

MasterSeries – Composite SlimFloor Beam Design **Sample Output**

The following output is from the MasterBeam Composite SlimFloor Design program.

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- 2 UC SlimFloor Beam
- 4 Built Up SlimFloor Beam
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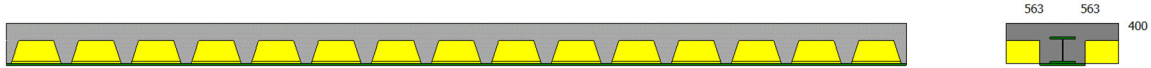
MasterSeries Sample Output

3 Castle Street
Carrickfergus
County Antrim BT38 7BE

Tel: 028 9036 5950

Job ref : My Project
Sheet : Slim Floor / 2 -
Made By : GHB
Date : 21 June 2015/ Version 2017.11
Checked : MOG
Approved : ATW

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM UC SlimFloor Beam



Summary of Design Data EC4 - NA UK (Symmetrical Beam)

EuroCode National Annex	Using UK values, SCI P405
Steel Section (161 kg/m)	254x254 UC 89 + 456.3x20 B Plate 160.59 [S 355] Floor Area Supported 9 m Span, 5 m to LH Beam and 5 m to RH Beam (5 m Supported Directly)
Non-Continuous SD 225 (SlimFloor)	Trough Spacing 600, Height 225, Average Width 174 in 1 mm thick
Concrete Slab	400 mm Thick @ 2350 kg/m ³ , Mod. Ratio 10, Gr C25/30 with 193 mm ² /m
Rib Pattern	Bond force per unit length = $[2(B_t+T_t+d)-t_w] \cdot f_{sb}$ where $f_{sb}=0.6$ N/mm ²
Floor Loads (kN/m ²)	Live 3, Partitions 1, Services 0.5, Deck/Mesh 0.2, Construction 0.75
Self Weight Loads	Concrete Slab 5.538 kN/m ² , Steel Beam 1.575 kN/m
User Defined Values	Combinations, Deck/Mesh, Construction Load, Vibration and Deflection Limits

Section Properties

Concrete Effective Area	95 x 1125 mm ² , b1= 563 mm and b2= 563 mm
Steel Section Elastic Properties	y _e 192.7 mm, A 204.6 cm ² , I _x 24227 cm ⁴ , Z _t 1257 cm ³ , Z _b 2765 cm ³
Composite Section Elastic Properties	y _e 242.7 mm, I _x 85866 cm ⁴ , Z _{s.t} 9151 cm ³ , Z _{s.b} 5320 cm ³ , Z _{c.t} 38847 cm ³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	319.32 kN each si	< 613.65 kN	OK
Plate Loading (factored)	Max. 310.456 kN, Min. 310.456 kN, Steel Beam 17.723 kN		
	Deck bearing 75 mm		
Transverse Plate Bending	310.456x62.5/1000, M _p 310.5 kN.m	19.403 kN.m	
Von Mises Criterion	Trans. Str. 21.6 N/mm ² , Per. Longitudinal Str. =	333.7 N/mm ²	
Check @ 4.5 m (Max. Moment)	M = 718.46 kN.m, F _v = 0 kN		
Shear Connection	Bond developed over half span 1334.2 kN < 1518.8	Partial	
Axial Resistance (kN)	R _c 1518.84 kN, R _s 6954.68 kN, F _{sb} 1334.21 kN	1334.21 kN	
Degree of Shear Connection	F _{sb} /R _c = 1334 / 1518.8 > 0.83	0.878	OK
Reduced Concrete Area	Area required to resist 1334.21 kN	83.7x1125mm ²	
Moment Capacity	Plastic neutral axis in bottom flange @ 387.8 mm	997.79 kN.m	OK

Transverse Reinforcement

V _r = fn(As _v ,f _y ,γ _s ,θ _f , f _{ck})	a-a plane 193, 500, 1.15, 26.5, 25	168.30 kN	
V = ~DF _d /~Dx.Max(b1,b2)/(b1+b2)	a-a plane 1334.21/4.5x0.43/(0.56+0.56)	148.25 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	201.59 kN each si	< 613.65 kN	OK
Plate Loading (factored)	Max. 154.639 kN, Min. 6.075 kN, Steel Beam 17.723 kN		
	Deck bearing 75 mm		
Transverse Plate Bending	154.639x62.5/1000, M _p 310.5 kN.m	9.665 kN.m	
Von Mises Criterion	Trans. Str. 10.7 N/mm ² , Per. Longitudinal Str. =	339.5 N/mm ²	
Check @ 4.5 m (Max. Moment)	M = 453.59 kN.m, F _v = 0 kN		
Moment Capacity	Plastic neutral axis in bottom flange @ 256 mm	537.86 kN.m	OK
C ₁ =Fn(Moment Distribution)	(Unrestraint) - Uniform Load	1.127	
M _{cr} = Fn(C ₁ ,L _e ,I _z ,I _t ,I _w ,E, C ₂ ,Z _g ,C ₃ ,Z _i)	1.127, 9.000, 20692, 224.0, 1.357, 210000, 0.454, -12.2, 0.525, -96.3	965.283 kN.m	
M _b =fn(λ _{LT} ,C _{LT} ,S _{xx} ,p _y)	0.746, 0.871, 1559, 345	468.474 kN.m	OK
Combined Torsion and Bending Check (Out of Balance Loads)			
Out of Balance Moments	M _x 200.741 kN.m, M _{out} 28.324 kN.m		
J, H, a, W _n	224.0 cm ⁴ , 1.357 dm ⁵ , 1255 mm, 284.7 cm ²		
L _{eF} = 1 x L	1 x 9	9 m	
M _{cr} = Fn(C ₁ ,L _e ,I _z ,I _t ,I _w ,E, C ₂ ,Z _g ,C ₃ ,Z _i)	1.127, 9.000, 20692, 224.0, 1.357, 210000, 0.454, -12.2, 0.525, -96.3	965.283 kN.m	
M _b =fn(λ _{LT} ,C _{LT} ,S _{xx} ,p _y)	0.746, 0.871, 1559, 345	468.474 kN.m	
M _{z,Ed} = M _{xb} . θ	200.7 . 150.2 . 10 ⁻³	30.16 kN.m	
σ _w = E . W _n . θ	210 . 284.7 . 16.43 . 10 ⁻⁹	98.21 N/mm ²	
M _{w,Ed} = E . I _{tr} . θ . (h-t _f)/2	210 . 2427 . 10 ⁴ . 16.43 . 10 ⁻⁹ . 222.13	18.60 kN.m	
Local Torsion			

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$(M_{y,Ed}/M_{y,Rd})^2 + M_{z,Ed}/M_{z,Rd} + M_{w,Ed}/M_{f,Rd}$	$(200.741/433.67)^2 + 30.158/312.88 + 18.602/98.017$	0.500	OK
Torsion Buckling			
$k = k_w \cdot k_{z_w} \cdot k_a$	$0.662 \cdot 0.904 \cdot 1.263$	0.755	
$M_{y,Rd}/M_{b,Rd} + C_{mz} \cdot M_{z,Ed}/M_{z,Rd} + k \cdot M_{w,Ed}/M_{w,Rd}$	$200.741/468.47 + 0.95 \cdot 30.158/312.881 + 0.755 \cdot 18.602/98.017$	0.663	OK

Serviceability Limit State

Support Reactions (kN)

Live Loads 90 kN each side
Super Imposed Dead Load 11.25 kN each side
Dead Load (Self Weight) 136.2 kN each side

Maximum Deflection (Partial Connection All Loads)

Live Loads	9.47 (16.71) mm @ 4.5 m < L / 360 = 25 mm	16.71 mm	OK
Super Imposed Dead Loads	1.18 (2.09) mm @ 4.5 m	2.09 mm	
Dead Loads (Self Weight)	50.82 mm @ 4.5 m	50.82 mm	

Maximum Steel Stress

TOTAL (Tension)	Live 38.1, Super Dead 4.8, SW 110 < 345	153.65 N/mm ²	OK
TOTAL (Compression)	Live 22.1, Super Dead 2.8, SW 243 < 345	268.59 N/mm ²	OK
Maximum Concrete Stress	Live 5.21, Super Dead 0.65, SW < 15	5.86 N/mm ²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	18.1 mm	
Natural Frequency	$18/\sqrt{18.10/1.1} = 4.44 > 4$ Hz	4.44 Hz	OK

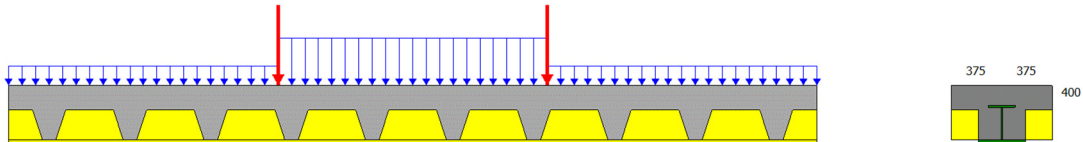
MasterSeries Sample Output

3 Castle Street
Carrickfergus
County Antrim BT38 7BE

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Job ref : My Project
Sheet : Slim Floor / 4 -
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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM Built Up SlimFloor Beam



Summary of Design Data EC4 - NA UK (Symmetrical Beam)

EuroCode National Annex	Using UK values, SCI P405
Steel Section (101 kg/m)	200x15 T + 350x20 B + 240x10 W 24 r 101.22 [S 355]Floor Area Supported 6 m Span, 6 m to LH Beam and 6 m to RH Beam (6 m Supported Directly)
Non-Continuous SD 225 (SlimFloor)	Trough Spacing 600, Height 225, Average Width 174 in 1 mm thick
Concrete Slab	400 mm Thick @ 2350 kg/m ³ , Mod. Ratio 10, Gr C25/30 with 252 mm ² /m
Rib Pattern	Bond force per unit length = $[2(B_t+T_t+d)-t_w].f_{sb}$ where $f_{sb}=0.6$ N/mm ²
Floor Loads (kN/m ²)	Live 2, Partitions 1, Services 0.5, Deck/Mesh 0.2, Construction 0.75
Self Weight Loads	Concrete Slab 5.538 kN/m ² , Steel Beam 0.993 kN/m
Additional Point Loads (kN)	Dead 10 @ 2 and 4 m
Additional Partial Loads (kN/m)	Dead 5, Live 6, Super Imposed Dead 7 between 0 and 2 m
Additional Partial Loads (kN/m)	Dead 15, Live 12, Super Imposed Dead 17 between 2 and 4 m
Additional Partial Loads (kN/m)	Dead 5, Live 6, Super Imposed Dead 7 between 4 and 6 m
User Defined Values	Combinations, Deck/Mesh, Construction Load, Vibration and Deflection Limits

Section Properties

Concrete Effective Area	90 x 750 mm ² , b ₁ = 375 mm and b ₂ = 375 mm
Steel Section Elastic Properties	ye 175.9 mm, A 128.9 cm ² , I _x 16381 cm ⁴ , Z _t 931 cm ³ , Z _b 1653 cm ³
Composite Section Elastic Properties	ye 243.7 mm, I _x 56006 cm ⁴ , Z _{s.t} 6105 cm ³ , Z _{s.b} 3417 cm ³ , Z _{c.t} 24723 cm ³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	343.59 kN each si	< 547.76 kN	OK
Bottom Flange Loading (factored)	Max. 221.365 kN, Min. 221.365 kN, Steel Beam 7.447 kN		
	Deck bearing 75 mm		
Transverse Bottom Flange Bending	221.365x137.5/1000, M _p 207 kN.m	30.438 kN.m	
Von Mises Criterion	Trans. Str. 50.7 N/mm ² , Per. Longitudinal Str. =	316.8 N/mm ²	
Check @ 3 m (Max. Moment)	M = 555.63 kN.m, F _v = 0 kN		
Shear Connection	Bond developed over half span 810 kN < 956.3	Partial	
Axial Resistance (kN)	R _c 956.25 kN, R _s 4251.22 kN, F _{sb} 810 kN	810 kN	
Degree of Shear Connection	F _{sb} /R _c = 810 / 956.3 > 0.66	0.847	OK
Reduced Concrete Area	Area required to resist 810 kN	76.2x750mm ²	
Moment Capacity	Plastic neutral axis in web @ 334 mm	655.81 kN.m	OK
Check @ 2 m	M = 489.12 kN.m, F _v = 145.53 kN		
Shear Connection	Bond developed over half span 810 kN < 956.3	Partial	
Axial Resistance (kN)	R _c 956.25 kN, R _s 4251.22 kN, F _{sb} 810 kN	810 kN	
Reduced Concrete Area	Area required to resist 810 kN	76.2x750mm ²	
Moment Capacity	Plastic neutral axis in web @ 334 mm	655.81 kN.m	OK

Transverse Reinforcement

$V_r = fn(A_{sv}, f_y, \gamma_s, \theta_f, f_{ck})$	a-a plane 252, 500, 1.15, 26.5, 25	219.75 kN	
$V = \sim DF_a / \sim DX \cdot \text{Max}(b_1, b_2) / (b_1 + b_2)$	a-a plane 810/2x0.28/(0.38+0.38)	202.50 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	204.89 kN each si	< 547.76 kN	OK
Bottom Flange Loading (factored)	Max. 123.711 kN, Min. 4.86 kN, Steel Beam 7.447 kN		
	Deck bearing 75 mm		
Transverse Bottom Flange Bending	123.711x137.5/1000, M _p 207 kN.m	17.01 kN.m	
Von Mises Criterion	Trans. Str. 28.4 N/mm ² , Per. Longitudinal Str. =	330 N/mm ²	
Check @ 3 m (Max. Moment)	M = 327.59 kN.m, F _v = 0 kN		
Moment Capacity	Plastic neutral axis in bottom flange @ 256.9 mm	398.48 kN.m	OK
$C_1 = Fn(\text{Moment Distribution})$	(Unrestraint) - Uniform Load	1.127	
$M_{cr} = Fn(C_1, L_e, I_z, I_t, I_w, E, C_2, Z_g, C_3, Z_i)$	1.127, 6.000, 8154, 149.8, 0.5817, 210000, 0.454, -14.1, 0.525, -97.1	752.391 kN.m	
$M_b = fn(\lambda_{LT}, C_{LT}, S_{xx}, p_y)$	0.728, 0.881, 1155, 345	351.005 kN.m	OK

MasterSeries Sample Output

3 Castle Street
Carrickfergus
County Antrim BT38 7BE

Tel: 028 9036 5950

Job ref : My Project
Sheet : Slim Floor / 5 -
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Checked : MOG
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Combined Torsion and Bending Check (Out of Balance Loads)

Out of Balance Moments	M _x 102.014 kN.m, M _{out} 16.342 kN.m		
J, I _y , a, W _n	149.8 cm ⁴ , 0.5817 dm ⁶ , 1005 mm, 225.9 cm ²		
L _{ef} = 1 x L	1 x 6	6 m	
M _{cr} = Fn(C ₁ , L _{ef} , I _z , I _t , I _w , E, C ₂ , Z _g , C ₃ , Z _j)	1.127, 6.000, 8154, 149.8, 0.5817, 210000, 0.454, -14.1, 0.525, -97.1		
M _b = fn(λ _{LT} , C _{LT} , S _{xx} , p _y)	0.728, 0.881, 1155, 345	752.391 kN.m	
M _{z,Ed} = M _{xb} . θ	102.0 . 80.86 . 10 ⁻³	8.249 kN.m	
σ _w = E . W _n . θ"	210 . 225.9 . 20.24 . 10 ⁻⁹	96.03 N/mm ²	
M _{w,Ed} = E . I _{tf} . θ". e _{s,f}	210 . 1000.0 . 10 ⁻⁴ . 20.24 . 10 ⁻⁹ . 225.89	9.60 kN.m	
Local Torsion			
(M _{y,Ed} /M _{y,Rd}) ² + M _{z,Ed} /M _{z,Rd} + M _{w,Ed} /M _{f,Rd}	(102.014/321.26) ² + 8.249/160.77 + 9.603/51.75	0.338	OK
Torsion Buckling			
k = k _w . k _{zw} . k _a	0.663 . 0.949 . 1.157	0.728	
M _{y,Rd} /M _{b,Rd} + C _{mz} . M _{z,Ed} /M _{z,Rd} + k . M _{w,Ed} /M _{w,Rd}	102.014/351 + 0.95 . 8.249/160.77 + 0.728 . 9.603/51.75	0.474	OK
Check @ 2 m	M = 291.19 kN.m, F _v = 86.3 kN		
Moment Capacity	Plastic neutral axis in bottom flange @ 256.9 mm	398.48 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	78 kN each side		
Super Imposed Dead Load	40 kN each side		
Dead Load (Self Weight)	141.27 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.88 (6.69) mm @ 3 m < L / 360 = 16.7 mm	6.69 mm	OK
Super Imposed Dead Loads	2.16 (3.73) mm @ 3 m	3.73 mm	
Dead Loads (Self Weight)	24.54 mm @ 3 m	24.54 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 36, Super Dead 20.5, SW 137 < 345	193.73 N/mm ²	OK
TOTAL (Compression)	Live 20.1, Super Dead 11.5, SW 243 < 345	275.25 N/mm ²	OK
Maximum Concrete Stress	Live 4.97, Super Dead 2.83, SW < 15	7.81 N/mm ²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	11.58 mm	
Natural Frequency	18/√(11.58/1.1) = 5.55 > 4 Hz	5.55 Hz	OK

MasterSeries Sample Output

3 Castle Street
Carrickfergus
County Antrim BT38 7BE

Tel: 028 9036 5950

Job ref : My Project
Sheet : Slim Floor / 6 -
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Checked : MOG
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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM ASB Slimfloor beam with hollowcore units



Summary of Design Data EC4 - NA UK (Symmetrical Beam)

EuroCode National Annex	Using UK values
Steel Section (100 kg/m)	280 ASB 100 [S 355] Floor Area Supported 8 m Span, 3 m to LH Beam and 3 m to RH Beam (3 m Supported Directly)
Solid Slab	With 393 mm ² /m Bottom and 0 mm ² /m Top
Concrete Slab	400 mm Thick @ 2350 kg/m ³ , Mod. Ratio 15.36, Gr C28/35
Headed Stud Connector	19x95 mm (as welded) Placed @ 250 mm centres in pairs
Floor Loads (kN/m ²)	Live 5, Partitions 1, Services 0.5, Deck/Mesh 0.2, Construction 0.75
Self Weight Loads	Concrete Slab 8.449 kN/m ² , Steel Beam 0.984 kN/m
User Defined Values	Combinations, Deck/Mesh, Construction Load, Vibration and Deflection Limits

Section Properties

Concrete Effective Area	133 x 2000 mm ² , b1= 1000 mm and b2= 1000 mm
Steel Section Elastic Properties	ye 155.9 mm, A 127.8 cm ² , Ix 15506 cm ⁴ , Zt 995 cm ³ , Zb 1291 cm ³
Composite Section Elastic Properties	ye 163.9 mm, Ix 56753 cm ⁴ , Zs.t 23799 cm ³ , Zs.b 2256 cm ³ , Zc.t 53307 cm ³
Headed Stud Connector	64 No. 19x95 mm, Qk 99.57 kN, Qp 79.66 kN, k 1, Pd 79.66 Welded

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	250.15 kN each si	< 1044.53 kN	OK
Bottom Flange Loading (factored)	Max. 245.229 kN, Min. 245.229 kN, Steel Beam 9.84 kN Deck bearing 75 mm		
Transverse Bottom Flange Bending	245.229x109.5/1000, M _p 181.76 kN.m	26.853 kN.m	
Von Mises Criterion	Trans. Str. 52.4 N/mm ² , Per. Longitudinal Str. =	325.9 N/mm ²	
Check @ 4 m (Max. Moment)	M = 500.3 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 32 < 53	Partial	
Axial Resistance (kN)	Rc 4220.53 kN, Rs 4318.37 kN, Rq 2549.06 kN	2549.06 kN	
Degree of Shear Connection	Na/Np = 32 / 53 > 0.58	0.604	OK
Reduced Concrete Area	Area required to resist 2549.06 kN	80.3x2000mm ²	
Moment Capacity	Plastic neutral axis in top flange @ 152.6 mm	884.07 kN.m	OK

Transverse Reinforcement

V _r = fn(As _v ,f _y ,γ _s ,θ _f , f _{ck})	a-a plane 393, 500, 1.15, 26.5, 28	342.71 kN	
V = ~DF _d /~DX.Max(b1,b2)/(b1+b2)	a-a plane 2549.06/4x0.91/(1+1)	289.32 kN	OK
V _r = fn(As _v ,b,f _y ,γ _s ,θ _f , f _{ck})	b-b plane 786, 500, 1.15, 26.5, 28	685.77 kN	
V = ~DF _d /~DX	b-b plane 2549.06/4	637.26 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	154.87 kN each si	< 1044.53 kN	OK
Bottom Flange Loading (factored)	Max. 119.142 kN, Min. 3.24 kN, Steel Beam 9.84 kN Deck bearing 75 mm		
Transverse Bottom Flange Bending	119.142x109.5/1000, M _p 181.76 kN.m	13.046 kN.m	
Von Mises Criterion	Trans. Str. 25.5 N/mm ² , Per. Longitudinal Str. =	341.6 N/mm ²	
Check @ 4 m (Max. Moment)	M = 309.74 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 183.1 mm	446.43 kN.m	OK
C ₁ =Fn(Moment Distribution)	(Unrestraint) - Uniform Load	1.127	
M _{cr} = Fn(C ₁ ,L _e ,I _z ,I _t ,I _w ,E, C ₂ ,Z _g ,C ₃ ,Z ₁)	1.127, 8.000, 4245, 160.5, 0.4509, 210000, 0.454, -35.2, 0.525, -78.8	463.957 kN.m	
M _b =fn(λ _{LT} ,C _{LT} ,S _{xx} ,p _y)	0.981, 0.731, 1294, 345	326.401 kN.m	OK
Combined Torsion and Bending Check (Out of Balance Loads)			
Out of Balance Moments	M _x 132.223 kN.m, M _{out} 12.691 kN.m		
J, H, a, W _n	160.5 cm ⁴ , 0.4509 dm ⁶ , 854.8 mm, 192.1 cm ²		
L _e f = 1 x L	1 x 8	8 m	
M _{cr} = Fn(C ₁ ,L _e ,I _z ,I _t ,I _w ,E, C ₂ ,Z _g ,C ₃ ,Z ₁)	1.127, 8.000, 4245, 160.5, 0.4509, 210000, 0.454, -35.2, 0.525, -78.8	463.957 kN.m	
M _b =fn(λ _{LT} ,C _{LT} ,S _{xx} ,p _y)	0.981, 0.731, 1294, 345	326.401 kN.m	
M _{z,Ed} = M _{xb} . θ	132.2 . 89.15•10 ⁻³	11.79 kN.m	

<p>MasterSeries Sample Output</p> <p>3 Castle Street Carrickfergus County Antrim BT38 7BE</p> <p>Tel: 028 9036 5950</p>	<p>Job ref : My Project</p> <p>Sheet : Slim Floor / 7 -</p> <p>Made By : GHB</p> <p>Date : 21 June 2015/ Version 2017.11</p> <p>Checked : MOG</p> <p>Approved : ATW</p>
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$\sigma_w = E \cdot W_n \cdot \theta''$	$210 \cdot 192.1 \cdot 12.01 \cdot 10^{-9}$	48.47 N/mm ²	
$M_{w,Ed} = E \cdot I_{ef} \cdot \theta'' \cdot e_{s,f}$	$210 \cdot 830.6 \cdot 10^4 \cdot 12.01 \cdot 10^{-9} \cdot 208.81$	4.38 kN.m	
Local Torsion			
$(M_{y,Ed}/M_{y,Rd})^2 + M_{z,Ed}/M_{z,Rd} + M_{w,Ed}/M_{f,Rd}$	$(132.223/343.1)^2 + 11.788/99.64 + 4.376/46.721$	0.360	OK
Torsion Buckling			
$k = k_w \cdot k_{z,w} \cdot k_a$	$0.681 \cdot 0.882 \cdot 1.399$	0.84	
$M_{y,Rd}/M_{b,Rd} + C_{mz} \cdot M_{z,Ed}/M_{z,Rd} + k \cdot M_{w,Ed}/M_{w,Rd}$	$132.223/326.4 + 0.95 \cdot 11.788/99.636 + 0.84 \cdot 4.376/46.721$	0.596	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	72 kN each side		
Super Imposed Dead Load	6 kN each side		
Dead Load (Self Weight)	107.72 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.05 (10.60) mm @ 4 m < L / 360 = 22.2 mm	10.60 mm	OK
Super Imposed Dead Loads	0.67 (0.88) mm @ 4 m	0.88 mm	
Dead Loads (Self Weight)	44.11 mm @ 4 m	44.11 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 63.8, Super Dead 5.3, SW 166 < 345	235.98 N/mm ²	OK
TOTAL (Compression)	Live 6.1, Super Dead 0.5, SW 216 < 345	223.15 N/mm ²	OK
Maximum Concrete Stress	Live 2.7, Super Dead 0.23, SW < 17.5	2.93 N/mm ²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	13.99 mm	
Natural Frequency	$18/\sqrt{(13.99/1.1)} = 5.05 > 4$ Hz	5.05 Hz	OK