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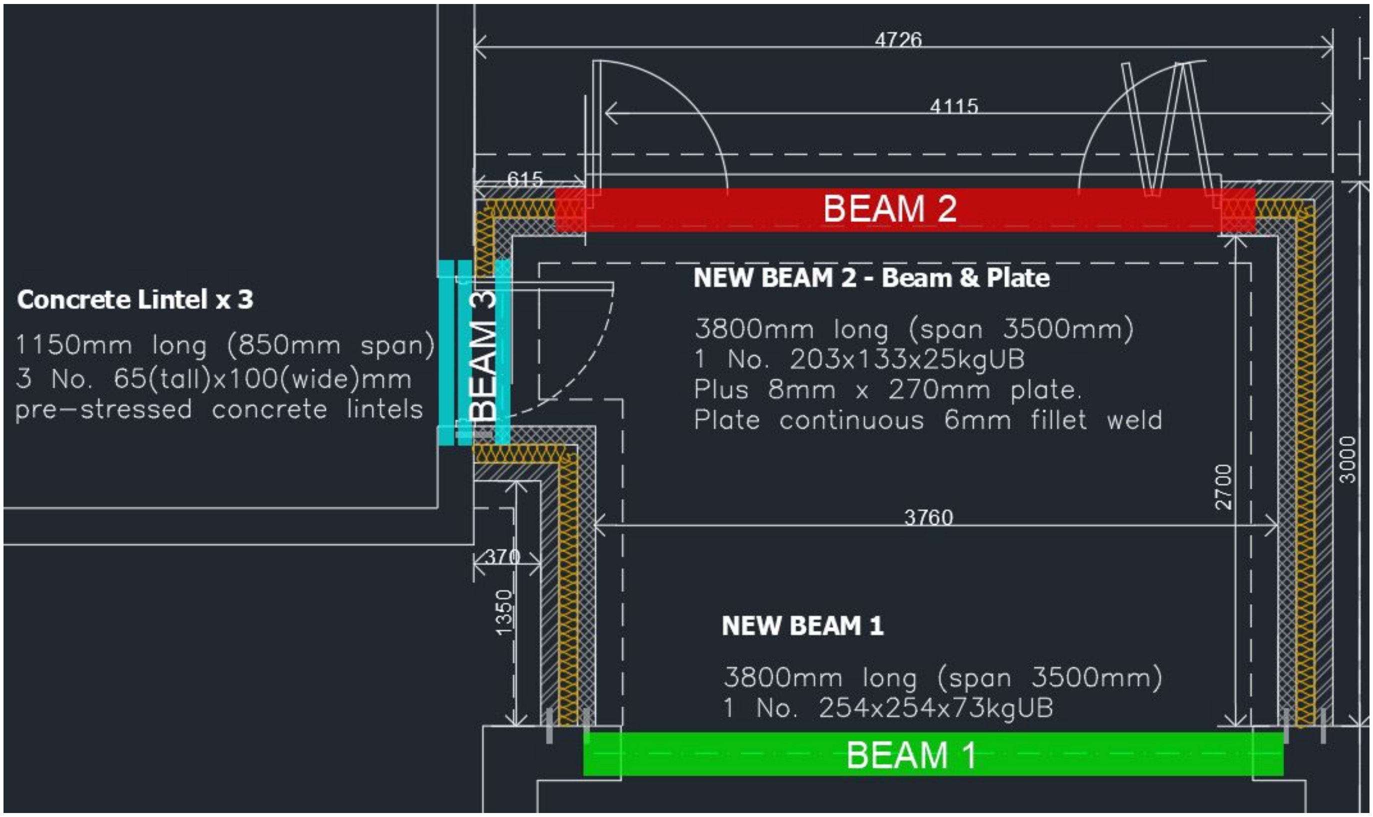
Project				Job no.	
Plan of BEAMS 1, 2, 3.				2023-7459	
Calcs for				Start page no./Revision	
Mr Wisidagama 29 Hartfield Road, Leatherhead, KT22 0AR				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
SB	19/09/2023	DB	19/09/2023	SB	19/09/2023



SUMMARY

Beam 1 - 254x254x73kgUB S275 to support 300mm cavity wall existing rear structure.
3800mm total length - dimension to be checked on site.

Beam 2 - 203x133x25kgUB S275 + 8mm x 270mm S275 welded plate to support 300mm cavity wall & permit facing brickwork to outer leaf to proposed single storey extension.
3800mm total length - dimension to be checked on site.

Beam 3 - 3 x pre-stressed 65x100mm concrete lintels to span over new doorway opening.
1150mm total length - dimension to be checked on site.

HUGHES

Load Span Tables for Prestressed Lintels

CE

4" x 3" Prestressed Concrete Lintels
65mm x 100mm

Nominal Length mm	Safe Load Capacity[1] On Edge kN/m	Safe Load Capacity[1] On Flat kN/m
	Rm = 0.53 kNm	*Rm = 0.21 kNm*
900	37.43	22.27
1050	33.54	20.66
1200	29.65	19.05
1350	25.76	17.44
1500	21.87	15.83
1650	17.98	14.22
1800	14.09	12.61
1950	10.20	11.01
2100	7.54	8.88
2250	6.29	6.76
2400	5.24	4.64

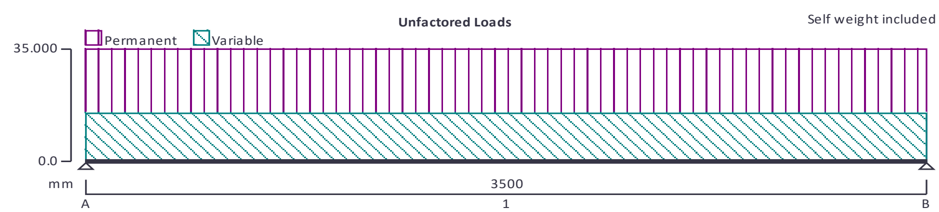
BEAM 3

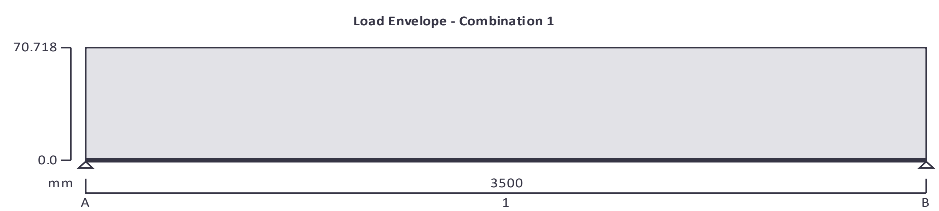
Lintel PASS Calc
Span 900mm, laid flat side, max load capacity 22.27
Actual load condition = 2kNm Therefore PASS

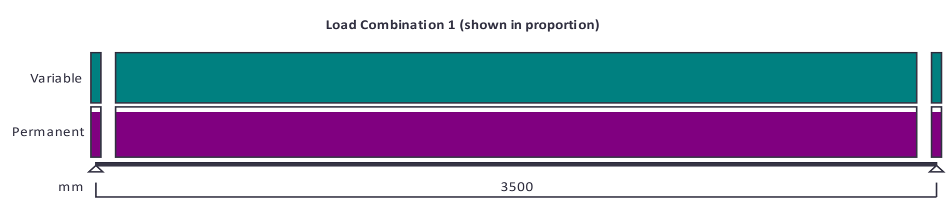
STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)

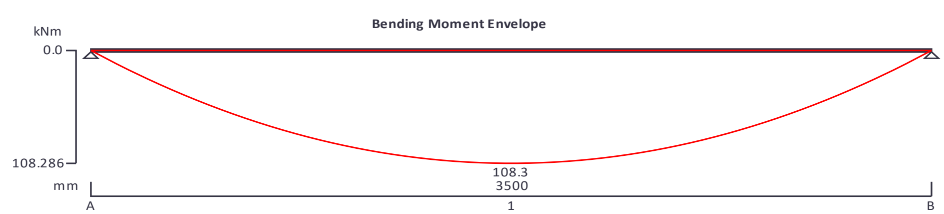
In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

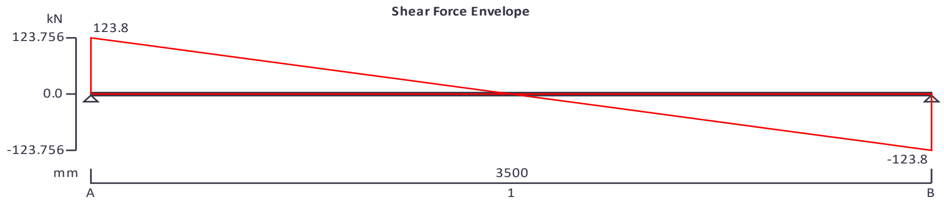
TEDDS calculation version 3.0.13











Support conditions

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

Applied loading

Beam loads	Permanent self weight of beam × 1
	Permanent full UDL 35 kN/m
	Variable full UDL 15 kN/m

Load combinations

Load combination 1	Support A	Permanent × 1.35
		Variable × 1.50
		Permanent × 1.35
		Variable × 1.50
	Support B	Permanent × 1.35
		Variable × 1.50

Analysis results

Maximum moment	M_{max} = **108.3** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **123.8** kN	V_{min} = **-123.8** kN
Deflection	δ_{max} = **1.2** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **123.8** kN	R_{A_min} = **123.8** kN
Unfactored permanent load reaction at support A	$R_{A\_Permanent}$ = **62.5** kN	
Unfactored variable load reaction at support A	$R_{A\_Variable}$ = **26.3** kN	
Maximum reaction at support B	R_{B_max} = **123.8** kN	R_{B_min} = **123.8** kN
Unfactored permanent load reaction at support B	$R_{B\_Permanent}$ = **62.5** kN	
Unfactored variable load reaction at support B	$R_{B\_Variable}$ = **26.3** kN	

Section details

Section type	**UC 254x254x73 (BS4-1)**
Steel grade	**S275**

EN 10025-2:2004 - Hot rolled products of structural steels

Nominal thickness of element	$t = \max(t_f, t_w)$ = **14.2** mm
Nominal yield strength	f_y = **275** N/mm^2
Nominal ultimate tensile strength	f_u = **410** N/mm^2
Modulus of elasticity	E = **210000** N/mm^2

PlanningApplications.com Summer House, Upper Court Road Woldingham SURREY CR3 7BF support@planningapplications.com 07922 148 701	Project BEAM 1 (1 No. 254x254x73kgUB)				Job no. 2023-7459	
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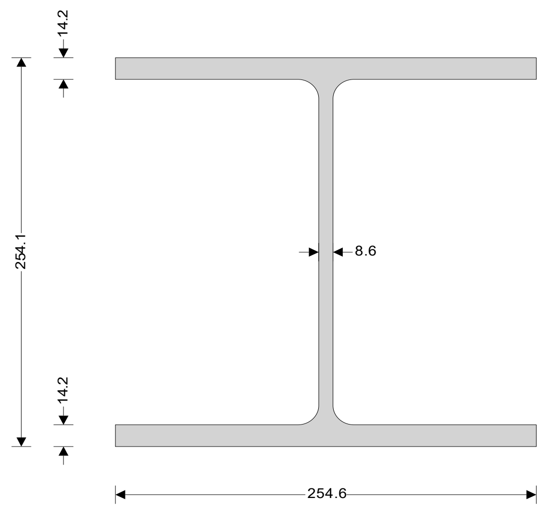


Partial factors - Section 6.1

Resistance of cross-sections γ_{M0} = **1.00**

Resistance of members to instability γ_{M1} = **1.00**

Resistance of tensile members to fracture γ_{M2} = **1.10**

Lateral restraint

Span 1 has lateral restraint at supports only

Effective length factors

Effective length factor in major axis K_y = **1.000**

Effective length factor in minor axis K_z = **1.000**

Effective length factor for torsion $K_{LT.A}$ = **1.000**

$K_{LT.B}$ = **1.000**

Classification of cross sections - Section 5.5

$\varepsilon = \sqrt{[235 N/mm^2 / f_y]}$ = **0.92**

Internal compression parts subject to bending and compression - Table 5.2 (sheet 1 of 3)

Width of section c = d = **200.3** mm

$\alpha = \min([h / 2 + N_{Ed} / (2 \times t_w \times f_y) - (t_f + r)] / c, 1)$ = **0.817**

$c / t_w = 25.2 \times \varepsilon <= 396 \times \varepsilon / (13 \times \alpha - 1)$ Class 1

Outstand flanges - Table 5.2 (sheet 2 of 3)

Width of section $c = (b - t_w - 2 \times r) / 2$ = **110.3** mm

$c / t_f = 8.4 \times \varepsilon <= 9 \times \varepsilon$ Class 1

Section is class 1

Check shear - Section 6.2.6

Height of web $h_w = h - 2 \times t_f$ = **225.7** mm

Shear area factor η = **1.000**

$h_w / t_w < 72 \times \varepsilon / \eta$

Shear buckling resistance can be ignored

Design shear force $V_{Ed} = \max(\text{abs}(V_{max}), \text{abs}(V_{min}))$ = **123.8** kN

Shear area - cl 6.2.6(3) $A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w)$ = **2562** mm^2

Design shear resistance - cl 6.2.6(2) $V_{c,Rd} = V_{pl,Rd} = A_v \times (f_y / \sqrt{[3]}) / \gamma_{M0}$ = **406.8** kN

PASS - Design shear resistance exceeds design shear force

Check bending moment major (y-y) axis - Section 6.2.5

Design bending moment $M_{Ed} = \max(\text{abs}(M_{s1\_max}), \text{abs}(M_{s1\_min}))$ = **108.3** kNm

Design bending resistance moment - eq 6.13 $M_{c,Rd} = M_{pl,Rd} = W_{pl.y} \times f_y / \gamma_{M0}$ = **272.8** kNm

Slenderness ratio for lateral torsional buckling

Correction factor - Table 6.6 k_c = **0.94**

$C_1 = 1 / k_c^2$ = **1.132**

Curvature factor $g = \sqrt{[1 - (I_z / I_y)]}$ = **0.811**

Poissons ratio ν = **0.3**

Shear modulus $G = E / [2 \times (1 + \nu)]$ = **80769** N/mm^2

Unrestrained length $L = 1.0 \times L_{s1}$ = **3500** mm

Elastic critical buckling moment $M_{cr} = C_1 \times \pi^2 \times E \times I_z / (L^2 \times g) \times \sqrt{[I_w / I_z + L^2 \times G \times I_t / (\pi^2 \times E \times I_z)]}$ = **1350.9** kNm

Slenderness ratio for lateral torsional buckling $\bar{\lambda}_{LT} = \sqrt{(W_{pl.y} \times f_y / M_{cr})}$ = **0.449**

Limiting slenderness ratio $\bar{\lambda}_{LT,0}$ = **0.4**

$\bar{\lambda}_{LT}$ > $\bar{\lambda}_{LT,0}$ - Lateral torsional buckling cannot be ignored

Design resistance for buckling - Section 6.3.2.1

Buckling curve - Table 6.5 b

Imperfection factor - Table 6.3 α_{LT} = **0.34**

Correction factor for rolled sections β = **0.75**

LTB reduction determination factor $\phi_{LT} = 0.5 \times [1 + \alpha_{LT} \times (\bar{\lambda}_{LT} - \bar{\lambda}_{LT,0}) + \beta \times \bar{\lambda}_{LT}^2]$ = **0.584**

LTB reduction factor - eq 6.57 $\chi_{LT} = \min(1 / [\phi_{LT} + \sqrt{(\phi_{LT}^2 - \beta \times \bar{\lambda}_{LT}^2)}], 1, 1 / \bar{\lambda}_{LT}^2)$ = **0.981**

Modification factor $f = \min(1 - 0.5 \times (1 - k_c) \times [1 - 2 \times (\bar{\lambda}_{LT} - 0.8)^2], 1)$ = **0.977**

Modified LTB reduction factor - eq 6.58 $\chi_{LT,mod} = \min(\chi_{LT} / f, 1)$ = **1.000**

Design buckling resistance moment - eq 6.55 $M_{b,Rd} = \chi_{LT,mod} \times W_{pl.y} \times f_y / \gamma_{M1}$ = **272.8** kNm

PASS - Design buckling resistance moment exceeds design bending moment

Check compression - Section 6.2.4

Design compression force N_{Ed} = **300** kN

Design resistance of section - eq 6.10 $N_{c,Rd} = N_{pl,Rd} = A \times f_y / \gamma_{M0}$ = **2560.3** kN

Slenderness ratio for major (y-y) axis buckling

Critical buckling length $L_{cr,y} = L_{s1} \times K_y$ = **3500** mm

Critical buckling force $N_{cr,y} = \pi^2 \times E_{SEC3} \times I_y / L_{cr,y}^2$ = **19300.2** kN

Slenderness ratio for buckling - eq 6.50 $\bar{\lambda}_y = \sqrt{[A \times f_y / N_{cr,y}]}$ = **0.364**

Design resistance for buckling - Section 6.3.1.1

Buckling curve - Table 6.2 b

Imperfection factor - Table 6.1 α_y = **0.34**

Buckling reduction determination factor $\phi_y = 0.5 \times [1 + \alpha_y \times (\bar{\lambda}_y - 0.2) + \bar{\lambda}_y^2]$ = **0.594**

Buckling reduction factor - eq 6.49 $\chi_y = \min(1 / [\phi_y + \sqrt{(\phi_y^2 - \bar{\lambda}_y^2)}], 1)$ = **0.940**

Design buckling resistance - eq 6.47 $N_{b,y,Rd} = \chi_y \times A \times f_y / \gamma_{M1}$ = **2406.8** kN

PASS - Design buckling resistance exceeds design compression force

Slenderness ratio for minor (z-z) axis buckling

Critical buckling length $L_{cr,z} = L_{s1\_seg1} \times K_z$ = **3500** mm

Critical buckling force $N_{cr,z} = \pi^2 \times E_{SEC3} \times I_z / L_{cr,z}^2$ = **6611.7** kN

Slenderness ratio for buckling - eq 6.50 $\bar{\lambda}_z = \sqrt{[A \times f_y / N_{cr,z}]}$ = **0.622**

Design resistance for buckling - Section 6.3.1.1

Buckling curve - Table 6.2 c

Imperfection factor - Table 6.1 α_z = **0.49**

Buckling reduction determination factor $\phi_z = 0.5 \times [1 + \alpha_z \times (\bar{\lambda}_z - 0.2) + \bar{\lambda}_z^2]$ = **0.797**

Buckling reduction factor - eq 6.49 $\chi_z = \min(1 / [\phi_z + \sqrt{(\phi_z^2 - \bar{\lambda}_z^2)}], 1)$ = **0.772**

Design buckling resistance - eq 6.47 $N_{b,z,Rd} = \chi_z \times A \times f_y / \gamma_{M1}$ = **1976.8** kN

PASS - Design buckling resistance exceeds design compression force

Check torsional and torsional-flexural buckling - Section 6.3.1.4

Torsional buckling length factor K_T = **1.00**

Torsional buckling length $L_{cr,T} = \max(L_{s1}, L_{s1\_seg1}) \times K_T$ = **3500** mm

Distance from shear centre to centroid in y axis y_0 = **0.0** mm

Distance from shear centre to centroid in z axis z_0 = **0.0** mm

Radius of gyration $i_0 = \sqrt{[i_y^2 + i_z^2]}$ = **128.3** mm

Elastic critical torsional buckling force $N_{cr,T} = 1 / i_0^2 \times [G \times I_t + \pi^2 \times E_{SEC3} \times I_w / L_{cr,T}^2]$ = **8612.4** kN

Torsion factor $\beta_T = 1 - (y_0 / i_0)^2$ = **1.000**

Elastic critical torsional-flexural buckling force

$N_{cr,TF} = N_{cr,y} / (2 \times \beta_T) \times [1 + N_{cr,T} / N_{cr,y} - \sqrt{[(1 - N_{cr,T} / N_{cr,y})^2 + 4 \times (y_0 / i_0)^2 \times N_{cr,T} / N_{cr,y}]}]$ = **8612.4** kN

Elastic critical buckling force $N_{cr} = \min(N_{cr,T}, N_{cr,TF})$ = **8612.4** kN

Slenderness ratio for torsional buckling - eq 6.52 $\bar{\lambda}_T = \sqrt{[A \times f_y / N_{cr}]}$ = **0.545**

Design resistance for buckling - Section 6.3.1.1

Buckling curve - Table 6.2 c

Imperfection factor - Table 6.1 α_T = **0.49**

Buckling reduction determination factor $\phi_T = 0.5 \times [1 + \alpha_T \times (\bar{\lambda}_T - 0.2) + \bar{\lambda}_T^2]$ = **0.733**

Buckling reduction factor - eq 6.49 $\chi_T = \min(1 / [\phi_T + \sqrt{(\phi_T^2 - \bar{\lambda}_T^2)}], 1)$ = **0.817**

Design buckling resistance - eq 6.47 $N_{b,T,Rd} = \chi_T \times A \times f_y / \gamma_{M1}$ = **2092.7** kN

PASS - Design buckling resistance exceeds design compression force

Combined bending and axial force - Section 6.2.9

Normal force to plastic resistance force ratio $n = N_{Ed} / N_{pl,Rd}$ = **0.12**

Web area to gross area ratio $a_w = \min((A - 2 \times b \times t_f) / A, 0.5)$ = **0.22**

Design plastic moment resistance - eq 6.13 $M_{pl,Rd} = W_{pl.y} \times f_y / \gamma_{M0}$ = **272.8** kNm

Reduced plastic moment resistance - eq 6.36 $M_{N,Rd} = M_{pl,Rd} \times \min((1 - n) / (1 - 0.5 \times a_w), 1)$ = **271.1** kNm

PASS - Reduced bending resistance moment exceeds design bending moment

Check combined bending and compression - Section 6.3.3

Equivalent uniform moment factors - Table B.3 M_{hy} = **0** kNm

M_{sy} = **108** kNm

ψ_y = **1.000**

$\alpha_{hy} = M_{hy} / M_{sy}$ = **0.000**

$C_{my} = 0.95 + 0.05 \times \alpha_{hy}$ = **0.950**

M_{hz} = **0** kNm

M_{sz} = **0** kNm

ψ_z = **1.000**

$C_{mz} = 0.6 + 0.4 \times \psi_z$ = **1.000**

M_{hLT} = **0** kNm

M_{sLT} = **108** kNm

ψ_{LT} = **1.000**

$\alpha_{hLT} = M_{hLT} / M_{sLT}$ = **0.000**

$C_{mLT} = 0.95 + 0.05 \times \alpha_{hLT}$ = **0.950**

Interaction factors k_{ij} for members susceptible to torsional deformations - Table B.2

Characteristic moment resistance $M_{Rk} = W_{pl.y} \times f_y$ = **272.8** kNm

Characteristic resistance to normal force $N_{Rk} = A \times f_y$ = **2560.3** kN

Interaction factors $k_{yy} = C_{my} \times [1 + \min(\bar{\lambda}_y - 0.2, 0.8) \times N_{Ed} / (\chi_y \times N_{Rk} / \gamma_{M1})]$ = **0.969**

$k_{zy} = 1 - 0.1 \times \min(1, \bar{\lambda}_z) \times N_{Ed} / ((C_{mLT} - 0.25) \times \chi_z \times N_{Rk} / \gamma_{M1})$ = **0.987**

Interaction formulae - eq 6.61 & eq 6.62 $N_{Ed} / (\chi_y \times N_{Rk} / \gamma_{M1}) + k_{yy} \times M_{Ed} / (\chi_{LT} \times M_{Rk} / \gamma_{M1})$ = **0.517**

$N_{Ed} / (\chi_z \times N_{Rk} / \gamma_{M1}) + k_{zy} \times M_{Ed} / (\chi_{LT} \times M_{Rk} / \gamma_{M1})$ = **0.551**

PASS - Combined bending and compression checks are satisfied

Check vertical deflection - Section 7.2.1

Consider deflection due to variable loads

Limiting deflection $\delta_{lim} = L_{s1} / 360$ = **9.7** mm

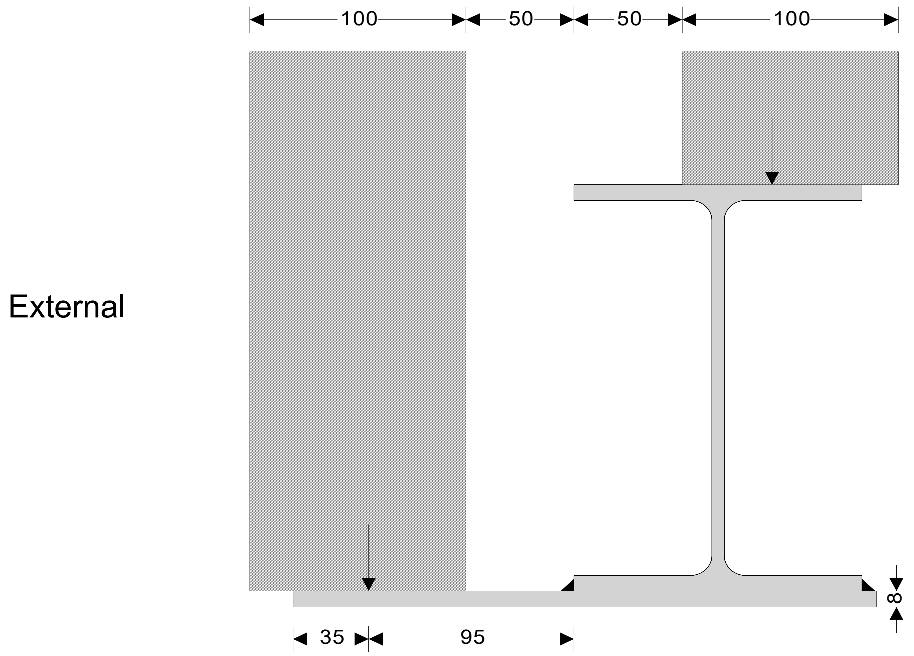
Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min}))$ = **1.223** mm

PASS - Maximum deflection does not exceed deflection limit

STEEL MASONRY SUPPORT

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

Tedds calculation version 1.0.04



Steel member details

Torsion beam UB 203x133x25

Masonry support plate User

Steel grade of support plate S275

Design strength of support plate p_{ysb} = **275** N/mm^2

Modulus of elasticity E = 205000 N/mm^2

Constant $\varepsilon = \sqrt{(275N/mm^2 / p_{ysb})}$ = **1.000**

Length of plate beyond beam l_h = **130** mm

Total length of plate l_{plate} = **270** mm

Thickness of plate t_{sb} = **8** mm

Width of main beam B_{mb} = **133** mm

Area of plate $A_{sbu} = t_{sb} \times l_{plate}$ = **2160.0** mm^2

Distance from weld position to CoG $c_{yysb} = l_h / 2 - (l_{plate} - l_h) / 2$ = **-5** mm

Supported materials detail

Density of masonry on main beam $\rho_{m,mb}$ = **10.0** kN/m^3

Width of masonry on main beam b_{mmb} = **100** mm

Height of masonry on main beam h_{mmb} = **300** mm

Eccentricity of main beam material e_{mb} = **50** mm

Add dead force main beam (not from masonry) P_{Gaddmb} = **0.0** kN/m

Add live force main beam (not from masonry) P_{Qaddmb} = **0.0** kN/m

Density of masonry on support beam $\rho_{m,sb}$ = **10.0** kN/m^3

Width of masonry on support beam b_{msb} = **100** mm

Height of masonry on support beam h_{msb} = **500** mm

Add dead force support beam (not from masonry) P_{Gaddsb} = **0.0** kN/m

Add live force support beam (not from masonry) P_{Qaddsb} = **0.0** kN/m

Geometry

Cavity width c = **100** mm

Supported width of masonry $d_m = l_h + e_{mb} - c$ = **80** mm

Biaxial stress effects in the plate (SCI-P-110)

Maximum overall bending moment M_x = **32.6** kNm

Dist to NA combined section (CoG torsion beam) $y_{e,all} = (D_{mb} + t_{sb}) \times A_{sbu} / (2 \times (A_{mb} + A_{sbu}))$ = **43** mm

Second moment of area of combined section $I_{xx,all} = (I_{xxmb} + A_{mb} \times y_{e,all}^2) + A_{sbu} \times (D_{mb} / 2 + t_{sb} / 2 - y_{e,all})^2$ = **3778** cm^4

Elastic section modulus of combined section $Z_{xx,all} = I_{xx,all} / (D_{mb} / 2 + t_{sb} - y_{e,all})$ = **563.66** cm^3

Section modulus of plate $Z_{xx,plate} = 1m \times t_{sb}^2 / (6 \times 1m)$ = **10.67** cm^3/m

Eccentricity of support beam masonry e_1 = **95** mm

Force of masonry on support plate $P_1 = (b_{msb} \times h_{msb} \times \rho_{m,sb} + P_{Gaddsb}) \times \gamma_{fG} + P_{Qaddsb} \times \gamma_{fQ}$ = **0.7** kN/m

Bending at heel $M_{x,plate} = P_1 \times e_1$ = **0.1** kNm/m

Moment capacity of plate $M_c = 1.2 \times Z_{x,plate} \times p_{ysb}$ = **3.5** kNm/m

PASS - Design strength exceeds stress at heel

Longitudinal stress due to overall bending $\sigma_1 = M_x / Z_{xx,all}$ = **57.9** N/mm^2

Constant relating to Von Mises curve $c_{fp} = (4 \times p_{ysb}^2 - 3 \times \sigma_1^2)^{0.5}$ = **540.8** N/mm^2

Transverse bending stress ratio limit $\alpha_{ts} = (c_{fp}^2 - \sigma_1^2) / (2 \times c_{fp} \times p_{ysb})$ = **0.972**

Transverse bending stress ratio $\alpha_{ls} = M_{x,plate} / M_c$ = **0.019**

PASS - Transverse bending stress ratio less than allowable limit

Deflection at toe

Unfactored force on support angle $P_{1SLS} = b_{msb} \times h_{msb} \times \rho_{m,sb} + P_{Gaddsb} + P_{Qaddsb}$ = **0.5** kN/m

Distance from weld to load position $a_m = e_1$ = **95** mm

Length of load resultant to edge of plate $b_m = l_h - e_1$ = **35** mm

Dist from weld to load position as ratio of length $a_l = a_m / (a_m + b_m)$ = **0.731**

Effective second moment of inertia $I_{eff\_def} = t_{sb}^3 / 12$ = **42667** mm^4/m

Deflection at toe $\delta = (a_l^2 \times (3 - a_l) / 6) \times (P_{1SLS} \times (a_m + b_m)^3) / (E_{S5950} \times I_{eff\_def})$ = **0.03** mm

Deflection limit δ_{lim} = **1.80** mm

PASS - Deflection is within specified criteria

Weld details - assume a full length weld and that the plate acts as a propped cantilever with the prop at the weld position and the fixed end at the centre of the torsion beam

Leg length of weld s_{weld} = **6** mm

Throat size of weld $a_{weld} = 1/\sqrt{(2)} \times s_{weld}$ = **4.2** mm

Shear force at weld position $R_A = P_1 \times maX((1 + (3 \times e_1) / (2 \times B_{mb} / 2)), 1.4)$ = **2.2** kN/m

Maximum possible force in plate $R_p = (l_h + B_{mb}) \times t_{sb} \times p_{ysb}$ = **579.0** kN

Longitudinal shear between beam and plate $R_l = 2 \times R_p / L$ = **330.9** kN/m

Horizontal shear between beam and plate $R_h = P_1 \times e_1 / (s_{weld} / 2 + t_{sb} / 2)$ = **9.5** kN/m

Resultant weld force $R_{weld} = (R_A^2 + R_l^2 + R_h^2)^{0.5}$ = **0.331** kN/mm

Strength of weld (Table 37) p_{weld} = **220.0** N/mm^2

Capacity of full length weld $p_{c,weld} = a_{weld} \times p_{weld}$ = **0.933** kN/mm

PASS - Capacity of weld exceeds resultant force on weld

Torsional loading ULS

Loading of support beam masonry $w_{1ULS} = (h_{msb} \times b_{msb} \times \rho_{m,sb} + P_{Gaddsb}) \times \gamma_{fG} + P_{Qaddsb} \times \gamma_{fQ}$ = **0.70** kN/m

Loading of main beam masonry $w_{2ULS} = (h_{mmb} \times b_{mmb} \times \rho_{m,mb} + P_{Gaddmb}) \times \gamma_{fG} + P_{Qaddmb} \times \gamma_{fQ}$ = **0.42** kN/m

Self weight of support beam $w_{3ULS} = A_{sbu} \times \rho_{sb} \times \gamma_{fG}$ = **0.24** kN/m

Torsional loading SLS

Loading of support beam masonry $w_{1SLS} = h_{msb} \times b_{msb} \times \rho_{m,sb} + P_{Gaddsb} + P_{Qaddsb}$ = **0.50** kN/m

Loading of main beam masonry $w_{2SLS} = h_{mmb} \times b_{mmb} \times \rho_{m,mb} + P_{Gaddmb} + P_{Qaddmb}$ = **0.30** kN/m

Self weight of support beam $w_{3SLS} = A_{sbu} \times \rho_{sb}$ = **0.17** kN/m

Eccentricities

Distance to shear centre of main beam e_{0mb} = **0** mm

Eccentricity of support beam masonry $e_{1mb} = (B_{mb} + b_{msb}) / 2 + c - e_{mb}$ = **167** mm

Eccentricity of main beam masonry $e_{2mb} = (B_{mb} - b_{mmb}) / 2 - e_{mb}$ = **-33** mm

Eccentricity of support beam $e_{3mb} = B_{mb} / 2 + c_{yysb}$ = **62** mm

Torsional effects

Applied torque (ULS) $T_{qULS} = abs(w_{1ULS} \times e_{1mb} + w_{2ULS} \times e_{2mb} + w_{3ULS} \times e_{3mb})$ = **0.12** kNm/m

Total torque (ULS) $T_q = T_{qULS} \times L$ = **0.41** kNm

Applied torque (SLS) $T_{qSLS} = abs(w_{1SLS} \times e_{1mb} + w_{2SLS} \times e_{2mb} + w_{3SLS} \times e_{3mb})$ = **0.08** kNm/m

Total torque (SLS) $T_{qu} = T_{qSLS} \times L$ = **0.29** kNm

STEEL BEAM TORSION DESIGN

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

Tedds calculation version 2.0.02

Section details

Section type UB 203x133x25

Steel grade S275

Design stength $p_{yw} = p_y$ = **275** N/mm^2

Constant $\varepsilon = \sqrt{(275 \text{ N/mm}^2 / p_y)}$ = **1.000**

Geometry - Beam unrestrained against lateral-torsional buckling between supports.

Effective span L = **3500** mm

Length of segment for LT buckling L_{LT} = **2550** mm

Compression flanges laterally restrained

Both flanges free to rotate on plan

Effective length for LT buckling $L_{E\_LT} = L_{LT} \times 1.0$ = **2550** mm

Loading - Torsional loading comprises only full-length uniformly distributed load(s)

Internal forces & moments on member under factored loading for uls design

Applied shear force F_{vy} = **43.0** kN

Maximum bending moment $M_{LT} = M_x$ = **32.62** kNm

Applied torque T_q = **0.41** kNm

Minor axis bending moment M_y = 0 kNm

Compression force F_c = 0 kN

Equivalent uniform moment factors

EUM factor (Cl. 4.3.6.6 and T18) m_{LT} = **1.000**

Torsional deflection parameters

Beam is torsion fixed and warping free at each end. (as defined in SCI-P-057 section 2.1.6) - Appendix B case 4

Dist along the beam for first derivative of twist z_1 = 0 mm

Dist along the beam for second derivative of twist $z_2 = L / 2$ = **1750** mm

First derivative of angle of twist $\phi'_1 = T_q / (G \times J) \times a / L \times [L^2 / (2 \times a) \times (1 / L - 2 \times z_1 / L^2) + \sinh(z_1 / a) - \tanh(L / (2 \times a)) \times \cosh(z_1 / a)] \times 1$ rads = **1.79×10^{-2}** rads/m

Third derivative of angle of twist $\phi'''_1 = T_q / (G \times J \times a^2) \times a/L \times [\sinh(z_1 / a) - \tanh(L / (2 \times a)) \times \cosh(z_1 / a)] \times 1$ rads = **-2.01×10^{-2}** rads/m^3

Angle of twist $\phi_2 = T_q \times a / (G \times J) \times a / L \times [L^2 / (2 \times a^2) \times (z_2 / L - z_2^2 / L^2) + \cosh(z_2 / a) - \tanh(L / (2 \times a)) \times \sinh(z_2 / a) - 1] \times 1$ rads = **0.019** rads

Second derivative of angle of twist $\phi''_2 = T_q / (G \times J \times a) \times a / L \times [\cosh(z_2 / a) - \tanh(L / (2 \times a)) \times \sinh(z_2 / a) - 1] \times 1$ rads = **-1.48×10^{-2}** rads/m^2

Design parameters

Total angle of twist $\phi = abs(\phi_2)$ = **0.019** rads

First derivative of ϕ $\phi' = abs(\phi'_1)$ = **1.79×10^{-2}** rads/m

Second derivative of ϕ $\phi'' = abs(\phi''_2)$ = **1.48×10^{-2}** rads/m^2

Third derivative of ϕ $\phi''' = abs(\phi'''_1)$ = **2.01×10^{-2}** rads/m^3

Section classification

b / T = **8.5**

d / t = **30.2**

$r_{1s} = \min(1.0, \max(-1.0, F_c / (d \times t \times p_{yw})))$ = **0.000**

$r_{2s} = F_c / (A_g \times p_{yw})$ = **0.000**

Section classification is plastic

Shear capacity (parallel to y-axis)

Design shear force F_{vy} = **43.0** kN

Design shear resistance (Cl. 4.2.3) $P_{vy} = 0.6 \times p_y \times A_{vy}$ = **191.1** kN

Pass - Shear

Moment capacity (x-axis)

Design bending moment M_x = **32.6** kNm

Moment capacity $M_{cxu} = p_y \times S_x$ = **70.9** kNm

Moment capacity low shear (Cl. 4.2.5.1) $M_{cx} = \min(p_y \times S_x, 1.2 \times p_y \times Z_x)$ = **70.9** kNm

Pass - Moment capacity exceeds design bending moment

Lateral torsional buckling

Effective length for lateral torsional buckling L_{E_LT} = **2550** mm

Slenderness ratio $\lambda = L_{E\_LT} / r_y$ =**82**

Buckling parameter u = **0.877**

Flange ratio η = 0.5

Torsional index x = **25.6**

Slenderness factor $v = 1 / (1 + 0.05 \times (\lambda / x)^2)^{0.25}$ = **0.90**

Ratio - cl 4.3.6.9 β_w = 1.0 = **1.000**

Equivalent slenderness – cl 4.3.6.7 $\lambda_{LT} = u \times v \times \lambda \times \sqrt{(\beta_w)}$ = **65**

Limiting slendernes – Annex B2.2 $\lambda_{L0} = 0.4 \times \sqrt{(\pi^2\times E_{S5950} / p_y)}$ = **34**

Euler stress $p_E = \pi^2 \times E_{S5950} / \lambda_{LT}^2$ = **479** N/mm^2

Perry factor $\eta_{LT} = \max(7.0 \times (\lambda_{LT} - \lambda_{L0}) / 1000, 0)$ = **0.215**

$\phi_{LT} = (p_y + (\eta_{LT} + 1) \times p_E) / 2$ = **428574344.389**

Bending strength $p_b = p_E \times p_y / (\phi_{LT} + \sqrt{(\phi_{LT}^2 - p_E \times p_y)})$ = **201** N/mm^2

Buckling resistance moment $M_b = p_b \times S_x$ = **51.8** kNm

Max moment governing buckling resistance M_{LT} = **32.6** kNm

Equiv uniform moment factor for LTB m_{LT} = **1.00**

M_b / m_{LT} = **51.8** kNm

Pass - lat. tors. buckling

Buckling under combined bending & torsion -SCI-P-057 section 2.3

For simplicity, a conservative check is applied using the maximum stresses due to each of the separate load effects, even though these do not necessarily all occur at the same section along the member.

Span factor: L / a = **3.09**

Angle of twist: ϕ = **0.019** rads

Second derivative of ϕ: ϕ'' = **14.8×10^{-3}** rads/m^2

Induced minor axis moment: $M_{yt} = M_x \times \phi / 1\ rad$ = **0.63** kNm

Normal stress at flange tip due to M_{yt}: $\sigma_{byt} = M_{yt} / Z_y$ = **14** N/mm^2

Normal stress at flange tip due to warping: $\sigma_w = E_{S5950} \times W_{n0} \times \phi'' / 1\ rad$ = **20** N/mm^2

Interaction index: $i_b = M_x \times m_{LT} / M_b + (\sigma_{byt} + \sigma_w) / p_y \times (1 + 0.5 \times M_x \times m_{LT} / M_b)$ = **0.79**

Pass - Combined bending and torsion check satisfied

Local capacity under combined bending & torsion

For simplicity, a conservative check is applied using the maximum stresses due to each of the separate load effects, even though these do not necessarily all occur at the same section along the member.

Max. direct stress due to M_x: $\sigma_{bx} = M_x / Z_x$ = **142** N/mm^2

Combined stress - eqn 2.22: $\sigma_{bx} + \sigma_{byt} + \sigma_w$ = **175** N/mm^2

Design strength: p_y = **275** N/mm^2

Pass - Local capacity

Combined shear stresses - SCI-P-057 section 2.3

For simplicity, a conservative check is applied using the maximum shear stresses due to each of the separate load effects, even though these do not necessarily all occur at the same section along the member.

Max shear stresses due to bending in web: $\tau_{bw} = F_{vy} \times Q_w / (I_x \times t)$ = **42** N/mm^2

Max shear stresses due to bending in flange: $\tau_{bf} = F_{vy} \times Q_f / (I_x \times T)$ = **12** N/mm^2

Max shear stresses due to torsion in web: $\tau_{tw} = abs(G \times t \times \phi' / 1rad)$ = **8** N/mm^2

Max shear stresses due to torsion in flange: $\tau_{tf} = abs(G \times T \times \phi' / 1\ rad)$ = **11** N/mm^2

Max shear stresses due to warping in flange: $\tau_{wf} = abs(-E_{S5950} \times S_{w1} \times \phi''' / 1\ rad / T)$ = **1** N/mm^2

Amp shear stress torsion & warping in web: $\tau_{vtw} = \tau_{tw} \times (1 + 0.5 \times M_x \times m_{LT} / M_b)$ = **11** N/mm^2

Amp shear stress torsion & warping in flange: $\tau_{vtf} = (\tau_{tf} + \tau_{wf}) \times (1 + 0.5 \times M_x \times m_{LT} / M_b)$ = **16** N/mm^2

Combined shear stresses due to bending, torsion & warping:

Combined shear stresses in web: $\tau_w = \tau_{bw} + \tau_{vtw}$ = **52** N/mm^2

Combined shear stresses in flange: $\tau_f = \tau_{bf} + \tau_{vtf}$ = **27** N/mm^2

Shear strength: $p_v = 0.6 \times p_y$ = **165** N/mm^2

Pass - Combined shear stresses

Twist check

Total applied torque (unfactored): T_{qu} = **0.29** kNm

Maximum twist under sls loading: $\phi_{sls} = \phi \times T_{qu} / T_q$ = **0.79** deg

Twist limit: ϕ_{lim} = **2.50** deg

Pass - Twist

Deflection

Maximum y-axis deflection: δ_{y_max} = **0.5** mm

Deflection limit - cl. 2.5.2: $\delta_{lim} = \min(L / k_\delta, \delta_{lim\_abs})$ = **9.7** mm

Pass - Deflection within specified limit

Notes:

DANGER ELECTRICITY service into existing buildings.
Care must be taken when any excavation is taking place near these positions. Confirm position of electricity cables with relevant power company before commencing on site, positions are to be marked on site and also on plans once confirmation has been received.

DANGER GAS service into existing buildings.
Care must be taken when any excavation is taking place near these positions. Confirm position of gas supply pipe with National Grid (0800 111 999) before commencing on site, positions are to be marked on site and also on plans once confirmation has been received.

DANGER WATER supply to be located and isolated prior to removal of any pipework, water supply pipe to be adequately protected at all time. If advice is required contact relevant water authority.

DANGER Electrical safety, all electrical required to meet the requirements of Part P (Electrical Safety) must be designed, installed, inspected and tested by a person competent to do so. Prior to completion the Council should be satisfied that Part P has been complied with. This will require an appropriate BS 7671:2008+A3:2015
Requirements for Electrical Installations. IET Wiring Regulations electrical installation certificate to be issued for the work by a person competent to do so.

 The drawings must not be scaled from. The contractor should take and verify all dimensions on site before proceeding with any works. All dimensions shown on the drawings are for Planning purposes only.

All dimensions must be checked onsite prior to works commencing. variations in squareness, depth of plaster etc., must be checked for.

Where new walls are shown aligned with existing walls, this must be checked by the physical removal of brickwork and or plaster to establish the actual position of the wall being attached to.

Site to be used only for demolition / construction of the proposed works, which is to be protected at all times along with adjacent properties, not forming part of the works.

Care must be taken at all times to ensure that any works on the supply of all services into / from the property (i.e. electricity, gas, water, KCOM, BT, foulwater and surfacewater drainage) does not ,at any time interfere with the supply of services into / from adjacent properties, is not affected, if this proves to be the case, then the contractor is to fully advise properties to be affected as soon as possible and is to negotiate with adjacent properties regarding any appropriate action that may be required.

Prevent smoke, dust, fumes, spillage and other harmful activities where possible. No fires to be allowed on site at any time and noise levels to be kept to a minimum and complying with BS 5228-1:2009+A1:2014 & BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites.'. Remember that adjacent properties are occupied and comply with all reasonable requests from the general public / neighbors regarding the use of power tools etc.

All positions of drainage runs and types of drainage indicated on drawings are provisional only, contractor to check invert and position of all drainage systems to ensure adequate fall & to ensure Building Control Officer is satisfied with site inverts before excavation of drainage runs.

All works are to be carried out with the relevant current British Standard Codes of Practice and Building Research Digest Papers, and to be to the approval of the local Authority and all Statutory Undertakings. All materials shall be suitable for the purpose intended and shall be used strictly in accordance with the manufacturer's recommendations. All necessary calculations are to be submitted to the Local Authority for approval prior to the commencement of work on site.
Robust details shall be adopted to prevent cold bridging, air leakage etc., continuity of insulation shall be provided at lintols, floors and all roof and wall junctions by the provision of ventilation trays. All joists are to be fixed galvanised joist hangers. All wall and roof insulation shall be continuous. It is the owners responsibility to ensure that the property and site is free from any onerous or unusual restrictions, covenants or easements.

Attention is drawn to the Party Wall Act 1996. The client or owner must give notice in writing to neighbours of the intended building operation and excavations and receive approval of same.

Attention is drawn to the client with regard to the CDM 2015 regulations. These drawings and specification are intended for Planning & Building Regulation purposes only; the scope of this does not go any further. It is the duty of the client under the regulations to appoint a 'Principal Contractor'. There is no obligation for the client to appoint a 'Principal Designer'. The 'Principal Contractor' will then take on the role of 'Principal Designer' for purposes of the 'pre construction' and 'construction' phases of the project under the CDM 2015 regulations when it gets under way; in order that a Health & Safety File and construction plan, is provided for the HSE; in order to reduce risks through the design processes of construction etc.

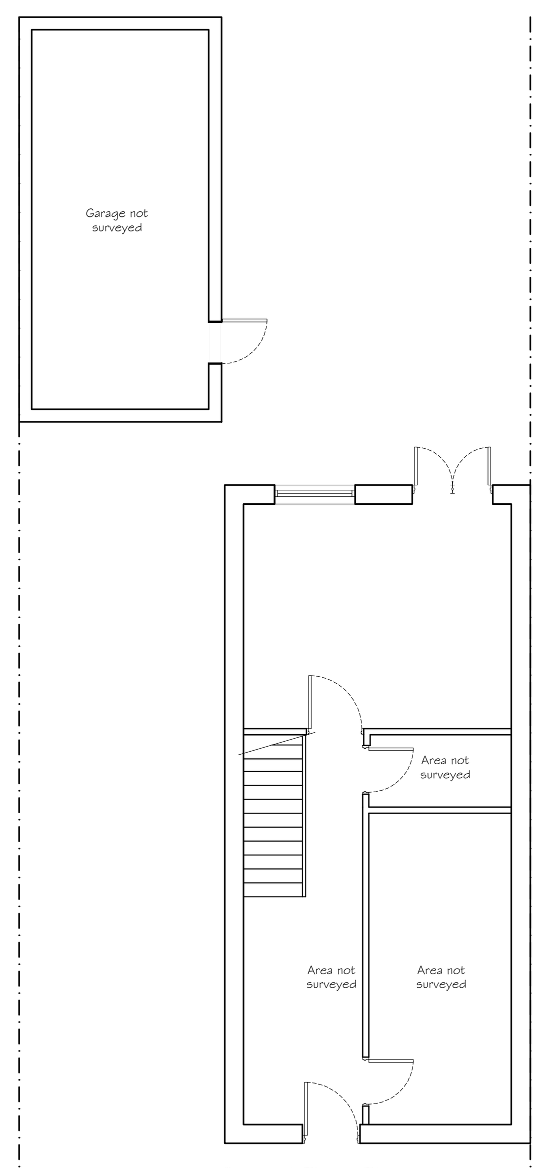
SYMBOLS, HATCH & LINETYPE KEY

- WARNING SIGNIFICANT HAZARD OR INFORMATION WHICH IS USEFUL
- ACTION (DO)
- AVOID OR REFRAIN FROM [DON'T]
- ON-SITE MEASUREMENTS REQUIRED
- RELEVANT INFORMATION
- SE STRUCTURAL ENGINEER ITEM
- BC BUILDING CONTROL ITEM

BRICK · CONCRETE · BLOCK · SAND · HARDCORE · PROPOSED · GLAZING · OBSCURE GLASS

BOUNDARY · FOUL DRAINAGE · SW DRAINAGE · INSULATION · DPM, DPC, VCL, FLASHING · STRUCTURAL BEAMS · DEMOLITION AREAS

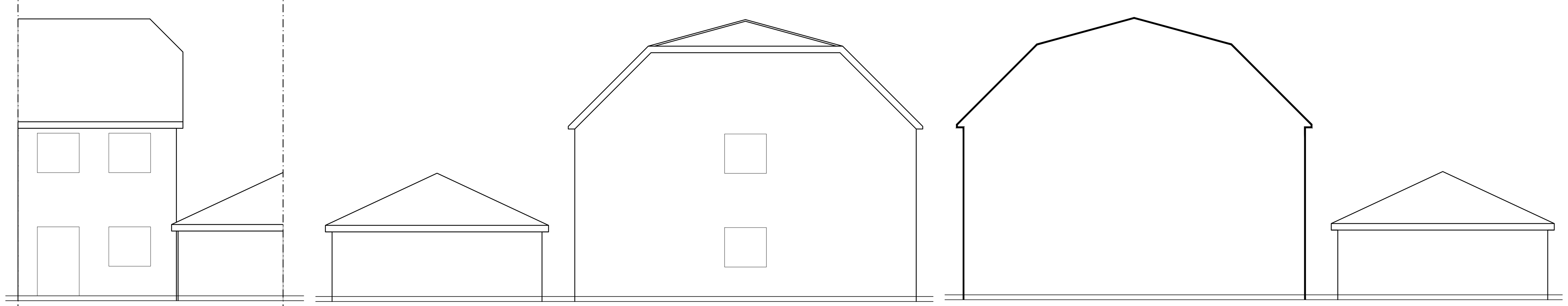
DATE	NOTES	BY	REV
07/08/23	First Draft For Client Approval	JR	A
21/08/23	Second Draft For Client Approval	JR	B



Ground Floor Plan
As Existing

0 0.51m 2m 5m

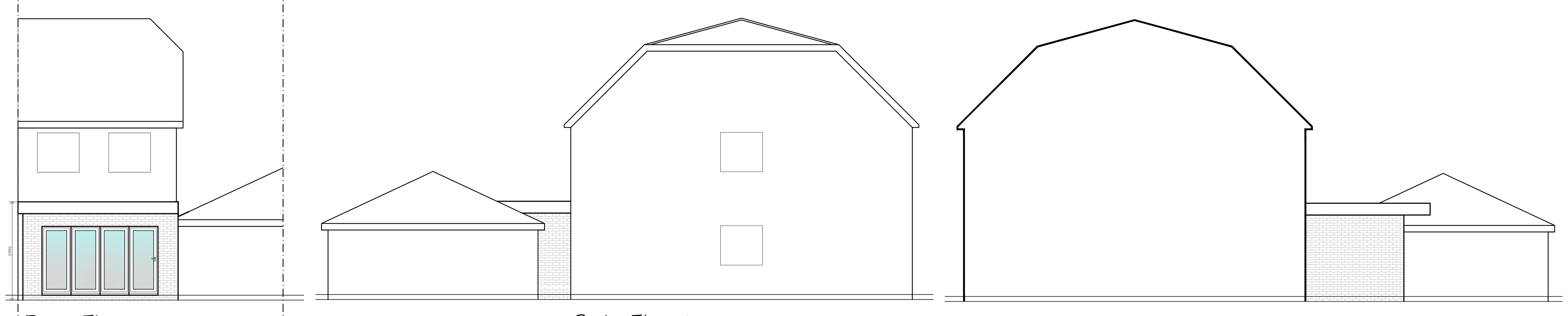
1:100



Rear Elevation
As Existing

Side Elevation
As Existing

Side Elevation
As Existing



Rear Elevation
As Proposed

Side Elevation
As Proposed

Side Elevation
As Proposed

Existing foundations assumed to be traditional concrete strip footings, to be confirmed on site prior to the commencement of works with trial hole adjacent to existing wall to confirm depth, type and spread.

Check critical dimension before commencement, on site design alterations to be done by contractor.

Radon gas level potentially between 1-3%, appropriate radon protection measures to be put in place - to be agreed and confirmed with building control.

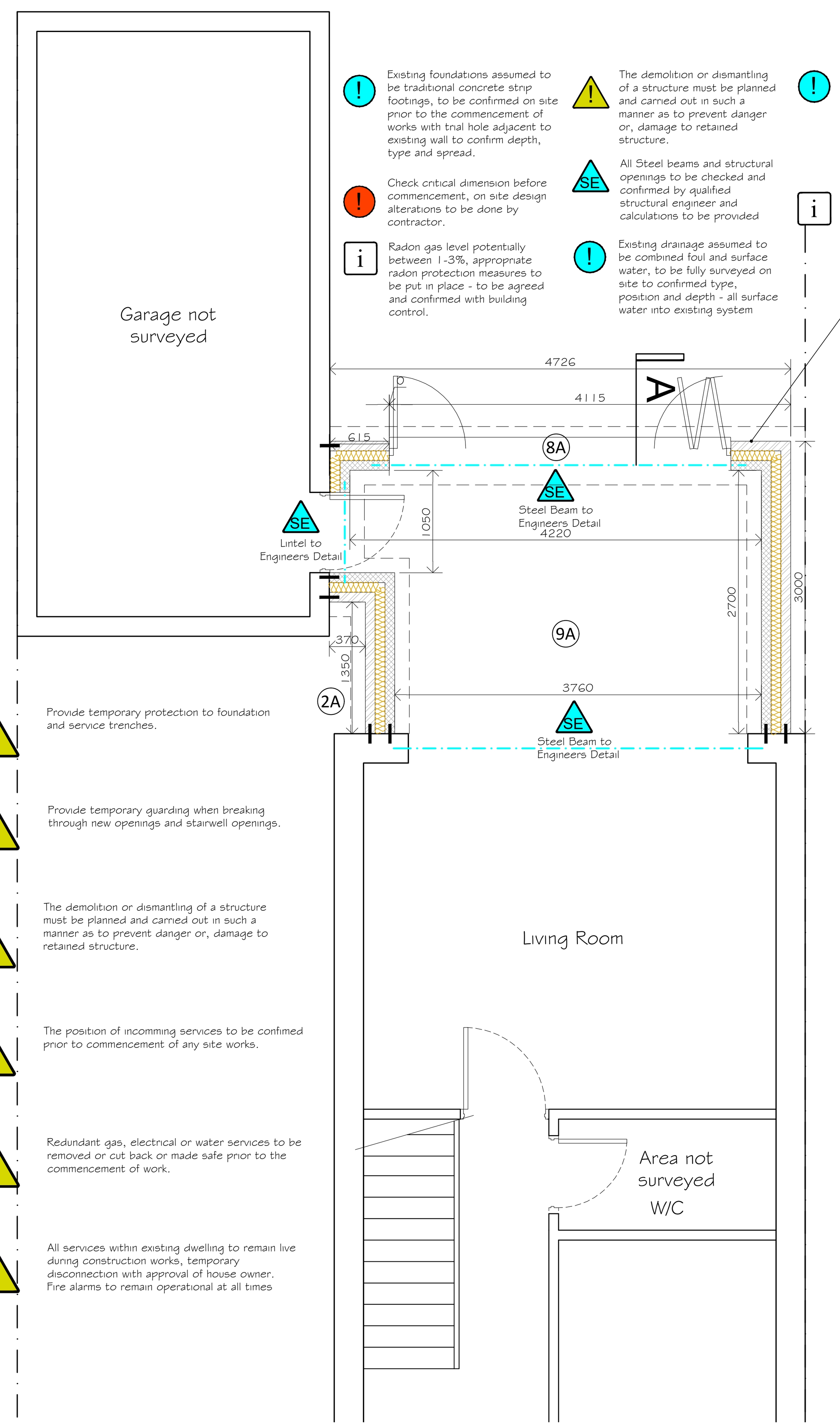
The demolition or dismantling of a structure must be planned and carried out in such a manner as to prevent danger or, damage to retained structure.

All Steel beams and structural openings to be checked and confirmed by qualified structural engineer and calculations to be provided

Existing drainage assumed to be combined foul and surface water, to be fully surveyed on site to confirmed type, position and depth - all surface water into existing system

New extension walls tied to existing external walls with catnic stronghold connectors or similar approved. Provide vertical dpc to both leafs with 12mm compressible filler board. Finish externally with non-setting mastic sealant

There are no significant trees or hedges on site likely to affect the proposed foundations



Provide temporary protection to foundation and service trenches.

Provide temporary guarding when breaking through new openings and stairwell openings.

The demolition or dismantling of a structure must be planned and carried out in such a manner as to prevent danger or, damage to retained structure.

The position of incomming services to be confimed prior to commencement of any site works.

Redundant gas, electrical or water services to be removed or cut back or made safe prior to the commencement of work.

All services within existing dwelling to remain live during construction works, temporary disconnection with approval of house owner. Fire alarms to remain operational at all times

Wall Build Up - Facing brickwork - Full fill

- 102.5mm facing brickwork.
- 10mm low emissivity cavity
- 90mm Celotex Thermaclass Cavity Wall 21 Insulation board.
- 100mm concrete blockwork [0.15 W/mk].
- 12.5mm Plasterboard on dabs with 3mm skim finish.

U value = 0.18 W/m²K.

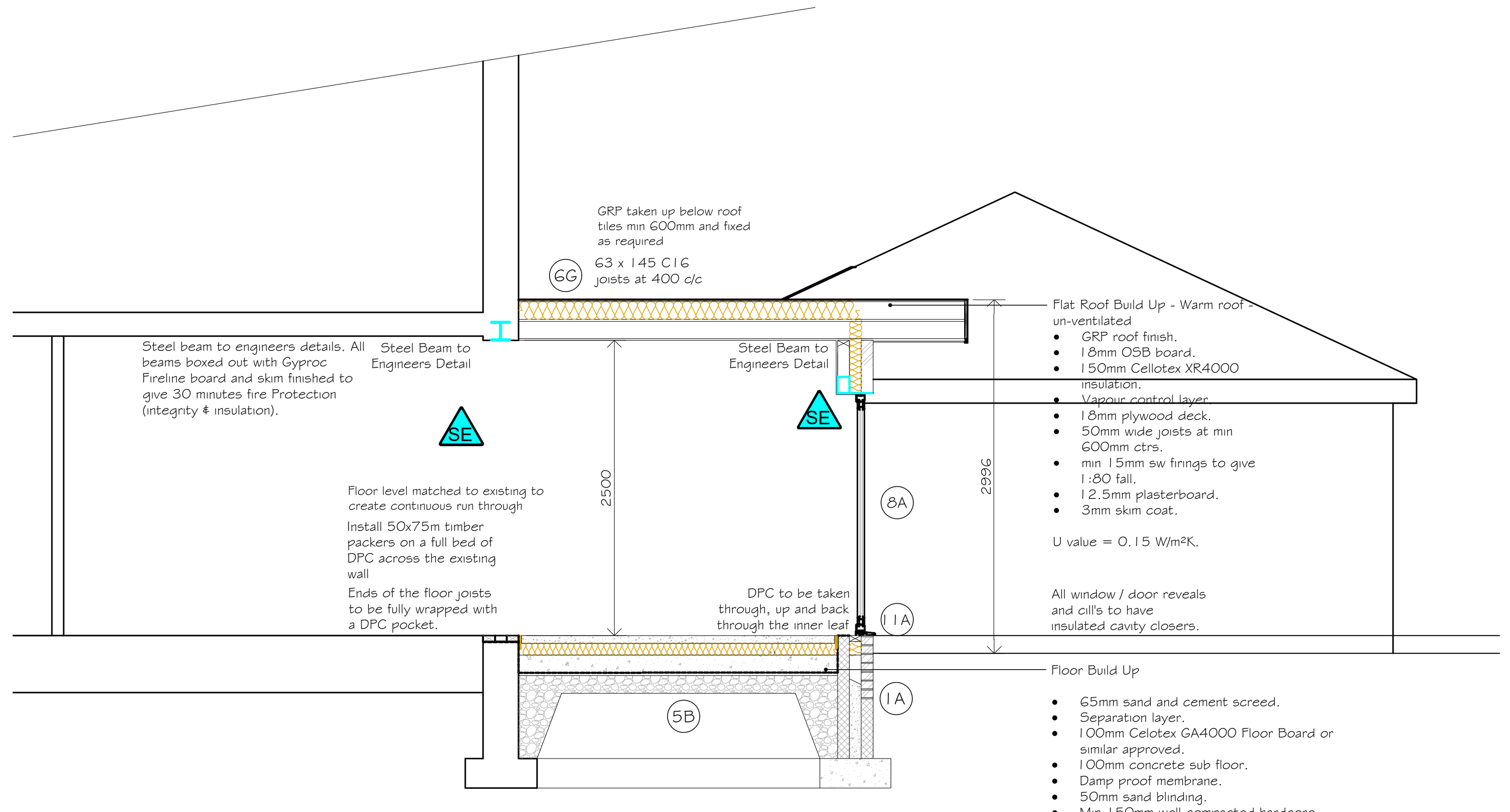
New extension walls tied to existing external walls with catnic stronghold connectors or similar approved.
Provide vertical dpc to both leafs with 12mm compressible filler board.
Finish externally with non-setting mastic sealant

Form 25mm wide cut in existing outer leaf brickwork, with Vertical DPC, at all new cavity wall abutments

Existing Above and Below Drainage to be adapted and reconfigured as necessary

0 0.5m 1m 2m 5m

1:50



Flat Roof Build Up - Warm roof - un-ventilated

- GRP roof finish.
- 18mm OSB board.
- 150mm Cellotex XR4000 insulation.
- Vapour control layer.
- 18mm plywood deck.
- 50mm wide joists at min 600mm ctrs.
- min 15mm sw firings to give 1:80 fall.
- 12.5mm plasterboard.
- 3mm skim coat.

U value = 0.15 W/m²K.

All window / door reveals and cill's to have insulated cavity closers.

Floor Build Up

- 65mm sand and cement screed.
- Separation layer.
- 100mm Celotex GA4000 Floor Board or similar approved.
- 100mm concrete sub floor.
- Damp proof membrane.
- 50mm sand blinding.
- Min 150mm well compacted hardcore.

U value = 0.18 W/m²K.

Section A-A

1A. Traditional Strip - Cavity Wall

600mm wide x 225mm thick concrete strip foundations 900mm below ground or at depth agreed with building inspector or to structural engineer's design to suit ground conditions including adjacent trees and hedges. Concrete GEN 1 ready mixed consistency class S3/. Sulphate resistant cement to be used if required by ground conditions. Foundations to be below the invert level of any drains within 1m. Stepped foundation to Building Regulations A1/2.

2A. Cavity Wall - Below dpc level - Traditional Strip

100mm dense concrete blockwork, minimum 2.8N/mm2 to BS EN 771-3, cavity filled with Concrete GEN 1 ready mixed consistency class S3/S4 to conform to BS EN 206 and BS 8500 upto 225mm below dpc level, 100mm dense concrete blockwork minimum 2.8N/mm2 to BS EN 771-3.

Minimum 3 courses of class B engineering brickwork below dpc level to external skin. Blocks laid in 1:0.5:4-4.5 cement - lime - sand mortar to BS EN 998-3 designation ii.

4Aii. Cavity Wall - facing brickwork - full fill

Maximum U value 0.18 W/m²K.

103mm facing brickwork to BS EN 771-1, minimum 5.0N/mm², F1, overall 100mm cavity, with 90mm insulation slab with a thermal conductivity of 0.021W/mK and 10mm residual cavity, 100mm medium density concrete blockwork 0.15Kg/m³ minimum 3.6N/mm², 12.5mm plasterboard on dabs, 3mm skim.

Walls to be built with 1:1:5-6 cement - lime - sand mortar to BS EN 998-3 designation iii.

Around openings install cavity closer to achieve a maximum u value of 0.45W/m2 K. Vertical twist type wall ties 750mm horizontal spacing and the maximum vertical spacing is 450mm. Set each wall tie a minimum of 50mm into both masonry leaves with a slight 'outward' fall, change the wall tie pattern around openings such as windows, doors, roof verges and movement joints reducing the vertical spacing is reduced to a maximum 300mm and should be within 225mm of the opening. Cavity wall ties should be stainless steel complying with BS EN 845-1.

5B. Floor Construction Ground (Concrete)

Maximum U value 0.18 W/(m2K).

Solid ground floor to consist of 150mm consolidated well-rammed hardcore. Blinded with 50mm sand blinding. Provide 100mm ST2 or Gen2 ground bearing slab. 1200mm gauge polythene DPM. DPM to be lapped in with DPC in walls. Floor to be insulated over slab and DPM with rigid thermoset insulation with glass tissue facing and thermal conductivity of 0.018 W/mK. Insulation thickness determined on P/A ratio. 25mm insulation to continue around floor perimeters to avoid thermal bridging. A VCL should be laid over the insulation boards and turned up 100mm at room perimeters behind the skirting, all joints to be lapped 150mm and sealed. Finish with 65mm sand/cement finishing screed with light mesh reinforcement.

Where drain runs pass under new floor, provide A142 mesh 1.0m wide and min 50mm above base of sub floor over length of drain.

6G Roof Construction (Flat Warm Deck)

Minimum U-Value of 0.15W/m2k

(imposed load max 1.0 kN/m² - dead load max 0.75 kN/m²)
Construction to be in accordance with Building Regulations Approved documents Parts B, L1 & E. GRP flat roof finish providing AA fire rating for surface spread of flame with a current BBA or WIMLAS Certificate and laid to specialist specification. Roof finishes within 6m of boundary to achieve a class Broof t4 fire performance rating. Rigid thermoset polyisocyanurate core [PIR] insulation board thermal conductivity 0.022 W/mK on vapour control layer and 18mm moisture resistant ply sheeting. 50mm treated s/w timber firings to create a min 1 in 80 crossfall, on sw flat roof joist. Underdraw at ceiling level with 12.5mm wallboard and min 3mm thistle multi-finish plaster skim. Provide restraint to flat roof by fixing of 30 x 5 x 1000mm ms galvanised lateral restraint straps at maximum 2000mm centres fixed to 100 x 50mm wall plates and anchored to wall.

6M General Roofing Notes

Install all leadwork to roofs etc, such as Code 4 lead flashing's soakers, drips, trims, lead rolls, and upstands etc in strict accordance with the recommendations and guidelines of the Lead Sheet Association, and in accordance with BS EN 12588:2006. Lead and lead alloys. Rolled lead sheet for building purposes. Ensure natural cross ventilation is provided to the loft space by means of proprietary ridge ventilators and over fascia rafter tray eaves ventilators. Ventilation to be equivalent or at least equal to a continuous strip 25mm wide in two opposite sides to promote cross-ventilation. Mono pitched roofs to have ridge/high level ventilation equivalent to a 5mm gap via proprietary tile vents spaced in accordance with manufacturer's details.

6N. Rainwater fittings

100mm half round section UPVC gutter with 68mm dia UPVC fall pipe. Fall pipes to drain directly in to trapped guleys on combined systems.

8A. External Doors & Windows / Glazing

Details and installation to be in accordance with industry standard codes of practice and Building Regulations Approved Documents Parts F, L1a & L1b and K where applicable. All to achieve a min U-Value of 1.4W/m2K to ensure an Energy Rating of Band C or better. New and replacement windows & doors to be of thermally broken Upvc or timber framed construction, with Hermetically sealed double glazed units with min 16mm argon fill air gap between panes and soft coat low-E glass. Airgap between panes to be min 16mm, with Inside pane having Low-E soft coat coating. To be installed with a max 10mm mastic sealed joint to the perimeter of the frame. All gaps / voids to the perimeter of the frame / masons opening, to be fully filled with expanding insulation foam. The door and window openings should be limited to 25% of the extension floor area plus the area of any existing openings covered by the extension. All windows to be fitted with limit stays of 100mm, but to also have a manual override for possible means of escape. Multi point Locking mechanisms to be included on all opening lights and to have a night latch option to open 10mm. Windows at ground floor level or those easily accessible above ground floor level shall be made secure to standards independently certified as set out in BS7950 'Windows for enhanced Security' with all incorporated glazing being 6.4mm laminated safety glass.

9A Ventilation Guide (Habitable Rooms)

Background ventilation - Controllable background ventilation via trickle vents to BS EN 13141-1:2004

Habitable rooms 8000mm2 [10000mm2 for single storey dwellings]. The minimum number of background ventilators in the dwellings habitable rooms should be 4 in a one bedroom dwelling and 5 win a dwelling with 2 or more bedrooms. In dwellings with more than 1 exposed façade, the area of ventilators should be similar on each façade. In areas of sustained loud noise attenuating background ventilators to be used.
Purge ventilation - New windows/rooflights to have openable area in excess of 1/20th of their floor area, if the window opens more than 30° or 1/10th of their floor area if the window opens less than 30°

Internal doors should be provided with a 10mm gap below the door to aid air circulation.

Ventilation provision to be in accordance with the Domestic Ventilation Compliance Guide

Purge ventilation to be provided for each habitable room giving a minimum of 4 air changes per hour. For windows with an opening angle of 15 to 30 degrees the minimum area of openings to be minimum of 1/10 of the floor area, for windows with an opening angle of 30 degrees or more the minimum area of openings to be minimum of 1/20 of the floor area.

9E. Heating (Extension)

Extend all heating and hot water services from existing and provide new TVRs to radiators. Heating system to be designed, installed, tested and fully certified by a GAS SAFE registered specialist. All work to be in accordance with the Local Water Authorities by laws, the Gas Safety (Installation and Use) Regulations 1998 and IEE Regulations

9G. Electrical installation (General)

All electrical work required to meet the requirements of Part P (electrical safety) must be designed, installed, inspected and tested by a competent person registered under a competent person self certification scheme such as BRE certification Ltd, BSI, NICEIC Certification Services or Zurich Ltd.

An Electrical Installation Certificate is to be issued for the work by a person competent to do so. A copy of a certificate will be given to Building Control on completion

9K Lighting (Internal)

Install low energy light fittings that only take lamps having a luminous efficiency greater than 75 lumens per circuit watt and a total output greater than 400 lamp lumens. Not less than three energy efficient light fittings per four of all the light fittings in the main dwelling spaces to comply with Part L of the current Building Regulations and the Domestic Building Services Compliance Guide.

10A. [2] Smoke Detection (extensions and material alterations)

A fire detection and alarm system should be installed where a new habitable room is provided above or below the ground storey or a new habitable room is provided at the ground storey, without a final exit. Mains operated linked smoke alarm and detection system should be provided in the circulation spaces of the dwelling. The code of practice for the design, installation, commissioning, and maintenance of voice alarm systems to at least a Grade D category LD3 standard and to be mains powered with battery back up. Smoke alarms should be sited so that there is a smoke alarm in the circulation space on all levels / storeys and within 7.5m of the door to every habitable room. If ceiling mounted they should be 300mm from the walls and light fittings. Where the kitchen area is not separated from the stairway or circulation space by a door, there should be an interlinked heat detector installed within the kitchen.

11A. DPM / DPC / Radon

Horizontal damp proof courses to be built into external walls, minimum 150 mm above finished ground level and at reveals to doors and windows. Provide horizontal strip polymer (hyload) damp proof course to both internal and external skins minimum 150mm above external ground level. New DPC to be made continuous with existing DPC's and with floor DPM. Vertical DPC to be installed at all reveals where cavity is closed. DPC to comply to BS EN 13984:2013.

Where development is within a Radon zone protection measures are required to BS 8485:2015. Where radon is found at low levels a suitable 1200 gauge DPC & DPM is to be installed and should be continuous across the cavity. Where the radon levels are high, a suitable dpm is to be provided and a sump may have to be installed with ducting to outside of the building foot print.

11C. Existing Structure

Existing structure including foundations, beams, walls and lintels carrying new and altered loads are to be exposed and checked for adequacy prior to commencement of work and as required by the Building Control Officer

11L. Steel

Min 215 end bearing to steelwork, block strength to be checked and upgraded where less than 4.1n/mm². Steel beam and padstones to structural engineer's details. All beams boxed out with 12.5mm fireline board and skim finished to give 30 minutes fire rating. Min 2.0m clearance to u/side of plasterboard.

Online Drawing

PROJECT TITLE	CLIENT				
Proposed Rear Extension	**Mr Wisidagama 29 Hartfield Road, Leatherhead, KT22 0AR**				
DRAWING STAGE **Building Regulations Client Check**	SCALE **Varies @ A1**	CHK	DRAWN BY **J.Ram**		
SHEET TITLE **Plans as existing & propsoed**	PROJECT NUMBER **KT22-3728**	STAGE **REG**	REV **B**	SHT **001**	