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LOFT CONVERSION

Revision

SNB ASSOCIATES LTD

Calculations By:

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Building Regulations Approval

Most structural alterations will require Building Regulations approval and must be inspected by an Approved Inspector prior to concealing or covering structural members. It is the client's and contractor's repsonsibility to ensure that applications and inspections have been carried out.

Planning Permission

Planning permission may or may not be required in connection with the work described herein, and a suitabily qualified architect or planning advisor should be consulted before commencement of work.

Party Wall Agreements

Structural alterations to a Party Wall, or excavations in the vicinity of a neighbour's property, will require the adjoining ower's consent under the Party Wall Act 1996. This will require a Party Wall Agreement to be made before commencement of the works. Advice may be obtained from the government Planning Portal www.planningportal.gov.uk or by contacting a Chartered Building Surveyor.

Safety

This information is provided in the expectation that those appointed to carry out the work are suitably qualified and experienced contractors. If there is any doubt about aspects of the specification, the engineer should be contacted before commencement of work on site. The work described should be capable of being carried out using the normal range of skills and equipement expected of a competent general contractor. If any operations are outside this norm a method statement or more detailed description of the procedure should be requested.

Excavations in excess of 1.2 metres deep or in unstable ground should not be entered by any person unless a system of shoring or ground support has been installed.

Any variation between the architect's drawings and specification and this information should be brought to the attention of the architect and engineer immediately.

Temporary Support

Installation of beams, lintels or other supporting structures should be undertaken only with the provision of suitable temporary support to the strucutre above. Attention should be paid to the nature of the supported loads (from the calculations/drawings) and the capacity of props, shores and needle beams as appropriate. If in doubt about the requirements, contact the engineer before commencement of work.

Dimensions etc

The dimensions given in these documents are for design purposes only and should be checked on site for construction. Beam sizes are give for identification of the section and span dimension is between centrelines of supports (i.e. neither the length of the beam nor the opening width).

Codes and references

BS 648 Weights of building materials
BS 6399 Part 1 1984 : Loading for buildings - Code of practice for dead and imposed loads.
BS 6399 Part 3 1988 : Loading for buildings - Code of practice for imposed roof loads.
BS 5268 Part 2 1988 : Structural use of timber - Code of practice for permissible stress design, materials and workmanship
BS 5950 Part 1 2000 : Structural use of steelwork in buildings - Code of practice for design in simple continuous construction: hot rolled sections
BS 5628 Part 1 1985 : Code of practice for masonry - the structural use of unreinforced masonry.
Steelwork design guide to BS 5950-1: 2000, Volume 1 Section Properties and Member Capacities, 'Blue Book' Publication P202
Span tables for solid timber members in floor, ceilings and roofs for dwellings, TRADA Design Aid DA1/2004

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Structural General Notes

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 steelwork connections to use grade 8.8 bolts unless stated otherwise. These are to be spanner tightened using the appropriate podger spanner (min length 460mm) or suitable power tools in accordance with BS2583. If a torque wrench is used the torque applied should be around 90Nm for M16 bolts, 110Nm for M20 & 130Nm for M24.

4. All timber to be grade C24 (SC4), unless stated otherwise. Preservative treated to Architects details.

5. To be read in conjunction with Architects drawings, any inconsistencies between the drawings should be reported. If any site conditions or existing details are found that may effect the structural design, Structural Engineer is to be notified immediately.

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

7. 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-slate introduced, then pointed up with mortar.8. All blockwork to be 7.3 N/mm2 in class III mortar below DPC in accordance with BS 5628 : Part 3 : 2005 or suitable 7.0 N/mm2 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.

9. The project requires the introduction of heavy structural elements such as steel beams or concrete lintels. the Construction (Design and Management) Regulation 2015 would apply to this type of construction, the designer has an obligation to foresee risks and bring to the attention of the builder such risks. In consequence, the builder is to take into consideration the placement of all 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.

10. CLIMATE CHANGE: The Building Research establishment have produced a document CBG 63 "Climate Change: impact on building design and construction". Part of their recommendations are that designers and builders should give consideration to:
a. Increased wind loading by providing additional laps and fixings to roof coverings
b. Consider foundation depth on shrinkable clays and to avoid future problems, increase the depth above standard requirements if there is a risk. This should be in accordance with the NHBC Standards, Chapter 4.2 Guidance on Building near Trees. If the calculations do not specifically design the depths of the foundations to take into account any local trees, then this should be checked and agreed with the Building Inspector on site.

11. DESIGN STRESSES FOR OLD BRICKWORK
The London District Surveyors recommended that the design stresses for old brickwork be calculated assuming 7N bricks laid in non-hydraulic lime mortar for which CP111: 1964 Table 3 recommended a basic compressive stress of 0.42 n/mm^2 for unfactored loads. Local bearing stresses to CP111.1964 Clause 315.d could be increased by 50% giving a permissible local bearing stress of 0.42*1.5 = 0.63 n/mm^2 for unfactored loads. The localised permissible stress for unfactored loads of 0.63 n/mm^2 is accepted by the City of London, Wandsworth Council, Bexley Council, Harrow Council, Newham Council, Greenwich Council, Enfield Council and Camden Council. In addition the unfactored stress on existing blockwork should not exceed 0.48 n/mm^2

12. Subsoil Conditions: Reference to the British Geological Survey Drift map indicates the property t o be sited in an area of Alluvium underlain by London ClayAssumed safe ground bearing pressure= 100 KN/m^2 min at GL.

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Structural Loading

Flat Roof

Chippings	0.24	
Felt	0.09	
Boarding	0.19	
Joist	0.12	
Insulation	0.02	
P'Board & Skim	0.19	
Dead Load	0.85	KN/m^2
Live Load	0.75	KN/m^2
Total	**1.5**	**KN/m^2**

Pitch Roof

Dead Load of slope		
Tiles	0.62	
Felt and Battens	0.05	
Rafter	0.09	
Dead load	0.76	
Dead Load on Plan		
Dead Load plan	0.95	KN/m^2
Live Load	0.75	KN/m^2
Total	**2**	**KN/m^2**

External Stud Wall

Tiles	0.62	
Felt & Battens	0.05	
Studs	0.19	
Insulation	0.01	
P'Board & Skim	0.19	
Dead Load	**1.06**	**KN/m^2**

External 215 Brick Wall

215 brickwork	4.3	
Plaster	0.21	
Dead Load	**4.51**	**KN/m^2**

Brick & Block Cavity Wall

112 Brick skin	2.16	
100 Block skin	0.77	
Plaster	0.21	
Dead Load	**3.14**	**KN/m^2**

Ceiling

Ceiling Joist	0.13	
Insulation	0.01	
P'Board & Skim	0.19	
Dead Load	0.33	
Live Load	0.75	KN/m^2
Total	**1.08**	**KN/m^2**

Suspended Timber Floor

Boarding	0.12	
Joists	0.19	
P'Board & Skim	0.19	
Dead Load	0.5	
Live Load	1.5	KN/m^2
Total	**2**	**KN/m^2**

Stud Partition

Studs	0.19	
P'Board & Skim	0.38	
Dead Load	**0.57**	**KN/m^2**

Block Partition

Blockwork	0.77	
Plaster both sides	0.43	
Dead Load	**1.2**	**KN/m^2**

External Block Wall

225 Blockwork	1.72	
Plaster both sides	0.21	
Render	0.44	
Dead Load	**2.37**	**KN/m^2**

Concrete Density	24	**KN/m^2**
Brick Density	20	**KN/m^2**
Block dessity	10	**KN/m^2**
Soil Density	18	**KN/m^2**

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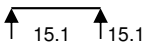
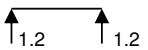
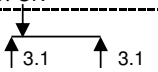
Floor Joist 200 x 50 @ 400 crs C24 Timbers					Max Span=		3.3	m	200 50
Loading	Floor=	2x0.4=	0.8	KN/m					Ixx= 33.33
	M=	0.8x3.3^2/8=		1.09	KNm				Zxx= 0.33
Bending Strength		fbc=1.1/0.33=	3.3	<8.3N/mm^2 ∴ OK					
δ=(5x0.8x3.3^4)/(384x10800x33.33)=				3.4	<0.003xL=		9.9		∴ OK
Roof Joist 150 x 50 @ 400 crs C24 Timbers					Span=		2.3	m	
Loading	Roof=	2x0.4=	0.8	KN/m					Ixx= 14.06
	M=	0.8x2.3^2/8=	0.5	KNm					Zxx= 0.19
Bending Strength		fbc=0.5/0.19=	2.8	<8.3N/mm^2 ∴ OK					
δ=(5x0.8x2.3^4)/(384x10800x14.06)=				1.9	<0.003xL=		6.9		∴ OK
Note: Existing Rafter if retained to be strengthened with 150x50 timber C16 bolted to existing rafters with M10 Bolts									
Flat Roof Joist 150x 50 @ 400 crs C24 Timbers					Max Span=		3.4	m	150 50
Loading	Roof=	1.5x0.4=	0.6	KN/m					Ixx= 14.06
	M=	0.6x3.4^2/8=	0.9	KNm					Zxx= 0.19
Bending Strength		fbc=0.9/0.19=	4.6	<8.3N/mm^2 ∴ OK					
δ=(5x0.6x3.4^4)/(384x10800x14.06)=				6.9	<0.003xL=		10.2		∴ OK
Ridge Beam R1		Span Le =	5.8	m					 15.1 15.1
Loadings	Roof=	2x2.3/2=	2.3	w=	5.2	KN/m			
	Flat Roof=	1.5x3.4/2=	2.6						
	SW=	0.37=	0.37						
	M= (5.2x5.8^2/8)=	**22.0**	KNm	x(γ)1.5=	**33**	KNm			
Bending Moment Check 152UC37 From BS5950-2000-1 Member Capacities									
M_b=	43.1	KNm >>>>	33	KNm	Le=8m	∴ OK			152UC37
Shear Capacity=	214	KN >>>>	22.7	KN ∴ OK					Ixx= 22.1
Deflection Check									Z= 273
δt=(5x5.2x5.8^4)/(384x0.21x22.1)=				16.6	mm<L/250=		23.2		∴ OK
δLL= 70% x δt=				11.6	mm<L/360=		16.1		∴ OK
Bearing on 400x100x25thk MS Bearing Plate and spreader over chimney					15/(100xL)=1.5x0.42 L =				240
Trimmer T1 2 No. 200x 50 C24 timbers			Span	1.4	m				 1.2 1.2
Loading:	Floor=	2x1/2=	1	w=	1.75	KN/m			
	Stud=	0.5x1.5=	0.75						
	M=1.8x1.3^2/8=	0.43	KNm	R=	1.2	KN			Ixx= 33.33
Bending Strength		fbc=0.43/(2*0.33)=	0.6	<8.3N/mm^2 ∴ OK					Zxx= 0.33
δ=(5x1.8x1.3^4)/(384x10800x2x33.33)=			0.122	<0.003xL=		4.2			∴ OK
Trimmer T2 3 No. 200x 50 C24 timbers			Span	3.3	m				 3.1 3.1
Loading:	Floor=	2 @ 0.4m=	0.8						0.9 0.3
	Stud=	0.5x2.2=	1.1	w=	1.9	KN/m			
Point T1=	1.2	KN @ 0.6m	Equiv UDL=	1.979431	KM/m				4.1 3.4
M=(3.4x1.8)-(1.9x1.8^2/2)=		2.69	KNm	R=	3.1	KN			Ixx= 33.33
Bending Strength		fbc=2.7/(3*0.33)=	2.7	<8.3N/mm^2 ∴ OK					Zxx= 0.33
δ=(5x2x3.3^4)/(384x10800x3x33.33)=			2.830	<0.003xL=		9.9			∴ OK

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Beam LB2			Span =	5.8	m				
Loadings	Floor =	2x5.7/2=		5.7					18.0 18.0
	s/w=			0.46	w=	6.2	KN/m		2.6 0.8
Point T2=		3.4 KB @ 1.3m							
	M=(19x3)-(6.2x3^2/2)=		29.10	KNm>xγ1.5=	44	KNm			
Bending Moment Check 203UC46 From BS5950-2000-1 Member Capacities									21 18.7
	M_b=	72.5 KNm >>>>	44	KNm		Le=8m∴	OK		203UC46
	Shear Capacity=	241	KN >>>>	30.9	KN ∴ OK				Ixx= 45.6
Deflection Check		Equiv UDL=		6.9					
δt=(5x6.9x5.8^4)/(384x0.21x1x45.6)=				10.6	mm<L/250=	23.2			∴ OK
	δLL= 70% x δt=			7.5	mm<L/360=	16.1			∴ OK
600x100x25thk MS Bearing plate and 203x102UB23			21/(100xL)=	1.5x0.42		L=	327		∴ OK
Beam LB1			Span =	5.8	m				
Loadings	Floor =	2x3.3/2=		3.3					24.9 24.9
	Stud Wall=	1x1=		1					3.2 0.9
	Roof=	2x3.8/2=		3.8					
	s/w=			0.46	w=	8.6	KN/m		
Point T2=		4.1 KB @ 1.3m							
	M=(26x3)-(8.6x3^2/2)=		39.30	KNm>xγ1.5=	59	KNm			28.1 25.9
Bending Moment Check 203UC46 From BS5950-2000-1 Member Capacities									
	M_b=	72.5 KNm >>>>	59	KNm		Le=8m∴	OK		203UC46
	Shear Capacity=	241	KN >>>>	38.8	KN ∴ OK				Ixx= 45.6
Deflection Check		Equiv UDL=		9.3					
δt=(5x9.3x5.8^4)/(384x0.21x1x45.6)=				14.4	mm<L/250=	23.2			∴ OK
	δLL= 70% x δt=			10.1	mm<L/360=	16.1			∴ OK
600x100x25thk MS Bearing plate and 203x102UB23			28/(100xL)=	1.5x0.42		L=	446		∴ OK
Part Wall Design Check on foundations									
Existing loads on Part wall									
Brick Loading	4.3x6.5=		27.95	Average Height Assumed					
	w=		27.95	KN/m					
Proposed Load on Party Wall									
Existing Loading as per above				27.95					
Equivalent UDL from LB1+2+3+R1=		95/7.6m=		12.2	Assuming 45 Degree load spread to Foundation				
Assuming equivalent loft at neighbouring property				12.2	This is a conservative assumption				
		w=		52.3	KN/m				
Assuming minimum foundation width at 12" depth of 600mm Bearing stress applied									
52/0.525=		99.6 << 110 KN/m^2	So therefore Okay						
40/0.525=		76.4 << 110 KN/m^3	So therefore Okay assuming no neigbouring loft conversion						

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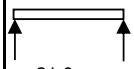
Beam LB3			Span =	5.8	m				
Loadings	Floor =	2x2.5/2=		2.5					
	Stud Wall=	1x2.2=		2.2					
	Roof=	1.5x3.4/2=		2.55	w=		7.25		
	M=(7.3x5.8^2/8)=		30.49	KNm>xγ1.5=	46	KNm			
Bending Moment Check 203UC46 From BS5950-2000-1 Member Capacities									
	M_b=	72.5	KNm >>>>	46	KNm		Le=8m∴ OK		
	Shear Capacity=	241	KN >>>>	31.5	KN ∴ OK				
Deflection Check		Equiv UDL=		7.3					
δt=(5x7.3x5.8^4)/(384x0.21x1x45.6)=				11.2	mm<L/250=	23.2			∴ OK
	δLL= 70% x δt=			7.8	mm<L/360=	16.1			∴ OK
600x100x25thk MS Bearing plate and 203x102UB23			21/(100xL)=	1.5x0.42		L=	334		∴ OK



21.0 21.0

203UC46
Ixx= 45.6