Barratt Associates Ltd.

Structural, Civil and Geotechnical Engineers

Project reference: 22568

Project Address: 101 Caeconna Road, SA5 5HZ

Client: Kelly Guarino

Description: Steel UB with UDL and 1 Point Load Design - rear extension knock through

Design Code

Design for steel is based on:

Eurocode 3: Design of steel structures

Eurocode 5: Design of timber structures

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INTRODUCTION

The following document is associated with the construction work to take place at the mentioned address and contains design calculations for structural elements, as well as approximate schematic arrangements of those elements.

IMPORTANT GUIDANCE ON THE USE OF THIS DOCUMENT (TO BE READ BY ALL PARTIES) - The document should be reviewed in its entirety by the builder, architect (if applicable) and client, along with any other relevant documentation, prior to commencement of the work, and any layouts, instructions or recommendations should be followed. Any deviations from the proposals made without the engineer's consent are beyond the scope of this document and the engineer cannot be held liable for any adverse consequences of such deviations. It is the responsibility of the architect (where applicable), client or builder to notify the engineer if any changes have been made.
The calculations carried out in this document have been carried out in good faith based on the proposed and existing dimensions and data provided by the client, architect or site visit. Approval of these calculations and drawings by the Local Authority Building Control should be obtained prior to any ordering of material or fabrication. Where information about the existing arrangements of buildings, such as floor / roof span orientations or load-bearing wall arrangements, is not available, the engineer will use their judgement to make assumptions. These, generally conservative assumptions will be clearly outlined within the document, and should be confirmed by a suitably qualified individual on site prior to commencement of the work. The engineer is then to be notified of any discrepancies prior to commencement of the work as design changes may be necessary. Where drawings, construction specifications, method statements or additional design calculations are omitted and are not referenced it is because these have not been requested by the client. These can be made available by the engineer at the client's request. IF IN DOUBT: ASK!!

DESIGN STANDARDS - All calculations are carried out using Eurocodes or British Standards.

HEALTH AND SAFETY INFORMATION - Any specific risks that are identified either within these calculations / drawings or any related to this document are to be assessed and managed by the builder / contractor or client. No responsibility for risk assessments or means of mitigating these risks will be taken by the Engineer.

GENERAL CONSTRUCTION NOTES
• Any span dimensions shown in this document are for the purpose of calculations only and are not to be used as a final dimension. Suitable end bearings are to be added to the calculated open span.
• All structural work has is to be carried out by a competent builder in accordance with the requirements of The Building Regulations Part A and the recommendations set out in BS8103 Parts 1-3.
• All dimensions are to be checked on site by the builder / contractor / fabricator prior to commencement of fabrication / machining /construction. Any discrepancies between the information outlined herein and the dimensions on site are to be reported to the engineer.
• All parties are assumed to be aware of their responsibilities under the Construction Design and Management (CDM) Regulations 2015.
• The client must find out whether the work falls under the Party Wall Act. If it does, the Act requires the client to notify all affected neighbours of proposed works.
• The architects drawings are to be read in conjunction with this document and any discrepancies reported to the engineer immediately.
• Barratt Associates could have not visited site and therefore take no responsibility for the quality of construction nor its compliance with this document, it is the contractors responsibility to ensure that all works comply with the drawings, notes and assumptions made within these calculations.
• The client should be aware that where beams are installed within existing masonry structures it is likely that minor cracking will occur within the masonry above due to the load redistribution.
• For structural elements not covered by this document it is assumed that a design is being prepared / provided by others, if additional calculations / drawings / specifications are required then please contact Barratt Associates and we can provide a fee for their design.
• All proprietary (i.e. off-the-shelf) items specified within this document are to be installed in strict accordance with the manufacturer's recommendations.

MASONRY NOTES
• At locations where bearing information is provided on the layout generally this will be in a position where load-bearing masonry (with foundations / support) has been assumed. It should be confirmed by a suitably qualified individual that these walls are load-bearing, and the masonry is to be inspected for suitability prior to commencement of the work.
• In many instances historic buildings, will have poor quality masonry and degrading mortar capable of sustaining only a limited amount of compressive force. In such cases the engineer should be notified as the padstone sizes specified may need to be increased in size.
• All padstones specified are to be C35 concrete (as specified in the materials section). Where it is not possible to find "off the shelf" padstone sizes it may be necessary to cast in-situ padstones.
• Where existing masonry is deemed to be of poor quality, or the mortar has degraded significantly, the brickwork should be either re-pointed or replaced in its entirety as appropriate prior to loading.
• Where steel beams bear directly onto masonry (i.e. no padstones) they are to be bedded onto a dry / level mortar bed.
• Horizontal/Vertical restraint strapping to floors and roofs as indicated in the Building Regulations Part A "Lateral support by roofs and floors" [Diagrams 15 and 16] must be provided.
• Ties movement joints should be provided at the following maximum centres; 6m centres in blockwork, 12m centres in brickwork. Joint locations should be as per the architects/LABC recommendations.

STEELWORK NOTES
• It is the responsibility of the client or builder to check the span of the opening pier to steel fabrication, and suitable end bearing lengths are to be added to the open span.
• Where possible beams installed in pairs should be bolted together through the centre of the webs using M12 bolts @ 500mm cent res with spacer tubes in between.
• All beams are to be seated centrally on padstones, columns or masonry posts unless noted otherwise.
• Unless noted otherwise in the design or layout information beams are to bear over the full width of any spreader or post.
• All steel beams which are to support a wall above are to be positioned centrally to that wall.
• All steelwork is to be fabricated and erected in accordance with the latest edition of the National Structural Steelwork Specification (NSSS) and Building Regulations.
• Steelwork finish / paint systems shall be in accordance with the recommendations of the Corus / Tata guide; "The Prevention of Corrosion on Structural Steelwork".
• Fire protection of steelwork is to be specified by the architect, if intumescent painting is required then the paint system should be compatible with the primer / underlying corrosion protection system.
• Any welded joints should be carried out by a suitably qualified steel fabricator tested in accordance with the relevant British or European standards.
• Where columns / posts are to be set into or flush up against a masonry wall they are to be fixed / tied into the masonry by the method detailed by building regulations.
• Provide 15mm gap to under-side of steelwork at intersecting wall locations where no bearing information is shown so as to prevent unintended load transfer to non load-bearing walls.

TIMBER NOTES
• All timbers are to be C24 unless otherwise stated.
• Timber members to be notched and cut in accordance with current Building Regulations.
• All timber shall be factory treated in accordance with BS5268 'code of practice for the preservation treatment of structural timber'.
• Unless fully built into masonry, new timber joists will be supported using hangers with side flanges to prevent rotation, or side flanges full depth blocking should be provided to joist ends.
• Where built into masonry, all timbers are to have an end bearing length of not less than 100mm,
• Where supported by timber posts, the bearing should be the full width of any such supporting post. Where beams are seated on posts they are to be positioned centrally.
• At the top and bottom of timber column / post positions a minimum of 2No horizontal restraint straps and noggins should be provided running orthogonally to the joist / rafter to provide restraint.
• For columns / posts directly adjacent to existing masonry, these should be resin anchored into the masonry using M12 Hilti-HY70 anchors (or similar) @ 450mm vertical centres.
• Where steelwork is to be installed in loft conversions ensure there is a 25mm gap between the top of the existing ceiling joist and the underside of the steel beam to avoid unintended load transfer.

FOUNDATION & CONCRETING NOTES
• Foundation design calculations will, unless noted otherwise, be based on an assumed bearing capacity of 100kN/m2. For the design to be valid it should be ensured that the formation level bearing stratum is inspected for suitability on site by an LABC officer or other suitably qualified individual prior to commencement of the work.
• In certain incidences 100kN/m2 bearing pressure will not be achievable and so ground improvement or piled foundations & suspended substructures will be required, this will require recalculation of the foundation design and so it is recommended that such a requirement is established early on and Barratt Associates made aware of the requirements.
• Where extra load or an additional storey is to be added onto an existing wall/foundation, the existing foundation is to be exposed and inspected by the Building Inspector to check it is adequate to support the new loads. Contact the engineer if further guidance is needed, or if the Building Inspector requests calculations to be provided.
• Where existing loadbearing walls have been assumed in this calculation document, the foundation supporting the wall should be exposed and checked/approved by the Building Inspector prior to commencement of works.
• Unless this is a document specifically intended to calculate required spread footing depths for shrinkable clays with near-by vegetation the foundation depths will not be specified within this document. Any reference to "depths" of footings or pads will likely refer to the minimum thickness of the concrete required. If new pad foundations are required adjacent to existing strip footing or brick spread foundations then the new pad should extend beyond the minimum depth to at least as deep as the existing adjacent footing. If the existing adjacent footing is shallower than the new pad, local underpinning may be required to prevent undermining.
• General minimum depths for strip footings / spread foundations are not less than 450mm for bearing strata other than clay, and not less than 900mm for footings in shrinkable clay with no nearby vegetation. For foundations in shrinkable clays the proximity of nearby vegetation should be carefully considered and the guidance of the engineer and/or LABC officer should be sought.
• Where the thickness of concrete specified in spread foundations is not sufficient to reach a suitable bearing stratum the excavation can be filled using either well compacted crushed hardcore or lean-mix concrete up to foundation formation level.
• Where openings are to be created in existing walls which may reduce the effective area of the foundations, or where the load is to be focused on a particular area of existing foundations, it is advised that the foundations are inspected for suitability by an LABC officer or other suitably qualified individual prior to commencement of the work.
• For foundations in chemically aggressive soil conditions the guidance in BS8500-1 and BRE Special Digest 1 should be followed, if in doubt chemical testing should be undertaken.
• Any site requirements for Radon / Ground Gas Protection should be made by the Architect / LABC officer and not the Engineer unless requested.

Revision	**03**
Rev Date	**17/08/20**
Checked by	**Ian Lumby**

Loading

Load breakdown for pitched roof

Roof pitch = 35 °

		Characteristic	Factor	Design	
Dead	Concrete tile, Timber battens, and felt	0.55	1.35	0.74	kN/m²
	Ceiling and services	0.15	1.35	0.20	kN/m²
	Rafters & Insulation	0.20	1.35	0.27	kN/m²
Live	Snow	0.28	1.5	0.42	kN/m²
	$w_{1,1}'=$	1.18	$w_{1,1}=$	1.64	kN/m²
Load on plan	$w_1'=$	1.44	$w_1=$	2.00	kN/m²

Load breakdown for flat roof

		Characteristic	Factor	Design	
Dead	Ashphalt and waterproofing	0.45	1.35	0.61	kN/m²
	Ceiling and services	0.15	1.35	0.20	kN/m²
	Joists and Insulation	0.2	1.35	0.27	kN/m²
Live	Snow	0.28	1.5	0.42	kN/m²
	$w_{2,1}'=$	1.08	$w_{2,1}=$	1.50	kN/m²
Load on plan	$w_2'=$	1.08	$w_2=$	1.50	kN/m²

Load breakdown for timber floor

		Characteristic	Factor	Design	
Dead	Flooring	0.15	1.35	0.20	kN/m²
	Ceiling and services	0.15	1.35	0.20	kN/m²
	Joists and Insulation	0.2	1.35	0.27	kN/m²
Live	Domestic	1.5	1.5	2.25	kN/m²
	$w_{3,1}'=$	2	$w_{3,1}=$	2.93	kN/m²
Load on plan	$w_3'=$	2.00	$w_3=$	2.93	kN/m²

Load breakdown for stud wall

		Characteristic	Factor	Design	
Dead	12mm ply sheathing	0.08	1.35	0.11	kN/m²
	Timber cladding	0.35	1.35	0.47	kN/m²
	Studs & insulation	0.24	1.35	0.32	kN/m²
Live	Plasterboared, skim & services	0.15	1.5	0.23	kN/m²
	$w_{4,1}'=$	0.82	$w_{4,1}=$	1.13	kN/m²
Load on plan	$w_4'=$	0.82	$w_4=$	1.13	kN/m²

Load breakdown for masonry

. Density	$\gamma =$	19	kN/m^3
Thickness	$t =$	0.11	m
Characteristic load	$w_5' = \gamma t =$	2.09	kN/m²
Design load	$w_5 = 1.35 w_5' =$	2.8215	kN/m²

Load breakdown for external stonework

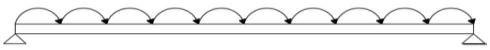
. Density	$\gamma =$	24	kN/m^3
Thickness	$t =$	0.11	m
Characteristic load	$w_5' = \gamma t =$	2.64	kN/m²
Design load	$w_5 = 1.35 w_5' =$	3.564	kN/m²

Barratt Associates Ltd.	Project	101 Caeconna Road, SA5 5HZ	Made by	Date	Job No
Structural, Civil and Geotechnical Engineers	Client	Kelly Guarino	IL	4-1-23	22568
Tel: 07946 065051	Description	Steel Beam Design - extension inner skin (cheek wall)	Checked	Revision	Page No
Email: info@barratt-associates.co.uk			BA	A	3

1.Loads

See page 2 for load breakdown

Loaded width for pitched roof =	d_1 =	0.00	m
Loaded width for flat roof =	d_2 =	0.00	m
Loaded width for timber floor =	d_3 =	0.40	m
Loaded height for stud wall =	d_4 =	0.00	m
Loaded height for masonry wall =	d_5 =	2.40	m



Beam self weight w_s = 0.19 kN/m

Factored load on beam $w=\sum w_n d_n + 1.35 w_s$ = **8.20** kN/m

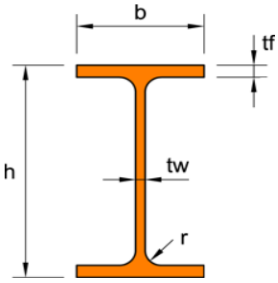
Unfactored load on beam $w'=\sum w'_n d_n + w_s$ = **6.01** kN/m

Beam clear span **L=** **2.9** **m**

End Bearings must be added

Design bending moment **M=wL²/8=** **8.62** **kN.m**

Design shear force $V_{Ed}=wL/2=$ **11.89** **kN**



2.Beam properties UB 178 × 102 × 19#

Depth of section	h=	177.8	mm
Width of section	b=	101.2	mm
Web thickness	t_w=	4.8	mm
Flange thickness	t_f=	7.9	mm
Root radius	r=	7.6	mm
Second moment of area	I_x=	1360	cm^4
Plastic modulus	W_{pl}=	171	cm³
Section area	A=	24.3	cm²
Young's modulus	E=	210000	N/mm²
Steel yield strength	f_y=	275	N/mm²
Shear area	$A_v=A-2bt_f+(t_w+2r)t_f=$	9.89	cm² (but not less than $\eta h_w t_w$)

UB 178 × 102 × 19#

3.Cross-section classification

	ε=√235/fy=	0.924			
Flange	$c=(b-t_w-2r)/2=$	40.6			
	c/t_f=	5.14	<9ε=	8.320	
	Class 1				
Web	$c=h-2t_f-2r=$	146.8 mm			
	c/t_w=	31	<72ε=	66.56	
	Class 1				EU3 Table 5.2
Cross section resistance partial safty factor	γ_{M0}=	1.00			EU3 6.1

4.Shear resistance of cross section

Design shear resistance	$V_{c,Rd}=A_v(f_y/\sqrt{3})/\gamma_{Mo}$=	157.03	kN		EU3 (6.18)
Maximum shear force to shear resistance ratio	$V_{Ed}/V_{C,Rd}$=	0.08	<1	OK	EU3 (6.17)

5.Bending resistance of cross section

Design moment resistance	$M_{c,Rd}=W_{pl}\times f_y/\gamma_{M0}$=	47.03	kN.m		EU3 (6.14)
Maximum moment to moment resistance ratio	$M/M_{c,Rd=}$	0.18	<1	OK	

6.Deflection

Maximum deflection	$u_{max}=5w'L^4/384EI$=	1.94	mm	
Allowable deflection	u'=L/360=	8.06	mm	
Actual to permissible deflection ratio	u_{max}/u'=	0.24	<1	OK

Beam is OK

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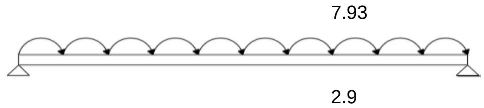
Project	101 Caeconna Road, SA5 5HZ	Made by	Date	Job No
Client	Kelly Guarino	IL	4-1-23	22568
Description	Steel Beam Design - extension outer skin (cheek wall)	Checked	Revision	Page No
		BA	A	4

1.Loads

See page 2 for load breakdown

Loaded width for pitched roof =	d_1 =	0.00	m
Loaded width for flat roof =	d_2 =	0.60	m
Loaded width for timber floor =	d_3 =	0.00	m
Loaded height for stud wall =	d_4 =	0.00	m
Loaded height for masonry wall =	d_5 =	2.40	m



Beam self weight w_S = 0.19 kN/m

Factored load on beam $w=\sum w_n d_n + 1.35 w_S$= **7.93** kN/m

Unfactored load on beam $w'=\sum w'_n d_n + w_S$= **5.85** kN/m

Beam clear span **L=** **2.9** **m**

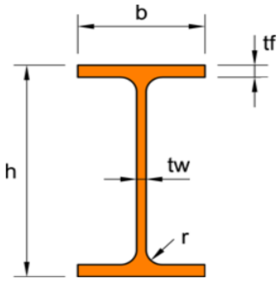
End Bearings must be added

Design bending moment **M=wL²/8=** **8.33** **kN.m**

Design shear force **V_{Ed}=wL/2=** **11.50** **kN**

2.Beam properties UB 178 × 102 × 19#

Depth of section	h=	177.8	mm
Width of section	b=	101.2	mm
Web thickness	t_w=	4.8	mm
Flange thickness	t_f=	7.9	mm
Root radius	r=	7.6	mm
Second moment of area	I_x=	1360	cm^4
Plastic modulus	W_{pl}=	171	cm³
Section area	A=	24.3	cm²
Young's modulus	E=	210000	N/mm²
Steel yield strength	f_y=	275	N/mm²
Shear area	$A_v=A-2bt_f+(t_w+2r)t_f$=	9.89	cm² (but not less than $\eta h_w t_w$)



3.Cross-section classification

	ε=√235/fy=	0.924			
Flange	$c=(b-t_w-2r)/2$=	40.6			
	c/t_f=	5.14	<9ε=	8.320	
	Class 1				
Web	$c=h-2t_f-2r$=	146.8 mm			
	c/t_w=	31	<72ε=	66.56	
	Class 1				EU3 Table 5.2
Cross section resistance partial safty factor	γ_{M0}=	1.00			EU3 6.1

4.Shear resistance of cross section

Design shear resistance	$V_{c,Rd}=A_v(f_y/\sqrt{3})/\gamma_{Mo}$=	157.03	kN		EU3 (6.18)
Maximum shear force to shear resistance ratio	$V_{Ed}/V_{C,Rd}$=	0.07	<1	OK	EU3 (6.17)

5.Bending resistance of cross section

Design moment resistance	$M_{c,Rd}=W_{pl}\times f_y/\gamma_{M0}$=	47.03	kN.m		EU3 (6.14)
Maximum moment to moment resistance ratio	$M/M_{c,Rd}$=	0.18	<1	OK	

6.Deflection

Maximum deflection	$u_{max}=5w'L^4/384EI$=	1.89	mm	
Allowable deflection	u'=L/360=	8.06	mm	
Actual to permissible deflection ratio	u_{max}/u'=	0.23	<1	OK

Beam is OK

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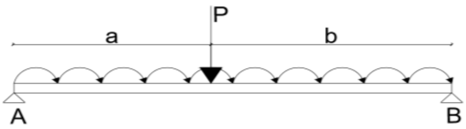
		Made by	Date	Job No
Project	101 Caeconna Road, SA5 5HZ	IL	4-1-23	22568
Client	Kelly Guarino	Checked	Revision	Page No
Description	Steel Beam with UDL and 1no pont load - outer skin to knock through	BA	B	5

1.Loads

See page 2 for load breakdown

Loaded width for pitched roof =	d_1 =	0.00	m
Loaded width for flat roof =	d_2 =	1.20	m
Loaded width for timber floor =	d_3 =	1.20	m
Loaded height for stud wall =	d_4 =	0.00	m
Loaded height for masonry wall =	d_5 =	2.40	m

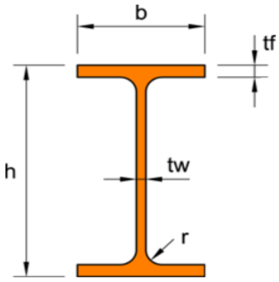


L = 4.7 m
a = 1.80 m
b = 2.90 m

Beam self weight w_s = 0.25 kN/m

Factored load on beam	$w=\sum w_n d_n + 1.35 w_s$=	12.42	kN/m
Unfactored load on beam	$w'=\sum w'_n d_n + w_s$=	8.96	kN/m
Unfactored Point load	P' =	17.00	kN
Factored Point load from	P=	23.00	kN
Beam Clear Span	**L=**	**4.7**	**m**
Design bending moment	**M=[wL²/8]+[Pab/L]=**	**59.84**	**kN.m**
Design shear force	**V_{Ed}=(wL/2)+Max[(Pa/L),(Pb/L)]=**	**43.38**	**kN**
Reactions	**R_A=**	**43.38**	**kN**
	R_B=	**37.99**	**kN**

End Bearings must be added



UB 254 x 102 x 25#

2.Beam properties UB 254 x 102 x 25#

Depth of section	h=	257.2	mm
Width of section	b=	101.9	mm
Web thickness	t_w=	6	mm
Flange thickness	t_f=	8.4	mm
Root radius	r=	7.6	mm
Second moment of area	I_x=	3410	cm^4
Plastic modulus	W_{pl}=	306	cm³
Section area	A=	32	cm²
Young's modulus	E=	210000	N/mm²
Steel yield strength	f_y=	275	N/mm²
Shear area	$A_v=A-2bt_f+(t_w+2r)t_f$=	16.66	cm² (but not less than $\eta h_w t_w$)

3.Cross-section classification

	ε=√235/fy=	0.033			
Flange	$c=(b-t_w-2r)/2$=	-321.75			
	c/t_f=	-1.25	<9ε=	0.30	
	Class 1				
web	$c=h-2t_f-2r$=	-1058.4	mm		
	c/t_w=	-10	<72ε=	2.41	
	Class 1				EU3 Table 5.2
Cross section resistance partial safty factor	γ_{M0}=	1.00			EU3 6.1

4.Shear resistance of cross section

Design shear resistance	$V_{c,Rd}=A_v(f_y/\sqrt{3})/\gamma_{Mo}$=	264.5	kN		EU3 (6.18)
Maximum shear force to shear resistance ratio	$V_{Ed}/V_{C,Rd}$=	0.16	<1	OK	EU3 (6.17)

5.Bending resistance of cross section

Design moment resistance	$M_{c,Rd}=W_{pl}\times f_y/\gamma_{M0}$=	84.15	kN.m		EU3 (6.14)
Maximum moment to moment resistance ratio	$M/M_{c,Rd=}$	0.71	<1	OK	

6.Deflection

Maximum deflection	$u_{max}=[5w'L^4/384EI]+[((Pab(b+L)/27EIL)\sqrt{(3a(L+b))}]$=	12.71	mm	(Assumes a>b)
Allowable deflection	u'=L/360=	13.06	mm	
Actual to permissible deflection ratio	u_{max}/u'=	0.97	<1	OK

Beam is OK

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Tel: 07946 065051	Description	Steel Beam Design - inner skin to knock through	Checked	Revision	Page No
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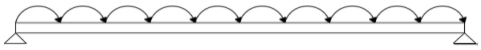
1.Loads

See page 2 for load breakdown

Loaded width for pitched roof =	d_1 =	3.70	m
Loaded width for flat roof =	d_2 =	0.00	m
Loaded width for timber floor =	d_3 =	1.40	m
Loaded height for stud wall =	d_4 =	0.00	m
Loaded height for masonry wall =	d_5 =	2.40	m



Beam self weight w_s = 0.19 kN/m

Factored load on beam $w=\sum w_n d_n + 1.35 w_s=$ **18.51** kN/m

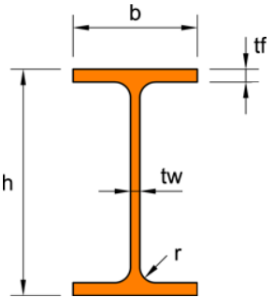
Unfactored load on beam $w'=\sum w'_n d_n + w_s=$ **13.34** kN/m

Beam clear span **L=** **4.7** **m** ***End Bearings must be added***

Design bending moment **$M=wL^2/8=$** **51.11** **kN.m**

Design shear force $V_{Ed}=wL/2=$ **43.49** **kN**

2.Beam properties UB 254 x 102 x 25#



UB 254 x 102 x 25#

Depth of section	h=	257.2	mm
Width of section	b=	101.9	mm
Web thickness	t_w=	6	mm
Flange thickness	t_f=	8.4	mm
Root radius	r=	7.6	mm
Second moment of area	I_x=	3410	cm^4
Plastic modulus	W_{pl}=	306	cm^3
Section area	A=	32	cm^2
Young's modulus	E=	210000	N/mm^2
Steel yield strength	f_y=	275	N/mm^2
Shear area	$A_v=A-2bt_f+(t_w+2r)t_f=$	16.66	cm^2 (but not less than $\eta h_w t_w$)

3.Cross-section classification

	$\varepsilon=\sqrt{235/fy}=$	0.924			
Flange	$c=(b-t_w-2r)/2=$	40.35			
	c/t_f=	4.80	$<9\varepsilon=$	8.320	
	Class 1				
Web	$c=h-2t_f-2r=$	225.2 mm			
	c/t_w=	38	$<72\varepsilon=$	66.56	
	Class 1				EU3 Table 5.2
Cross section resistance partial safty factor	γ_{M0}=	1.00			EU3 6.1

4.Shear resistance of cross section

Design shear resistance	$V_{c,Rd}=A_v(f_y/\sqrt{3})/\gamma_{Mo}=$	264.54	kN		EU3 (6.18)
Maximum shear force to shear resistance ratio	$V_{Ed}/V_{C,Rd}$=	0.16	<1	OK	EU3 (6.17)

5.Bending resistance of cross section

Design moment resistance	$M_{c,Rd}=W_{pl}\times f_y/\gamma_{M0}=$	84.15	kN.m		EU3 (6.14)
Maximum moment to moment resistance ratio	$M/M_{c,Rd=}$	0.61	<1	OK	

6.Deflection

Maximum deflection	$u_{max}=5w'L^4/384EI=$	11.83	mm	
Allowable deflection	u'=L/360=	13.06	mm	
Actual to permissible deflection ratio	u_{max}/u'=	0.91	<1	OK

Beam is OK

Barratt Associates Ltd. Structural, Civil and Geotechnical Engineers Tel: 07946 065051 Email: info@barratt-associates.co.uk	Project	101 Caeconna Road, SA5 5HZ	Made by	Date	Job No
	Client	Kelly Guarino	IL	4-1-23	22568
	Description	Padstone Design - knock through	Checked	Revision	Page No
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Padstone Calculator

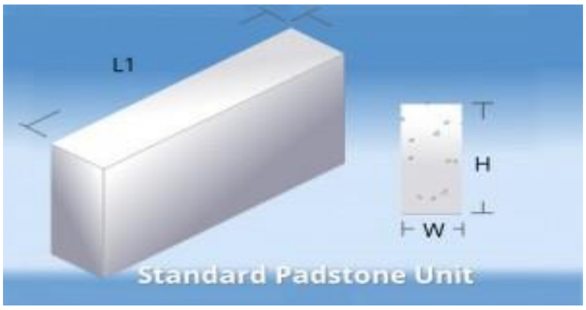
Beam End Reaction = **86.00** kN (factored)

Factored Load at End of Beam

Variable Load Safety Factor = 1.5
Permanent Load Safety Factor = 1.35

Characteristic strength of masonry = **4.2** N/mm²

(Brickwork usually = 4.5 N/mm²)
(3.6N Blockwork usually = 2.6 N/mm²)
(A Engineering Brick = 13.2 N/mm²)
(B Engineering Brick = 10.5 N/mm²)
(Weak Brickwork = approx 2.8 N/mm²)
(7.3N Blockwork usually = 4.2 N/mm²)
(10.4N Blockwork usually = 5.4 N/mm²)



Width of beam end bearing = **100** mm
Length of beam end bearing = **150** mm

γm = 3.0
Bearing Factor = **1.25**

Results

Maximum Bearing Stress = 1.75 N/mm²
Actual Bearing Stress = 5.73 N/mm²

Padstone Required

Padstone Results

Characteristic strength of Padstone = **40.0** N/mm²

(A Engineering Brick = 13.2 N/mm²)
(B Engineering Brick = 10.5 N/mm²)
(Concrete C15 = 15 N/mm²)
(Concrete C30 = 30 N/mm²)
(Concrete C40 = 40 N/mm²)
(Steel Plate = 275 N/mm²)

Width of Padstone = **215** mm
Length of Padstone = **330** mm
Depth of Padstone = **215** mm

Allowable padstone stress = 16.67 N/mm²
Stress under beam end bearing = 5.73 N/mm² — Therefore Padstone Stress OK
Allowable masonry stress = 1.75 N/mm²
Stress under padstone = 1.21 N/mm² — Therefore Masonry Stress OK

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Structural, Civil and Geotechnical Engineers	Client	Kelly Guarino	IL	4-1-23	22568
Tel: 07946 065051	Description	Nib Foundation details/check	Checked	Revision	Page No
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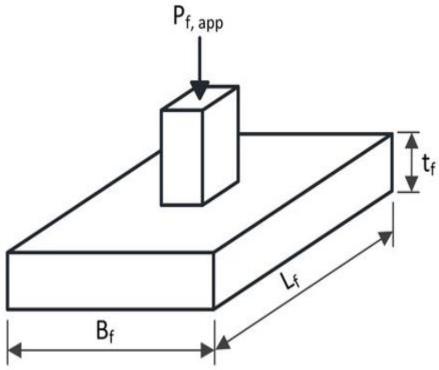
Contact Pressure Check on Concrete Ground Slab/Foundation



Nib Contact Length	L=	780	mm
Nib Contact Width	B=	300	mm
Minimum depth of foundations required	T_f=	200	mm
Pad Length (using 45°rule)	L_f=	1180	mm
Pad Width (using 45°rule)	B_f=	600	mm
Unit weight of concrete	γ =	24	kN/m^3
Weight of foundation	W = LBDγ =	3.3984	kN
Axial load from colummn	N_{Ed}=	86.00	kN
Weight of foundation	W = LBDγ =	3.3984	kN
Self-weight of wall above concrete	W =	3	kN
Total applied presure	Pf,app=	92.40	kN
Pad length	L_f=	1.18	m
Pad width	B_f=	0.6	m
Base area of pad foundation	A=	0.708	m^2
Contact pressure on ground	$q=N_{Ed}/A$=	130.51	kN/m^2
Assumed ground bearing capacity	$q_{allowable}$	150	kN/m^2
Factor of safety	F.O.S = $q/q_{allowable}$=	1.15	>1 OK

Bearing capacity is OK

Minimum depth of existing foundations required D= 200 mm

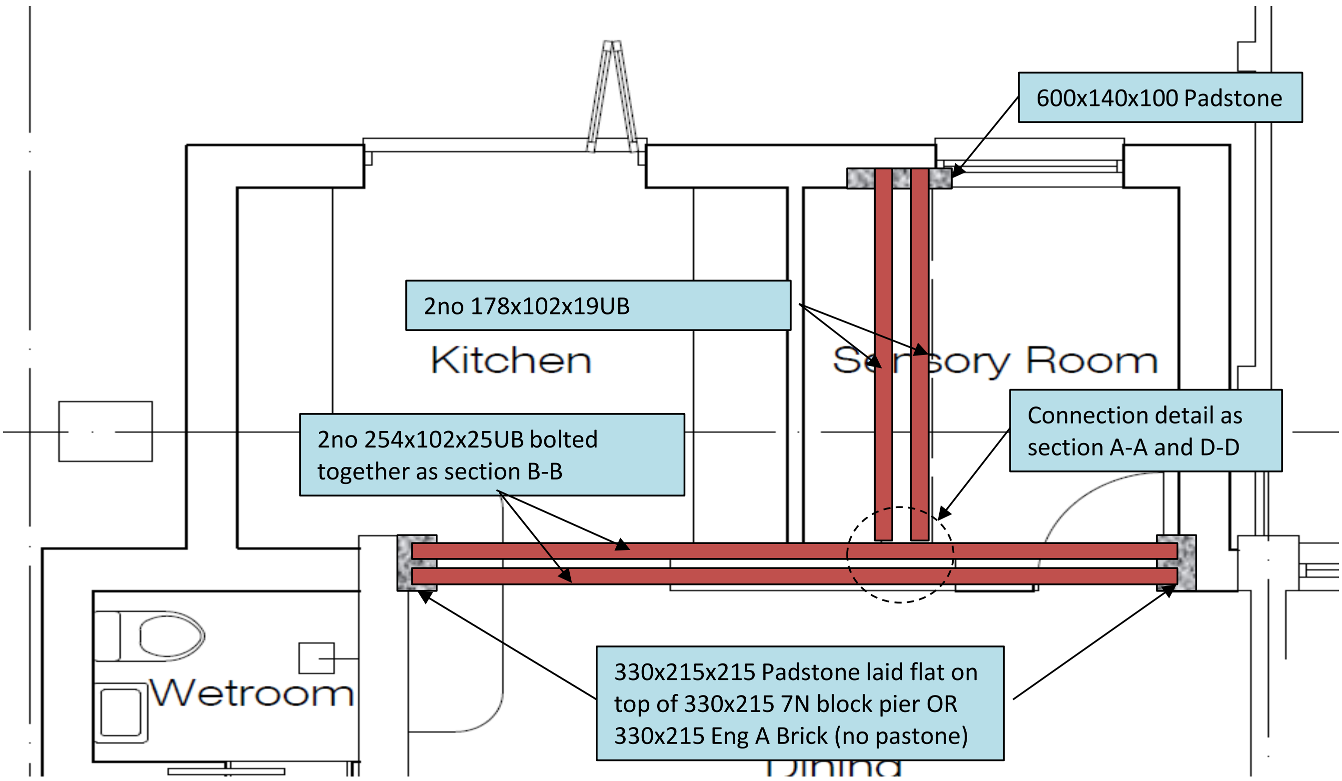
The design is assuming:

780mm min long masonry nib wall return either side of end bearing (ignore in extension)

Masonry is in good condition and 7Nmm2

Cavity wall is suitable tied

Foundations are present, adequately designed and on a standard load bearing strata of 150kN/m2



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Structural, Civil and Geotechnical Engineers	Client	Kelly Guarino	IL	4-1-23	22568
Tel: 07946 065051	Description	Connection Details	Checked	Revision	Page No
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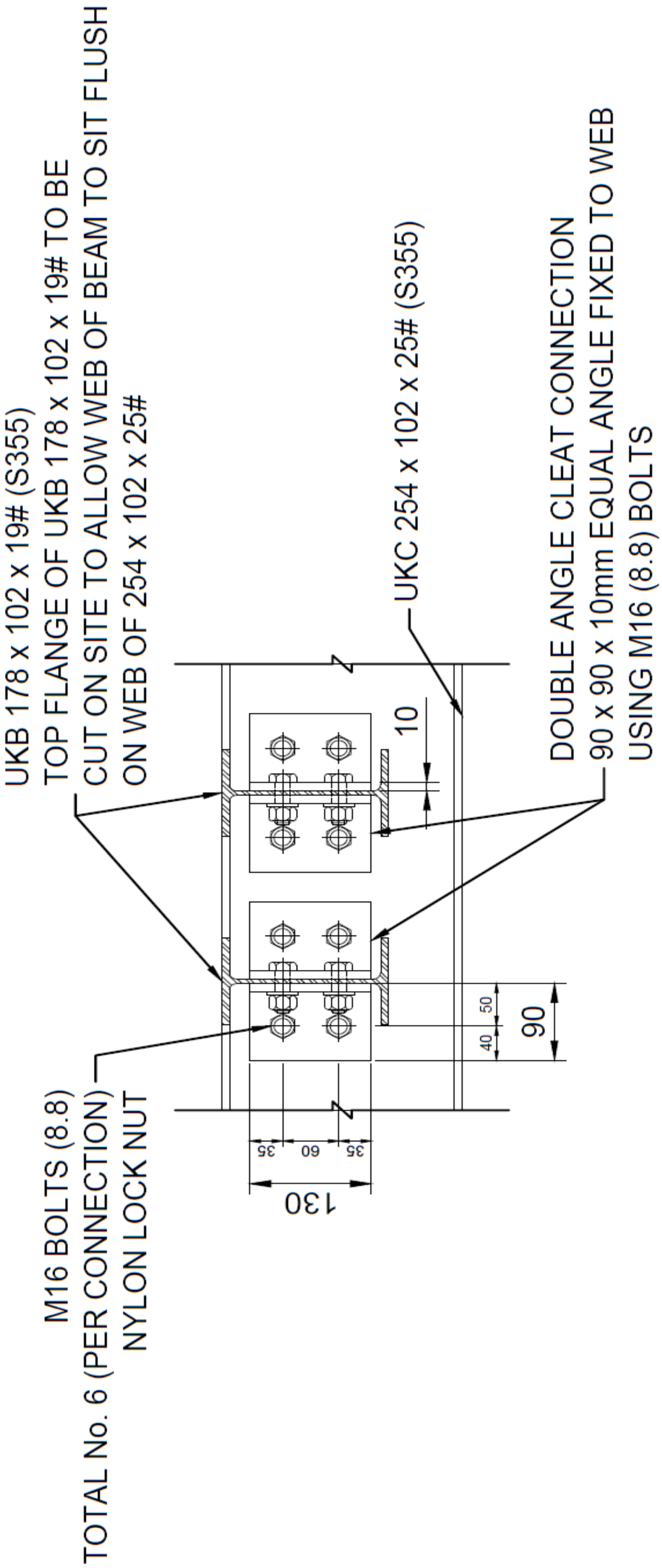
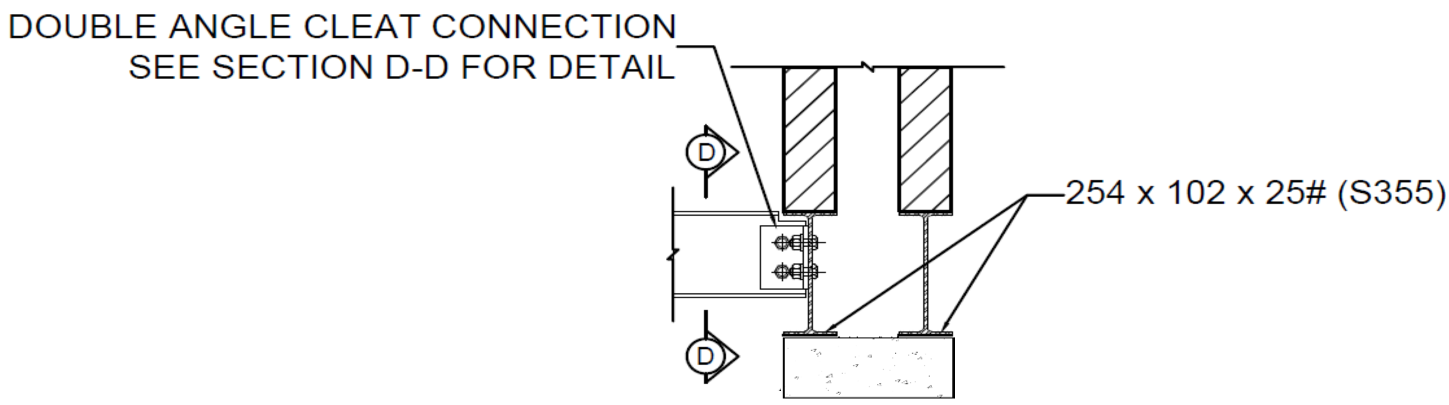
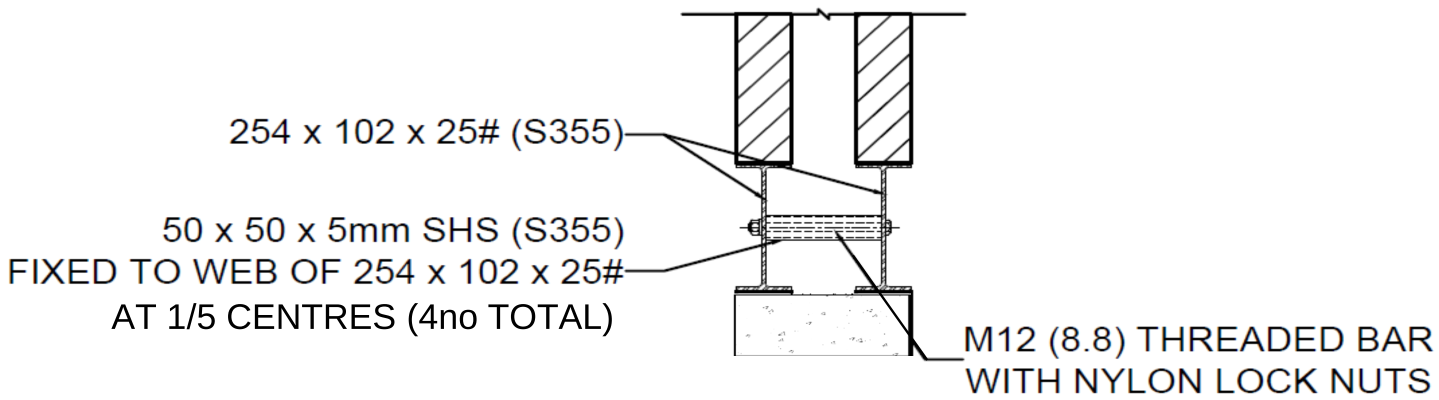


SECTION D-D (DOUBLE ANGLE CLEAT CONNECTION DETAIL)



SECTION A-A



SECTION B-B