Hudds Design
Structural & Architectural Engineering
DESIGN CONSULTANTS

STRUCTURAL CALCULATIONS

FOR

69 WASHINGTON RD, GOLDTHORPE, ROTHERHAM S63 9EE.

Design Summary: (See Sheet A1)

Notes:
- All dimensions and Beam Lengths to be confirmed and checked by builder on site prior to works commencing and materials being ordered
- All steel to be minimum grade S275 (UNO)
- All Timber / Timber Packing to be minimum grade C16 (UNO)
- Minimum end bearing for steel to be 100mm (UNO)
- Minimum end bearing for timber to be 100mm
- Minimum end bearing for lintels to be 150mm
- All Beams to have minimum fire protection of 30 minutes or as required by building regulations
- All new masonry blockwork to be minimum 7.3 N/mm^2 strength
- All returns and loadbearing walls as shown on Architects drawings and mark ups
- All temporary support works to builder/contractor's specification
- Hudds Design has not been appointed as CDM coordinator and is the responsibility of the builder.

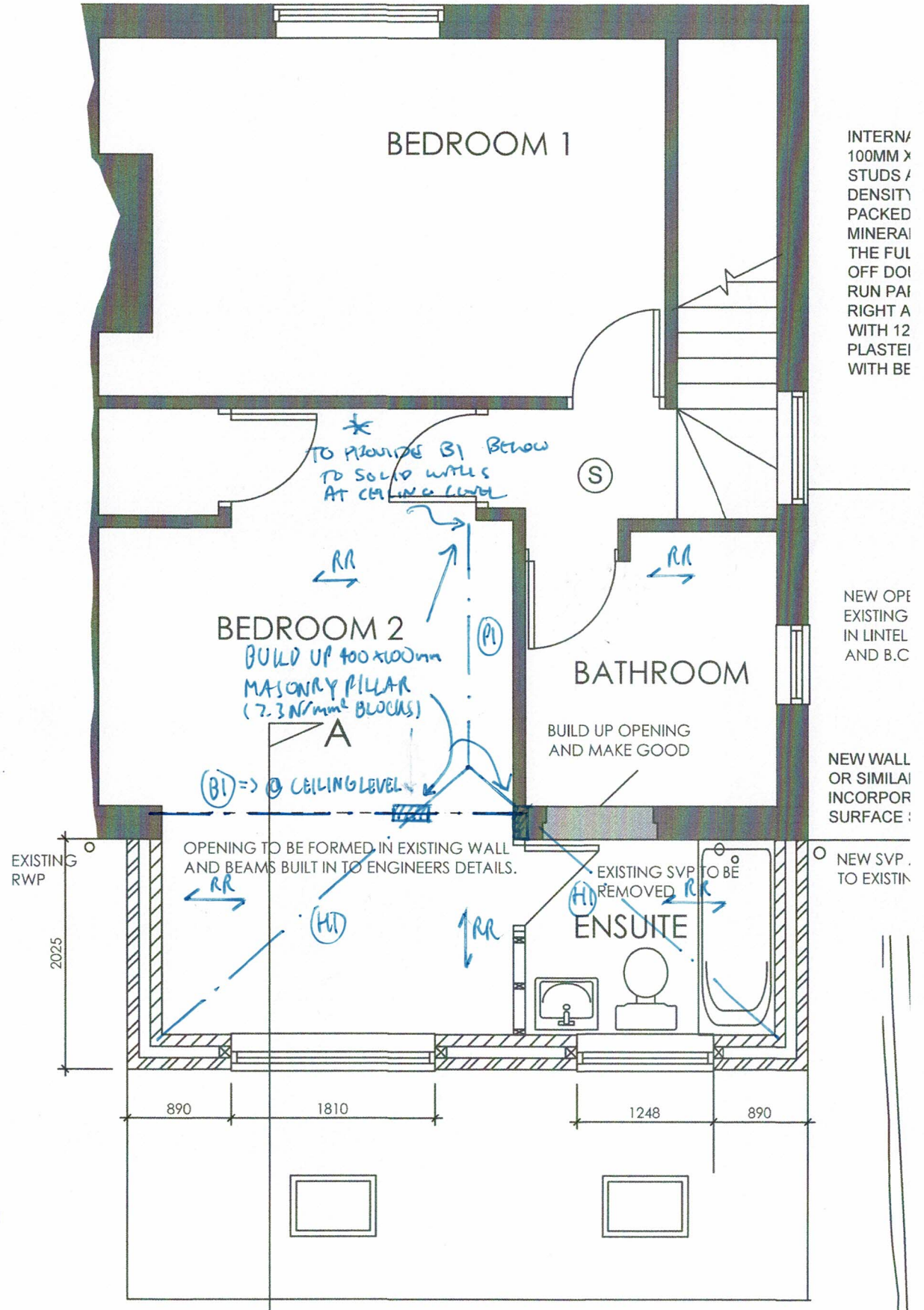**ISSUED FOR BUILDING CONTROL APPROVAL:**   **25th January 2021**
HUDDS DESIGN   **Ref: HD-S21-0118**

SHEET A1

Refer to sketch mark ups for references
Refer to Architects drawings for dimensions

DESIGN SUMMARY

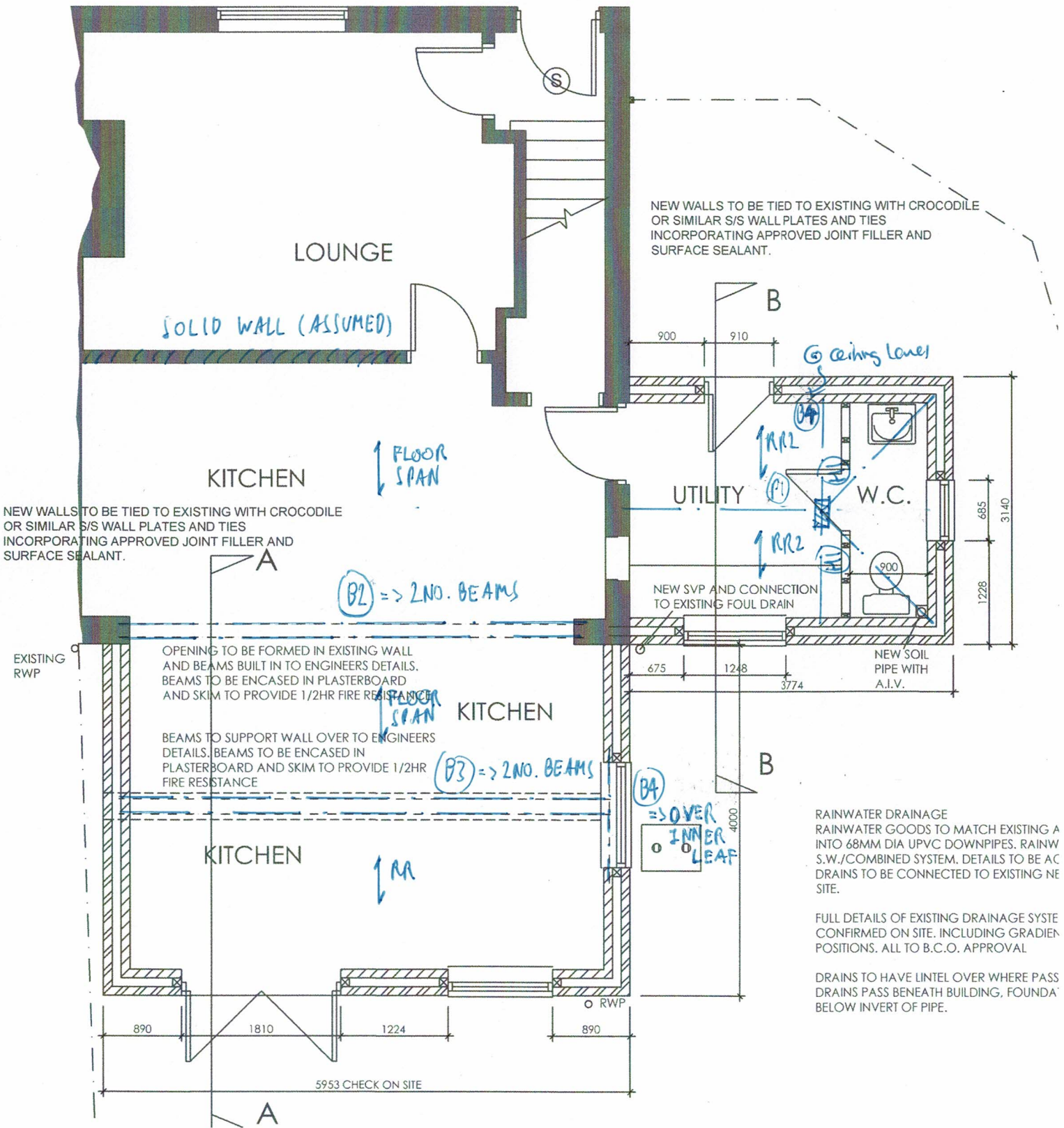|	
'Rafters RR'	50x150 Deep Timber Rafters @400mm Ctrs Min Grade C24 Double Up Rafters around Roof Light Openings
'Purlin P1'	100x275mm Deep Timber Min Grade C24 Provide Beam B1 from solid walls as support below with pillar.
'Hip Rafter H1'	75x250mm Deep Timber Min Grade C24
'Beam B1'	**152x152x23 UC** 200x100x215mm Deep Concrete Padstones
'Beam B2'	**2 No. 254x146x37 UB's** 300x300x215mm Deep Concrete Padstones
'Beam B3'	**2 No. 254x146x43 UB's** 400x100x215mm Deep Concrete Padstones
'Beam B4	**152x89x16 UB** 200x100x215mm Deep Concrete Padstones

BEDROOM 1

TO PROVIDE B1 BELOW
TO SOLID WALLS
AT CEILING LEVEL

S

RR

RR

BEDROOM 2

BUILD UP 400 x 100mm
MASONRY PILLAR
(7.3 N/mm² BLOCKS)

A

P1

BATHROOM

BUILD UP OPENING
AND MAKE GOOD

B1 => @ CEILING LEVEL

OPENING TO BE FORMED IN EXISTING WALL
AND BEAMS BUILT IN TO ENGINEERS DETAILS.

EXISTING
RWP

RR

HD

2025

890   1810

RR

HD

RR

ENSUITE

EXISTING SVP TO BE
REMOVED   RR

1248   890

INTERN/
100MM X
STUDS /
DENSITY
PACKED
MINERAL
THE FUL
OFF DOI
RUN PAI
RIGHT A
WITH 12
PLASTE
WITH BE

NEW OPE
EXISTING
IN LINTEL
AND B.C

NEW WALL
OR SIMILAI
INCORPOR
SURFACE

NEW SVP
TO EXISTIN

R

A

PROPOSED FIRST FLOOR PLAN

A

LOUNGE

SOLID WALL (ASSUMED)

NEW WALLS TO BE TIED TO EXISTING WITH CROCODILE
OR SIMILAR S/S WALL PLATES AND TIES
INCORPORATING APPROVED JOINT FILLER AND
SURFACE SEALANT.

B

900   910

@ ceiling level

KITCHEN

FLOOR
SPAN

RR2

B4

UTILITY   W.C.

685   3140

NEW WALLS TO BE TIED TO EXISTING WITH CROCODILE
OR SIMILAR S/S WALL PLATES AND TIES
INCORPORATING APPROVED JOINT FILLER AND
SURFACE SEALANT.

A

RR2

1228

B2 => 2 NO. BEAMS

900

NEW SVP AND CONNECTION
TO EXISTING FOUL DRAIN

EXISTING
RWP

OPENING TO BE FORMED IN EXISTING WALL
AND BEAMS BUILT IN TO ENGINEERS DETAILS.
BEAMS TO BE ENCASED IN PLASTERBOARD
AND SKIM TO PROVIDE 1/2HR FIRE RESISTANCE

FLOOR
SPAN

675   1248

3774

NEW SOIL
PIPE WITH
A.I.V.

KITCHEN

BEAMS TO SUPPORT WALL OVER TO ENGINEERS
DETAILS. BEAMS TO BE ENCASED IN
PLASTERBOARD AND SKIM TO PROVIDE 1/2HR
FIRE RESISTANCE

B3 => 2 NO. BEAMS

B

B4

=> OVER
INNER
LEAF

KITCHEN

M

4000

RAINWATER DRAINAGE
RAINWATER GOODS TO MATCH EXISTING A
INTO 68MM DIA UPVC DOWNPIPES. RAINW
S.W./COMBINED SYSTEM. DETAILS TO BE AC
DRAINS TO BE CONNECTED TO EXISTING NE
SITE.

FULL DETAILS OF EXISTING DRAINAGE SYSTE
CONFIRMED ON SITE. INCLUDING GRADIEN
POSITIONS. ALL TO B.C.O. APPROVAL

DRAINS TO HAVE LINTEL OVER WHERE PASS
DRAINS PASS BENEATH BUILDING, FOUNDAT
BELOW INVERT OF PIPE.

890   1810   1224   890

RWP

5953 CHECK ON SITE

A

PROPOSED GROUND FLOOR PLAN

(RR)

(B1)

EAD FLASHING INTO NEW STEPPED TRAY
L AT ROOF AND WALL ABUTMENTS

GUED
PBOARD

HE

ROC
FLOOR

WEEN

IM

FLOOR TO ALIGN WITH EXISTING

(RR)

(B2) => 2NO. BEAMS

(B3) => 2NO. BEAMS

FLOOR TO ALIGN WITH EXISTING

N

SECTION A-A

NEW PITCHED ROOF
ROOF TILES TO MATCH EXISTING AND TO SUIT LOW ROOF PITCH TO BUILDING CONTROL OFFICERS
APPROVAL & INSTALLED FULLY IN ACCORDANCE WITH THE MANUFACTURERS DETAILS ON 25X50MM
TAN SW BATTENS ON **APPROVED BREATHER FELT** ON150X50MM C16 RAFTE4RS AT 40OC/C

100MM X 50MM WALL PLATE STRAPPED DOWN TO WALLS WITH 30X5MM GALVANISED MS STRAPS AT
1200C/C

INSULATION BETWEEN RAFTERS TO BE 120MM XTRATHERM XT/TL-MF BETWEEN RAFTERS AND 25MM
XTRATHERM XT/TL-MF BELOW RAFTERS WITH 13MM PLASTERBOARD AND SKIM ON VCL

INSULATION AT CEILING LEVEL
400MM CROWN LOFTROLL 40 (OR EQUAL) LAID ACROSS TOP
13MM FOIL BACKED PLASTERBOARD AND SKIM CEILINGS

EXTERNAL WALL CONSTRUCTION
103MM OUTER LEAF OF FACING BRICKWORK TO
MATCH EXISTING,100MM DRITHERM CAVITY WALL
BATTS &100MM PLASMOR AGLITE® BLOCKWORK INNER
LEAF.
ALL EXTERNAL CAVITY WALLS TO BE DOT AND DABBED
WITH PLASTERBOARD& SKIM
STAINLESS STEEL WALL TIES TO BE PROVIDED AT
450MM C/C VERTICALLY & 700MM C/C HORIZONTALLY
AND EVERY BLOCK AT REVEALS
NOTE - FISH TAIL TIES MUST NOT BE USED.

D.P.C IN WALLS MINIMUM 150MM ABOVE
EXTERNAL GROUND LEVEL

7N SOLID BLOCKS BELOW D.P.C LEVEL

WEAK MIX CAVITY FILL TO WITHIN 75MM OF G.L.
BUT NOT LESS THAN 150MM BELOW D.P.C.

SUB-STRUCTURE

MINIMUM 200 X 600MM CONCRETE STRIP FOOTINGS,
MINIMUM 900MM FROM LOWER GROUND LEVEL TO
UNDER SIDE OF CONCRETE (ALL SUBJECT TO BUILDING
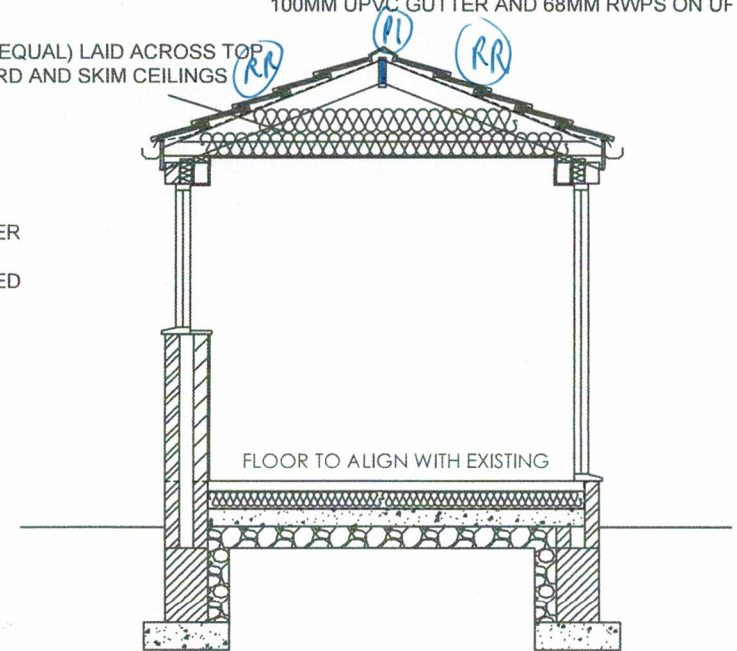CONTROL OFFICERS APPROVAL)

PITCHED ROOF SINGLE STOREY STOREY EXT
SLATE TO MATCH EXISTING ON 25X50MM TAN
BREATHER FELT ON100X47 C16 RAFTERS @ 4
150X100 C 16 HIP RAFTERS AND RIDGE, 120X4
JOISTS AT 400C/C.
MAINTAIN A 50MM AIR GAP ABOVE INSULATION
ROOF. PROVIDE OPENING AT EAVES LEVEL A
CONTINUOUS STRIP10MM WIDE

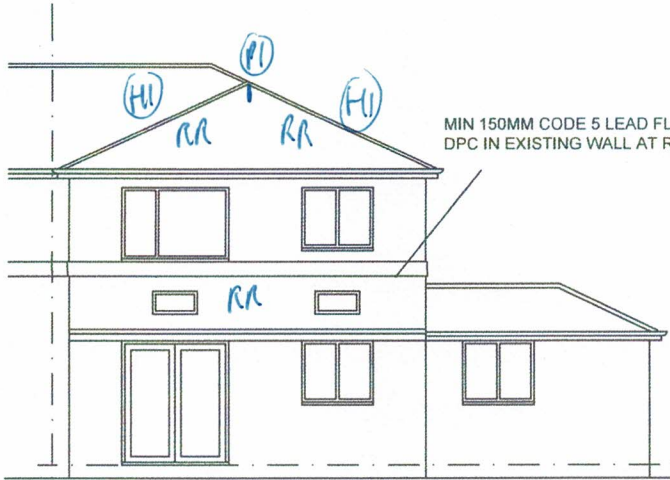100MM X 50MM WALL PLATE STRAPPED DOWN
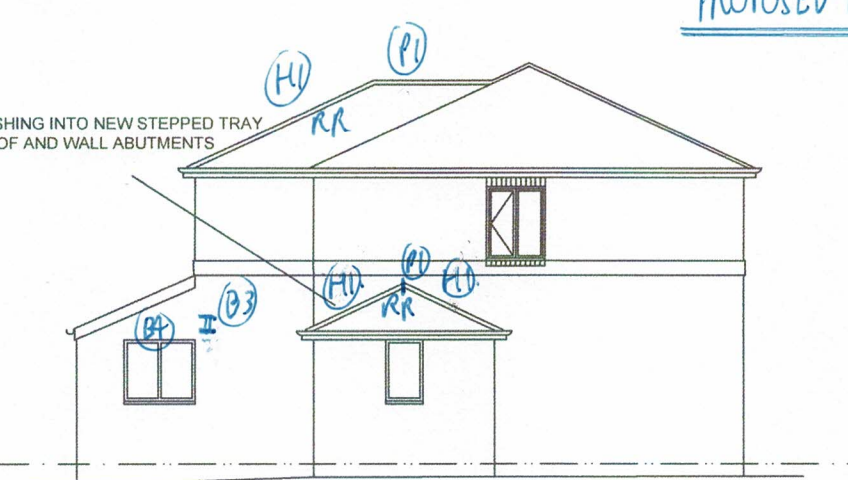30X5MM GALVANISED MS STRAPS AT 1200C/C

100MM UPVC GUTTER AND 68MM RWPS ON UF

(P1)

(RR) (RR)

FLOOR TO ALIGN WITH EXISTING

SECTION B-B

MIN 150MM CODE 5 LEAD FLASHING INTO NEW STEPPED TRAY
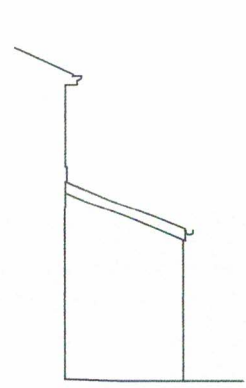DPC IN EXISTING WALL AT ROOF AND WALL ABUTMENTS

**PROPOSED
REAR ELEVATION**

**PROPOSED
SIDE ELEVATION**

**PROPOSED
FRONT ELEVATION**

**PROPOSED
SIDE ELEVATION**

FIRST FLOOR CON
AND GROOVED M
FIXED WITH APPR
SCREWED DOWN
PERIMETER AND
INTERMEDIATE SL
DRYWALL TIMBER
JOISTS @ 400C/C

100MM ROCKWOC
JOISTS AND 13MM
CEILING

GROUND FLOOR C
75MM SCREED ON
(VCL) ON 125MM P
2000 G VISQUEEN
DPC IN WALLS ON
FLOOR SLAB WITH S
MESH ON150MM W
AND BLINDED LIME

STRUCTURAL CALCULATIONS

Address: **69 Washington Rd, Goldthorpe, Rotherham S63 9EE.**

Calculations for:

Side and Rear Extension.

DESIGN LOADINGS

Walls

Inner Skin $\rightarrow$ 0.1 x 20 kN/m^3 = 2.0 kN/m^2 – (**Block**)

Outer Skin $\rightarrow$ 0.1 x 20 kN/m^3 = 2.0 kN/m^2 – (**Brick**)

$$\underline{\text{Total}} \quad = \mathbf{4.0 \text{ kN/m}^2}$$

Roof – (Tiles)

Dead Loads   = 1.3 kN/m^2

Imposed Loads   = 0.8 kN/m^2

$$\underline{\text{Total}} \quad = \underline{\mathbf{2.1 \text{ kN/m}^2}}$$

Floor – (Timber)

Dead Loads   = 1.0 kN/m^2

Imposed Loads   = 1.5 kN/m^2

$$\underline{\text{Total}} \quad = \underline{\mathbf{2.5 \text{ kN/m}^2}}$$

Hudds Design — Structural Engineering Consultants — Hudds Design — 103-105 Bradford Rd — Huddersfield — HD1 6DZ	Project: 69 Washington Rd, Goldthorpe, Rotherham S63 9EE	Job no.: HD-S21-0118
	Calcs for: Roof Rafter RR	Start page no./Revision: RR - 1
	Calcs by: JT — Calcs date: 25/01/2021 — Checked by: JA — Checked date: 25/01/2021	Approved by: — Approved date:

TIMBER RAFTER DESIGN (BS5268-2:2002)

TEDDS calculation version 1.0.03

25 degrees
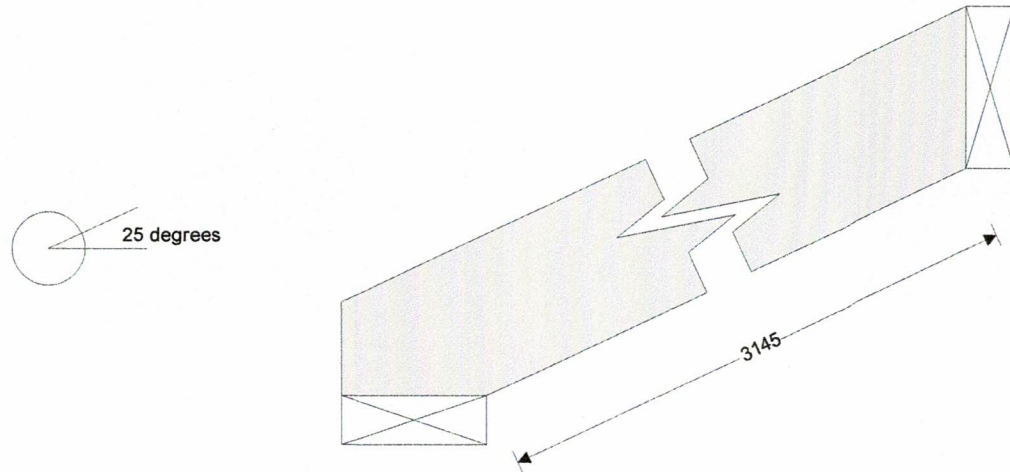
3145

Rafter details

Breadth of timber sections	$b = 50$ mm	Depth of timber sections	$h = 150$ mm
Rafter spacing	$s = 400$ mm	Rafter span	**Single span**
Clear length of span on slope	$L_{cl} = 3145$ mm	Rafter slope	$\alpha = 25.0$ deg
Timber strength class	~~C16~~ C24 (use)		

Section properties

Cross sectional area of rafter	$A = 7500$ mm^2	Section modulus	$Z = 187500$ mm^3
Radius of gyration	$r = 43$ mm	Second moment of area	$I = 14062500$ mm^4

Loading details

Rafter self weight	$F_j = 0.02$ kN/m	Dead load on slope	$F_d = 1.18$ kN/m^2
Imposed snow load on plan	$F_u = 0.80$ kN/m^2	Imposed point load	$F_p = 0.90$ kN

Modification factors

Section depth factor	$K_7 = 1.08$	Load sharing factor	$K_8 = 1.10$

Consider long term load condition

Load duration factor	$K_3 = 1.00$	Total UDL perp. to rafter	$F = 0.448$ kN/m
Notional bearing length	$L_b = 6$ mm	Effective span	$L_{eff} = 3150$ mm

Check bending stress

Permissible bending stress	$\sigma_{m\_adm} = 6.292$ N/mm^2	Applied bending stress	$\sigma_{m\_max} = 2.967$ N/mm^2

PASS - Applied bending stress within permissible limits

Check compressive stress parallel to grain

Permissible comp. stress	$\sigma_{c\_adm} = 4.212$ N/mm^2	Applied compressive stress	$\sigma_{c\_max} = 0.334$ N/mm^2

PASS - Applied compressive stress within permissible limits

Check combined bending and compressive stress parallel to grain

Combined loading check   **0.563 < 1**

PASS - Combined compressive and bending stresses are within permissible limits

Check shear stress

Permissible shear stress	$\tau_{adm} = 0.737$ N/mm^2	Applied shear stress	$\tau_{max} = 0.141$ N/mm^2

PASS - Applied shear stress within permissible limits

	Project			Job no.	
Hudds Design Structural Engineering Consultants **Hudds Design** 103-105 Bradford Rd Huddersfield HD1 6DZ	69 Washington Rd, Goldthorpe, Rotherham S63 9EE			HD-S21-0118	
	Calcs for			Start page no./Revision	
	Roof Rafter RR			RR - 2	
	Calcs by JT	Calcs date 25/01/2021	Checked by JA	Checked date 25/01/2021	Approved by	Approved date

Check deflection

Permissible deflection $\quad \delta_{adm} = 9.451$ mm $\qquad$ Total deflection $\quad \delta_{max} = 4.810$ mm

PASS - Total deflection within permissible limits

Consider medium term load condition

Load duration factor $\quad K_3 = 1.25 \qquad$ Total UDL perp. to rafter $\quad F = 0.711$ kN/m

Notional bearing length $\quad L_b = 9$ mm $\qquad$ Effective span $\quad L_{eff} = 3154$ mm

Check bending stress

Permissible bending stress $\quad \sigma_{m\_adm} = 7.865$ N/mm$^2 \qquad$ Applied bending stress $\quad \sigma_{m\_max} = 4.717$ N/mm^2

PASS - Applied bending stress within permissible limits

Check compressive stress parallel to grain

Permissible comp. stress $\quad \sigma_{c\_adm} = 4.831$ N/mm$^2 \qquad$ Applied compressive stress $\quad \sigma_{c\_max} = 0.530$ N/mm^2

PASS - Applied compressive stress within permissible limits

Check combined bending and compressive stress parallel to grain

Combined loading check $\quad$ **0.733 < 1**

PASS - Combined compressive and bending stresses are within permissible limits

Check shear stress

Permissible shear stress $\quad \tau_{adm} = 0.921$ N/mm$^2 \qquad$ Applied shear stress $\quad \tau_{max} = 0.224$ N/mm^2

PASS - Applied shear stress within permissible limits

Check deflection

Permissible deflection $\quad \delta_{adm} = 9.462$ mm $\qquad$ Total deflection $\quad \delta_{max} = 7.663$ mm

PASS - Total deflection within permissible limits

Consider short term load condition

Load duration factor $\quad K_3 = 1.50 \qquad$ Total UDL perp. to rafter $\quad F = 0.448$ kN/m

Notional bearing length $\quad L_b = 9$ mm $\qquad$ Effective span $\quad L_{eff} = 3154$ mm

Check bending stress

Permissible bending stress $\quad \sigma_{m\_adm} = 9.438$ N/mm$^2 \qquad$ Applied bending stress $\quad \sigma_{m\_max} = 6.404$ N/mm^2

PASS - Applied bending stress within permissible limits

Check compressive stress parallel to grain

Permissible comp. stress $\quad \sigma_{c\_adm} = 5.317$ N/mm$^2 \qquad$ Applied compressive stress $\quad \sigma_{c\_max} = 0.385$ N/mm^2

PASS - Applied compressive stress within permissible limits

Check combined bending and compressive stress parallel to grain

Combined loading check $\quad$ **0.769 < 1**

PASS - Combined compressive and bending stresses are within permissible limits

Check shear stress

Permissible shear stress $\quad \tau_{adm} = 1.106$ N/mm$^2 \qquad$ Applied shear stress $\quad \tau_{max} = 0.305$ N/mm^2

PASS - Applied shear stress within permissible limits

Check deflection

Permissible deflection $\quad \delta_{adm} = 9.462$ mm $\qquad$ Total deflection $\quad \delta_{max} = 9.326$ mm

PASS - Total deflection within permissible limits

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Project:	69 WASHINGTON RD, ROTHERHAM S63 9CE		Job No. HD-521-018	
Calcs for:	PURLIN P1		Start Page: P1-1	Rev:
Calcs by: JT	Calcs Date: 25/01/2021	Checked:	Checked Date:	Approved:	Approved Date:

PURLIN P1

MAX CLEAR SPAN = 3000 mm

SUPPORTING ROOF LENGTH = 0.5 (3.4m) × 2NO. = 3.4m

LOADS ON PURLIN P1

ROOF DEAD LOAD =   3.4m   ×   1.3 kN/m2   = 4.5 kN/m

ROOF IMPOSED LOAD =   3.4m   ×   0.8 kN/m2   = 2.7 kN/m

ADOPT 100 × 275mm DEEP TIMBER (SEE CALC P1)

MIN GRADE C24

$R_{DL} = 7.0 kN$

$R_{LL} = 4.1 kN$

Hudds Design	Project	Job no.	
Structural Engineering Consultants	69 Washington Rd, Goldthorpe, Rotherham S63 9EE	HD-S21-0118	
Hudds Design	Calcs for	Start page no./Revision	
103 - 105 Bradford Rd	Purlin P1 (Timber)	P1 - 1	
Huddersfield			
HD1 6DZ	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	JT	25/01/2021	JA	25/01/2021		

TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.7.01
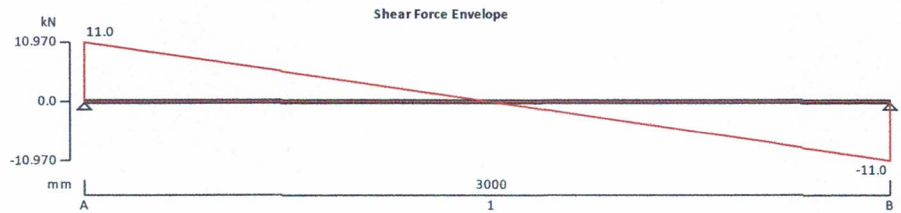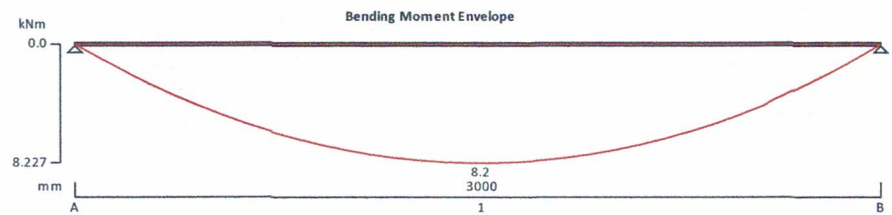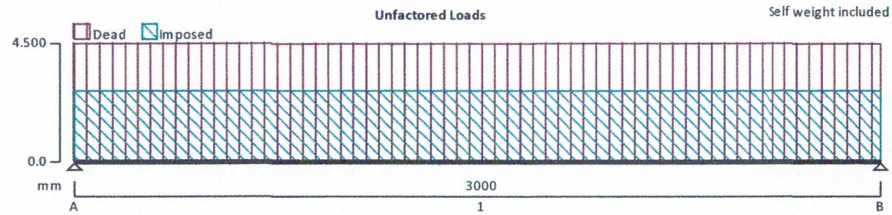
Applied loading

Beam loads

Dead self weight of beam × 1
Dead full UDL 4.500 kN/m
Imposed full UDL 2.700 kN/m

Load combinations

Load combination 1

	Support A	Dead × 1.00
		Imposed × 1.00
	Span 1	Dead × 1.00
		Imposed × 1.00
	Support B	Dead × 1.00
		Imposed × 1.00

Analysis results

Design moment $M = 8.227$ kNm   Design shear $F = 10.970$ kN

Total load on beam $W_{tot} = 21.940$ kN

Reactions at support A $R_{A\_max} = 10.970$ kN $R_{A\_min} = 10.970$ kN

Unfactored dead load reaction at support A $R_{A\_Dead} = 6.920$ kN

Unfactored imposed load reaction at support A $R_{A\_Imposed} = 4.050$ kN

	Project			Job no.	
Hudds Design Structural Engineering Consultants **Hudds Design** 103 - 105 Bradford Rd Huddersfield HD1 6DZ	69 Washington Rd, Goldthorpe, Rotherham S63 9EE			HD-S21-0118	
	Calcs for			Start page no./Revision	
	Purlin P1 (Timber)			P1 - 2	
	Calcs by JT	Calcs date 25/01/2021	Checked by JA	Checked date 25/01/2021	Approved by	Approved date

Reactions at support B $\qquad$ R_{B_max} = **10.970** kN $\qquad$ R_{B_min} = **10.970** kN

Unfactored dead load reaction at support B $\qquad$ R_{B_Dead} = **6.920** kN

Unfactored imposed load reaction at support B $\qquad$ $R_{B\_Imposed}$ = **4.050** kN

Timber section details

Breadth of section $\qquad$ b = **100** mm $\qquad$ Depth of section $\qquad$ h = **275** mm

Number of sections $\qquad$ N = **1** $\qquad$ Breadth of beam $\qquad$ b_b = **100** mm

Timber strength class $\qquad$ **C24**

Member details

Service class of timber $\qquad$ **1** $\qquad$ Load duration $\qquad$ **Medium term**

Length of span $\qquad$ L_{s1} = **3000** mm

Length of bearing $\qquad$ L_b = **100** mm

Lateral support - cl.2.10.8

Permiss.depth-to-breadth ratio **4.00** $\qquad$ Actual depth-to-breadth ratio **2.75**

PASS - Lateral support is adequate

Check bearing stress

Permissible bearing stress $\qquad$ σ_{c_adm} = **3.000** N/mm^2 $\qquad$ Applied bearing stress $\qquad$ σ_{c_a} = **1.097** N/mm^2

PASS - Applied compressive stress is less than permissible compressive stress at bearing

Bending parallel to grain

Permissible bending stress $\qquad$ σ_{m_adm} = **9.465** N/mm^2 $\qquad$ Applied bending stress $\qquad$ σ_{m_a} = **6.528** N/mm^2

PASS - Applied bending stress is less than permissible bending stress

Shear parallel to grain

Permissible shear stress $\qquad$ τ_{adm} = **0.888** N/mm^2 $\qquad$ Applied shear stress $\qquad$ τ_a = **0.598** N/mm^2

PASS - Applied shear stress is less than permissible shear stress

Deflection

Permissible deflection $\qquad$ δ_{adm} = **9.000** mm $\qquad$ Total deflection $\qquad$ δ_a = **6.979** mm

PASS - Total deflection is less than permissible deflection

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Project: 69 WASHINGTON RD, ROTHERHAM S63 9EE		Job No. HD-S21- 0118	
Calcs for: HIP RAFTER H1		Start Page: H1-1	Rev:
Calcs by: JT	Calcs Date: 25/01/2021	Checked:	Checked Date:
		Approved:	Approved Date:

HIP RAFTER H1

MAX CLEAR SPAN = 3200mm

SUPPORTING ROOF LENGTH = 1.6m

LOADS ON HIP RAFTER H1

ROOF DEAD LOAD =	1.6m	$\times$	1.3 kN/m²	=	2.1 kN/m
ROOF IMPOSED LOAD =	1.6m	$\times$	0.8 kN/m²	=	1.3 kN/m

ADOPT 75 x 250mm DEEP TIMBER (SEE CALC H1)

MIN GRADE C24

$R_{DL} = 3.5 kN$

$R_{LL} = 2.1 kN$

Hudds Design — Structural Engineering Consultants	Project	Job no.
Hudds Design	69 Washington Rd, Goldthorpe, Rotherham S63 9EE	HD-S21-0118
103 - 105 Bradford Rd	Calcs for	Start page no./Revision
Huddersfield	Hip Rafter H1 (Timber)	H1 - 1
HD1 6DZ		

Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
JT	25/01/2021	JA	25/01/2021		

TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.7.01
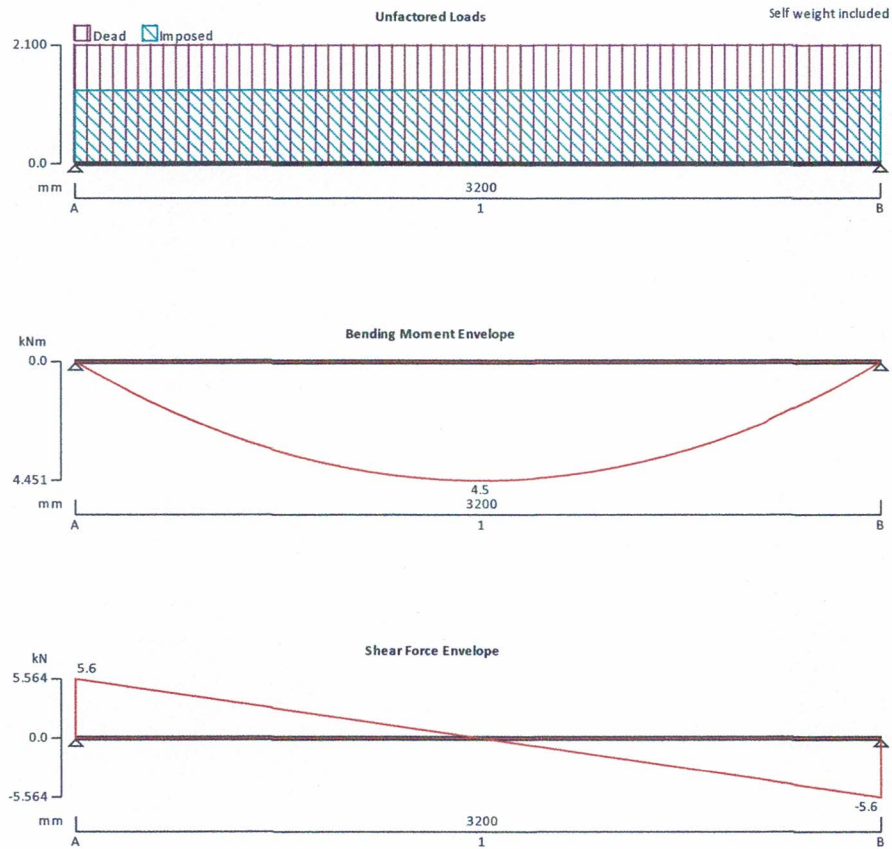
Applied loading

Beam loads

Dead self weight of beam × 1
Dead full UDL 2.100 kN/m
Imposed full UDL 1.300 kN/m

Load combinations

Load combination 1
Support A   Dead × 1.00
                 Imposed × 1.00

Span 1   Dead × 1.00
                 Imposed × 1.00

Support B   Dead × 1.00
                 Imposed × 1.00

Analysis results

Design moment   M = 4.451 kNm   Design shear   F = 5.564 kN

Total load on beam W_{tot} = 11.127 kN

Reactions at support A R_{A_max} = 5.564 kN R_{A_min} = 5.564 kN

Unfactored dead load reaction at support A R_{A_Dead} = 3.484 kN

Unfactored imposed load reaction at support A $R_{A\_Imposed}$ = 2.080 kN

Hudds Design	Project		Job no.	
Hudds Design Structural Engineering Consultants	69 Washington Rd, Goldthorpe, Rotherham S63 9EE		HD-S21-0118	
Hudds Design 103 - 105 Bradford Rd Huddersfield HD1 6DZ	Calcs for		Start page no./Revision	
	Hip Rafter H1 (Timber)		H1 - 2	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	JT	25/01/2021	JA	25/01/2021		

Reactions at support B $\quad$ R_{B_max} = **5.564** kN $\qquad$ R_{B_min} = **5.564** kN

Unfactored dead load reaction at support B $\qquad$ R_{B_Dead} = **3.484** kN

Unfactored imposed load reaction at support B $\qquad$ $R_{B\_Imposed}$ = **2.080** kN

Timber section details

Breadth of section	b = **75** mm	Depth of section	h = **250** mm
Number of sections	N = **1**	Breadth of beam	b_b = **75** mm
Timber strength class	**C24**		

Member details

Service class of timber	1	Load duration	**Medium term**
Length of span	L_{s1} = **3200** mm		
Length of bearing	L_b = **100** mm		

Lateral support - cl.2.10.8

Permiss.depth-to-breadth ratio **4.00** $\qquad$ Actual depth-to-breadth ratio **3.33**

PASS - Lateral support is adequate

Check bearing stress

Permissible bearing stress $\quad$ σ_{c_adm} = **3.000** N/mm² $\qquad$ Applied bearing stress $\quad$ σ_{c_a} = **0.742** N/mm²

PASS - Applied compressive stress is less than permissible compressive stress at bearing

Bending parallel to grain

Permissible bending stress $\quad$ σ_{m_adm} = **9.565** N/mm² $\qquad$ Applied bending stress $\quad$ σ_{m_a} = **5.697** N/mm²

PASS - Applied bending stress is less than permissible bending stress

Shear parallel to grain

Permissible shear stress $\quad$ τ_{adm} = **0.888** N/mm² $\qquad$ Applied shear stress $\quad$ τ_a = **0.445** N/mm²

PASS - Applied shear stress is less than permissible shear stress

Deflection

Permissible deflection $\quad$ δ_{adm} = **9.600** mm $\qquad$ Total deflection $\quad$ δ_a = **7.385** mm

PASS - Total deflection is less than permissible deflection

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Project: 69 WASHINGTON RD, ROTHERHAM S63 9EE		Job No. HD-S21-0118	
Calcs for: BEAM B1		Start Page: B1-1	Rev:
Calcs by: JT	Calcs Date: 25/01/2021	Checked:	Checked Date:	Approved:	Approved Date:

BEAM B1

MAX CLEAR SPAN = 3100mm

(PARTIAL) SUPPORTING PILLAR HEIGHT = 1.3m
+ PURLIN P1 REACTION
+ HIP RAFTER H1 REACTION   } @ MID-SPAN
+ ROOF LENGTH = 2.0m   (EXISTING ROOF)

LOADS ON BEAM B1

(PARTIAL) PILLAR DEAD LOAD =   1.3m   ×   2.0kN/m² = 2.6kN/m

PURLIN P1 DEAD REACTION   = 7.0kN
PURLIN P1 IMPOSED REACTION   = 4.1kN

HIP RAFTER H1 DEAD REACTION   = 3.5kN
HIP RAFTER H1 IMPOSED REACTION   = 2.1kN

ROOF DEAD LOAD   =   2.0m   ×   1.3kN/m² = 2.6 kN/m
ROOF IMPOSED LOAD =   2.0m   ×   0.8kN/m² = 1.6 kN/m

ADOPT   152 × 152 × 23   UC   (SEE CALC B1)

PADSTONES

$R = 23.1 kN$

$\sigma_c = \dfrac{23.1 \times 1000}{200 \times 100} = 1.16 N/mm^2 < 1.2 N/mm^2$ SATISFACTORY

ADOPT 200 × 100 × 215mm   DEEP CONCRETE PADSTONES
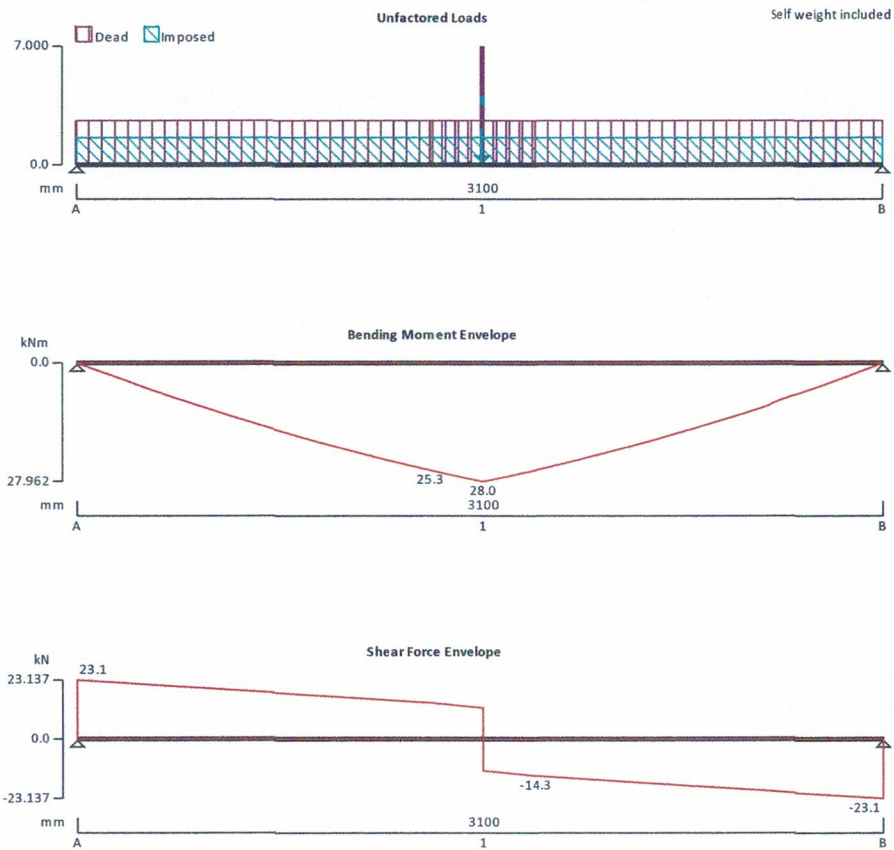

$R_{DL} = 10.1 kN$

$R_{LL} = 5.6 kN$

	Project	Job no.
Hudds Design Structural Engineering Consultants **Hudds Design** 103 - 105 Bradford Rd Huddersfield HD1 6DZ	69 Washington Rd, Goldthorpe, Rotherham S63 9EE	HD-S21-0118
	Calcs for	Start page no./Revision
	Beam B1	B1 - 1

Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
JT	25/01/2021	JA	25/01/2021		

STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07

Support conditions

Support A — Vertically restrained
Rotationally free

Support B — Vertically restrained
Rotationally free

Applied loading

Beam loads — Dead self weight of beam × 1
Dead partial UDL 2.6 kN/m from 1350 mm to 1750 mm
Dead point load 7 kN at 1550 mm
Imposed point load 4.1 kN at 1550 mm
Dead point load 3.5 kN at 1550 mm
Imposed point load 2.1 kN at 1550 mm
Dead full UDL 2.6 kN/m
Imposed full UDL 1.6 kN/m

Load combinations

Load combination 1 — Support A — Dead × 1.40
Imposed × 1.60

Hudds Design	Project	Job no.
Hudds Design Structural Engineering Consultants Hudds Design 103 - 105 Bradford Rd Huddersfield HD1 6DZ	69 Washington Rd, Goldthorpe, Rotherham S63 9EE	HD-S21-0118
	Calcs for Beam B1	**Start page no./Revision** B1 - 2

Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
JT	25/01/2021	JA	25/01/2021		

Dead × 1.40

Imposed × 1.60

Support B · Dead × 1.40

Imposed × 1.60

Analysis results

Maximum moment	M_{max} = **28** kNm	M_{min} = **0** kNm	
Maximum shear	V_{max} = **23.1** kN	V_{min} = **-23.1** kN	
Deflection	δ_{max} = **2.3** mm	δ_{min} = **0** mm	
Maximum reaction at support A	R_{A_max} = **23.1** kN	R_{A_min} = **23.1** kN	
Unfactored dead load reaction at support A	R_{A_Dead} = **10.1** kN		
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **5.6** kN		
Maximum reaction at support B	R_{B_max} = **23.1** kN	R_{B_min} = **23.1** kN	
Unfactored dead load reaction at support B	R_{B_Dead} = **10.1** kN		
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **5.6** kN		

Section details

Section type   **UC 152x152x23 (BS4-1)**   Steel grade   **S275**

Classification of cross sections - Section 3.5

Tensile strain coefficient ε = **1.00**   Section classification   **Semi-compact**

Shear capacity - Section 4.2.3

Design shear force F_v = **23.1** kN   Design shear resistance P_v = **145.8** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment   M = **28** kNm   Moment capacity low shear M_c = **48.5** kNm

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment M_b = **35.8** kNm M_b / m_{LT} = **41.1** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to imposed loads

Limiting deflection δ_{lim} = **8.611** mm   Maximum deflection δ = **2.253** mm

PASS - Maximum deflection does not exceed deflection limit

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Project: 69 WASHINGTON RD, ROTHERHAM S63 9EE		Job No. HD-521-0118	
Calcs for: BEAM B2		Start Page: B2-1	Rev:
Calcs by: JT	Calcs Date: 25/01/2021	Checked:	Checked Date:
		Approved:	Approved Date:

BEAM B2 => 2 No. BEAMS

MAX CLEAR SPAN = 5100mm

(PARTIAL) SUPPORTING   WALL HEIGHT = 2.5m
(PARTIAL)   + ROOF LENGTH = 2.0m (INNER) & 0.5(3.0m)=1.5m (OUTER) } @ 3000 - 5100m ALONG SPAN
                     + FLOOR LENGTH = 0.5(3.0m) (INNER) & 0.5(1.8m) (OUTER)
                     + BEAM B1 REACTION @ 3000mm ALONG SPAN

LOADS ON BEAM B2 (INNER)

WALL DEAD LOAD =	2.5m	×	2.0kN/m2	= 5.0kN/m }	= 7.6kN/m	
ROOF DEAD LOAD =	2.0m	×	1.3kN/m2	= 2.6kN/m }		
ROOF IMPOSED LOAD =	2.0m	×	0.8kN/m2	= 1.6kN/m		
FLOOR DEAD LOAD =	1.5m	×	1.0kN/m2	= 1.5kN/m		
FLOOR IMPOSED LOAD =	1.5m	×	1.5kN/m2	= 2.3kN/m		
BEAM B1 DEAD REACTION				= 10.1kN		
BEAM B1 IMPOSED REACTION				= 5.6kN		

LOADS ON BEAM B2 (OUTER)

WALL DEAD LOAD =	2.5m	×	2.0kN/m2	= 5.0kN/m }	= 7.0kN/m	
ROOF DEAD LOAD =	1.5m	×	1.3kN/m2	= 2.0kN/m }		
ROOF IMPOSED LOAD =	1.5m	×	0.8kN/m2	= 1.2kN/m		
FLOOR DEAD LOAD =	0.9m	×	1.0kN/m2	= 0.9kN/m		
FLOOR IMPOSED LOAD =	0.9m	×	1.5kN/m2	= 1.4kN/m		

ADOPT 2 No. 254 × 146 × 37 UB'S (SEE CALC B2)

PADSTONES

R = 47.6 kN + 29.8kN = 77.4kN

$\sigma_c = \dfrac{77.4 \times 1000}{300 \times 300}$ = 0.9N/mm2 < 1.2 N/mm2   SATISFACTORY

ADOPT 300 × 300 × 215mm DEEP CONCRETE PADSTONES

	Project		Job no.	
Hudds Design Structural Engineering Consultants **Hudds Design** 103 - 105 Bradford Rd Huddersfield HD1 6DZ	69 Washington Rd, Goldthorpe, Rotherham S63 9EE		HD-S21-0118	
	Calcs for		Start page no./Revision	
	Beam B2 (Inner)		B2 - 1	
	Calcs by JT	Calcs date 25/01/2021	Checked by JA	Checked date 25/01/2021	Approved by	Approved date

STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07

Support conditions

Support A
Vertically restrained
Rotationally free

Support B
Vertically restrained
Rotationally free

Applied loading

Beam loads
Dead self weight of beam × 1
Dead partial UDL 7.6 kN/m from 3000 mm to 5100 mm
Imposed partial UDL 1.6 kN/m from 3000 mm to 5100 mm
Dead full UDL 1.5 kN/m
Imposed full UDL 1.3 kN/m
Dead point load 10.1 kN at 3000 mm
Imposed point load 5.6 kN at 3000 mm

Load combinations

Load combination 1
Support A
Dead × 1.40
Imposed × 1.60
Dead × 1.40

	Project	Job no.
Hudds Design	69 Washington Rd, Goldthorpe, Rotherham S63 9EE	HD-S21-0118
Structural Engineering Consultants	Calcs for	Start page no./Revision
Hudds Design	Beam B2 (Inner)	B2 - 2
103 - 105 Bradford Rd		
Huddersfield	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
HD1 6DZ	JT	25/01/2021	JA	25/01/2021		

Imposed × 1.60

Support B   Dead × 1.40

Imposed × 1.60

Analysis results

Maximum moment	M_{max} = **60.4 kNm**	M_{min} = **0 kNm**
Maximum shear	V_{max} = **27.2 kN**	V_{min} = **-47.6 kN**
Deflection	δ_{max} = **2.8 mm**	δ_{min} = **0 mm**
Maximum reaction at support A	R_{A_max} = **27.2 kN**	R_{A_min} = **27.2 kN**
Unfactored dead load reaction at support A	R_{A_Dead} = **12.2 kN**	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **6.3 kN**	
Maximum reaction at support B	R_{B_max} = **47.6 kN**	R_{B_min} = **47.6 kN**
Unfactored dead load reaction at support B	R_{B_Dead} = **23.4 kN**	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **9.3 kN**	

Section details

Section type   **UB 254x146x37 (BS4-1)**   Steel grade   **S275**

Classification of cross sections - Section 3.5

Tensile strain coefficient ε = **1.00**   Section classification   **Plastic**

Shear capacity - Section 4.2.3

Design shear force F_v = **47.6 kN**   Design shear resistance P_v = **266.1 kN**

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment   M = **60.4 kNm**   Moment capacity low shear M_c = **132.9 kNm**

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment M_b = **54.6 kNm** M_b / m_{LT} = **65.1 kNm**

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2
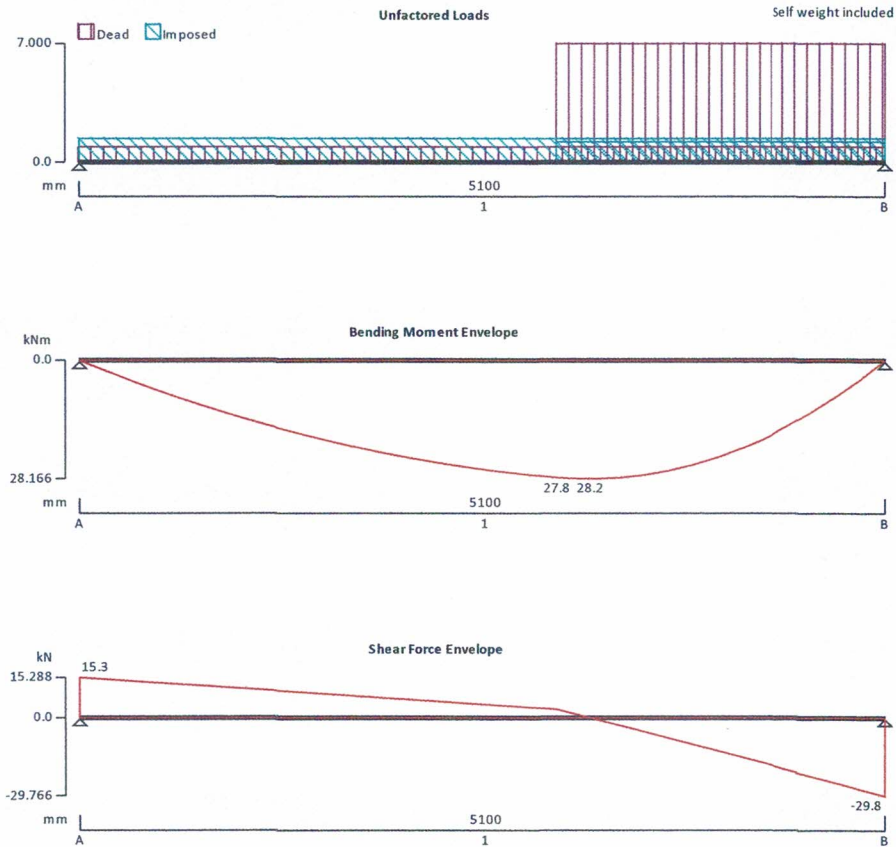
Consider deflection due to imposed loads

Limiting deflection δ_{lim} = **14.167 mm**   Maximum deflection δ = **2.767 mm**

PASS - Maximum deflection does not exceed deflection limit

Hudds Design	Project		Job no.	
Hudds Design Structural Engineering Consultants	69 Washington Rd, Goldthorpe, Rotherham S63 9EE		HD-S21-0118	
Hudds Design 103 - 105 Bradford Rd Huddersfield HD1 6DZ	Calcs for		Start page no./Revision	
	Beam B2 (Outer)		B2 - 1	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	JT	25/01/2021	JA	25/01/2021		

STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07

Support conditions

Support A

Vertically restrained
Rotationally free

Support B

Vertically restrained
Rotationally free

Applied loading

Beam loads

Dead self weight of beam × 1
Dead partial UDL 7 kN/m from 3000 mm to 5100 mm
Imposed partial UDL 1.2 kN/m from 3000 mm to 5100 mm
Dead full UDL 0.9 kN/m
Imposed full UDL 1.4 kN/m

Load combinations

Load combination 1

	Support A	Dead × 1.40
		Imposed × 1.60
		Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40

	Project			Job no.	
Hudds Design Structural Engineering Consultants **Hudds Design** 103 - 105 Bradford Rd Huddersfield HD1 6DZ	69 Washington Rd, Goldthorpe, Rotherham S63 9EE			HD-S21-0118	
	Calcs for			Start page no./Revision	
	Beam B2 (Outer)			B2 - 2	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	JT	25/01/2021	JA	25/01/2021		

Imposed × 1.60

Analysis results

Maximum moment
M_{max} = **28.2 kNm**
M_{min} = **0 kNm**

Maximum shear
V_{max} = **15.3 kN**
V_{min} = **-29.8 kN**

Deflection
δ_{max} = **1.4 mm**
δ_{min} = **0 mm**

Maximum reaction at support A
R_{A_max} = **15.3 kN**
R_{A_min} = **15.3 kN**

Unfactored dead load reaction at support A
R_{A_Dead} = **6.2 kN**

Unfactored imposed load reaction at support A
$R_{A\_Imposed}$ = **4.1 kN**

Maximum reaction at support B
R_{B_max} = **29.8 kN**
R_{B_min} = **29.8 kN**

Unfactored dead load reaction at support B
R_{B_Dead} = **14.9 kN**

Unfactored imposed load reaction at support B
$R_{B\_Imposed}$ = **5.6 kN**

Section details

Section type
UB 254x146x37 (BS4-1)
Steel grade
S275

Classification of cross sections - Section 3.5

Tensile strain coefficient
ε = **1.00**
Section classification
Plastic

Shear capacity - Section 4.2.3

Design shear force
F_v = **29.8 kN**
Design shear resistance
P_v = **266.1 kN**

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment
M = **28.2 kNm**
Moment capacity low shear
M_c = **132.9 kNm**

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment
M_b = **54.6 kNm**
M_b / m_{LT} = **62 kNm**

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to imposed loads

Limiting deflection
δ_{lim} = **14.167 mm**
Maximum deflection
δ = **1.424 mm**

PASS - Maximum deflection does not exceed deflection limit

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Project: 69 WASHINGTON RD, ROTHERHAM S63 9EE		Job No. HD-S21-0118	
Calcs for: BEAM B3		Start Page:	Rev:
Calcs by:	Calcs Date:	Checked:	Checked Date:
		Approved:	Approved Date:

BEAM B3 => 2NO. BEAMS

MAX CLEAR SPAN = 5500mm

SUPPORTING WALL HEIGHT = 2.4m
+ ROOF LENGTH = 0.5(3.0m) = 1.5m (INNER) X 0.5(2.0m) = 1.0m (OUTER)
+ FLOOR LENGTH = 0.5(1.8m) = 0.9m

LOADS ON BEAM B3 (INNER)

WALL DEAD LOAD =	2.4m	x	2.0kN/m² = 4.8N/m	⎫
ROOF DEAD LOAD =	1.5m	x	1.3kN/m² = 2.0kN/m	⎬ = 7.7kN/m
FLOOR DEAD LOAD =	0.9m	x	1.0kN/m² = 0.9kN/m	⎭
ROOF IMPOSED LOAD =	1.5m	x	0.8kN/m² = 1.2kN/m	⎫ 2.6kN/m
FLOOR IMPOSED LOAD =	0.9m	x	1.5kN/m² = 1.4kN/m	⎭

LOADS ON BEAM B3 (OUTER)

WALL DEAD LOAD =	2.4m	x	2.0kN/m² = 4.8N/m	⎫ = 6.1N/m
ROOF DEAD LOAD =	1.0m	x	1.3kN/m² = 1.3kN/m	⎭
ROOF IMPOSED LOAD =	1.0m	x	0.8kN/m² = 0.8kN/m	

ADOPT 2NO. 254x146x43 UB's (SEE CALC B3)

PADSTONES

$R = 66.8kN$

(NEW BUILD)

$\sigma_c = \dfrac{66.3 \times 1000}{400 \times 100} = 1.6N/mm² < 2.4 N/mm²$ SATISFACTORY

ADOPT 400x100x215mm DEEP CONCRETE PADSTONES

$R_{DL} = 13.2 + 8.8 = 22.0kN$

$R_{LL} = 7.2 + 2.2 = 9.4kN$

| Hudds Design	Project		Job no.	
Hudds Design Structural Engineering Consultants **Hudds Design** 103 - 105 Bradford Rd Huddersfield HD1 6DZ	69 Washington Rd, Goldthorpe, Rotherham S63 9EE		HD-S21-0118	
	Calcs for Beam B3 (Inner)		Start page no./Revision B3 - 1	
	Calcs by JT	Calcs date 25/01/2021	Checked by JA	Checked date 25/01/2021	Approved by	Approved date

STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07
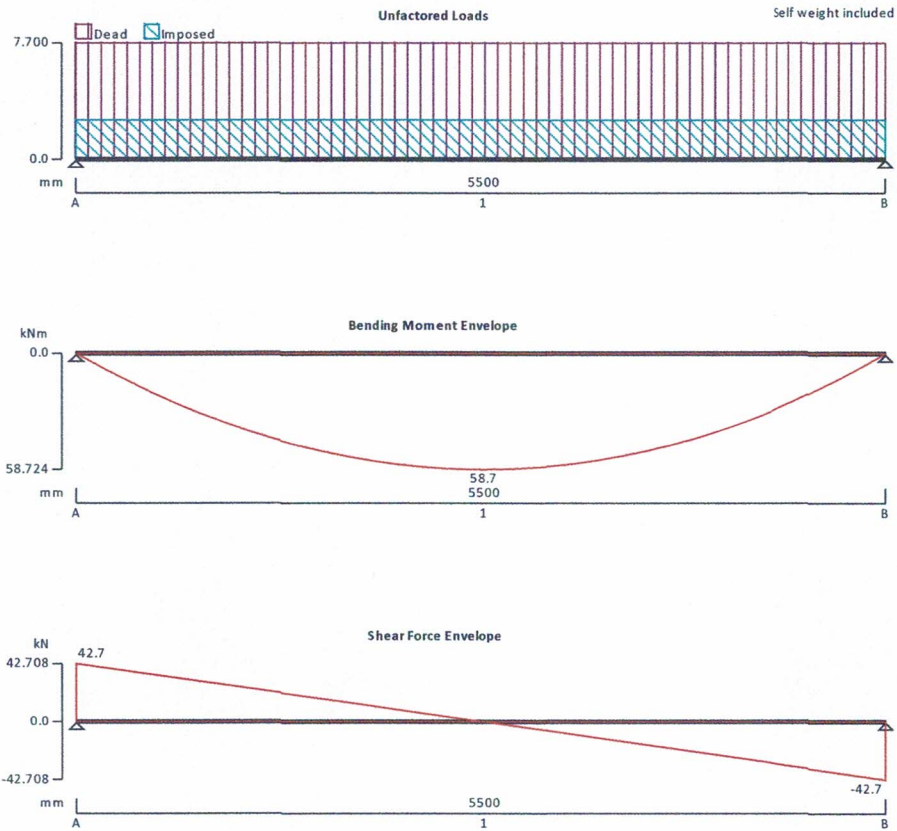
Support conditions

Support A — Vertically restrained
Rotationally free

Support B — Vertically restrained
Rotationally free

Applied loading

Beam loads — Dead self weight of beam × 1
Dead full UDL 7.7 kN/m
Imposed full UDL 2.6 kN/m

Load combinations

Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
		Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

	Project			Job no.	
Hudds Design Structural Engineering Consultants **Hudds Design** 103 - 105 Bradford Rd Huddersfield HD1 6DZ	69 Washington Rd, Goldthorpe, Rotherham S63 9EE			HD-S21-0118	
	Calcs for Beam B3 (Inner)			Start page no./Revision B3 - 2	
	Calcs by JT	Calcs date 25/01/2021	Checked by JA	Checked date 25/01/2021	Approved by	Approved date

Analysis results

Maximum moment $M_{max} = 58.7$ kNm $M_{min} = 0$ kNm

Maximum shear $V_{max} = 42.7$ kN $V_{min} = -42.7$ kN

Deflection $\delta_{max} = 2.3$ mm $\delta_{min} = 0$ mm

Maximum reaction at support A $R_{A\_max} = 42.7$ kN $R_{A\_min} = 42.7$ kN

Unfactored dead load reaction at support A $R_{A\_Dead} = 22.3$ kN

Unfactored imposed load reaction at support A $R_{A\_Imposed} = 7.2$ kN

Maximum reaction at support B $R_{B\_max} = 42.7$ kN $R_{B\_min} = 42.7$ kN

Unfactored dead load reaction at support B $R_{B\_Dead} = 22.3$ kN

Unfactored imposed load reaction at support B $R_{B\_Imposed} = 7.2$ kN

Section details

Section type **UB 254x146x43 (BS4-1)** Steel grade **S275**

Classification of cross sections - Section 3.5

Tensile strain coefficient $\epsilon = 1.00$ Section classification **Plastic**

Shear capacity - Section 4.2.3

Design shear force $F_v = 42.7$ kN Design shear resistance $P_v = 308.4$ kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment $M = 58.7$ kNm Moment capacity low shear $M_c = 155.7$ kNm

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment $M_b = 65.1$ kNm $M_b / m_{LT} = 70.4$ kNm

PASS - Buckling resistance moment exceeds design bending moment

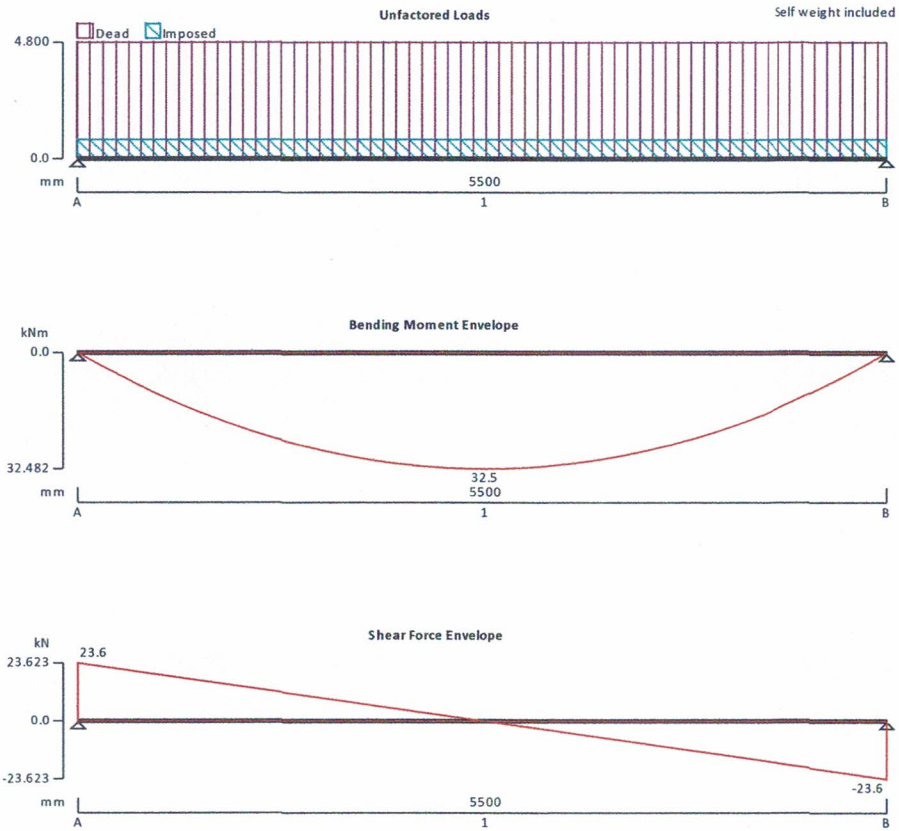### Check vertical deflection - Section 2.5.2

Consider deflection due to imposed loads

Limiting deflection $\delta_{lim} = 15.278$ mm Maximum deflection $\delta = 2.309$ mm

PASS - Maximum deflection does not exceed deflection limit

Hudds Design	Project		Job no.	
Structural Engineering Consultants	69 Washington Rd, Goldthorpe, Rotherham S63 9EE		HD-S21-0118	
Hudds Design	Calcs for		Start page no./Revision	
103 - 105 Bradford Rd	Beam B3 (Outer)		B3 - 1	
Huddersfield	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
HD1 6DZ	JT	25/01/2021	JA	25/01/2021		

STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07

Support conditions

Support A
Vertically restrained
Rotationally free

Support B
Vertically restrained
Rotationally free

Applied loading

Beam loads
Dead self weight of beam × 1
Dead full UDL 4.8 kN/m
Imposed full UDL 0.8 kN/m

Load combinations

Load combination 1
Support A
Dead × 1.40
Imposed × 1.60
Dead × 1.40
Imposed × 1.60

Support B
Dead × 1.40
Imposed × 1.60

Analysis results

Maximum moment	M_{max} = **32.5** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **23.6** kN	V_{min} = **-23.6** kN
Deflection	δ_{max} = **0.7** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **23.6** kN	R_{A_min} = **23.6** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **14.4** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **2.2** kN	
Maximum reaction at support B	R_{B_max} = **23.6** kN	R_{B_min} = **23.6** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **14.4** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **2.2** kN	

Section details

Section type	**UB 254x146x43 (BS4-1)**	Steel grade	**S275**

Classification of cross sections - Section 3.5

Tensile strain coefficient	ε = **1.00**	Section classification	**Plastic**

Shear capacity - Section 4.2.3

Design shear force	F_v = **23.6** kN	Design shear resistance	P_v = **308.4** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment	M = **32.5** kNm	Moment capacity low shear	M_c = **155.7** kNm

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment	M_b = **65.1** kNm	M_b / m_{LT} = **70.4** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to imposed loads

Limiting deflection	δ_{lim} = **15.278** mm	Maximum deflection	δ = **0.711** mm

PASS - Maximum deflection does not exceed deflection limit

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Project:	64 WASHINGTON RD, ROTHERHAM S63 9EE		Job No. HD-S21-018	
Calcs for:	BEAM B4		Start Page: B4-1	Rev:
Calcs by: J1	Calcs Date: 25/01/2021	Checked:	Checked Date:	Approved:	Approved Date:

BEAM B4

MAX CLEAR SPAN = 1200mm

SUPPORTING WALL HEIGHT = 2.7m
      + BEAM B3 REACTION @ MID-SPAN

LOADS ON BEAM B4

WALL DEAD LOAD =   2.7m   ×   2.0kN/m2   = 5.4kN/m

BEAM B3 DEAD REACTION   = 36.7kN
BEAM B3 IMPOSED REACTION   = 9.4kN

ADOPT 152 × 89 × 16 UB (SEE CALC B4)

PADSTONES

R = 37.9 kN

σ_c: $\dfrac{37.9 \times 1000}{200 \times 100}$ = 1.4N/mm2   < 2.4N/mm2   SATISFACTORY

ADOPT 200 × 100 × 215mm DEEP CONCRETE PADSTONES

Hudds Design Structural Engineering Consultants	Project		Job no.	
Hudds Design 103 - 105 Bradford Rd Huddersfield HD1 6DZ	69 Washington Rd, Goldthorpe, Rotherham S63 9EE		HD-S21-0118	
	Calcs for		Start page no./Revision	
	Beam B4		B4 - 1	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	JT	25/01/2021	JA	25/01/2021		

STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07

Unfactored Loads — Dead / Imposed — Self weight included

Bending Moment Envelope

Shear Force Envelope

Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Dead self weight of beam × 1
	Dead full UDL 5.4 kN/m
	Dead point load 36.7 kN at 600 mm
	Imposed point load 9.4 kN at 600 mm

Load combinations

Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
		Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

Hudds Design Structural Engineering Consultants **Hudds Design** 103 - 105 Bradford Rd Huddersfield HD1 6DZ	Project 69 Washington Rd, Goldthorpe, Rotherham S63 9EE		Job no. HD-S21-0118	
	Calcs for Beam B4		Start page no./Revision B4 - 2	
	Calcs by JT	Calcs date 25/01/2021	Checked by JA	Checked date 25/01/2021	Approved by	Approved date

Analysis results

Maximum moment	M_{max} = **21.3 kNm**	M_{min} = **0 kNm**
Maximum shear	V_{max} = **37.9 kN**	V_{min} = **-37.9 kN**
Deflection	δ_{max} = **0.2 mm**	δ_{min} = **0 mm**
Maximum reaction at support A	R_{A_max} = **37.9 kN**	R_{A_min} = **37.9 kN**
Unfactored dead load reaction at support A	R_{A_Dead} = **21.7 kN**	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **4.7 kN**	
Maximum reaction at support B	R_{B_max} = **37.9 kN**	R_{B_min} = **37.9 kN**
Unfactored dead load reaction at support B	R_{B_Dead} = **21.7 kN**	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **4.7 kN**	

Section details

Section type **UB 152x89x16 (BS4-1)**   Steel grade   **S275**

Classification of cross sections - Section 3.5

Tensile strain coefficient ϵ = **1.00**   Section classification   **Plastic**

Shear capacity - Section 4.2.3

Design shear force F_v = **37.9 kN**   Design shear resistance P_v = **113.2 kN**

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment   M = **21.3 kNm**   Moment capacity low shear M_c = **33.9 kNm**

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment M_b = **27.5 kNm** M_b / m_{LT} = **32.2 kNm**

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to imposed loads

Limiting deflection δ_{lim} = **3.333 mm**   Maximum deflection δ = **0.198 mm**

PASS - Maximum deflection does not exceed deflection limit