

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project 39 Vallance Road, Wood Green, London N22 7UD				Job no. 39/N227UD	
	Calcs for Building alterations				Start page no./Revision 39/N227UD/ 1	
	Calcs by Hugh Levy	Calcs date 10/08/2026	Checked by Office	Checked date 10/08/2026	Approved by	Approved date

Timber pitched roof rafters to the existing SS extension	5
Timber Rafter design (Bs5268-2:2002).....	5
Consider long term load condition	5
Consider medium term load condition	6
Consider short term load condition.....	7
Steel beam 1	12
Steel beam analysis & design (BS5950).....	12
Steel beam 2	20
Steel beam analysis & design (BS5950).....	20
Beam end connection design of steel beam 1 to steel beam 2	24
Beam to Beam - Cleat Connection.....	24

The structural calculations have been prepared in accordance with the following British Standards:

- Weight of building materials: BS 648.
- Loading: BS 6399.
- Timber (grade C24): BS 5268.
- Steel: BS 5950

Notes:

- All structural calculations are to be checked and approved by the building control's appointed structural engineer before any of the building construction works commence at the site.
- The client is to ensure all the building contractors' works on site to comply with and meet approval of the relevant British Standards and the Building Control (whether Local Authority or Private Building Control) and Planning Departments.
- Dimensions - Note that all dimensions shown on the drawings are indicative and should be checked prior to start of the works on site. It is the responsibility of the client to notify the Designer of any discrepancies. The same applies to the alignment of walls and general layouts. All existing foundations and lintels to be exposed to verify suitability and to be checked for adequacy and/or replaced if necessary.
- Structural calculations loadings – There has been no access to any 'as built' plans of building as they were originally constructed. Consequently, structural calculations are based upon accessible areas and assumptions. The client should be aware that the calculations have limitations based upon the information forthcoming. We are not privy to the original construction details of the building from the time of its construction.
- All steel beam are to have a minimum of ½ hour fire resistance – refer to the structural construction notes that accompany these structural calculations.
- The dimensions of all steel sections required should be measured on site by the client (or their representative building contractor or steelwork fabricator). Where the wall above is wider than the steel (supporting it) below there is the need to weld a 10mm thick plate to the top flange/s of the steel section to ensure that the wall/steel interface are identical in overall structural width.



Photo 1 – rear elevation of the existing building



H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

Project

39 Vallance Road, Wood Green, London N22 7UD

Job no.

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 2

Calcs by

Hugh Levy

Calcs date

10/08/2026

Checked by

Office

Checked date

10/08/2026

Approved by

Approved date

Hugh Levy I.Eng A.M.I.Struct.E

H. Levy Consulting Ltd

STRUCTURAL CALCULATIONS

Project: 39 Vallance Road, Wood Green, London N22 7UD

Part of structure: LOADING

Calc. Sheet no: Ld/1.1

Drawing reference: PL01

Calculations by: H Levy Consulting Limited

Date: August 2026

LOADING

Existing pitched roof

Dead Load:

Concrete tiles	= 0.55
Battens	= 0.04
Felt	= 0.02
Rafters	= 0.08
	<u>0.69 KN/m²</u>

Weight on plan $\frac{0.69}{\cos 35^\circ}$	= <u>0.84 KN/m²</u>
---	--------------------------------

Existing ceiling joists	= 0.08
Insulation	= 0.03
Plasterboard	= 0.11
Skim	= 0.07
Services	= 0.10
	<u>0.39 KN/m²</u>

TOTAL	= <u>1.23KN/m²</u>
-------	-------------------------------

Imposed Load:

Pitched roof = $0.75 \times \frac{60-35}{30} = 0.63$

Ceiling tie	= 0.25
TOTAL	= 0.88 KN/m ²

Hugh Levy' is a trading name of 'H. Levy Consulting Limited'

Registered Office Address:

Oak Accounting Services Limited, Oak Farm, Oak Farm Road, Woodham Waller, Essex CM9 6RH

Registered in England No. 7151972



H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

Project

39 Vallance Road, Wood Green, London N22 7UD

Job no.

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 3

Calcs by

Hugh Levy

Calcs date

10/08/2026

Checked by

Office

Checked date

10/08/2026

Approved by

Approved date

Hugh Levy I.Eng A.M.I.Struct.E

H. Levy Consulting Ltd

Pitched roof to the existing extension

Dead Load:

Concrete tiles	= 0.55
Battens	= 0.04
Felt	= 0.02
Rafters	= 0.08
Insulation	= 0.03
Plasterboard	= 0.11
Skim	= 0.07
Services	= <u>0.10</u>
	1.0 KN/m ²

Imposed load:

Pitched roof	= 0.75 KN/m ²
TOTAL	= 1.75 KN/m ²

Floor

Dead Load

Boarding	= 0.18
Joists	= 0.15
Insulation	= 0.03
Services	= 0.10
Plasterboard	= 0.11
Skim	= <u>0.07</u>
	0.64 KN/m ²

Imposed Load

Floor	= 1.5 KN/m ²
TOTAL	= 2.14 KN/m ²

(Use total of 1.96 KN/m² if no finishes to underside)

Existing external wall

Dead Load

215mm solid brickwork	= 4.3
Plaster	= 0.25
Render	= <u>0.22</u>
	4.77 KN/m ²

(No imposed load implications)

Internal wall

Dead load

100mm thick brickwork wall	= 2.05
Plaster (x2)	= <u>0.44</u>
	2.49 KN/m ²

(No imposed load implications)

Hugh Levy' is a trading name of 'H. Levy Consulting Limited'

Registered Office Address:

Oak Accounting Services Limited, Oak Farm, Oak Farm Road, Woodham Walter, Essex CM9 6RH

Registered in England No. 7151972



H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

Project

39 Vallance Road, Wood Green, London N22 7UD

Job no.

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 4

Calcs by

Hugh Levy

Calcs date

10/08/2026

Checked by

Office

Checked date

10/08/2026

Approved by

Approved date



Project:

39 VALLANCE ROAD N22 7UD

Job Ref:

39/N227UD

Part of Structure:

TIMBER PITCHED ROOF RAFTERS

Calc Sheet No:

T '1:1'

Rev

Drawing Ref

PL01

Calc by

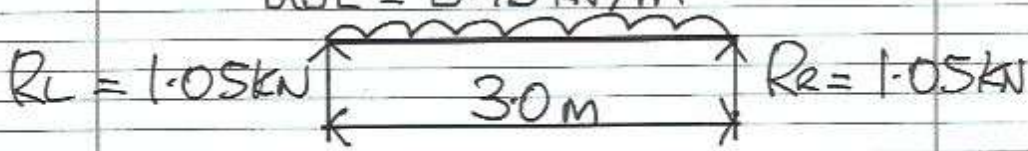
HOL

Date

08/2026

Check by

Date

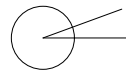
REF	CALCULATIONS	OUTPUT
	All rafters are grade C24 @ Maximum centres of 400 mm.	
	Maximum span = 3m	
	<u>LOADING (UNFACTORED)</u>	
UDL	<u>Dead Load</u>	
	Pitched roof = $1.0 \times 0.4 = 0.40 \text{ kN/m}$	
	<u>Imposed Load</u>	
	Pitched roof = $\frac{0.75 \times 0.4}{1.75 \text{ kN/m}^2} = \frac{0.30 \text{ kN/m}}{0.70 \text{ kN/m}}$	
	UDL = 0.70 kN/m	
		
	Total load = $0.70 \times 3.0 = 2.10 \text{ kN}$	
	Use 50 x 200 timber rafters @ 400 mm maximum centres throughout	

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project 39 Vallance Road, Wood Green, London N22 7UD				Job no. 39/N227UD	
	Calcs for Building alterations				Start page no./Revision 39/N227UD/ 5	
	Calcs by Hugh Levy	Calcs date 10/08/2026	Checked by Office	Checked date 10/08/2026	Approved by	Approved date

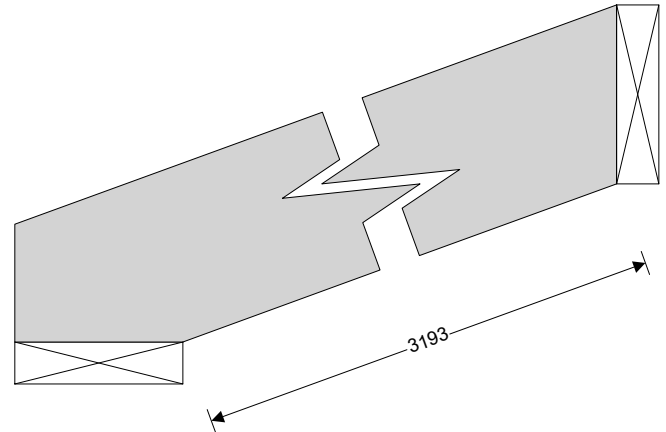
TIMBER PITCHED ROOF RAFTERS TO THE EXISTING SS EXTENSION

TIMBER RAFTER DESIGN (BS5268-2:2002)

TEDDS calculation version 1.0.03



20 degrees



Rafter details

Breadth of timber sections;	b = 50 mm
Depth of timber sections;	h = 200 mm
Rafter spacing;	s = 400 mm
Rafter slope;	$\alpha = 20.0$ deg
Clear span of rafter on horizontal;	L_{clh} = 3000 mm
Clear span of rafter on slope;	L_{cl} = L_{clh} / cos(α) = 3193 mm
Rafter span;	Single span

Timber strength class; **C24**

Section properties

Cross sectional area of rafter;	A = b × h = 10000 mm²
Section modulus;	Z = b × h² / 6 = 333333 mm³
Second moment of area;	I = b × h³ / 12 = 33333333 mm⁴
Radius of gyration;	r = $\sqrt{I / A}$ = 57.7 mm

Loading details

Rafter self weight;	F_j = b × h × ρ_{char} × g_{acc} = 0.03 kN/m
Dead load on slope;	F_d = 0.69 kN/m²
Imposed load on plan;	F_u = 0.75 kN/m²
Imposed point load;	F_p = 0.90 kN

Modification factors

Section depth factor;	K₇ = (300 mm / h)^{0.11} = 1.05
Load sharing factor;	K₈ = 1.10

Consider long term load condition

Load duration factor;	K₃ = 1.00
Total UDL perpendicular to rafter;	F = F_d × cos(α) × s + F_j × cos(α) = 0.292 kN/m
Notional bearing length;	L_b = F × L_{cl} / [2 × (b × σ_{cp1} × K₈ - F)] = 4 mm
Effective span;	L_{eff} = L_{cl} + L_b = 3196 mm

Check bending stress

Bending stress parallel to grain;	σ_m = 7.500 N/mm²
-----------------------------------	---

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project		Job no.	
	39 Vallance Road, Wood Green, London N22 7UD		39/N227UD	
	Calcs for		Start page no./Revision	
	Building alterations		39/N227UD/ 6	
	Calcs by	Calcs date	Checked by	Checked date
	Hugh Levy	10/08/2026	Office	10/08/2026
			Approved by	Approved date

Permissible bending stress;

$$\sigma_{m_adm} = \sigma_m \times K_3 \times K_7 \times K_8 = \mathbf{8.626 \text{ N/mm}^2}$$

Applied bending stress;

$$\sigma_{m_max} = F \times L_{eff}^2 / (8 \times Z) = \mathbf{1.117 \text{ N/mm}^2}$$

PASS - Applied bending stress within permissible limits

Check compressive stress parallel to grain

Compression stress parallel to grain;

$$\sigma_c = \mathbf{7.900 \text{ N/mm}^2}$$

Minimum modulus of elasticity;

$$E_{min} = \mathbf{7200 \text{ N/mm}^2}$$

Compression member factor;

$$K_{12} = \mathbf{0.70}$$

Permissible compressive stress;

$$\sigma_{c_adm} = \sigma_c \times K_3 \times K_8 \times K_{12} = \mathbf{6.074 \text{ N/mm}^2}$$

Applied compressive stress;

$$\sigma_{c_max} = F \times L_{eff} \times (\cot(\alpha) + 3 \times \tan(\alpha)) / (2 \times A) = \mathbf{0.179 \text{ N/mm}^2}$$

PASS - Applied compressive stress within permissible limits

Check combined bending and compressive stress parallel to grain

Euler stress;

$$\sigma_e = \pi^2 \times E_{min} / \lambda^2 = \mathbf{23.189 \text{ N/mm}^2}$$

Euler coefficient;

$$K_{eu} = 1 - (1.5 \times \sigma_{c_max} \times K_{12} / \sigma_e) = \mathbf{0.992}$$

Combined axial compression and bending check;

$$\sigma_{m_max} / (\sigma_{m_adm} \times K_{eu}) + \sigma_{c_max} / \sigma_{c_adm} = \mathbf{0.160; < 1}$$

PASS - Combined compressive and bending stresses are within permissible limits

Check shear stress

Shear stress parallel to grain;

$$\tau = \mathbf{0.710 \text{ N/mm}^2}$$

Permissible shear stress;

$$\tau_{adm} = \tau \times K_3 \times K_8 = \mathbf{0.781 \text{ N/mm}^2}$$

Applied shear stress;

$$\tau_{max} = 3 \times F \times L_{eff} / (4 \times A) = \mathbf{0.070 \text{ N/mm}^2}$$

PASS - Applied shear stress within permissible limits

Check deflection

Permissible deflection;

$$\delta_{adm} = 0.003 \times L_{eff} = \mathbf{9.588 \text{ mm}}$$

Bending deflection;

$$\delta_b = 5 \times F \times L_{eff}^4 / (384 \times E_{mean} \times I) = \mathbf{1.101 \text{ mm}}$$

Shear deflection;

$$\delta_s = 12 \times F \times L_{eff}^2 / (5 \times E_{mean} \times A) = \mathbf{0.066 \text{ mm}}$$

Total deflection;

$$\delta_{max} = \delta_b + \delta_s = \mathbf{1.167 \text{ mm}}$$

PASS - Total deflection within permissible limits

Consider medium term load condition

Load duration factor;

$$K_3 = \mathbf{1.25}$$

Total UDL perpendicular to rafter;

$$F = [F_u \times \cos(\alpha)^2 + F_d \times \cos(\alpha)] \times s + F_j \times \cos(\alpha) = \mathbf{0.557 \text{ kN/m}}$$

Notional bearing length;

$$L_b = F \times L_{cl} / [2 \times (b \times \sigma_{cp1} \times K_8 - F)] = \mathbf{7 \text{ mm}}$$

Effective span;

$$L_{eff} = L_{cl} + L_b = \mathbf{3199 \text{ mm}}$$

Check bending stress

Bending stress parallel to grain;

$$\sigma_m = \mathbf{7.500 \text{ N/mm}^2}$$

Permissible bending stress;

$$\sigma_{m_adm} = \sigma_m \times K_3 \times K_7 \times K_8 = \mathbf{10.783 \text{ N/mm}^2}$$

Applied bending stress;

$$\sigma_{m_max} = F \times L_{eff}^2 / (8 \times Z) = \mathbf{2.136 \text{ N/mm}^2}$$

PASS - Applied bending stress within permissible limits

Check compressive stress parallel to grain

Compression stress parallel to grain;

$$\sigma_c = \mathbf{7.900 \text{ N/mm}^2}$$

Minimum modulus of elasticity;

$$E_{min} = \mathbf{7200 \text{ N/mm}^2}$$

Compression member factor;

$$K_{12} = \mathbf{0.67}$$

Permissible compressive stress;

$$\sigma_{c_adm} = \sigma_c \times K_3 \times K_8 \times K_{12} = \mathbf{7.307 \text{ N/mm}^2}$$

Applied compressive stress;

$$\sigma_{c_max} = F \times L_{eff} \times (\cot(\alpha) + 3 \times \tan(\alpha)) / (2 \times A) = \mathbf{0.342 \text{ N/mm}^2}$$

PASS - Applied compressive stress within permissible limits

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project		Job no.	
	39 Vallance Road, Wood Green, London N22 7UD		39/N227UD	
	Calcs for		Start page no./Revision	
	Building alterations		39/N227UD/ 7	
	Calcs by	Calcs date	Checked by	Checked date
	Hugh Levy	10/08/2026	Office	10/08/2026
			Approved by	Approved date

Check combined bending and compressive stress parallel to grain

Euler stress; $\sigma_e = \pi^2 \times E_{min} / \lambda^2 = 23.142 \text{ N/mm}^2$
Euler coefficient; $K_{eu} = 1 - (1.5 \times \sigma_{c_max} \times K_{12} / \sigma_e) = 0.985$
Combined axial compression and bending check; $\sigma_{m_max} / (\sigma_{m_adm} \times K_{eu}) + \sigma_{c_max} / \sigma_{c_adm} = 0.248; < 1$

PASS - Combined compressive and bending stresses are within permissible limits

Check shear stress

Shear stress parallel to grain; $\tau = 0.710 \text{ N/mm}^2$
Permissible shear stress; $\tau_{adm} = \tau \times K_3 \times K_8 = 0.976 \text{ N/mm}^2$
Applied shear stress; $\tau_{max} = 3 \times F \times L_{eff} / (4 \times A) = 0.134 \text{ N/mm}^2$

PASS - Applied shear stress within permissible limits

Check deflection

Permissible deflection; $\delta_{adm} = 0.003 \times L_{eff} = 9.598 \text{ mm}$
Bending deflection; $\delta_b = 5 \times F \times L_{eff}^4 / (384 \times E_{mean} \times I) = 2.109 \text{ mm}$
Shear deflection; $\delta_s = 12 \times F \times L_{eff}^2 / (5 \times E_{mean} \times A) = 0.127 \text{ mm}$
Total deflection; $\delta_{max} = \delta_b + \delta_s = 2.235 \text{ mm}$

PASS - Total deflection within permissible limits

Consider short term load condition

Load duration factor; $K_3 = 1.50$
Total UDL perpendicular to rafter; $F = F_d \times \cos(\alpha) \times s + F_j \times \cos(\alpha) = 0.292 \text{ kN/m}$
Notional bearing length; $L_b = [F \times L_{cl} + F_p \times \cos(\alpha)] / [2 \times (b \times \sigma_{cp1} \times K_8 - F)] = 7 \text{ mm}$
Effective span; $L_{eff} = L_{cl} + L_b = 3199 \text{ mm}$

Check bending stress

Bending stress parallel to grain; $\sigma_m = 7.500 \text{ N/mm}^2$
Permissible bending stress; $\sigma_{m_adm} = \sigma_m \times K_3 \times K_7 \times K_8 = 12.939 \text{ N/mm}^2$
Applied bending stress; $\sigma_{m_max} = F \times L_{eff}^2 / (8 \times Z) + F_p \times \cos(\alpha) \times L_{eff} / (4 \times Z) = 3.149 \text{ N/mm}^2$

PASS - Applied bending stress within permissible limits

Check compressive stress parallel to grain

Compression stress parallel to grain; $\sigma_c = 7.900 \text{ N/mm}^2$
Minimum modulus of elasticity; $E_{min} = 7200 \text{ N/mm}^2$
Compression member factor; $K_{12} = 0.65$
Permissible compressive stress; $\sigma_{c_adm} = \sigma_c \times K_3 \times K_8 \times K_{12} = 8.413 \text{ N/mm}^2$
Applied compressive stress; $\sigma_{c_max} = F \times L_{eff} \times (\cot(\alpha) + 3 \times \tan(\alpha)) / (2 \times A) + F_p \times \sin(\alpha) / A = 0.210 \text{ N/mm}^2$

PASS - Applied compressive stress within permissible limits

Check combined bending and compressive stress parallel to grain

Euler stress; $\sigma_e = \pi^2 \times E_{min} / \lambda^2 = 23.142 \text{ N/mm}^2$
Euler coefficient; $K_{eu} = 1 - (1.5 \times \sigma_{c_max} \times K_{12} / \sigma_e) = 0.991$
Combined axial compression and bending check; $\sigma_{m_max} / (\sigma_{m_adm} \times K_{eu}) + \sigma_{c_max} / \sigma_{c_adm} = 0.270; < 1$

PASS - Combined compressive and bending stresses are within permissible limits

Check shear stress

Shear stress parallel to grain; $\tau = 0.710 \text{ N/mm}^2$
Permissible shear stress; $\tau_{adm} = \tau \times K_3 \times K_8 = 1.172 \text{ N/mm}^2$
Applied shear stress; $\tau_{max} = 3 \times F \times L_{eff} / (4 \times A) + 3 \times F_p \times \cos(\alpha) / (2 \times A) = 0.197 \text{ N/mm}^2$

PASS - Applied shear stress within permissible limits

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project				Job no.	
	39 Vallance Road, Wood Green, London N22 7UD				39/N227UD	
	Calcs for				Start page no./Revision	
	Building alterations				39/N227UD/ 8	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	Hugh Levy	10/08/2026	Office	10/08/2026		

Check deflection

Permissible deflection;	$\delta_{adm} = 0.003 \times L_{eff} = \mathbf{9.598 \text{ mm}}$
Bending deflection;	$\delta_b = L_{eff}^3 \times (5 \times F \times L_{eff} / 384 + F_p \times \cos(\alpha) / 48) / (E_{mean} \times I) = \mathbf{2.708 \text{ mm}}$
Shear deflection;	$\delta_s = 12 \times L_{eff} \times (F \times L_{eff} + 2 \times F_p \times \cos(\alpha)) / (5 \times E_{mean} \times A) = \mathbf{0.187 \text{ mm}}$
Total deflection;	$\delta_{max} = \delta_b + \delta_s = \mathbf{2.894 \text{ mm}}$
	PASS - Total deflection within permissible limits
;	



H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

Project

39 Vallance Road, Wood Green, London N22 7UD

Job no.

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 9

Calcs by

Hugh Levy

Calcs date

10/08/2026

Checked by

Office

Checked date

10/08/2026

Approved by

Approved date



Project: 39 VALLANCE ROAD N22 7UD		Job Ref: 39/N227UD	
Part of Structure: STEEL BEAM 1		Calc Sheet No: St '1.1'	Rev
Drawing Ref: PL01	Calc by: HOL	Date: 08/2026	Check by: Date

REF	CALCULATIONS	OUTPUT
	Span of steel beam 1 = 4.4m	
	<u>LOADING (UNFACTORED)</u>	
UDL	<u>Dead load</u>	
	Loft floor = $0.39 \times 0.4 = 0.16$	
	Internal wall = $2.49 \times 3.0 = 7.47$	
	First floor = $0.64 \times 0.4 = 0.26$	
	SW beam = 0.50	
	<u>Imposed load</u>	<u>8.39 kN/m</u>
	Loft floor = $0.25 \times 0.4 = 0.10$	
	First floor = $1.50 \times 0.4 = 0.60$	
	<u>0.70 kN/m</u>	
	<u>TOTAL = 9.09 kN/m</u>	
	UDL = 9.09 kN/m	
	Total load = $9.09 \times 4.4 = 40 \text{ kN}$	
	<u>Use a 152 x 152 UC @ 37 kg/m</u>	
	<u>steel beam</u>	



H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

Project

39 Vallance Road, Wood Green, London N22 7UD

Job no.

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 10

Calcs by

Hugh Levy

Calcs date

10/08/2026

Checked by

Office

Checked date

10/08/2026

Approved by

Approved date



Project: 39 VALLANCE ROAD N22 7UD		Job Ref: 39/N227UD	
Part of Structure: STEEL BEAM 1		Calc Sheet No: Rev	
Drawing Ref PL01		Calc by HOL	Date 08/2026
		Check by	Date

REF	CALCULATIONS	OUTPUT
	@ R _c , check the bearing onto the internal spine wall of the existing house.	
	Allowable stress on existing brickwork masonry = 0.83 N/mm^2	
	for a 150mm bearing, actual stress	
	$= \frac{20 \times 10^3}{100 \times 150} = 1.33 \text{ N/mm}^2 > 0.83 \text{ N/mm}^2$	
	Provide a concrete padstone.	
	Length required = $\frac{20 \times 10^3}{0.83 \times 100} = 241 \text{ mm}$	
	The steel beam is to bear 250mm onto the internal brickwork spine wall onto a precast concrete padstone 440mm long x 100mm wide x 215mm deep.	



H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

Project

39 Vallance Road, Wood Green, London N22 7UD

Job no.

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 11

Calcs by

Hugh Levy

Calcs date

10/08/2026

Checked by

Office

Checked date

10/08/2026

Approved by

Approved date

St/1-3

Padstone Range

Padstones

Dimensions L x W x H mm

215 x 140 x 100

330 x 140 x 100

440 x 140 x 100

215 x 100 x 215

330 x 100 x 215

440 x 100 x 215

660 x 100 x 215

215 x 140 x 215

330 x 140 x 215

440 x 140 x 215

660 x 140 x 215

215 x 215 x 215

330 x 215 x 215

440 x 215 x 215

660 x 215 x 215

330 x 140 x 140

440 x 140 x 140

L-Shaped Padstone - Section mm

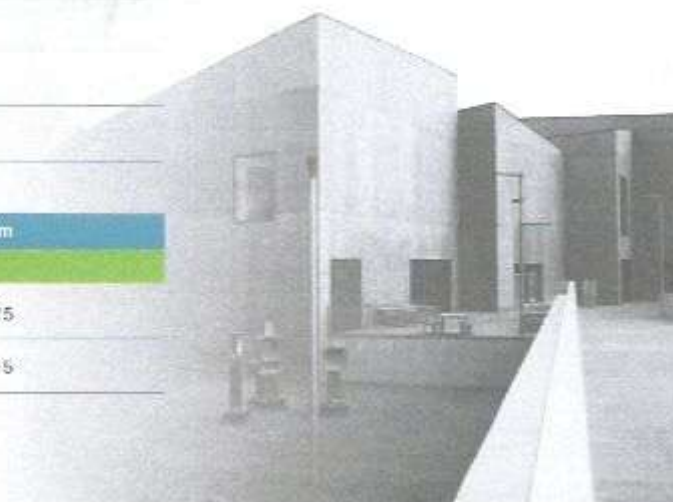
Dimensions L x W x H mm

330/330 x 100 x 215

440/440 x 100 x 215



A full range of padstones are available with a strength that is a minimum of 50N/mm².





H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

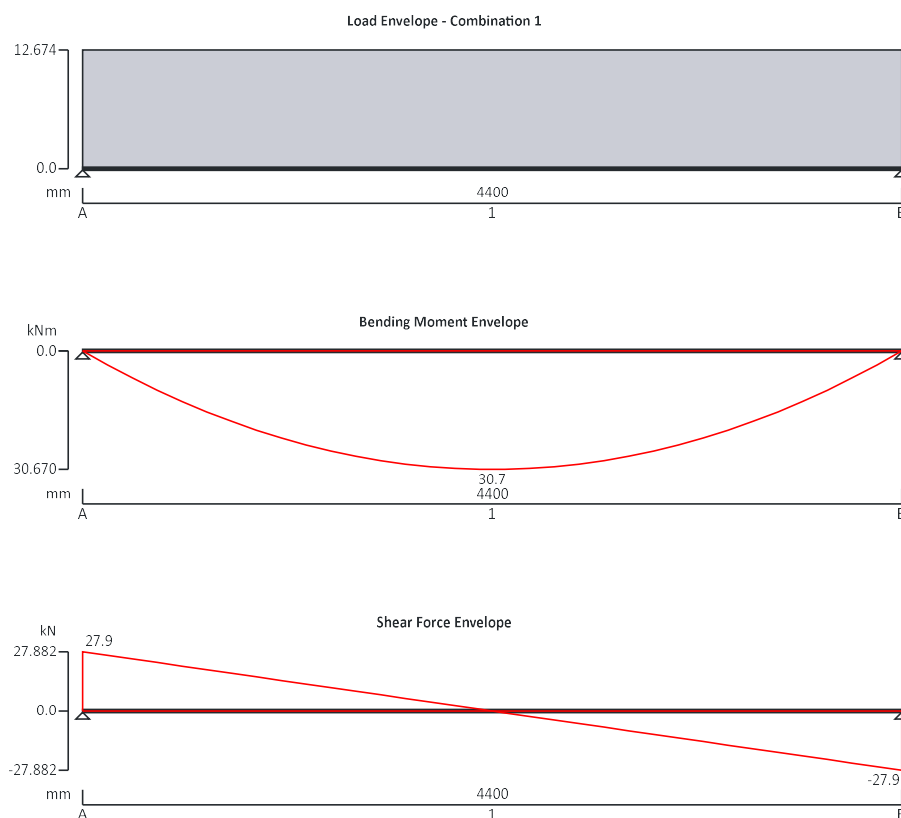
Project				Job no.	
39 Vallance Road, Wood Green, London N22 7UD				39/N227UD	
Calcs for				Start page no./Revision	
Building alterations				39/N227UD/ 12	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
Hugh Levy	10/08/2026	Office	10/08/2026		

STEEL BEAM 1

STEEL BEAM ANALYSIS & DESIGN (BS5950)

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

TEDDS calculation version 3.0.08



Support conditions

Support A

Vertically restrained

Rotationally free

Support B

Vertically restrained

Rotationally free

Applied loading

Beam loads

SW beam - Dead self weight of beam $\times 1$

UDL - Dead full UDL 7.89 kN/m

UDL - Imposed full UDL 0.7 kN/m

Load combinations

Load combination 1

Support A

Dead $\times 1.40$

Imposed $\times 1.60$

Dead $\times 1.40$

Imposed $\times 1.60$

Support B

Dead $\times 1.40$

Imposed $\times 1.60$



H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

Project

39 Vallance Road, Wood Green, London N22 7UD

Job no.

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 13

Calcs by

Hugh Levy

Calcs date

10/08/2026

Checked by

Office

Checked date

10/08/2026

Approved by

Approved date

Analysis results

Maximum moment;

$M_{max} = 30.7 \text{ kNm};$

$M_{min} = 0 \text{ kNm}$

Maximum shear;

$V_{max} = 27.9 \text{ kN};$

$V_{min} = -27.9 \text{ kN}$

Deflection;

$\delta_{max} = 9.6 \text{ mm};$

$\delta_{min} = 0 \text{ mm}$

Maximum reaction at support A;

$R_{A_{max}} = 27.9 \text{ kN};$

$R_{A_{min}} = 27.9 \text{ kN}$

Unfactored dead load reaction at support A;

$R_{A_{Dead}} = 18.2 \text{ kN}$

Unfactored imposed load reaction at support A;

$R_{A_{Imposed}} = 1.5 \text{ kN}$

Maximum reaction at support B;

$R_{B_{max}} = 27.9 \text{ kN};$

$R_{B_{min}} = 27.9 \text{ kN}$

Unfactored dead load reaction at support B;

$R_{B_{Dead}} = 18.2 \text{ kN}$

Unfactored imposed load reaction at support B;

$R_{B_{Imposed}} = 1.5 \text{ kN}$

Section details

Section type;

UC 152x152x37 (British Steel Section Range 2022 (BS4-1))

Steel grade;

S275

From table 9: Design strength p_y

Thickness of element;

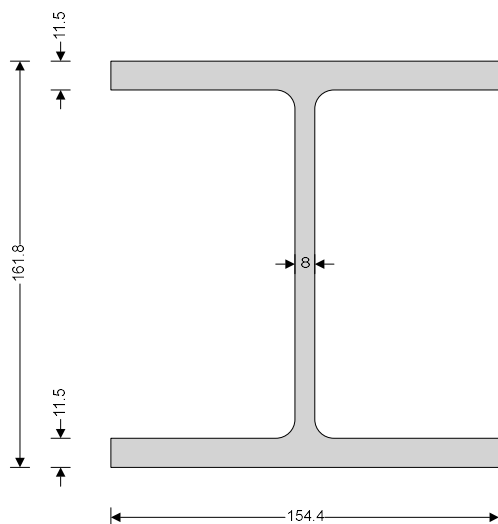
$\max(T, t) = 11.5 \text{ mm}$

Design strength;

$p_y = 275 \text{ N/mm}^2$

Modulus of elasticity;

$E = 205000 \text{ N/mm}^2$



Lateral restraint

Span 1 has lateral restraint at supports only

Effective length factors

Effective length factor in major axis;

$K_x = 1.00$

Effective length factor in minor axis;

$K_y = 1.00$

Effective length factor for lateral-torsional buckling;

$K_{LT,A} = 1.20; + 2 \times D$

Library item: Effective length factor output

$K_{LT,B} = 1.00;$

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275 \text{ N/mm}^2 / p_y]} = 1.00$

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project				Job no.	
	39 Vallance Road, Wood Green, London N22 7UD				39/N227UD	
	Calcs for				Start page no./Revision	
	Building alterations				39/N227UD/ 14	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date	
Hugh Levy	10/08/2026	Office	10/08/2026			

Internal compression parts - Table 11

Depth of section; $d = 123.6 \text{ mm}$
 $d / t = 15.5 \times \varepsilon \leq 80 \times \varepsilon$; Class 1 plastic

Outstand flanges - Table 11

Width of section; $b = B / 2 = 77.2 \text{ mm}$
 $b / T = 6.7 \times \varepsilon \leq 9 \times \varepsilon$; Class 1 plastic
Section is class 1 plastic

Shear capacity - Section 4.2.3

Design shear force; $F_v = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 27.9 \text{ kN}$
 $d / t < 70 \times \varepsilon$
Web does not need to be checked for shear buckling

Shear area; $A_v = t \times D = 1294 \text{ mm}^2$
Design shear resistance; $P_v = 0.6 \times p_y \times A_v = 213.6 \text{ kN}$
PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment; $M = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = 30.7 \text{ kNm}$

Moment capacity low shear - cl.4.2.5.2; $M_c = \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx}) = 84.9 \text{ kNm}$

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling; $L_E = ((1.2 + 1.0) \times L_{s1} + 2 \times D) / 2 = 5002 \text{ mm}$
Slenderness ratio; $\lambda = L_E / r_{yy} = 129.185$

Equivalent slenderness - Section 4.3.6.7

Buckling parameter; $u = 0.848$
Torsional index; $x = 13.334$
Slenderness factor; $v = 1 / [1 + 0.05 \times (\lambda / x)^2]^{0.25} = 0.647$
Ratio - cl.4.3.6.9; $\beta_W = 1.000$
Equivalent slenderness - cl.4.3.6.7; $\lambda_{LT} = u \times v \times \lambda \times \sqrt{[\beta_W]} = 70.936$
Limiting slenderness - Annex B.2.2; $\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5} = 34.310$
 $\lambda_{LT} > \lambda_{L0}$ - Allowance should be made for lateral-torsional buckling

Bending strength - Section 4.3.6.5

Robertson constant; $\alpha_{LT} = 7.0$
Perry factor; $\eta_{LT} = \max(\alpha_{LT} \times (\lambda_{LT} - \lambda_{L0}) / 1000, 0) = 0.256$
Euler stress; $p_E = \pi^2 \times E / \lambda_{LT}^2 = 402.1 \text{ N/mm}^2$
 $\phi_{LT} = (p_y + (\eta_{LT} + 1) \times p_E) / 2 = 390.1 \text{ N/mm}^2$
Bending strength - Annex B.2.1; $p_b = p_E \times p_y / (\phi_{LT} + (\phi_{LT}^2 - p_E \times p_y)^{0.5}) = 186.1 \text{ N/mm}^2$

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project				Job no.	
	39 Vallance Road, Wood Green, London N22 7UD				39/N227UD	
	Calcs for				Start page no./Revision	
	Building alterations				39/N227UD/ 15	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date	
Hugh Levy	10/08/2026	Office	10/08/2026			

Equivalent uniform moment factor - Section 4.3.6.6

Moment at quarter point of segment; $M_2 = 23 \text{ kNm}$
Moment at centre-line of segment; $M_3 = 30.7 \text{ kNm}$
Moment at three quarter point of segment; $M_4 = 23 \text{ kNm}$
Maximum moment in segment; $M_{abs} = 30.7 \text{ kNm}$
Maximum moment governing buckling resistance; $M_{LT} = M_{abs} = 30.7 \text{ kNm}$
Equivalent uniform moment factor for lateral-torsional buckling;
 $m_{LT} = \max(0.2 + (0.15 \times M_2 + 0.5 \times M_3 + 0.15 \times M_4) / M_{abs}, 0.44) = 0.925$

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment; $M_b = p_b \times S_{xx} = 57.5 \text{ kNm}$
 $M_b / m_{LT} = 62.1 \text{ kNm}$

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection; $\delta_{lim} = L_{s1} / 360 = 12.222 \text{ mm}$

Maximum deflection span 1; $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = 9.642 \text{ mm}$

PASS - Maximum deflection does not exceed deflection limit

;



H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

Project

39 Vallance Road, Wood Green, London N22 7UD

Job no.

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 16

Calcs by

Hugh Levy

Calcs date

10/08/2026

Checked by

Office

Checked date

10/08/2026

Approved by

Approved date



Project:

39 VALLANCE ROAD N22 7UD

Job Ref:

39/N227UD

Part of Structure:

STEEL BEAM 2

Calc Sheet No:

St 2.1

Rev

Drawing Ref

PL01

Calc by

HOL

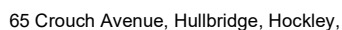
Date

08/2026

Check by

Date

REF	CALCULATIONS	OUTPUT
	Span of steel beam 2 = 4.4m	
	<u>LOADING (UNFACTORED)</u>	
UOL	<u>Dead Load</u>	
	Pitched roof = $1.23 \times \frac{6.4}{2} = 3.94$	
	External wall = $4.77 \times 3.0 = 14.31$	
	First floor = $0.64 \times \frac{5.5}{2} = 1.76$	
	sw beam = 1.0	
	Imposed load	21.01 kN/m
	Pitched roof = $0.88 \times \frac{6.4}{2} = 2.82$	
	First floor = $1.50 \times \frac{5.5}{2} = 4.13$	
		6.95 kN/m
	TOTAL = 27.96 kN/m	
PL	<u>Dead Load</u>	
	Steel beam 1 = $20 \times \frac{8.39}{9.09} = 18.46$ kN	
	<u>Imposed Load</u>	
	Steel beam 1 = $20 \times \frac{0.70}{9.09} = 1.54$ kN	
	TOTAL = 20 kN	



39 Vallance Road, Wood Green, London N22 7UD

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 17

Calcs by

Hugh Levy

Calcs date	
------------	--

10/08/2026

Checked by	
------------	--

Office

Checked date

10/08/2026

Approved by	
-------------	--

Approved date



H Levy Consulting Ltd Registered Address: 65 Crouch Avenue, Hullbridge, Hookley, Essex SS5 6BS
Mobile: 07860 928512 Email: office@hlevyconsultinglimited.com Company Number 10198146



H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

Project

39 Vallance Road, Wood Green, London N22 7UD

Job no.

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 18

Calcs by

Hugh Levy

Calcs date

10/08/2026

Checked by

Office

Checked date

10/08/2026

Approved by

Approved date



Project: 39 VALLANCE ROAD N22 7UD		Job Ref: 39/N227UD	
Part of Structure: STEEL BEAM 2		Calc Sheet No: St '23'	Rev
Drawing Ref: PL01	Calc by: HOL	Date: 08/2026	Check by: Date

REF	CALCULATIONS	OUTPUT
	@ R_c, check the bearing of the steel beam onto the existing brickwork masonry wall. Allowable stress on brickwork masonry wall = 0.83 N/mm^2. For a 150mm bearing, actual stress $= \frac{65 \times 10^3}{205.8 \times 150} = 2.11 \text{ N/mm}^2 > 0.83 \text{ N/mm}^2$ Provide sufficient bearing so that the brickwork masonry is not overstressed. Length of bearing required $= \frac{65 \times 10^3}{0.83 \times 215} = 364.2 \text{ mm}$ (say 400 mm) The steel beam is to bear 400 mm onto the brickwork wall, and onto 3 courses of engineering brickwork in a 1:1:6 mortar 440 mm long x 215 mm wide.	



H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

Project

39 Vallance Road, Wood Green, London N22 7UD

Job no.

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 19

Calcs by

Hugh Levy

Calcs date

10/08/2026

Checked by

Office

Checked date

10/08/2026

Approved by

Approved date



Project: 39 VALLANCE ROAD N22 7UD		Job Ref: 39/N227UD	
Part of Structure: STEEL BEAM 2		Calc Sheet No: St '2.4'	Rev
Drawing Ref PL01	Calc by HOL	Date 08/2026	Check by
		Date	

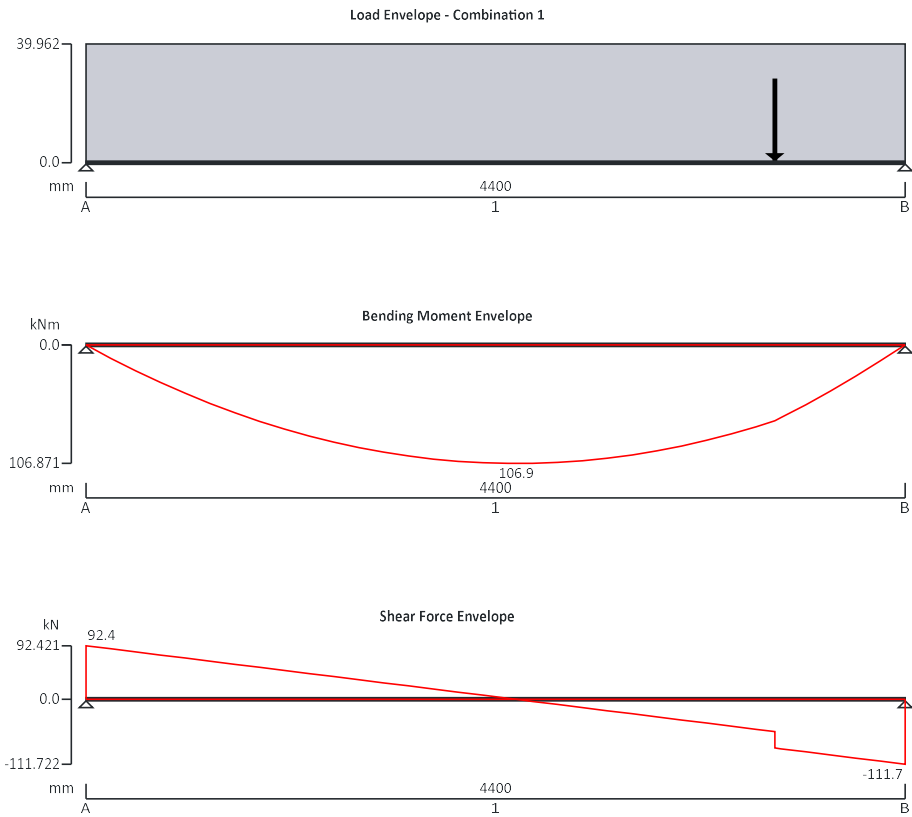
REF	CALCULATIONS	OUTPUT
	@ Rk, check the bearing of the steel beam onto the existing brickwork masonry wall. Allowable stress on brickwork masonry wall = 0.83 N/mm^2. For a minimum 150mm bearing, the actual stress $= \frac{79 \times 10^3}{205.8 \times 150} = 2.56 \text{ N/mm}^2 > 0.83 \text{ N/mm}^2$ Provide sufficient bearing so that the brickwork masonry is not overstressed. Length of bearing required $= \frac{79 \times 10^3}{0.83 \times 215} = 442.7 \text{ mm (say 500mm)}$ The steel beam is to bear 500mm onto the brickwork wall, and onto 3 courses of engineering brickwork in a 1:1:6 mortar 665mm long x 215mm wide.	

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project 39 Vallance Road, Wood Green, London N22 7UD				Job no. 39/N227UD	
	Calcs for Building alterations				Start page no./Revision 39/N227UD/ 20	
	Calcs by Hugh Levy	Calcs date 10/08/2026	Checked by Office	Checked date 10/08/2026	Approved by	Approved date

STEEL BEAM 2

STEEL BEAM ANALYSIS & DESIGN (BS5950)

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



Support conditions

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

Applied loading

Beam loads	SW beam - Dead self weight of beam × 1 UDL - Dead full UDL 20.01 kN/m UDL - Imposed full UDL 6.95 kN/m PL - Dead point load 18.46 kN at 3700 mm PL - Imposed point load 1.54 kN at 3700 mm
------------	--

Load combinations

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

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project 39 Vallance Road, Wood Green, London N22 7UD				Job no. 39/N227UD	
	Calcs for Building alterations				Start page no./Revision 39/N227UD/ 21	
	Calcs by Hugh Levy	Calcs date 10/08/2026	Checked by Office	Checked date 10/08/2026	Approved by	Approved date

Imposed $\times 1.60$

Analysis results

Maximum moment;

$M_{\max} = 106.9 \text{ kNm};$

$M_{\min} = 0 \text{ kNm}$

Maximum shear;

$V_{\max} = 92.4 \text{ kN};$

$V_{\min} = -111.7 \text{ kN}$

Deflection;

$\delta_{\max} = 11.9 \text{ mm};$

$\delta_{\min} = 0 \text{ mm}$

Maximum reaction at support A;

$R_{A_{\max}} = 92.4 \text{ kN};$

$R_{A_{\min}} = 92.4 \text{ kN}$

Unfactored dead load reaction at support A;

$R_{A_{\text{Dead}}} = 48.3 \text{ kN}$

Unfactored imposed load reaction at support A;

$R_{A_{\text{Imposed}}} = 15.5 \text{ kN}$

Maximum reaction at support B;

$R_{B_{\max}} = 111.7 \text{ kN};$

$R_{B_{\min}} = 111.7 \text{ kN}$

Unfactored dead load reaction at support B;

$R_{B_{\text{Dead}}} = 60.8 \text{ kN}$

Unfactored imposed load reaction at support B;

$R_{B_{\text{Imposed}}} = 16.6 \text{ kN}$

Section details

Section type;

UC 203x203x60 (British Steel Section Range 2022 (BS4-1))

Steel grade;

S275

From table 9: Design strength p_y

Thickness of element;

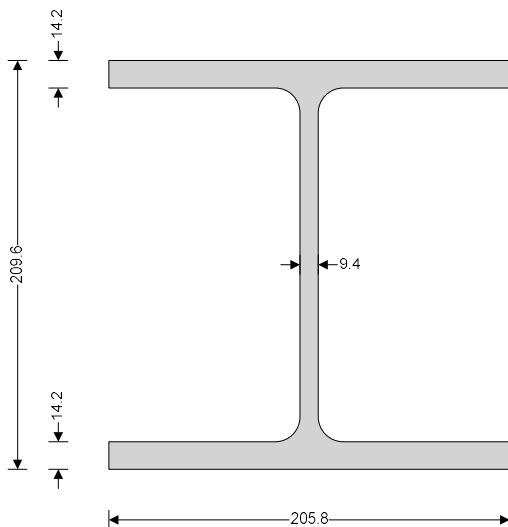
$\max(T, t) = 14.2 \text{ mm}$

Design strength;

$p_y = 275 \text{ N/mm}^2$

Modulus of elasticity;

$E = 205000 \text{ N/mm}^2$



Lateral restraint

Span 1 has lateral restraint at supports only

Effective length factors

Effective length factor in major axis;

$K_x = 1.00$

Effective length factor in minor axis;

$K_y = 1.00$

Effective length factor for lateral-torsional buckling;

$K_{LT,A} = 1.20; + 2 \times D$

Library item: Effective length factor output

$K_{LT,B} = 1.00;$

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275 \text{ N/mm}^2 / p_y]} = 1.00$

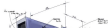
Internal compression parts - Table 11

Depth of section;

$d = 155.8 \text{ mm}$

$d / t = 16.6 \times \varepsilon \leq 80 \times \varepsilon;$

Class 1 plastic

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project				Job no.	
	39 Vallance Road, Wood Green, London N22 7UD				39/N227UD	
	Calcs for				Start page no./Revision	
	Building alterations				39/N227UD/ 22	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date	
Hugh Levy	10/08/2026	Office	10/08/2026			

Outstand flanges - Table 11

Width of section; $b = B / 2 = 102.9 \text{ mm}$
 $b / T = 7.2 \times \varepsilon \leq 9 \times \varepsilon$; Class 1 plastic
Section is class 1 plastic

Shear capacity - Section 4.2.3

Design shear force; $F_v = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 111.7 \text{ kN}$
 $d / t < 70 \times \varepsilon$
Web does not need to be checked for shear buckling

Shear area; $A_v = t \times D = 1970 \text{ mm}^2$
Design shear resistance; $P_v = 0.6 \times p_y \times A_v = 325.1 \text{ kN}$
PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment; $M = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = 106.9 \text{ kNm}$

Moment capacity low shear - cl.4.2.5.2; $M_c = \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx}) = 181.6 \text{ kNm}$

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling; $L_E = ((1.2 + 1.0) \times L_{s1} + 2 \times D) / 2 = 5050 \text{ mm}$

Slenderness ratio; $\lambda = L_E / r_{yy} = 97.423$

Equivalent slenderness - Section 4.3.6.7

Buckling parameter; $u = 0.847$
Torsional index; $x = 13.842$
Slenderness factor; $v = 1 / [1 + 0.05 \times (\lambda / x)^2]^{0.25} = 0.732$
Ratio - cl.4.3.6.9; $\beta_W = 1.000$
Equivalent slenderness - cl.4.3.6.7; $\lambda_{LT} = u \times v \times \lambda \times \sqrt{[\beta_W]} = 60.412$
Limiting slenderness - Annex B.2.2; $\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5} = 34.310$
 $\lambda_{LT} > \lambda_{L0}$ - Allowance should be made for lateral-torsional buckling

Bending strength - Section 4.3.6.5

Robertson constant; $\alpha_{LT} = 7.0$
Perry factor; $\eta_{LT} = \max(\alpha_{LT} \times (\lambda_{LT} - \lambda_{L0}) / 1000, 0) = 0.183$
Euler stress; $p_E = \pi^2 \times E / \lambda_{LT}^2 = 554.4 \text{ N/mm}^2$
 $\phi_{LT} = (p_y + (\eta_{LT} + 1) \times p_E) / 2 = 465.3 \text{ N/mm}^2$
Bending strength - Annex B.2.1; $p_b = p_E \times p_y / (\phi_{LT} + (\phi_{LT}^2 - p_E \times p_y)^{0.5}) = 212.2 \text{ N/mm}^2$

Equivalent uniform moment factor - Section 4.3.6.6

Moment at quarter point of segment; $M_2 = 77.5 \text{ kNm}$
Moment at centre-line of segment; $M_3 = 106.6 \text{ kNm}$
Moment at three quarter point of segment; $M_4 = 87.4 \text{ kNm}$
Maximum moment in segment; $M_{abs} = 106.9 \text{ kNm}$
Maximum moment governing buckling resistance; $M_{LT} = M_{abs} = 106.9 \text{ kNm}$
Equivalent uniform moment factor for lateral-torsional buckling;
 $m_{LT} = \max(0.2 + (0.15 \times M_2 + 0.5 \times M_3 + 0.15 \times M_4) / M_{abs}, 0.44) = 0.930$

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project				Job no.	
	39 Vallance Road, Wood Green, London N22 7UD				39/N227UD	
	Calcs for				Start page no./Revision	
	Building alterations				39/N227UD/ 23	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	Hugh Levy	10/08/2026	Office	10/08/2026		

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment;

$$M_b = p_b \times S_{xx} = \mathbf{140.1 \text{ kNm}}$$

$$M_b / m_{LT} = \mathbf{150.6 \text{ kNm}}$$

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection;

$$\delta_{lim} = L_{s1} / 360 = \mathbf{12.222 \text{ mm}}$$

Maximum deflection span 1;

$$\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = \mathbf{11.944 \text{ mm}}$$

PASS - Maximum deflection does not exceed deflection limit

;



H Levy Consulting Limited

Registered Address:

Oak Accounting Services

65 Crouch Avenue, Hullbridge, Hockley,

Project

39 Vallance Road, Wood Green, London N22 7UD

Job no.

39/N227UD

Calcs for

Building alterations

Start page no./Revision

39/N227UD/ 24

Calcs by

Hugh Levy

Calcs date

10/08/2026

Checked by

Office

Checked date

10/08/2026

Approved by

Approved date

BEAM END CONNECTION DESIGN OF STEEL BEAM 1 TO STEEL BEAM 2

BEAM TO BEAM - CLEAT CONNECTION

TEDDS calculation version 2.0.16

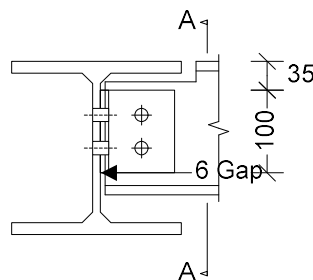
Section Details

Supporting Beam - UC 203x203x60;; Grade_{supporting} = "S275"

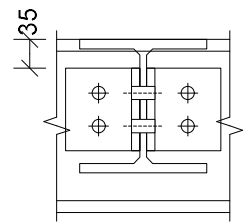
Supported Beam - UC 152x152x37;; Grade_{supported} = "S275"

Cleats 2 x RSA 90x90x10;; Grade_{cleats} = "S275"

Bolts M16 (Grade 8.8)



SECTION THROUGH SUPPORTING BEAM



SECTION A - A

Connection Details

; Bolt eccentricity for supported beam;	$a_{bolts} = 50 \text{ mm}$
; number of bolt rows;	$n_{bolts} = 2$
; Bolt pitch;;	$p_{bolts} = 40 \text{ mm}$
; Bolt gauge;	$g_{bolts} = 108 \text{ mm}$
; End projection;	$t_1 = 6 \text{ mm}$
; Cleat end distance (top & bottom);	$e_{1cleats} = 30 \text{ mm}$
; Cleat edge distance on supported beam;	$e_{2cleatssupported} = 40 \text{ mm}$
; Cleat edge distance on supporting beam;	$e_{2cleatssupporting} = 40 \text{ mm}$
Cleat length;	$l_{cleats} = p_{bolts} \times (n_{bolts} - 1) + 2 \times e_{1cleats} = 100 \text{ mm}$
;Supported Beam end reaction;	$Q = 20.0 \text{ kN}$

Notch details

; Top notch length;	$C_{topnotch} = 110 \text{ mm}$
; Top notch depth;	$d_{ctopnotch} = 25 \text{ mm}$

Check 1 - Essential detailing requirements

; Cleat thickness;	$t_{cleats} = 10 \text{ mm}$; PASS
; Bolt gauge;	$g_{bolts} = 108 \text{ mm}$; PASS
; Cleat Length;	$l_{cleats} = 100 \text{ mm}$
; ;	Cleat length for torsional requirements : PASS;
; ;	Cleats fit between beam fillets : PASS

Check 2 - Shear capacity of bolt group connecting cleats to web of supported beam (taking account of eccentricity 'a')

;;; Elastic section modulus of bolt group	
$Z_{bolts} = n_{bolts} \times (n_{bolts} + 1) \times p_{bolts} / 6$	$= 40 \text{ mm}$
Force on outermost bolt due to moment	

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project 39 Vallance Road, Wood Green, London N22 7UD				Job no. 39/N227UD	
	Calcs for Building alterations				Start page no./Revision 39/N227UD/ 25	
	Calcs by Hugh Levy	Calcs date 10/08/2026	Checked by Office	Checked date 10/08/2026	Approved by	Approved date

$$F_m = Q \times a_{bolts} / Z_{bolts} = \mathbf{25 \text{ kN}}$$

Force on bolt due to shear

$$F_v = Q / n_{bolts} = \mathbf{10.0 \text{ kN}}$$

Resultant force on bolt due to direct shear and moment

$$F_r = \sqrt{(F_v^2 + F_m^2)} = \mathbf{26.9 \text{ kN}}$$

Shear capacity of a single bolt in double shear

$$; 2 \times P_{sbolts} = \mathbf{117.8 \text{ kN}}$$

$$\text{Utilisation factor; } U_{check2shear} = F_r / (2 \times P_{sbolts}) = \mathbf{0.229}$$

**Shear capacity to web :
PASS**

Check 3 - Shear and bearing capacity of cleat connected to supported beam

for shear

;;

$$p_{ycleats} = \mathbf{275 \text{ N/mm}^2}$$

;;

$$e_{1cleats} = e_{1cleats} = \mathbf{30 \text{ mm}}$$

;;

$$A_{vcleats} = 0.9 \times (2 \times e_{1cleats} + (n_{bolts} - 1) \times p_{bolts}) \times t_{cleats} = \mathbf{900 \text{ mm}^2}$$

;

$$A_{vnetcleats} = A_{vcleats} - n_{bolts} \times D_{hbolts} \times t_{cleats} = \mathbf{540 \text{ mm}^2}$$

Effective net area coefficient

$$K_{ecleats} = \mathbf{1.20}$$

Plain shear capacity of cleats

$$P_{vPcleats} = \min(0.6 \times p_{ycleats} \times A_{vcleats}, 0.7 \times K_{ecleats} \times p_{ycleats} \times A_{vnetcleats}) = \mathbf{124.7 \text{ kN}}$$

$$A_{v1cleats} = (e_{1cleats} + (n_{bolts} - 1) \times p_{bolts}) \times t_{cleats} = \mathbf{700 \text{ mm}^2}$$

;

$$A_{teffcleats} = (e_{2cleatssupported} - 0.5 \times D_{hbolts}) \times t_{cleats} = \mathbf{310 \text{ mm}^2}$$

$$P_{vBcleats} = 0.6 \times p_{ycleats} \times A_{v1cleats} + 0.6 \times K_{ecleats} \times p_{ycleats} \times A_{teffcleats} = \mathbf{176.9 \text{ kN}}$$

Shear capacity of the angle cleat leg; $P_{vcleats} = \min(P_{vPcleats}, P_{vBcleats}) = \mathbf{124.7 \text{ kN}}$

; Shear force on angle cleat; $Q / 2 = \mathbf{10.0 \text{ kN}}$

$$\text{Utilisation factor; } U_{check3shear} = Q / (2 \times P_{vcleats}) = \mathbf{0.080}$$

Shear capacity of cleats to beam: PASS

for bearing

$$e_{cleats} = \min(e_{1cleats}, e_{2cleatssupported}) = \mathbf{30 \text{ mm}}$$

bearing strength of the cleat

$$p_{bscleats} = \mathbf{460 \text{ N/mm}^2}$$

bearing capacity of the leg of the angle cleat per bolt

$$P_{bscleats} = \min(d_{bolts} \times t_{cleats} \times p_{bscleats}, 0.5 \times e_{cleats} \times t_{cleats} \times p_{bscleats}) = \mathbf{69.0 \text{ kN}}$$

; Bearing force on cleat; $F_r / 2 = \mathbf{13.5 \text{ kN}}$

$$\text{Utilisation factor; } U_{check3bearing} = F_r / (2 \times P_{bscleats}) = \mathbf{0.195}$$

Bearing capacity of cleats to beam: PASS

Check 4b - shear and bearing capacity of the supported beam (1 notch)

;; for shear

;;

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project 39 Vallance Road, Wood Green, London N22 7UD				Job no. 39/N227UD	
	Calcs for Building alterations				Start page no./Revision 39/N227UD/ 26	
	Calcs by Hugh Levy	Calcs date 10/08/2026	Checked by Office	Checked date 10/08/2026	Approved by	Approved date

$p_{ysupported} = 275 \text{ N/mm}^2$
; Distance top supported beam to 1st hole; $e_{tsupported} = 65 \text{ mm}$
; $e_{tsupported} = e_{tsupported} - d_{ctopnotch} = 40 \text{ mm}$
; $e_{bsupported} = D_{supported} - e_{tsupported} - (n_{bolts} - 1) \times p_{bolts} = 57 \text{ mm}$
; $A_{vsupported} = 0.9 \times (e_{tsupported} + (n_{bolts} - 1) \times p_{bolts} + e_{bsupported}) \times t_{supported} = 985 \text{ mm}^2$
; $A_{vnetsupported} = A_{vsupported} - n_{bolts} \times D_{nbolts} \times t_{supported} = 697 \text{ mm}^2$

Effective net area coefficient

$$K_{supported} = 1.20$$

Plain shear capacity of beam

$$P_{vPsupported} = \min(0.6 \times p_{ysupported} \times A_{vsupported}, 0.7 \times K_{supported} \times p_{ysupported} \times A_{vnetsupported}) = 161.0 \text{ kN}$$

$$A_{v1supported} = (e_{tsupported} + (n_{bolts} - 1) \times p_{bolts}) \times t_{supported} = 640 \text{ mm}^2$$

$$e_{3supported} = a_{bolts} - t_1 = 44 \text{ mm}$$

$$A_{teffsupported} = (e_{3supported} - 0.5 \times D_{nbolts}) \times t_{supported} = 280 \text{ mm}^2$$

Block shear capacity of beam

$$P_{vBsupported} = 0.6 \times p_{ysupported} \times A_{v1supported} + 0.6 \times K_{supported} \times p_{ysupported} \times A_{teffsupported} = 161.0 \text{ kN}$$

$$\text{Shear capacity of the beam; } P_{vsupported} = \min(P_{vPsupported}, P_{vBsupported}) = 161.0 \text{ kN}$$

$$\text{;Shear force on beam; } Q = 20.0 \text{ kN}$$

$$\text{Utilisation factor; } U_{check4shear} = Q / P_{vsupported} = 0.124$$

Shear capacity of beam : PASS

for bearing

bearing strength of the beam

$$p_{bssupported} = 460 \text{ N/mm}^2$$

bearing capacity of the beam per bolt

$$P_{bssupported} = \min(d_{bolts} \times t_{supported} \times p_{bssupported}, 0.5 \times e_{3supported} \times t_{supported} \times p_{bssupported}) = 59 \text{ kN}$$

$$\text{;Resultant bearing force on bolts; } F_r = 26.9 \text{ kN}$$

$$\text{Utilisation factor; } U_{check4bearing} = F_r / P_{bssupported} = 0.457$$

Bearing capacity of beam : PASS

Check 4c - bending capacity of reduced beam section at the notch - 1 flange notched

;; Properties of notched section ignoring root radii

;; Depth of ; $d_{web} = D_{supported} - d_{ctopnotch} - T_{supported}$

;; Area of notched section; $A_{notched} = d_{web} \times t_{supported} + B_{supported} \times T_{supported} = 2778 \text{ mm}^2$

Distance from top of notch to centroid of notched section

$$y_{bar} = (d_{web}^2 \times t_{supported} / 2 + B_{supported} \times T_{supported} \times (d_{web} + T_{supported} / 2)) / A_{notched} = 106 \text{ mm}$$

Inertia of notched section

$$I_{notched} = t_{supported} \times d_{web}^3 / 12 + t_{supported} \times d_{web} \times (y_{bar} - d_{web} / 2)^2 + B_{supported} \times T_{supported}^3 / 12 + B_{supported} \times T_{supported} \times (d_{web} + T_{supported} / 2 - y_{bar})^2$$

$$I_{notched} = 433 \text{ cm}^4$$

Modulus of notched section

$$Z_{notched} = I_{notched} / y_{bar} = 40.7 \text{ cm}^3$$

$$\text{;Moment capacity of notched section; } M_{capnotched} = p_{ysupported} \times Z_{notched} = 11.2 \text{ kNm}$$

$$\text{;Moment applied to notched section; } M_{appnotched} = Q \times \max(C_{topnotch} + t_1) = 2.3 \text{ kNm}$$

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project		Job no.	
	39 Vallance Road, Wood Green, London N22 7UD		39/N227UD	
	Calcs for		Start page no./Revision	
	Building alterations		39/N227UD/ 27	
	Calcs by	Calcs date	Checked by	Checked date
	Hugh Levy	10/08/2026	Office	10/08/2026
			Approved by	Approved date

Utilisation factor; $U_{check4cmoment} = M_{apnotched} / M_{capnotched} = 0.207$

Moment capacity of notched section : PASS

Check 4d - local stability of notched beams restrained against lateral torsional buckling - 1 flange notched

;; Depth of Notch; $d_{ctopnotch} = 25$ mm

Length of notch; $C_{topnotch} = 110$ mm

;Depth of top notch less than limit of D/2 : PASS

; Grade_{supported} = "S275"

;; $\dot{d} = D_{supported} / t_{supported} = 20.2$

$C_{limit} = \text{if}(\text{or}(\text{Grade}_{supported} == "S275", \text{Grade}_{supported} == "300"), \text{if}(\dot{d} \leq 54.3, D_{supported}, 160000 \times D_{supported} / \dot{d}^3), \text{if}(\dot{d} \leq 48.0, D_{supported}, 110000 \times D_{supported} / \dot{d}^3))$

$C_{limit} = 161.8$ mm

Length of top notch less than limit : PASS

Check 5 - Shear capacity of bolt group connecting cleats to supporting beam

Shear capacity of top pair of bolts

;;;; $P_{sbolts1} = \min(P_{sbolts}, 0.5 \times e_{1cleats} \times t_{cleats} \times p_{bscleats}) = 58.9$ kN

Shear capacity of other bolts

$P_{sbolts} = 58.9$ kN

Shear capacity of bolt group - sum of bolt capacities

; $P_{sboltssum} = 2 \times P_{sbolts1} + 2 \times (n_{bolts} - 1) \times P_{sbolts} = 235.5$ kN

; Shear on bolt group; $Q = 20.0$ kN

Utilisation factor; $U_{check5} = Q / P_{sboltssum} = 0.085$

Shear capacity of bolt group to supporting beam : PASS

Check 6 - Shear and bearing capacity of cleats connected to supporting beam

for shear

;;

$p_{ycleats} = 275$ N/mm²

;;

$e_{1acleats} = e_{1cleats} = 30$ mm

;;

$A_{vcleats} = 0.9 \times (2 \times e_{1acleats} + (n_{bolts} - 1) \times p_{bolts}) \times t_{cleats} = 900$ mm²

Effective net area coefficient

$K_{ecleats} = 1.20$

;

$A_{vnetcleats} = A_{vcleats} - n_{bolts} \times D_{hbolts} \times t_{cleats} = 540$ mm²

Plain shear capacity of cleats

$P_{vPcleats} = \min(0.6 \times p_{ycleats} \times A_{vcleats}, 0.7 \times K_{ecleats} \times p_{ycleats} \times A_{vnetcleats}) = 124.7$ kN

$A_{v1cleats} = (e_{1acleats} + (n_{bolts} - 1) \times p_{bolts}) \times t_{cleats} = 700$ mm²

;

$A_{teffcleatssupporting} = (e_{2cleatssupporting} - 0.5 \times D_{hbolts}) \times t_{cleats} = 310$ mm²

Block shear capacity of cleats

$P_{vBcleatssupporting} = 0.6 \times p_{ycleats} \times A_{v1cleats} + 0.6 \times K_{ecleats} \times p_{ycleats} \times A_{teffcleatssupporting} = 176.9$ kN

Shear capacity of the angle cleat leg; $P_{vcleatssupporting} = \min(P_{vPcleats}, P_{vBcleatssupporting}) = 124.7$ kN

; Shear force on angle cleat; $Q / 2 = 10.0$ kN

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project 39 Vallance Road, Wood Green, London N22 7UD				Job no. 39/N227UD	
	Calcs for Building alterations				Start page no./Revision 39/N227UD/ 28	
	Calcs by Hugh Levy	Calcs date 10/08/2026	Checked by Office	Checked date 10/08/2026	Approved by	Approved date

Utilisation factor; $U_{\text{check6shear}} = Q / (2 \times P_{\text{vcleatssupporting}}) = \mathbf{0.080}$

Shear capacity of cleats to supporting beam: PASS

for bearing

$$e_{\text{cleatssupporting}} = e_{1\text{cleats}} = \mathbf{30 \text{ mm}}$$

bearing strength of the cleat

$$p_{\text{bscleats}} = \mathbf{460 \text{ N/mm}^2}$$

For top bolt,

bearing capacity of the leg of the angle cleat per bolt

$$P_{\text{bscleatssupporting1}} = \min(d_{\text{bolts}} \times t_{\text{cleats}} \times p_{\text{bscleats}}, 0.5 \times e_{\text{cleatssupporting}} \times t_{\text{cleats}} \times p_{\text{bscleats}}) = \mathbf{69.0 \text{ kN}}$$

For other bolts,

bearing capacity of the leg of the angle cleat per bolt

$$P_{\text{bscleatssupporting}} = d_{\text{bolts}} \times t_{\text{cleats}} \times p_{\text{bscleats}} = \mathbf{73.6 \text{ kN}}$$

Capacity of bolt group;

$$P_{\text{bscleatssupportingsum}} = 2 \times P_{\text{bscleatssupporting1}} + 2 \times (n_{\text{bolts}} - 1) \times P_{\text{bscleatssupporting}} = \mathbf{285.2 \text{ kN}}$$

Bearing force on bolt group; $Q = \mathbf{20.0 \text{ kN}}$

Utilisation factor; $U_{\text{check6bearing}} = Q / P_{\text{bscleatssupportingsum}} = \mathbf{0.070}$

Bearing capacity of cleats to supporting beam: PASS

Check 7 - Local shear and bearing capacity of supporting beam web

for shear;,,,;

$$;e_{\text{bsupporting}} = \min(p_{\text{bolts}}, D_{\text{supporting}} - e_{\text{tsupporting}} - (n_{\text{bolts}} - 1) \times p_{\text{bolts}}) = \mathbf{40 \text{ mm}}$$

$$A_{\text{vsupporting}} = (e_{\text{bsupporting}} + (n_{\text{bolts}} - 1) \times p_{\text{bolts}} + e_{\text{tsupporting}}) \times t_{\text{supporting}} = \mathbf{1363 \text{ mm}^2}$$

$$; A_{\text{vnetsupporting}} = A_{\text{vsupporting}} - n_{\text{bolts}} \times D_{\text{hbolts}} \times t_{\text{supporting}} = \mathbf{1025 \text{ mm}^2}$$

;

$$p_{\text{ysupporting}} = \mathbf{275 \text{ N/mm}^2}$$

Effective net area coefficient

$$K_{\text{esupporting}} = \mathbf{1.20}$$

$$P_{\text{vsupporting}} = \min(0.6 \times p_{\text{ysupporting}} \times A_{\text{vsupporting}}, 0.7 \times K_{\text{esupporting}} \times p_{\text{ysupporting}} \times A_{\text{vnetsupporting}}) = \mathbf{224.9 \text{ kN}}$$

;Shear load on supporting beam; $Q / 2 = \mathbf{10.0 \text{ kN}}$

Utilisation factor; $U_{\text{check7shear}} = Q / (2 \times P_{\text{vsupporting}}) = \mathbf{0.044}$

Local shear capacity of supporting beam web: PASS

for bearing

$$p_{\text{bssupporting}} = \mathbf{460 \text{ N/mm}^2}$$

$$P_{\text{bssupporting}} = d_{\text{bolts}} \times t_{\text{supporting}} \times p_{\text{bssupporting}} = \mathbf{69.2 \text{ kN}}$$

$$Q / (2 \times n_{\text{bolts}}) = \mathbf{5.0 \text{ kN}}$$

Utilisation factor; $U_{\text{check7bearing}} = Q / (2 \times n_{\text{bolts}} \times P_{\text{bssupporting}}) = \mathbf{0.072}$

Local bearing capacity of supporting beam web : PASS

 H Levy Consulting Limited Registered Address: Oak Accounting Services 65 Crouch Avenue, Hullbridge, Hockley,	Project				Job no.	
	39 Vallance Road, Wood Green, London N22 7UD				39/N227UD	
	Calcs for				Start page no./Revision	
	Building alterations				39/N227UD/ 29	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	Hugh Levy	10/08/2026	Office	10/08/2026		

SUMMARY OF RESULTS

Check 2 - Capacity of bolt group connecting cleats to web of supported beam (taking account of eccentricity 'a')

Shear utilisation factor; $U_{\text{check2shear}} = 0.229$; **PASS**

Check 3 - Capacity of cleat connected to supported beam

Shear utilisation factor; $U_{\text{check3shear}} = 0.080$; **PASS**

Bearing utilisation factor; $U_{\text{check3bearing}} = 0.195$; **PASS**

Check 4b - Capacity of the supported beam

Shear utilisation factor; $U_{\text{check4shear}} = 0.124$; **PASS**

Bearing utilisation factor; $U_{\text{check4bearing}} = 0.457$; **PASS**

Check 4c - bending capacity of reduced beam section at the notch - 1 flange notched

Moment Utilisation factor; $U_{\text{check4cmoment}} = 0.207$; **PASS**

Check 4d - local stability of notched beams restrained against lateral torsional buckling - 1 flange notched

Local stability limit; $C_{\text{limit}} = 161.8 \text{ mm}$; **PASS**

Check 5 - Capacity of bolt group connecting cleats to supporting beam

Shear utilisation factor; $U_{\text{check5}} = 0.085$; **PASS**

Check 6 - Capacity of cleats connected to supporting beam

Shear utilisation factor; $U_{\text{check6shear}} = 0.080$; **PASS**

Bearing utilisation factor; $U_{\text{check6bearing}} = 0.070$; **PASS**

Check 7 - Local capacity of column web

Shear utilisation factor; $U_{\text{check7shear}} = 0.044$; **PASS**

Bearing utilisation factor; $U_{\text{check7bearing}} = 0.072$; **PASS**

;

;