General Construction Notes and Guidance:

1. Calculations are not to be used for the purpose of ordering materials and should only be used for Building Regulations submissions. All dimensions should be checked by the contractor on site.

2. All steelwork to be mechanically wire brushed and painted two coats of red oxide. Steelwork located in the cavity or below DPC to be suitably protected with 2 coats of bituminous paint.

3. All timber to be graded C24 (SC4) unless stated otherwise. Preservative treated to Architect´s details

4. To be read in conjunction with architect's drawings, any inconsistencies should be reported.

5. For details of fire protection to steelwork, see Architects drawings.

6. The contractor is to ensure that all existing construction is adequately supported, using needles and props as required. Where a new beam supports the existing construction adequate pre-load is to be applied and suitable packs such as driven dry-state introduced, then pointed up with mortat.

7. All blockwork to be 7.3 N/mm^2 in class III mortar below DPC in accordance with BS5628:Part3:2005 or suitable 7.0 N/mm^2 foundation quality blocks in class II mortar in accordance with the manufacturer's instructions. All brickwork below DPC to be engineering bricks DPC in accordance with BS 5628: Part 3: 2005.

8. The builder is to take into consideration the placement of the structural elements, ensuring that the method of lifting and placement is safely carried out. Responsibility for this element lies with the Contractor. As the existing walls need to be propped in order to introduce some of the lintels, this should also be considered in relationship to the risk assessment of the Contractor. Safe working procedures must be adopted. Responsibility for this element lies with the Contractor. Splice details for long-span beams can often be accommodated if required.

9. By using these calculations you agree to have read and agreed to our terms and conditions. Details of these can be found at https://www.pmce.co.uk/terms-and-conditions should you have any queries relating to our terms and conditions please inform us in writing prior to commencing structural works

Party Wall Act 1996

If part of the work is adjacent to the boundary, the adjacent neighbours right to support could be affected; the issues associated with Party Wall Act may need to be considered. This may include providing information to the adjoining owner, giving sufficient notice of works in compliance with the Act. If the following list applies to this project then the Party Wall Act will apply.

1. Installing a new beam into the shared wall between properties
2. Demolishing, building or under-pinning an existing shared wall
3. Building a new wall at or on the boundary or junction of two properties
4. Damp-proofing all the way through a party wall
5. Digging foundations that are within 3m of a Party Wall, where the new foundations are deeper than the existing ones
6. Where the new foundations are within 6m and lower than a 45° line from the bottom of the existing foundations.

Codes

BS EN 1990+A1:2006/NA: 2005-06	Basis of structural design
BS EN 1991-1-1	Part 1-1: General actions - Self-weight, imposed loads for buildings
BS EN 1991-1-3/NA: 2005-12	Part 1-3: General actions - Snow loads
BS EN 1995-1-1+A1:2008/NA: 2006	Part 1-1: General - Common rules and rules for buildings
BS EN 1995-1-2	Part 1-2: General - Structural fire design
BS EN 1991-1-4/NA: 2006	Part 1-4: General actions - Wind loads
BS EN 14080:2013-08	Timber structures - Glued laminated timber and solid timber - Requirements
BS EN 338:2010-03	Structural timber - Strength classes

Tel: 01287 348404
E-mail: info@pmce.co.uk
Website: www.pmce.co.uk

PM Consulting Engineers LTD
79 - 81 Church Street
Guisborough
TS14 6HG

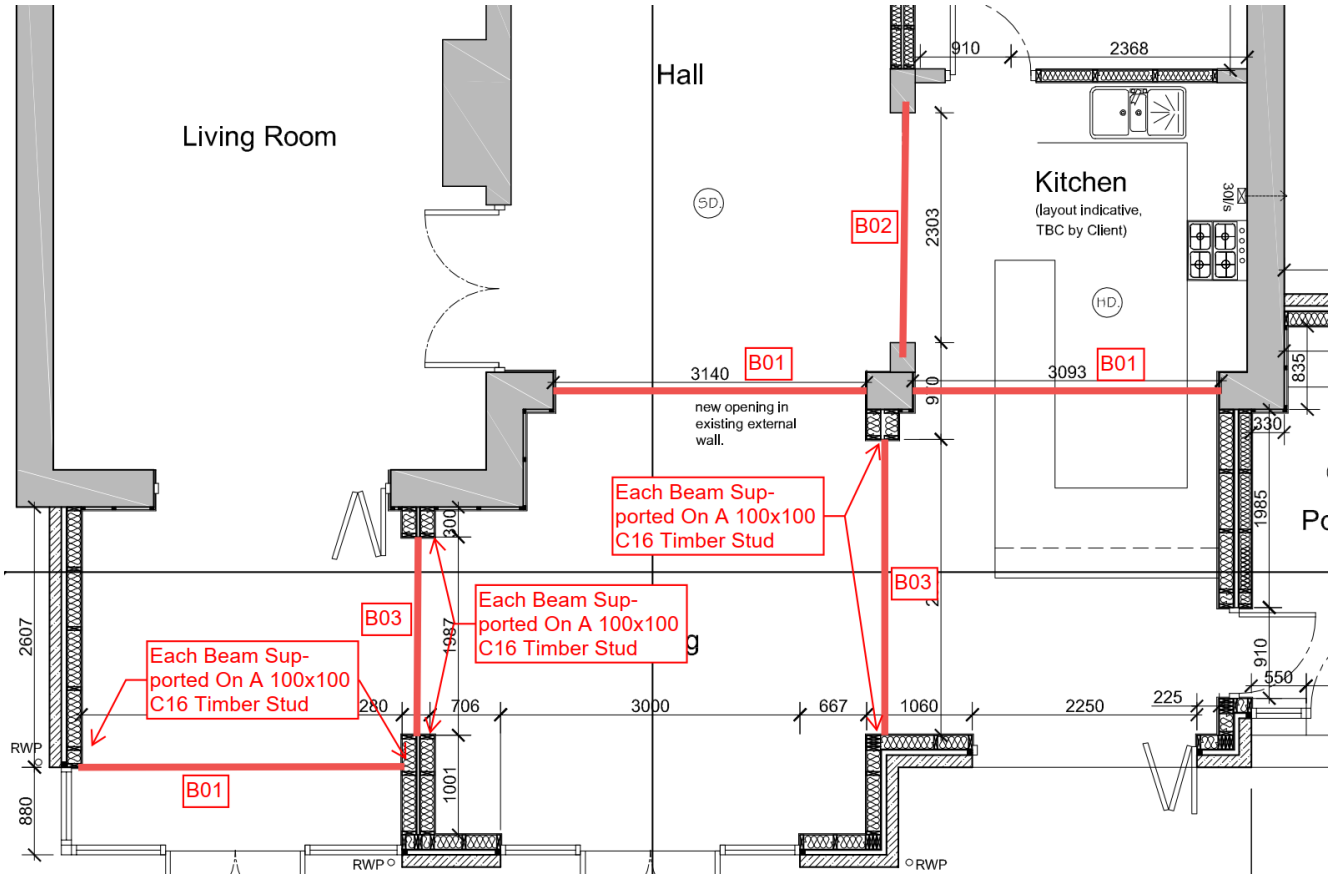
Loading

					Dead	Live
Roof1b						
	Tiles	g_1=		0.65 kN/m^2		
	Rafters,felt,insulation etc	g_2=		0.30 kN/m^2		
	Plasterboard	g_3=		0.25 kN/m^2		
		g_0=		1.20 kN/m^2		
	Roof pitch	a=		35 °		
		g_k=	g_0/COS(a)	=	**1.46 kN/m^2**	
	Roof snow loading	q_k=	0,60*((60-a)/30)	=		**0.50 kN/m^2**
Floor						
	Joist & boarding,finishes	g_1=		0.25 kN/m^2		
	Plasterboard	g_2=		0.25 kN/m^2		
		g_k=	g_1+g_2	=	**0.50 kN/m^2**	
	Imposed	q_k=		=		**1.50 kN/m^2**
Walls						
W1	External cavity blockwork	g_1=	2,7*(2,1+1,4)=	9.45 kN/m		
	Plasterboard	g_2=	2,4*0,25	0.60 kN/m		
		g_k=	g_1+g_2	=	**10.05 kN/m**	
W4						
"Promat"	External studwork timber	g_1=	2,7*0,80 =	=	**2.16 kN/m**	

	Profile	Padstone
B01	2 No. 203x102 UB 23 [Grade 43]	215 long x 300 wide 2 Course Eng. Bwk Padstone
B02	2 No. 203x102 UB 23 [Grade 43]	215 long x 300 wide 2 Course Eng. Bwk Padstone
B03	2 No. 152x89 UB 16 [Grade 43]	Each Beam Supported On 100x100 C16 Timber Stud

Plans:

Proposed Extension



Pos: B01

Span length l= 3.20 m

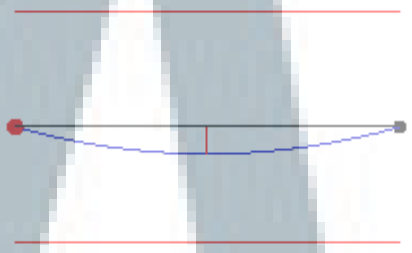
Loading:				Dead	Live
Floor	g=	7.60 / 2 * 0.50	=	1.90 kN/m	
Wall Ext	g=		=	10.05 kN/m	
				11.95 kN/m	
Floor	q=	7.60 / 2 * 1.50	=		5.70 kN/m
					5.70 kN/m

B01
Member 1 (N.1-N.2) @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.25 D1 + 1.5 L1

D1 UDLY -011.950 (kN/m)
L1 UDLY -005.700 (kN/m)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 2

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.188T	37.580	0.000	30.064	2.724
	2	0.188T	-37.580	0.000	@ 1.600	@ 1.600

Classification and Effective Area (EN 1993: 2006)

Section (23.07 kg/m)	2 No. 203x102 UB 23 [Grade 43]		
Class = Fn(b/T,d/t,f_y,N,M_y,M_z)	5.47, 31.37, 275, 0, 30.06, 0	(Axial: Non-Slender)	Class 1
Auto Design Load Cases	1		

Local Capacity Check

$V_{y.Ed}/V_{pl.y.Rd}$	0.002 / 392.832 =	0	Low Shear
$M_{c.y.Rd} = f_y.W_{pl.y}/ \gamma_{M0}$	275 x 468.2/1	128.755 kN.m	
$N_{pl.Rd} = Ag.fy/\gamma_{M0}$	58.78x275/1	1616.45 kN	
$n = N_{Ed}/N_{pl.Rd}$	-0.188 / 1616.45 =	0.000	OK
$W_{pl.N.y}$ = Fn($W_{pl.y}$, A_w, n)	468.2, 24.742, 0	468.2 cm^3	
$M_{N.y.Rd} = W_{pl.N.y}.f_y/ \gamma_{M0}$	468.2 x 275/1	128.755 kN.m	
$(M_{y.Ed}/M_{N.y.Rd})+(M_{z.Ed}/M_{N.z.Rd})$	$(30.062/128.755)^2+(0)^1$=	0.055	OK

Equivalent Uniform Moment Factors C1, C.mLT, C.mz, and C.my

C_1= fn(M_1, M_2, M_o, ψ,μ)	0.0, 0.0, 30.0, 1.000, 300.000	1.127	Uniform
$C_{mLT}=0.95+0.05\alpha_h$	M_h= 0.04, M_s= 30.06, ψ = 1.000, α_s= 0.001	0.95	Table B.3
$C_{mz}=Max(0.6+0.4\psi, 0.4)$	M = 0, ψ = 1.000	1	Table B.3
$C_{my}=0.95+0.05\alpha_h$	M_h= 0, M_s= 30.06, ψ = 0.000, α_s= 0.000	0.95	Table B.3

Lateral Buckling Check M.b.Rd

Le = 1.2L+2D	1.2 x 3.2 + 2 x 0.203 =	4.246 m	
M_{cr}= Fn(C_1,L_e,I_z,I_t,I_w,E)	1.127, 4.246, 329.6, 14.04, 0.03074, 210000	84.595 kN.m	
$\lambda_{LT}= \sqrt{W.f_y/M_{cr}}$	$\sqrt{468.2 \times 275 / 84.595}$	1.234	
χ_{LT}= Fn(λ_{LT}, λ_{LT5950})	1.234, 1.285	0.560	Curve b
χ_{LT}.mod = Fn(χ_{LT},λ_{LT},k_c,f)	0.560, 1.234, 0.942, 0.982	0.570	6.3.2.3
$M_{b.Rd} = \chi W_{pl.y}.f_y \leq M_{c.y.Rd}$	0.570 x 468.2 x 275 ≤ 128.755 =	73.431 kN.m	

Buckling Resistance

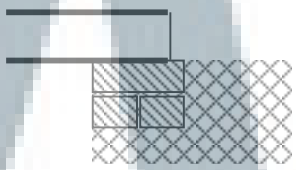
$U_{N.y} = N_{Ed}/(\chi_y.N_{Rk}/\gamma_{M1})$	0 / 1524.534	0.000	OK
$U_{N.z} = N_{Ed}/(\chi_z.N_{Rk}/\gamma_{M1})$	0 / 521.57	0.000	OK
$U_{M.y} = M_{y.Ed}/(\chi_{LT}.M_{y.Rk}/\gamma_{M1})$	30.062 / 73.431	0.409	OK
$U_{M.z} = M_{z.Ed}/(M_{z.Rk}/\gamma_{M1})$	0 / 27.39	0.000	OK
$k_{yy}=C_{my}\{1+(\lambda_y-0.2)U_{N.y}\}$		0.950	
$k_{zz}=C_{mz}\{1+1.4U_{N.z}\}$		1.000	
$k_{yz}=0.6\ k_{zz}$		0.600	
$k_{zy}= 1- \{0.1\lambda_z/(C_{mLT}-0.25)\}U_{N.z}$		1.000	
$U_{Ny}+k_{yy}.U_{M.y}+k_{yz}.U_{M.z}$	0.000+0.950x0.409+0.600x0.000	0.389	OK
$U_{Nz}+k_{zy}.U_{M.y}+k_{zz}.U_{M.z}$	0.000+1.000x0.409+1.000x0.000	0.409	OK

Deflection Check - Load Case 2

$\delta \leq$ Span/360	2.72 ≤ 3200 / 360	2.72 mm	OK

Section (23.07 kg/m) 2 No. 203x102 UB 23 [Grade 43]

Consider Bearings:



Max Load R_d= 38.00 kN

Assuming γ_m = 3.5 f_k = 3.5

Bearing b = 200 mm

Required Bearing length = Rd*E3*γ_m/(f_k*1,5)/b= **126.67 mm**

Provide 215 long x 300 wide 2 Course Eng. Bwk Padstone

Pos: B02

Span length l= 2.30 m

Loading:

				Dead	Live
Roof 1b	g=	7.60 / 2 * 1.46	=	5.55 kN/m	
Floor	g=	7.60 / 2 * 0.50	=	1.90 kN/m	
Wall Ext	g=		=	10.05 kN/m	
				17.50 kN/m	
Roof 1b	q=	7.90 / 2 * 0.50	=		1.98 kN/m
Floor	q=	7.60 / 2 * 1.50	=		5.70 kN/m
					7.68 kN/m

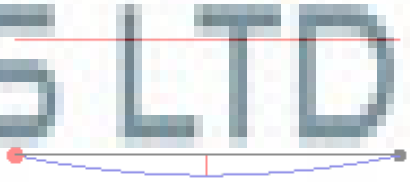
B02

Member 1 (N.1-N.2) @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UI + 1.25 D1 + 1.5 L1

D1 UDLY -017.500 (kN/m)
L1 UDLY -007.680 (kN/m)



Tel: 01287 348404
E-mail: info@pmce.co.uk
Website: www.pmce.co.uk

PM Consulting Engineers LTD
79 - 81 Church Street
Guisborough
TS14 6HG

Member Forces in Load Case 1 and Maximum Deflection from Load Case 2						
Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.192T	38.404	0.000	22.082	1.037
	2	0.192T	-38.404	0.000	@ 1.150	@ 1.150

Classification and Effective Area (EN 1993: 2006)

Section (23.07 kg/m)	2 No. 203x102 UB 23 [Grade 43]		
Class = Fn(b/T,d/t,f_y,N,M_y,M_z)	5.47, 31.37, 275, 0, 22.08, 0	(Axial: Non-Slender)	Class 1
Auto Design Load Cases	1		

Local Capacity Check

$V_{y.Ed}/V_{pl.y.Rd}$	0.004 / 392.832 =	0	Low Shear
$M_{c.y.Rd} = f_y.W_{pl.y}/\gamma_{M0}$	275 x 468.2/1	128.755 kN.m	
$N_{pl.Rd} = Ag.fy/\gamma_{M0}$	58.78x275/1	1616.45 kN	
$n = N_{Ed}/N_{pl.Rd}$	-0.192 / 1616.45 =	0.000	OK
$W_{pl.N.y}$ = Fn($W_{pl.y}$, A_{vy}, n)	468.2, 24.742, 0	468.2 cm^3	
$M_{N.y.Rd} = W_{pl.N.y}.f_y/\gamma_{M0}$	468.2 x 275/1	128.755 kN.m	
$(M_{y.Ed}/M_{N.y.Rd})+(M_{z.Ed}/M_{N.z.Rd})$	$(22.082/128.755)^2+(0)^1$=	0.029	OK

Equivalent Uniform Moment Factors C1, C.mLT, C.mz, and C.my

C_1= fn(M_1, M_2, M_o, ψ,μ)	0.0, 0.0, 22.0, 0.949, 300.000	1.127	Uniform
$C_{mLT}=0.95+0.05\alpha_h$	M_h= 0.04, M_s= 22.08, ψ = 0.949, α_s= 0.002	0.95	Table B.3
C_{mz}=Max(0.6+0.4ψ, 0.4)	M = 0, ψ = 1.000	1	Table B.3
$C_{my}=0.95+0.05\alpha_h$	M_h= 0, M_s= 22.08, ψ = 0.000, α_s= 0.000	0.95	Table B.3

Lateral Buckling Check M.b.Rd

Le = 1.2L+2D	1.2 x 2.3 + 2 x 0.203 =	3.166 m	
M_{cr}= Fn(C_1,Le,I_z,I_t,I_w,E)	1.127, 3.166, 329.6, 14.04, 0.03074, 210000	123.743 kN.m	
λ_{LT}= √ W.f_y/M_{cr}	√ 468.2 x 275 / 123.743	1.020	
χ_{LT}= Fn(λ_{LT}, λ_{LT5950})	1.020, 1.062	0.687	Curve b
χ_{LT}.mod = Fn(χ_{LT},λ_{LT},k_c,f)	0.687, 1.020, 0.942, 0.974	0.706	6.3.2.3
$M_{b.Rd}$ = χ $W_{pl.y}.f_y \leq M_{c.y.Rd}$	0.706 x 468.2 x 275 ≤ 128.755 =	90.887 kN.m	

Buckling Resistance

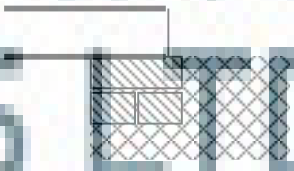
$U_{N.y} = N_{Ed}/(\chi_y.N_{Rk}/\gamma_{M1})$	0 / 1575.066	0.000	OK
$U_{N.z} = N_{Ed}/(\chi_z.N_{Rk}/\gamma_{M1})$	0 / 848.044	0.000	OK
$U_{M.y} = M_{y.Ed}/(\chi_{LT}.M_{y.Rk}/\gamma_{M1})$	22.082 / 90.887	0.243	OK
$U_{M.z} = M_{z.Ed}/(M_{z.Rk}/\gamma_{M1})$	0 / 27.39	0.000	OK
$k_{yy}=C_{my}\{1+(\lambda_y-0.2)U_{N.y}\}$		0.950	
$k_{zz}=C_{mz}\{1+1.4U_{N.z}\}$		1.000	
$k_{yz}=0.6\ k_{zz}$		0.600	
k_{zy}= 1- {0.1λ_z/(C_{mLT}-0.25)}$U_{N.z}$		1.000	
$U_{Ny}+k_{yy}.U_{M.y}+k_{yz}.U_{M.z}$	0.000+0.950x0.243+0.600x0.000	0.231	OK
$U_{Nz}+k_{zy}.U_{M.y}+k_{zz}.U_{M.z}$	0.000+1.000x0.243+1.000x0.000	0.243	OK

Deflection Check - Load Case 2

δ ≤ Span/360	1.04 ≤ 2300 / 360	1.04 mm	OK

Section (23.07 kg/m) 2 No. 203x102 UB 23 [Grade 43]

Consider Bearings:



Max Load R_d= 38.00 kN

Assuming γ_m = 3.5 f_k = 3.5

Bearing b = 200 mm

Required Bearing length = Rd*E3*γ_m/(f_k*1,5)/b= **126.67 mm**

Tel: 01287 348404
E-mail: info@pmce.co.uk
Website: www.pmce.co.uk

PM Consulting Engineers LTD
79 - 81 Church Street
Guisborough
TS14 6HG

Provide 215 long x 300 wide 2 Course Eng. Bwk Padstone

Pos: B03

Span length l= 3.00 m

Loading:

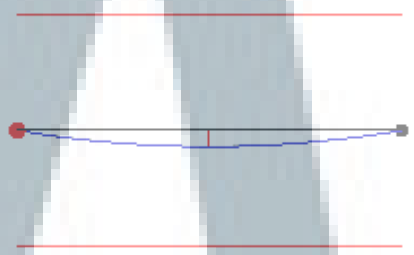
				Dead	Live
Roof 1b	g=	4.40 / 2 * 1.46	=	3.21 kN/m	
Stud Wall	g=		=	2.16 kN/m	
				5.37 kN/m	
Roof 1b	q=	4.40 / 2 * 0.50	=		1.10 kN/m
					1.10 kN/m

B03
Member 1 (N.1-N.2) @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.25 D1 + 1.5 L1

D1 UDLY -005.370 (kN/m)
L1 UDLY -001.100 (kN/m)



δ ≤ Span/360 2.62 ≤ 2300 / 360 2.62 mmOK

Member Forces in Load Case 1 and Maximum Deflection from Load Case 2

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.063T	12.544	0.000	9.408	1.945
	2	0.063T	-12.544	0.000	@ 1.500	@ 1.500

Classification and Effective Area (EN 1993: 2006)

Section (15.95 kg/m)	2 No. 152x89 UB 16 [Grade 43]		
Class = Fn(b/T,d/t,f_y,N,M_y,M_z)	5.76, 27.07, 275, 0, 9.41, 0	(Axial: Non-Slender)	Class 1
Auto Design Load Cases	1		

Local Capacity Check

$V_{y.Ed}/V_{pl.y.Rd}$	0 / 259.658 =	0	Low Shear
$M_{c.y.Rd} = f_y.W_{pl.y}/\gamma_{M0}$	275 x 246.6/1	67.815 kN.m	
$N_{pl.Rd} = Ag.fy/\gamma_{M0}$	40.64x275/1	1117.6 kN	
$n = N_{Ed}/N_{pl.Rd}$	-0.063 / 1117.6 =	0.000	OK
$W_{pl.N.y} = Fn(W_{pl.y}, A_{vy}, n)$	246.6, 16.354, 0	246.6 cm^3	
$M_{N.y.Rd} = W_{pl.N.y}.f_y/\gamma_{M0}$	246.6 x 275/1	67.815 kN.m	
$(M_{y.Ed}/M_{N.y.Rd})+(M_{z.Ed}/M_{N.z.Rd})$	$(9.406/67.815)^2+(0)^1=$	0.019	OK

Equivalent Uniform Moment Factors C1, C.mLT, C.mz, and C.my

C_1= fn(M_1, M_2, M_o, ψ,μ)	0.0, 0.0, 9.4, 0.917, 300.000	1.127	Uniform
C_{mLT}=0.95+0.05α_h	M_h= 0.01, M_s= 9.41, ψ = 0.917, α_s= 0.001	0.95	Table B.3
C_{mz}=Max(0.6+0.4ψ, 0.4)	M = 0, ψ = 1.000	1	Table B.3
C_{my}=0.95+0.05α_h	M_h= 0, M_s= 9.41, ψ = 1.000, α_s= 0.000	0.95	Table B.3

Lateral Buckling Check M.b.Rd

Le = 1.2L+2D	1.2 x 3 +2 x 0.152 =	3.905 m	
M_{cr}= Fn(C_1,L_e,I_z,I_t,I_w,E)	1.127, 3.905, 181.2, 7.121, 0.009376, 210000	46.883 kN.m	
λ_{LT}= √ W.f_y/M_{cr}	√ 246.6 x 275 / 46.883	1.203	

χ_{LT}= Fn(λ_{LT}, λ_{LT5950})	1.203, 1.244	0.578	Curve b
χ_{LT}.mod = Fn(χ_{LT},λ_{LT},k_c,f)	0.578, 1.203, 0.942, 0.980	0.589	6.3.2.3
$M_{b.Rd}$ = χ $W_{pl.y}$.f_y≤ $M_{c.y.Rd}$	0.589 x 246.6 x 275 ≤ 67.815 =	39.959 kN.m	

Buckling Resistance

$U_{N.y}$ = N_{Ed}/(χ_y.N_{Rk}/γ_{M1})	0 / 1018.889	0.000	OK
$U_{N.z}$ = N_{Ed}/(χ_z.N_{Rk}/γ_{M1})	0 / 330.973	0.000	OK
$U_{M.y}$ = $M_{y.Ed}$/(χ_{LT}.$M_{y.Rk}$/γ_{M1})	9.406 / 39.959	0.235	OK
$U_{M.z}$ = $M_{z.Ed}$/($M_{z.Rk}$/γ_{M1})	0 / 17.16	0.000	OK
k_{yy}=C_{my}{1+(λ_y-0.2)$U_{N.y}$}		0.950	
k_{zz}=C_{mz}{1+1.4$U_{N.z}$}		1.000	
k_{yz}=0.6 k_{zz}		0.600	
k_{zy}= 1- {0.1λ_z/(C_{mLT}-0.25)}$U_{N.z}$		1.000	
U_{Ny}+k_{yy}.$U_{M.y}$+k_{yz}.$U_{M.z}$	0.000+0.950x0.235+0.600x0.000	0.224	OK
U_{Nz}+k_{zy}.$U_{M.y}$+k_{zz}.$U_{M.z}$	0.000+1.000x0.235+1.000x0.000	0.235	OK

Deflection Check - Load Case 2

δ ≤ Span/360	1.94 ≤ 3000 / 360	1.94 mm	OK

Section (15.95 kg/m) - 2 No. 152x89 UB 16 [Grade 43]