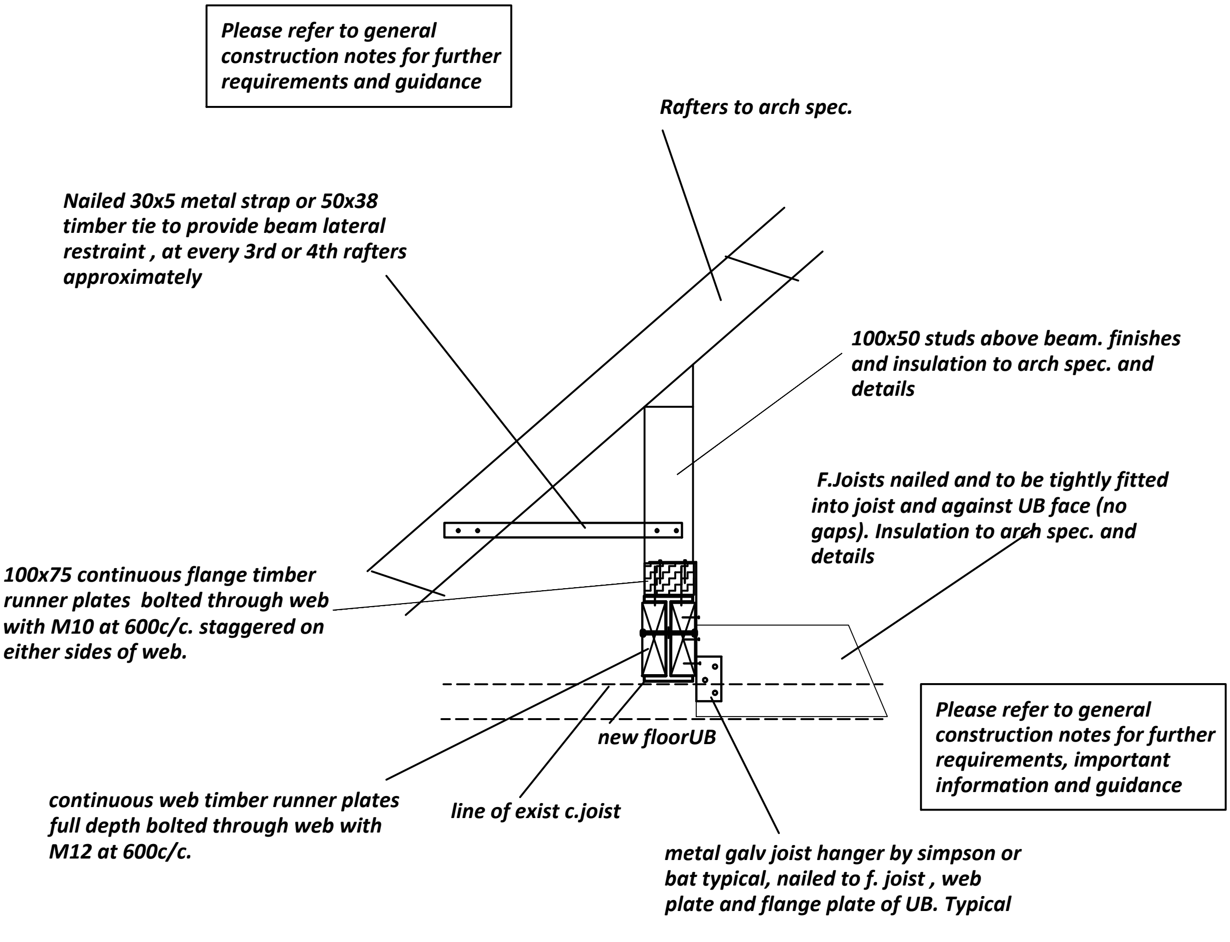
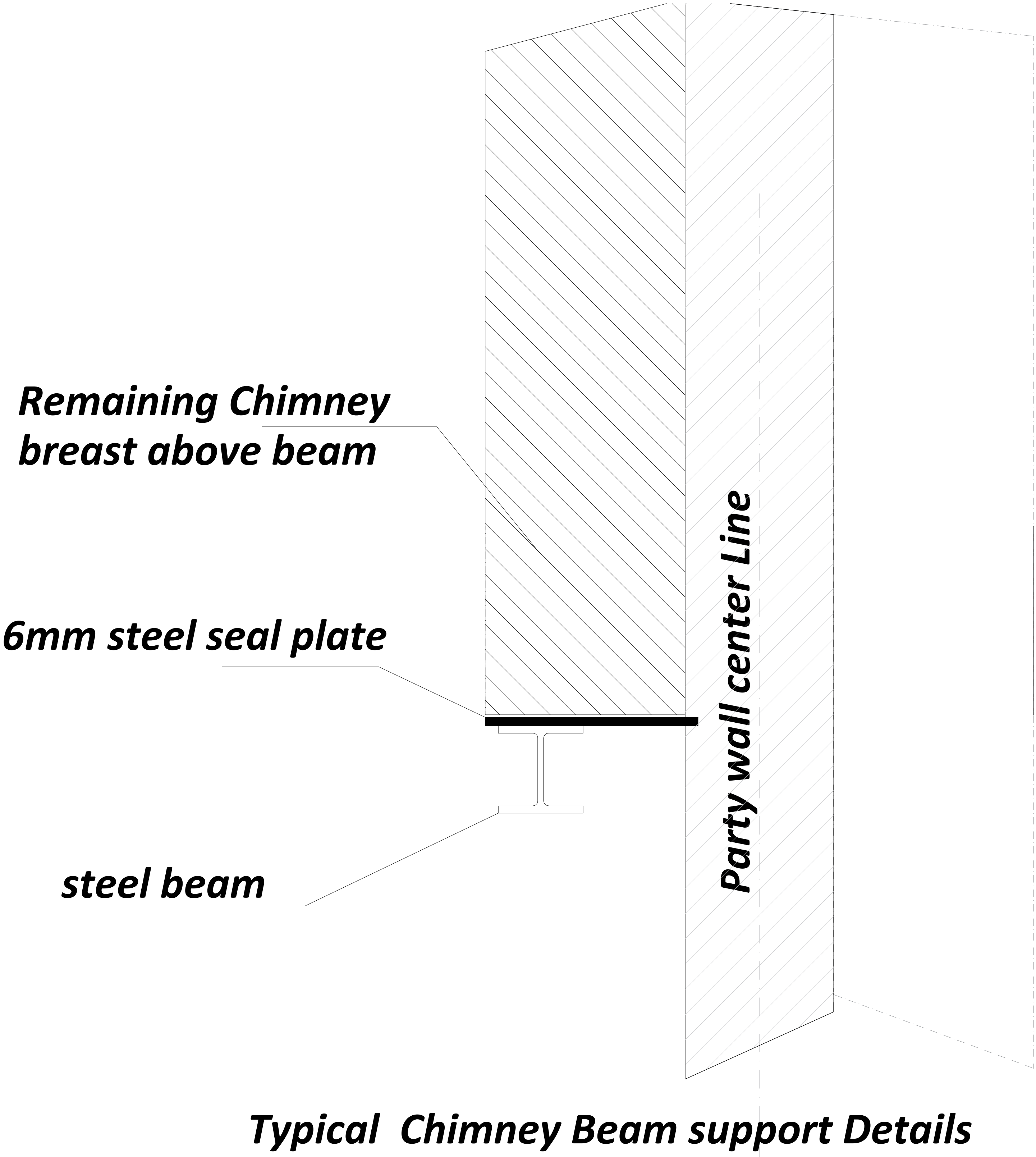
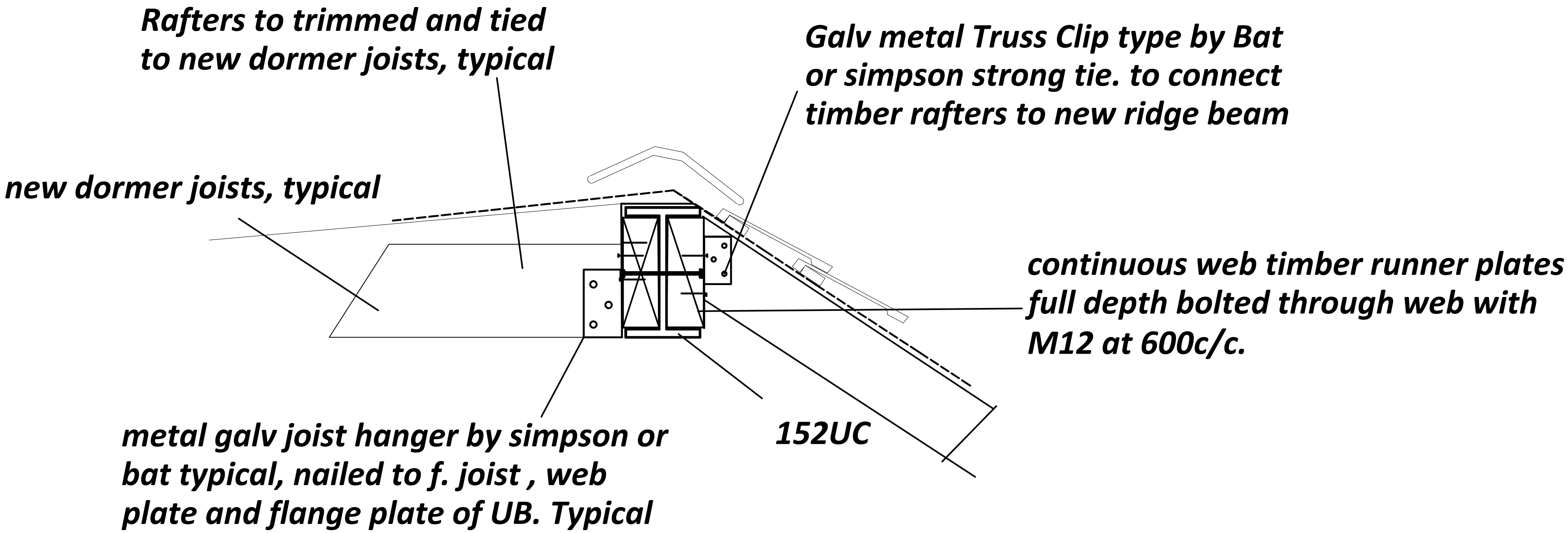
key (i.e.
and staple
g bolt
able for use
n doors
g foundations,
and lintels are to
equacy prior to
nd as required
fficer
one course dp PPc con lintel as required.
BR-03
A
6mm steel plate placed on top to seal chimney flue and support over hange
provide 2C dp PPC lintel or 100x100x4Steel box section positioned diagonally between rear wall and party wall
Bedroom 0
7.7 m²
SD
Red dashed lines denotes demolished walls
FD30s (SC)
D.101
686
S
2020
D.102
686
2875
105
Every bedroom to h
ventilation (openab
window cill height b
window should be i
removable restrictiv
allowing 10cm oper
should be easily rer
emergancy
Walls to be remove
structural engineer t
127x76UB beam supported on 200Lg x100x70dp PPC con lintel as a padstone spreader or use 3C dp PPC con lintel




***Typical Steel floor Beam Connection Details to F.joists***
***NTS - Indicative Only***




Typical Chimney Beam support Details
NTS - Indicative Only




# Typical upper Ridge Beam Connection Details
# NTS - Indicative Only